THE DEATH OF A GREAT LAND

Ritual, History and Subsistence Revolution in the Southern Highlands of Papua New Guinea

VOLUME I

Text

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Except where otherwise acknowledged in the text, this thesis represents the original work of the author

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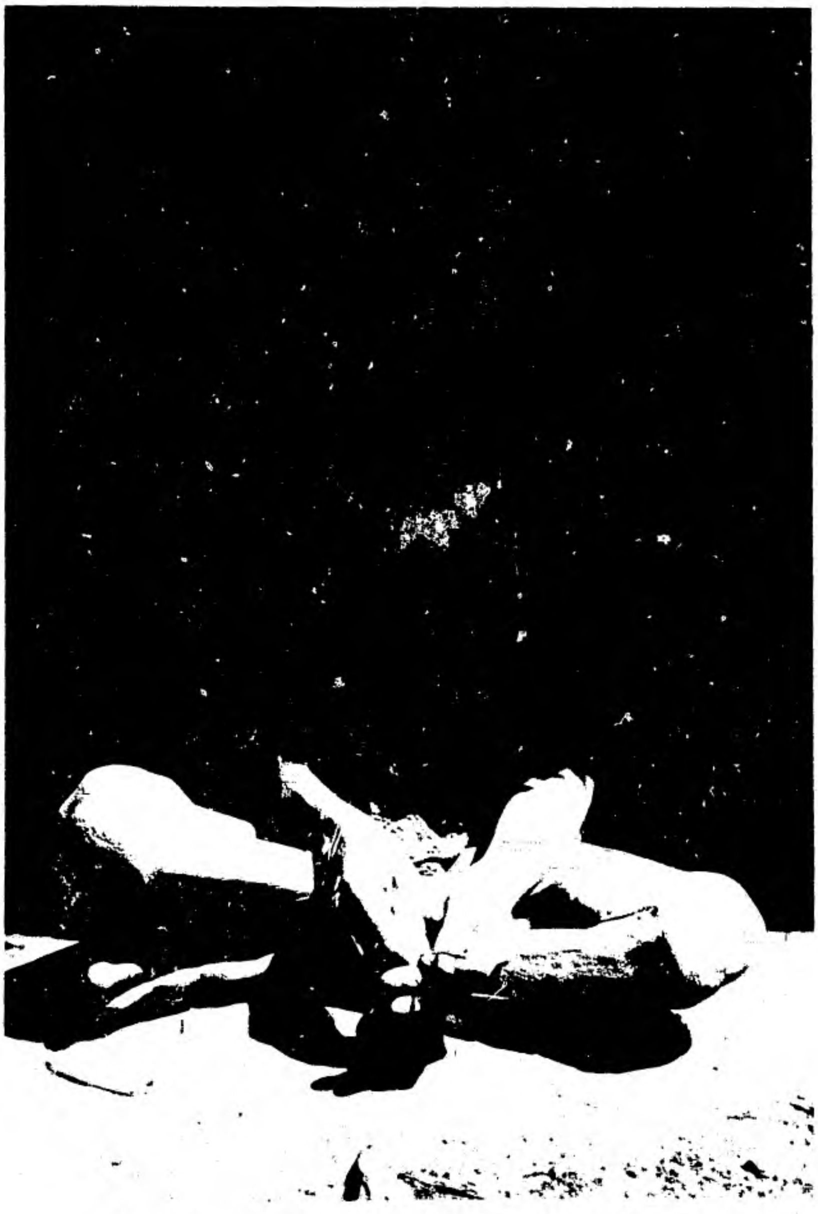

The late Hoyamo Hilira recounting the events
of the Alua mud flow, Biangoanda, Tari Basin, 1991

O dindi timbu homedaru...
A great land [community] has died...
o wali agali ira baowa timbuni dedaliru.
women, men and trees, all alike have been destroyed.
O tene agilene.
What is the cause of this?
Dindi[ni] walini nogoni...
[Disputes over] land, women and pigs...

Endeli, Chairman of Magistrates, Hiwanda Village Court, June 1978
(after Goldman 1988:v)

ABSTRACT

The relationship between environmental conditions and the decisions and actions of historical agents is the central issue of this thesis. In a brief review of the role that social and environmental factors have played in archaeological explanation, I describe the scope for a form of archaeological ethnography in which particular attention is paid to the contrast between the different worlds of meaning in and through which historical agents address their environments.

In the context of a debate over the impact of sweet potato upon society and environment in the New Guinea Highlands, the history of wetland use emerges as a focus for competing positions on the nature of explanation for relationships between societies and their environments. My study addresses this debate through consideration of the recent history of Huli-speaking communities of the Tari region, in the Southern Highlands of Papua New Guinea.

Part B sets out an ethnographic model of the relationship between Huli people and their environment. External and Huli perceptions of landscape, society and agricultural production are presented in order to permit explanations for change that encompass both the intentions of Huli agents of the recent historical past, and the broader social and environmental processes of which those historical individuals cannot have been aware. The roles of cosmology and ritual in the relationship between Huli and their environment are singled out for the contrast they evince between an external, Western concept of historical progress and a Huli notion of continuous, entropic decline in the world and in society.

The history of a particular landscape, the Haeapugua basin, is addressed in Part C. Detailed oral historical accounts of land tenure and wetland use set a context for the archaeological investigation of the Haeapugua wetlands and wetland margins. On the basis of archaeological and palaeoenvironmental evidence, it is possible to demonstrate the significance of environmental change in placing broad limits on the possibility of wetland reclamation; this leaves unanswered, however, the more complex issue of human agency and decision-making in the processes and actual timing of wetland reclamation and abandonment.

Through reference to the role of ritual in the relationship between Huli and their environment, as set out in Part B, Part D attempts an explanation for wetland reclamation at Haeapugua. The oral history of migration from the central Huli basins is shown to reflect an increase in population consequent upon the local adoption of sweet potato. While acknowledging the importance of population pressure on dryland resources, I suggest that the more significant imperative for the Huli who undertook the reclamation of the Haeapugua wetlands was the increased demand for fodder with which to augment the production of pigs. Pressure on dryland resources, decline in soil quality and increasing social conflict were all interpreted by Huli as tokens of entropic decline, of the death of the land. Within the framework of Huli cosmology, the appropriate response to these changes was the innovation and elaboration of ritual and it was the greater requirements of pigs for sacrifice and for exchange in ritual contexts that provided the immediate impetus for wetland reclamation.

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PART A

ARCHAEOLOGY AND SOCIAL HISTORY

When people... speak... of the influence of geography or climate on history, they are mistaking the effect of a certain person's or people's conception of nature on their actions for an effect of nature itself... In itself, [nature] is merely a raw material for historical activity, and the character of historical life depends on how this raw material is used.

Collingwood, 1946, p.200

CHAPTER A1 - EXPLANATION IN ARCHAEOLOGY

A fundamental point of departure for this thesis is the observation that much archaeological explanation is curiously ahistorical, insofar as it fails to address adequately the role of human agency in its accounts of the past. I take the principal purpose of archaeology to be the reconstruction of historical change in human society and in its interaction with the environment. Yet archaeology's approach to the nature of social change and, in particular, to the structure of engagement between social and environmental change appears poorly theorized. My intention in this thesis is not to expound such theory directly - I have reservations about the claims for any theory that would seek to embrace the entire discipline - but rather to explore through a particular case study the closer texture of historical interactions between humans and their environment as a means of rethinking the pivotal role in this relationship of human agency.

Debate over the relationship between, and relative weight to be accorded to, social and ecological factors in archaeological explanation appears to have reached something of an impasse with opposed camps of opinion grouped around seemingly irreconcilable creeds. This difference of opinion reflects a broader division in archaeological thought between two loose coalitions of thought: the behaviourists, processualists, or materialists on one side and the humanists, post-processualists or "mentalists" on the other (from amongst a wide range of other invective labels). In as much as it is possible to generalise about the range of diverse views expressed within each of these groups, the respective positions they have taken on the question of the role for human agency in archaeological explanation frame the intermediate position that I want to adopt here, and are briefly sketched in the course of this chapter.

Behaviourist explanation is characterised by an avowedly scientific and empiricist approach to archaeological evidence in which explanation proceeds from the surer ground of ecological and technological observation. Cultural influences on this material record are engaged largely to address the residual 'dissonances' unaccounted for by strictly ecological and utilitarian explanations (Gould 1985:641, Gould and Watson 1982:367). In line with the chain of inference that this procedural sequence establishes, where technological or ecological explanations are not forthcoming, archaeologists are 'forced back to a cultural one' (Jones, cited in N.Thomas 1981:166). Behaviour and cognition are distinguished from one another and deliberately 'disaggregated', with the latter treated explicitly as a 'black box' (Gould 1985:642) to which archaeologists should seek no access.

The principal tenet underpinning this approach is the uniformitarian assumption that 'processes in the past were not qualitatively different than those we observe today' (Kent 1987:43, see also Gould 1980:x). Closely allied to this assumption is the presumption of a universal rationality which enables archaeologists to distinguish between decisions founded on sound economic and ecological rationales and those that are ecologically or economically irrational and hence a product of the specific cultural environment (e.g. Trigger 1982:35); conversely, when culture is 'held constant', the variability in behaviour which constitutes the real data of archaeology can more clearly be identified (Binford 1985:585)[1]. It is probably fair to suggest that the bulk of archaeological writing, and specifically the writing on archaeology of the New Guinea Highlands discussed in the following chapter, adopts this broad logic of explanation, unconsciously or otherwise.

The post-processualist critique of behavioural archaeology takes the black box of human cognition as the primary goal of archaeological enquiry. Although my sympathies lie firmly with this latter position and this thesis is itself an elaboration upon the critique of behavioural archaeology, I do not intend to rehearse in detail the central arguments of post-processual archaeology[2]. It is sufficient here to note that the assumptions of uniformitarianism and of a universal and trans-temporal rationality are rejected in favour of an approach which assumes that subjectivity is culturally distinct in the present and that the past is qualitatively different from the present (J.Thomas 1991b:16). In its most extreme form, the post-processualist critique argues that,

> Social change can only be explained in terms of the social. Non-social factors, at best, set down parameters. They have no direct explanatory power.
>
> Tilley 1982:37 (emphasis in original)

While I am essentially in agreement with this position, it risks neglecting the role that non-social or environmental factors play in social change or the complexities of the relationship between change in the environment and change in society. What this thesis attempts is a closer examination of this relationship through consideration of the role that perceptions of their environment play in the decisions of human agents.

Bailey has attempted to find some middle ground between these two poles of opinion by relating social and ecological forms of explanation to different temporal

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1. Gould elaborates upon Binford's point: 'Only by looking for and recognizing anomalies to general patterns of conformity to utilitarian expectations in human behavior can we reliably infer when and under what conditions symbolic and ideational factors make a difference in the ways people actually behave' (1980:xi).
2. For details of the broad post-processualist critique see Hodder (1986), Shanks and Tilley (1987a, 1987b), J.Thomas (1991a).

scales in his theory of "time perspectivism" (1983, 1987) which he defines as,

> the belief that different time scales bring into focus different sorts of processes, requiring different concepts and different sorts of explanatory variables.
>
> Bailey 1987:7

The emerging pattern in archaeology which sees explanations for the distant past invoking ecological factors and those for the more recent past deriving from social factors may reflect the relative ease of such solutions but should not go unchallenged (J.Thomas 1988, Wobst 1990:338). A significant objection to time perspectivism, and one that Bailey himself acknowledges (1983:181, 1987:15), is that changes over longer periods of time are no more (or less) reducible to ecological causes than are changes over short periods (Ingold 1983:5). Alternatively put, while acknowledging the difficulty of conceiving of human agency compounded over millenia, it needs to be recognised that social factors are at play in change over long periods to the same extent that they are over short periods. The challenge for archaeology is to think of the scope for human agency even in the apparent absence of evidence and thus create the possibility of its identification (N.Thomas 1981:172). This possibility is not, as Murray (1994:19) would have it, subject to varying circumstances of archaeological preservation, but rather a requirement that we look to forms of evidence and links in explanation other than those with which the discipline has traditionally equipped itself. This, in turn, requires that we reconsider the nature of archaeological evidence and its analogical interpretation.

Patrik (1985) has shown how different notions of archaeological evidence, constituted as the archaeological "record", underwrite both the essentially positivist approach to knowledge of the processualists and the post-processual treatment of archaeological material as a text requiring interpretation. The terms employed by each approach expose contrasting sets of metaphysical implications and assumptions about the admissibility of different forms of analogical reasoning. Patrik raises the possibility that the two approaches reflect different stages in the process of archaeological interpretation: the processualist position emphasising the recovery of acts of deposition from the archaeological record and the post-processualists focusing instead upon the construction of the archaeological record as the material residue of worlds of meaning (Patrik 1985:55). Both approaches assume the presence of archaeological material as a record, though the interpretative constitution of evidence from different theoretical standpoints may yield radically different types of record (Wylie 1985:87).

We need, says Barrett (1987), to consider what it means to constitute material evidence as a record. How are the concerns of archaeological inquiry in the present and the evidence of meaningful practices in the past combined in the construction of the notion of a record? The crucial link in this process of construction is the role played by analogical inference. Archaeology, however particular positions within it might otherwise pretend, is unavoidably analogical (Wylie 1985:64). Attempts to prescribe a "scientific" model for archaeological reasoning do so at the expense of reducing analogical inferences to the status of universalist observation, flattening out the landscape of culturally informed human agency. Where analogues are admitted in archaeological explanation under the scientific model, they tend to be restricted to the most direct and mechanical forms, a process that treats ethnography as a quarry. Instead, as I argue below, an archaeological ethnography should be a forum for debate over the social contexts for material evidence, a means of understanding the role of human agency in the constitution of archaeological evidence.

Archaeology, as a form of history, must address human agency and, by extension, the intentional constitution of history. Human agency reflects intentionality, expressed as action (or practice) mediated by decision. Significantly, human action in the environment of the material world reflects particular cultural dispositions. Crops, technologies and landscapes, for example, are not universally perceived and thus acted upon in the same ways; their significance for historical agents cannot therefore be unproblematically understood across either cultures or time from the perspective of a single (and commonly Western) rationality[3]. This is not to adopt a position of extreme "emergentism" in which history is seen as entirely the product of an autonomous human agency, unmediated by its material environment. The material world influences human decisions, but it does so initially through the lens of human perception. Archaeological explanation, then, needs some understanding of environmental influences as they are understood and acted upon by human agents.

If a role for human agency in history is accepted, the extent to which agents are themselves temporally embedded and time-reflective must be appreciated, and an attempt made to comprehend the cultural constitution of that temporality. To understand the twin and inseparable influences of environmental and social factors upon the world of historical agents, we need therefore to consider the role of a "worldview"

3. Hodder (1986:13-14) offers a nice illustration of this point that has a particular resonance for the case study presented in this thesis: 'Causes in the form of events, conditions and consequences (intended and unintended) in the world, cannot have social effects except via human perception and evaluation of them. Thus land erosion may be a cause with the effect that people abandon their village and disperse. But the effect of land erosion does not by itself determine any particular response because there are many ways of dealing with or avoiding or preventing land erosion. How land erosion or its effects are perceived, and how the possible responses are evaluated, depend on how land erosion is involved in individual social strategies within particular culture-historical contexts.'

for those agents[4]. Necessary though this perspective is, it remains but one component of the broader process of historical or archaeological explanation. While history requires an understanding of intentionality, it must also be recognised that human agents often have no sense of the broader social and environmental conditions of their actions (Shanks and Tilley 1987a:116); further, that their actions have unintentional effects, both in the sense that individual actions have unintended consequences and in the sense in which the broader significance of historical action lies beyond the comprehension of individual agents or groups[5].

Explanation must thus account for both intentional action and unintentional consequences, but must also seek to distinguish between them. Gardner (1989), referring to Weber's injunction that interpretation be adequate at the levels of both cause and meaning, or structure and intention, notes that this entails that studies which address the actions of humans cannot 'permanently dispense with a consideration of their intentional world'. Conflation of these two levels of explanation gives rise to teleological accounts of history (O'Grady 1986) which impute to historical actors intentions read backwards from their longer-term effects and legitimate an improperly temporalized vocabulary[6]. One means of drawing attention to the distinction between the levels of cause and meaning is to treat archaeology as a narrative discourse and consider the role of narrative structures in archaeological explanation.

The writing of archaeological history turns upon the notion of event. Yet events have no existential reality; they are not immanent in the past (Shanks and Tilley 1987b:135). Rather, events acquire valence and meaning through their position in a relative sequence of other events, their "emplotment" within a narrative context. Revolutions, for example, are defined as such in terms of the perceived transformation between previous and subsequent conditions (Landau 1987:112-113). However it might be available to us in the form of evidence, history is made known to us, is rendered meaningful, through the form of narrative[7]. While we may accept that the past "really" happened, there can be no absolute rendition or truth of that past but rather accounts of the past that bear the trace of their own historical contexts. Specific narratives, then, betray implicit assumptions or "prefigurative constructs". The most

4. Some of the dangers of employing an encompassing "worldview" in this way are addressed in Chapters B1 and D2.

5. Binford is thus correct in his statement that archaeologists should study 'an order of reality that was unknown to participants in ancient cultural systems' (cited in Duke 1991:21) though it requires the proviso that the role of the "reality" which structured their actions, however inaccessible that might be, needs also to be addressed.

6. Such as 'incipient horticulture' (Saggers and Gray 1987:119), 'nascent agriculture' (Feil 1987:29) or 'protoagriculture' (Sorenson 1976).

7. Useful accounts of narrative approaches to history are given by Spence (1982), Ricoeur (1984) and H.White (1987).

pervasive of these in archaeological writing draws on what Jones (1990:49) identifies as 'the progressionist legacy of the 18th century Enlightenment'. Variously labelled "progressivism", "complexity", "modernism" or "meliorism", this tendency to represent historical change as a progression from simple to complex represents a temporal extension of the universalist assumptions of behavioural archaeology (Rowlands 1989, Tilley 1989:108, J.Thomas 1991a:1-2).

Relinquishing the possibility of access to an ultimate truth of the past is an uncomfortable move for many archaeologists. If there is scope for an infinite number of possible narratives to suit a finite past and yet no absolute measure of their relative value, how are we to judge amongst them? The criteria proposed by narrativists for such judgement centre around notions of the "usefulness" of narratives and their lack of "closure". Narratives can be evaluated on the basis of their internal consistency, but those narratives with a capacity to address without undue harm the available evidence whilst simultaneously opening up the widest range of further avenues for explanation are the most useful. The least useful are those "totalizing" narratives that seek to encompass the past within a single framework of explanation to the exclusion of other possible forms (J.Thomas 1991a:178). It is important to recognize that my argument here is not a prescription for archaeological writing but rather a description of the way in which archaeological explanation appears in fact to proceed. Archaeological practice contains within it a significant wisdom about the nature of archaeological explanation, however much this wisdom might have eluded our attempts at a theoretical legislation of practice.

In the following chapter, I consider the debate over the Ipomoean revolution in Highland New Guinea, both as a case study of the role of narrative in archaeological explanation and as a context for my own study of the impact on local society and the environment of the historically recent adoption of sweet potato by Huli-speaking communities of the Southern Highlands. This focus on the recent past of the last three to four centuries affords the clearest access to the level of detail necessary to trace the processes of social and environmental change which I wish to address. Working with a single language community and paying particular attention to oral narratives about Huli history allow me to consider issues of the relationship between historical individuals and the social structures within which they acted, and which they acted upon, while also providing a sense of change over a period sufficient to inform our understanding of change on an expanded temporal scale[8]. A further advantage of this form of "archaeological ethnography" is the closeness of analogical interpretation it affords.

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8. A strategy outlined and recommended by M.Johnson (1989:208-209); see also Irwin (1986:190) and Gosden (1989:47).

Ethnographic methods have rarely been used to full advantage by archaeologists, due in large part to misconceptions about the role of ethnographic analogy that stem from the use of ethnography in archaeology as a quarry for direct or mechanical analogues. In her review of archaeological uses of ethnography, Kent (1987) distinguishes between three different approaches: the early practice of "anthropological archaeology", whose goals were 'cultural historical' and whose methods were dependent largely upon direct analogies between present and past; "archaeologically oriented ethnography", the provision of 'potentially useful ethnographic material for analogs as aids in the identification of archaeological descriptions'; and "ethnoarchaeology" whose goals are 'to formulate and test archaeologically oriented and/or derived methods, hypotheses, models, and theories with ethnographic data'. Ethnoarchaeology, as Kent views it, is specifically not concerned with cultural history or with the generation of analogues.

What all three approaches appear to share is Kent's (1987:42-43) assertion that, '[a]t best, ethnographic analogies can only be limited identifications of cultural material', that 'analogy for identifications is valid but analogy for explanations or understanding is not'. This limited scope allowed to interpretation through analogy reflects the behaviourist framework within which much of ethnoarchaeology has been conducted, and is refuted in part by the work of Wylie (1985) referred to above. My objection to Kent's vision of ethnography is that it hardly touches upon the real potential of ethnography for the interpretation of past social process. What I have in mind, and what this thesis attempts to illustrate, is a form of ethnography conducted by archaeologists on a temporal and spatial scale that is considerably more inclusive than that conventionally practised by anthropological ethnographers.

Most importantly, an archaeological ethnography is a means of confronting the radical difference of cultural otherness[9]; a confrontation that is, in many ways, analogous to history's engagement with temporal difference. As such, an archaeological ethnography forces reconsideration of covert universalisms and redirects attention to relationships between agents and their environments that are otherwise inconceivable. Contra Kent, culture history is a necessary component of such a study because of the important light it sheds on the historical contexts of ethnographic observations. Further to this, an archaeological ethnography that failed to concern itself with the historical constitution of its subjects would, once again, engage not "data" but living individuals

9. In spite of Kent's attempted legislation, I use the term "archaeological ethnography" because it describes most succinctly the nature of my project. The history of the term "ethnoarchaeology" carries too heavy a weight of behaviourist usage for it to distinguish an alternative approach.

and societies as a resource to be quarried. Finally, the attention paid to culture history, particularly where this is expressed through the medium of oral narratives, has the additional benefit to archaeologists of introducing alternative historicities, conceptions of history, that are at odds with Western assumptions about the nature of history and of historical explanation. A notion of Huli historicity is engaged in this thesis precisely for its value in exposing, and thus introducing new possibilities for, a conventional archaeological approach to history.

This thesis represents an attempt, through the medium of archaeological ethnography, to address the issue of archaeological explanation for social and environmental change in the recent past of Huli-speakers of the Haeapugua basin in the Southern Highlands of Papua New Guinea. The remainder of part A grounds the thesis within the relevant regional literature and in the context of a particular topic (the debate over the Ipomoean revolution), and sketches a route towards the Haeapugua basin and the specific goals of my project. Part B provides an ethnographic model for Huli society and its interactions with the environment that focuses attention on the meaning and historical significance for Huli people of their landscape. The history of a discrete portion of that landscape, the Haeapugua basin, is then described in Part C through the juxtaposition of oral historical with archaeological and palaeoecological evidence. Finally, in Part D, I seek to show how archaeological ethnography offers new perspectives on issues of interest to both anthropology and archaeology by providing a sense of the historical genesis of elements of modern Huli society and by identifying fresh areas of focus for archaeological research.

CHAPTER A2 - SWEET POTATO AND SOCIETY IN HIGHLAND NEW GUINEA

A2.1 Introduction

The character of historically modern societies in the central valleys of the New Guinea Highlands owes a considerable debt to the conjunction of the imported South American sweet potato and the Southeast Asian pig[1]. The first European miners, missionaries and colonial administrators to encounter societies of the Papua New Guinea Highlands between the 1920s and the 1960s made frequent comment on the obvious importance of sweet potato as the principal human staple and main source of fodder for pigs, which were both the most common domesticates and the most significant non-human form of valuable. The likely dates of introduction to New Guinea of sweet potato and pigs and the nature of their adoption by and consequent impact upon Highlands societies provide perhaps the most enduring problems for archaeologists working in the region; problems that also have a significant bearing on issues of concern to anthropologists and geographers, such as the causes of variation in agricultural production and social formation amongst Highlands societies.

One consequence of this convergence of interest has been the development of a wide-ranging inter-disciplinary debate over the historic constitution of Highlands societies, much of which addresses the role of the introduction and adoption of sweet potato. This debate over the possibility of a sweet potato or "Ipomoean" revolution, initiated by James Watson (1965a, 1965b), has provided a forum in which ideas about history and explanation have been brought to bear on an increasingly complex body of observations by archaeologists, ethnographers and geographers[2]. Although many of the positions and theories which I refer to under the rubric of the "Ipomoean revolution debate" have either opposed the very notion of a crop revolution or extended argument into regions or periods where the sweet potato is presumed absent, the issues initially raised by Watson have fundamentally shaped this wider debate.

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1. The island of New Guinea is currently divided into two politically distinct halves: the Indonesian province of Irian Jaya in the west and the independent nation of Papua New Guinea in the east. My primary concern in this thesis is with the Highlands region and largely with the better-documented portion of the Papua New Guinea Highlands; more specifically, I address the history of the Huli-speaking communities who occupy a cluster of basins and valleys between 1200 m and 2300 m in the Southern Highlands Province of Papua New Guinea. Definitions of the Highlands region, which extends along the central spine of the island of New Guinea, vary considerably (Hays 1993). For my purposes, a general and necessarily flexible distinction can be drawn between the Highlands, lying above approximately 1200 m above sea level, the Highlands fringe, between about 500 m and 1200 m, and the Lowlands, below 500 m. The term "Central Highlands" serves to distinguish between the central cordillera (abbreviated here as the "Highlands") and other areas above 1200 m, such as the Finisterre and Saruwaged mountains of the Huon Peninsula (Figure A1).
2. The term "Ipomoean" was coined by Watson (1965a) in reference to Ipomoea batatas, the scientific term for sweet potato. Watson's formal definition for the term is cited in Appendix A1.

This debate, which provides a critical context for my thesis, is presented in Appendix A1 within the framework of a chronological narrative. This allows for an understanding of the development of different positions within the debate and provides a perspective on the relationship between archaeological revelation and anthropological speculation. My account of the development of the debate is partial as there are two propositions that I want to pursue. The first is that the early phases of the debate were crucially formative for archaeological thought and research in the region. The second is that anthropological speculations, however poor their apparent grounding in archaeological fact, have proved consistently to be more productive and insightful in terms of understanding historical processes of social change in the New Guinea Highlands than the models developed by archaeologists on the basis of their own evidence (Feil 1989:119). A brief synopsis of the major positions adopted in the debate is given here in order to set the context for a more focused discussion of the archaeological evidence for the introduction of sweet potato and pigs. This is followed by a review of the ways in which conventional archaeological evidence has been deployed in the explanation of social change and of the prospects for widening the net of archaeological enquiry to address other forms of evidence.

A2.2 The Ipomoean Revolution Debate: A Synoptic Account

Building upon the common observations on the importance of sweet potato and the knowledge that the ultimate origins of this tuberous crop lay in tropical America, Watson (1965a, 1965b, 1967) proposed that the adoption of sweet potato in the Highlands, presumably after its introduction to the Indonesian archipelago in the 15th or 16th century and to the Philippines in the 16th century (see A2.3 below), must have had a revolutionary impact on local society. Archaeological research in the Highlands, which had begun only in 1959, had already demonstrated an antiquity of occupation slightly in excess of 10,000 BP, but shed little direct light on agricultural history (S. and R.Bulmer 1964). Watson's modelling of possible scenarios for the impact of sweet potato adoption was thus speculative in terms of the archaeological evidence available. Drawing instead on the treatment of sweet potato in local oral traditions, ritual practices and agricultural technologies, Watson suggested that the dense settlement of the central Highlands valleys most probably reflected a post-Ipomoean increase in population. Sweet potato has a number of advantages over the postulated previous staple, taro (Colocasia esculenta), including a greater productivity on poorer soils, in drier environments and at altitudes above 2000 m (Clarke 1977), a potential which, Watson argued, Highlanders would quickly have recognised and exploited. A key element of Watson's modelling, and one on which he later elaborated, was the link in the Highlands between sweet potato and the production of pigs, which he held to be significant both for their protein and for their value as the principal medium of exchange in the region. Watson argued that the scope for population increase and the development of major networks of ceremonial exchange around the production and circulation of pigs, taken together, represented an 'Ipomoean revolution'.

Watson's papers coincided with the discovery in 1966 of buried agricultural drainage systems in swamps in the Wahgi valley (Figure A4), for which a preliminary date of 2300 $\pm$ 120 BP (ANU-44) was soon available (Golson et al. 1967). Equipped with this new finding, a seminar convened in Canberra in 1967 sharply dismissed Watson's preferred model of an Ipomoean revolution. In their review of the seminar's conclusions, Harold Brookfield and Peter White (1968) expressed a preference for archaeological evidence over anthropological speculation, for 'pragmatic' or 'technological' accounts of history over Watson's 'sociological' vision, and for 'gradualism' or 'evolution' rather than 'revolution' in accounting for the rate of change. This reaction to Watson's proposals was subsequently reflected in the ecological and technological emphases in research and explanation that have largely dominated Highlands archaeology since the 1960s.

Continued excavation of the Wahgi valley agricultural sites over six field seasons between 1972 and 1977 was conducted by an interdisciplinary team led by Jack Golson. This complex of sites, referred to collectively as "Kuk swamp" after the largest of the Wahgi valley sites at the government's Kuk Tea Research Station, has been the focus of the most intensive archaeological study in the Highlands. Detailed results from Kuk have begun to emerge only recently (Bayliss-Smith and Golson 1992a), but the broad outlines of the chronology and significance of Kuk have been sketched in an extensive series of articles by Golson (listed in Appendix A2).

A deep stratigraphic sequence at Kuk swamp has revealed a succession of superimposed drainage systems, interlain with inwashed sediments and reworked volcanic tephras (Figure A5). In this sequence, Golson has distinguished six principal phases of drainage and use of the Kuk swamp extending back over the last 9000 years, all but the two most recent phases being separated by long periods of disuse and abandonment of the drainage systems. The last phase, Phase 6, must have terminated by 1933, when the first European explorers documented the complete reversion to swamp of the Wahgi wetlands (Golson 1981b). An apparent general abandonment of the floor of the Wahgi valley by the 1920s, explained by Paul Gorecki (1979) in terms of an epidemic of malaria, deprived Golson's team of any direct ethnographic analogies for wetland use in the Wahgi area[3].

3. But see Gorecki (1982) for his use of observations on wetland reclamation at Kuk in the 1970s to

Details of Golson's explanations for wetland reclamation and abandonment at Kuk are described in Appendix A1. By 1977, Golson essentially accounted for wetland reclamation in terms of pressure on dryland resources, as a consequence of inexorable population increase, which forced communities into the labour-intensive strategy of wetland drainage. In explaining wetland abandonment Golson referred to the releasing effects of innovations in agricultural technology, which permitted higher yields and returns on labour from dryland gardens. Thus the end of Phase 3 marked the development of complete soil tillage (for which soil aggregates in the sediments infilling the Phase 3 drains served as evidence), the end of Phase 4 coincided with, and could be accounted for, by the introduction of tree-fallowing in dryland gardens (witnessed by an increase in Casuarina pollen) and the end of Phase 5 was the result of the innovation of raised bed gardening, assisting in the intensification of dryland agriculture.

A renewed interest amongst anthropologists in the issues surrounding Watson's proposed Ipomoean revolution saw three influential pieces of writing in 1977 return to the role of pig production in the genesis of modern Highlands societies (Morren 1977, Watson 1977, Modjeska 1977). Each of these authors argued that the development of intensive regimes of pig production was crucial to the character of modern societies: George Morren suggesting that destruction of forest resources led to an increased emphasis on the production of domesticated pigs to supplement the loss of protein sources; Watson that the prestige associated with pigs could account for the historical diffusion of both pig breeding and sweet potato; and Nicholas Modjeska that pig production met social as well as dietary needs and that the history of Highlands society was thus linked to change in the nature of social demands on production.

Modjeska's work, in particular, presented the first significant challenge to the assumptions of the Canberra seminar and to the prevailing logic of explanation in Highlands archaeology. In place of a vision of human agency bounded by calorific requirements and technological limits, Modjeska proposed that transformation in production regimes reflected the renegotiation of cultural concepts of value and of labour. In particular, Modjeska suggested that there may have been social motives at play in the commitment of labour to wetland drainage which turned upon the greater potential for production of drained wetland soils. Where phases of wetland reclamation had formerly been regarded as the enforced result of pressure on dryland resources, they could now be reconsidered as evidence for the development of social demands on production and for changes within, rather than external to, local society.

interpret the archaeology of drainage systems.

These changes, Modjeska argued, could best be identified in terms of transformation in a society's relations of production:

> For a transformation of production systems to have taken place, new relations of production were required in addition to new materials. People had to choose to work harder in order to produce more.
> Modjeska (1977:87)

Through comparison of the production regimes of eight different Highlands societies, Modjeska proposed that the ratio of pigs to people in a society could be taken as a rough index of the intensity of production and, by extension, the complexity of social relations of production in that society. By ranking these societies in order of increasing intensity of production, Modjeska continued, some sense of the historical trajectory of change could be derived.

Modjeska's comparative approach to the history of Highlands society has been taken up by a number of other anthropologists, including Daryl Feil, Maurice Godelier and Pierre Lemonnier. In his application of Modjeska's model to a major review of the regional literature for the Papua New Guinea Highlands, Feil (1987) attempted to show how variation in all aspects of social formation can be related to the relative intensity of production. Arguing that productive intensity increases amongst Highlands societies along a cline that runs from the Eastern Highlands in the east to Enga Province in the west, Feil proceeded, like Modjeska, to suggest that this variation in modern "ethnographic" societies could be read as an analogue of the historic evolution of the most developed societies in the west. Although Feil's commitment to his notion of east-west clinal variation tended to obscure more subtle forms of variation (see Appendix A1), he reiterated Watson's important insight that the nature and the impact of the adoption of sweet potato were likely to have varied from community to community, depending upon the nature of existing technologies and relations of production.

Godelier (1982) and Lemonnier (1990) together have shifted the focus of attention from ethnographic variation in production regimes towards the nature of difference in principles of exchange, characterised as "global social logics". Much as Feil has pursued Modjeska's use of the ratio of pigs to people as an index of the general intensity of production in a given society, Godelier and Lemonnier have taken up another of Modjeska's arguments in addressing the roles of leaders in different communities as a means of identifying the underlying logics of exchange. At either extreme of the range of structural transformations yielded by this approach are the "Big Man" and the "Great Man", to which Lemonnier has more recently added the intermediate "Leader"; thus Great Men are found in societies where the logic of direct exchange of identical materials (marriage partners, for example) is dominant, while Big Men correspond to social logics in which the principle of indirect or non-equivalent exchange predominates. Though there must be reservations about details of their reconstructions of Highlands history, the significance of these more recent contributions of Modjeska, Feil, Godelier and Lemonnier to the Ipomoean revolution debate is the emphasis they have placed on the role that changes within society, such as change in principles of exchange or in demands on production, must have played in the development of modern Highlands society.

Modejska's critique of the Canberra seminar's influence on Highlands archaeology an immediate response in the form of a series of papers by Golson, written after 1977, in which he has attempted to introduce a more active sense of human agency to his explanations for the Kuk swamp sequence by considering the possibility that swamp reclamation conferred a productive advantage upon those communities with access to swamps (Golson 1982b). This paper has also been the occasion for Golson's most sustained consideration of the possible impact of sweet potato on Wahgi valley society, in which he speculates on the reconfiguration of local variations in inequality brought about by the introduction firstly of sweet potato and then, in the aftermath of colonial contact and in unprecedented quantity, of shell valuables. Although there has been little new field research at Kuk since 1981, excavations at Yeni swamp in the adjacent Jimi valley (Gorecki 1989) and in the Arona valley in the Eastern Highlands (Sullivan, Hughes and Golson 1987), and palaeoecological results from Norikori swamp and the Baliem valley in Irian Jaya (Haberle n.d., Haberle et al. 1990) have begun to provide a regional context for the Kuk swamp sequence.

Within this brief framework of the development of the Ipomoean revolution debate, we can now consider the specific evidence for, and models for, the introduction of sweet potato.

A2.3 An Archaeology for the Ipomoean Revolution

Perhaps the outstanding irony in the Ipomoean revolution debate, in light of the Canberra seminar's privileging of archaeological evidence (Brookfield and White 1968, White with O'Connell 1982:187), is that there is no direct archaeological evidence for sweet potato from any site in New Guinea. Charred tuber fragments from a house site at Kuk dated to Phase 6, identified during excavation by Golson's local assistants as sweet potato, and previously published as the first direct evidence for sweet potato in New Guinea (Golson 1977a:627), have recently been identified by Jon Hather as yam (Golson pers.comm.). Neither is there any direct archaeological evidence for taro, the presumed staple tuber prior to the introduction of sweet potato[4]. All models for the introduction of sweet potato to the Highlands thus depend, to a greater or lesser degree, upon correspondence between different tuberous crops and specific field forms inferred from ethnographic analogues (Golson 1977a:627-628), evidence for increased rates of sedimentation interpreted as forest clearance for sweet potato gardens in catchment headwaters (Worsley and Oldfield 1988), increases in pollen from tree species associated ethnographically with fallow practices in gardens dominated by sweet potato (Haberle 1993), or evidence for major settlement expansion at higher altitudes than are considered possible with other, pre-Ipomoean staples (Bayliss-Smith 1985a).

Differences of opinion over the likely date for the introduction of sweet potato thus derive not from direct evidence but rather from assumptions about the scope for dramatic social change; anthropologists (Watson, Feil and Modjeska amongst them) tend to assume that a late introduction is feasible, whilst archaeologists and palaeo-ecologists (Golson, Gorecki and Haberle to name a few) have expressed a preference for an earlier introduction. Arguments for the "orthodox" or "late" date assume that the introduction of sweet potato to New Guinea followed the date of its initial post-Columbian transfer from South America to Southeast Asia; either along the "Batata" line of diffusion to the Indonesian archipelago via Africa and Europe in the 15th and 16th centuries, or along the "Camote" line to the Philippines in the early 16th century (Yen 1974, 1982). A third line of diffusion from South America, the "Kumara" line, represents an independent and direct introduction of sweet potato to Eastern Polynesia from South America prior to European contact; given the break in the distribution of sweet potato as a staple in the intermediate regions of Western Polynesia and Island Melanesia, the Kumara line had not been widely regarded as a likely source of sweet potato for New Guinea. The lateness of the introduction of sweet potato to New Guinea, presumably at some point during the 16th or 17th centuries, was the spur behind Watson's description of any changes in Highlands society that might be associated with sweet potato as "revolutionary".

As early as 1974, however, Golson (in Powell et al. 1975) was declaring himself troubled by the lateness of the "orthodox" date. The initiation of Phase 5 at Kuk, dated to 370 ± 70 BP (K-2643), fell tantalizingly close to the presumed date of the introduction of sweet potato to the western Pacific[5]. Initially, Golson (1976d, but

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4. Phytolith and pollen evidence for a range of other domesticates, including Eumusa section banana (Wilson 1985), Amaranthus, Oenanthe javanica, and Rorippa (Powell et al. 1975:47) has been identified at Kuk. Haberle (1993) has discussed the problems encountered in trying to locate or identify pollen from taro and sweet potato.

5. Note, however, that calibration of the raw radiocarbon date of 370 ± 70 BP yields a result between 520-290 cal BP (100% Pr.), which might be taken either to alleviate or to heighten Golson's anxiety (see Appendix C11).

written in 1973; see Appendix A2) had resolved the problem this implied for the speed with which sweet potato must have been introduced and adopted in the wetland agricultural system at Kuk by dividing Phase 5 into two: an earlier Phase (now identified as Phase 5) for which intensive wetland cultivation of taro was proposed, followed by a Phase 6, after the fall of the distinctive Tibito volcanic ash at between 305-270 cal BP (Appendix A3). The apparent tightening of the drainage grid in Phase 6, Golson (1977a:628) suggested, represented a modification to suit the edaphic requirements of sweet potato. But Golson was already toying with a radical alternative: that there had been an "early" introduction of sweet potato to New Guinea by about 1200 BP. This, Golson argued, would account for the apparent revolution in land use at that time, evident in the abandonment of Phase 4 at Kuk swamp and in the relative decrease of forest pollen and increase in tree fallow species such as Casuarina, evident in pollen diagrams from the Wahgi valley (Powell 1970).

Although Golson (1977b, 1982b, Golson and Gardner 1990) has subsequently withdrawn his claim for an early introduction of sweet potato, citing the lack of direct evidence, others have continued to express dissatisfaction with the conditions required for the orthodox date. Haberle (1993:311), citing claims by Worsley and Oldfield (1988) for an association between the dramatic increase in Casuarina pollen at 400 BP and the introduction of sweet potato, has argued that an earlier rise in the regional evidence for Casuarina pollen after 1200 BP could also be taken as proxy evidence for the presence of sweet potato during this period. Haberle (1994:34, Haberle, Hope and DeFretes 1990) also cites the negative evidence for a late introduction from the Baliem valley, where there is little evidence in a pollen record from the valley floor for dramatic change during the past 400 years, and takes this to indicate that the impact of sweet potato must have been registered at an earlier date in the valley. Gorecki (1986:164) had previously aired an apparent compromise, in which three distinct waves of introduction of sweet potato to the Highlands are proposed: the first corresponding to the early date of 1200 BP, the second to the orthodox date of 300 BP and the third to direct European contact in the Highlands in the 1930s. As Hather (1992) observes, each of the major transformations in the pollen record and the archaeological record at Kuk can thus be referred to the effects of successively fleshier and more productive sweet potato cultivars.

New evidence from Polynesia has strengthened the possibility for a pre-Columbian introduction to New Guinea. Carbonized tubers dating to earlier than 520 ± 70 BP (628-517 cal BP) (Beta-32829) and positively identified as sweet potato have been recovered from Mangaia in Central Polynesia (Hather and Kirch 1991)[6]. The

6. Two Ipomoea samples from Mangaia are bracketed by dates of 930 ± 70 BP (Beta-32826) and 490 ±

claim has also been advanced that analysis of the terms for sweet potato throughout Papua New Guinea suggests the possibility of a Polynesian and thus potentially early introduction via southeast New Guinea (Scaglion and Soto 1991).

Direct archaeological evidence may eventually provide an answer to the question of the date for the introduction of sweet potato to New Guinea. In the interim, the grounds for asserting either an earlier or later introduction are themselves of some interest. My principal objection to the early model is that it simply enlarges the scope for an existing tendency to refer historical change to technological innovations or introductions. Similarly, debate within the framework of Gorecki's compromise model over the extent of change at either 1200 BP or 300 BP introduces discussion of the relative qualities of new and old cultivars but no further advance on the issue of the social contexts for the deployment of successive cultivars. Another observation on the debate between early and late introductions is that revolutionary change appears to have re-entered archaeological explanation in Highlands New Guinea since the Canberra seminar where it was felt that 'no major technological revolution... was required to permit the adoption of sweet potato' (Brookfield and White 1968:50). Dramatic but unexplained changes (revolutions) in the archaeological record, as at 1200 BP, are now ascribed to the introduction of sweet potato. Through a still more tortuous logic, the absence of revolutionary change in a period is taken to signal the fact that sweet potato was not introduced during that period (as in the Baliem valley).

Revolutions, in fact, have long been in vogue as a form of explanation: 'Susian' (Morren 1977:313), 'Canine' (Kelly 1988:166) and 'Colocasian' (Bayliss-Smith and Golson 1992a) revolutions have all been proposed to account for historical changes in Highlands society. What each of these models apparently shares with the notion of an Ipomoean revolution is the assumption that social change revolves around the introduction or redeployment of crop staples or domesticated animals. While I certainly do not seek to deny the importance of these materials in the historical constitution of modern Highlands societies, the selection of tubers and animals to represent revolutions in the structure of society is an illuminating choice: an obvious one for archaeology, perhaps, but nevertheless an emphasis that continues to place social change in the background of archaeological explanation and enquiry. The scope for a more complex model of sweet potato introduction that foregrounds the decision-making of human agents in the processes of introduction, adoption and deployment is discussed amongst the conclusions of Chapter D2.

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50 BP (Beta-32818), and 790 ± 80 BP (Beta 32828) and 520 ± 70 BP (Beta 32829) respectively; note that this does not, as Haberle (1993:311) reports it, amount to evidence for sweet potato at the 980 ± 70 BP date.

In light of the importance attached to the relationship between sweet potato and pigs, it should be mentioned that the antiquity of the latter in New Guinea is also subject to some debate. The claims for a solitary pig incisor at a date earlier than 9780 $\pm$ 350 (ANU-358) from the Kiowa site (S.Bulmer 1966) and a second pig incisor from the Yuku site dated to 10 350 BP (sic) (S.Bulmer 1982:188) need to be considered in light of the broader range of evidence for pig from other sites[7]. Nowhere in New Guinea have pig bones been retrieved in significant numbers until after about 4500 BP, though major increases in their number are documented at dates earlier than 800 BP (White 1984:4, White with O'Connell 1982:187-189, Table 6.5). Most recently, accelerator mass spectrometry dating of a selection of the small sample of "early" bone fragments from Highlands sites has further undermined claims for pig earlier than 4000 BP (D.Harris, cited Spriggs in press). Given the small overall numbers of pig bones recovered thus far from archaeological sites in New Guinea, an attempt to interpret fluctuating quantities of pig material, most of which derive from rock-shelter sites, in terms of changes in the structure of pig production practices would be hazardous. Despite frequent claims of archaeological evidence for an increase in pig numbers in the Highlands (J.Watson 1977:61; Feil 1987:22), there are not, nor are there likely to be in the foreseeable future, sufficient pig remains from archaeological sites to determine much more than their gross presence or absence.

Appeals to the available archaeological evidence relevant to the Ipomoean revolution debate thus leave us with little to work on. Yet archaeological models for the impact of sweet potato have been developed, debated and, in some cases, discarded. Obviously, archaeologists have been able to incorporate a degree of informed speculation in their explanations for the impact of sweet potato, if only as a means of directing the limited resources for field research. The short history of archaeological research in the Papua New Guinea Highlands and the limited resources available for future work there do not allow the level of detailed reconstruction from archaeological evidence common, for example, in Europe. However, the social and technological continuities in the Highlands between the present and a recent but non-literate past accessible only through oral history and archaeology allow archaeologists working in the region to consider the relationship between archaeological problems and

7. At Kiowa, the single incisor in Layer 12A is the only cranial material identified as pig beneath the three or four fragments in Layer 2 of the same site (S.Bulmer 1979: Table 1). At Yuku, a total of six or seven pig cranial fragments, representing between 0.2% and 0.9% of the faunal cranial assemblage for each layer, have been identified from three layers immediately beneath a layer of human burials; this contrasts suspiciously with the much higher relative density of pig cranial material in the two layers above the burial layer, where pig crania represent between 12.0 and 28.6% of the faunal cranial assemblage (S.Bulmer 1979: Table 2). Post-cranial material was recovered from both the Kiowa and Yuku sites, but details have not yet been reported.

ethnographic contexts for human agency in great detail. There is scope here for a study that sketches the parameters of explanation for an archaeological problem such as the Ipomoean revolution, even where archaeological evidence is insufficiently available to support or contest the conclusions. Such a form of study requires that we reconsider conventional archaeological practice and methods.

Conventional practice in archaeologically new areas of the Papua New Guinea Highlands has commonly consisted of locating and excavating cave and rock-shelter sites and establishing chronological control over a region (White 1972, Mangi 1988c). Yet it must now be clear that the results of rock-shelter excavations in the Highlands tend to reflect primarily upon the use of rock-shelters and not upon the broader field of human activity, a conclusion strongly confirmed by Gorecki's (1991) local ethnoarchaeological study of rock-shelter use[8]. Chronologies of the presence or absence of specific items in technological inventories can be compiled (though the problems surrounding the antiquity of the pig in New Guinea should caution against optimism even in this regard), but our ability to reconstruct social processes from such evidence is very limited.

In his study of the material correlates of Big Man leaders, White (1984, 1985) expresses his doubts about the possibilities for success of a direct archaeological approach to questions of social hierarchy through, for example, the identification of larger houses or greater numbers of valuables. Instead, he proposes that

> if we wish to derive social history in the New Guinea highlands from archaeological sources we will have to eschew the simple equations between burials and ranking, settlement size and hierarchy, specialised organisation of production and social differentiation that are widespread in areas with more complex data sets.
>
> White (1984:9)

Though there must be some question about the analogical foundations for these equations even in areas so favoured, the implication for archaeology in the Highlands is that a different approach to ethnographic analogy as a means of archaeological access to processes of social change must be sought.

The use of ethnographic analogies in Highlands archaeology has largely been restricted to the identification of direct technical analogues for wooden tools (Golson

8. R.Bulmer (1971:40) made the point that hunter-gatherers and horticulturalists over-nighting in rock-shelters are unlikely to have left radically different signatures; early interpretation of the materials from rock-shelter excavations in the Eastern Highlands as evidence for a transition to agriculture within the past 300 years (Watson and Cole 1978) is at odds with the evidence gained by the adjacent Yonki Archaeological Project for extensive clearance and settlement associated with garden features from 4500 BP (Sullivan, Hughes and Golson 1987, Ballard n.d.a, Haberle n.d.).

and Steensberg 1985), house, cooking and garden structures (Gorecki 1982) and stone tool manufacture and use (White 1967b, White and Modjeska 1978a, 1978b). These ethnoarchaeological studies have tended to focus on the immediate contexts for production and use of structures and techniques identified first in the archaeological record. Few studies have attempted to relate material processes to broader social features; the notable exceptions include Golson's (1982b) modelling of the relationship between social change and swamp use at Kuk, and Burton's (1984) study of axe production and the movement of brides in the Wahgi Valley.

In the previous chapter I proposed that an approach identified here as archaeological ethnography be employed to address issues of social change from an archaeological perspective. The form that an archaeological ethnography might take in a Highlands context can now briefly be sketched, with emphasis on issues of human agency, of historicity and of scale.

The importance of human decision-making has been demonstrated in the Highlands for some of the key elements of Watson's postulated Ipomoean revolution. Studies by Robin Hide (1981) amongst Sinasina in Simbu Province and by David Boyd (1984, 1985) amongst Awa in the Eastern Highlands Province, have shown that the intensification of pig husbandry in these communities, whilst ecologically constrained in certain ways, has been the result of historical decisions made within particular groups, acting consciously within the specific circumstances of both their social and physical environments. Paul Wohlt (1978) has examined exchange strategies amongst high-altitude communities whose sweet potatoes are exposed to the hazard of frost, and Michael Bourke (1988) has argued for the significance of long-term planning in the production of sweet potato. John Burton's (1984) study of axe quarrying in the Wahgi valley, in many respects a model for this thesis, has emphasised the importance of 'human decision-making' in the development of a limited number of quarrying centres such as the Tungei source within an essentially homogeneous geological landscape. By combining genealogical recall of the clan origins of Tungei brides with his observations on the role of quarried axes in brideprice transactions, Burton (1987) has been able to explore changes in the movement of brides within the Wahgi Valley from the turn of the century, illustrating the scope for archaeological ethnography in Highlands archaeology.

As Burton's work suggests and as Ray Kelly (1988) has shown in his analysis of Etoro pig husbandry, all such decisions and strategies are made within the terms of culturally specific systems of value. If an understanding of intentionality is to be a significant component in explanations for social change in the past, the universes of cultural meaning within which those intentions are formed and expressed must also be considered. It cannot safely be assumed that the strategies deemed appropriate in dealing with pigs, sweet potato, and swamps, or indeed the very meanings of these objects, are similar across different societies. Given that archaeology generally addresses social change in the long term, the models of these worlds of meaning likely to be most appropriate will probably operate at a more inclusive scale than that with which most ethnographers are accustomed - something akin to Godelier's "global social logic" or anthropology's notion of a "worldview".

One consequence of recognising the influence of different worlds of meaning is the scope this introduces for alternative notions of temporality and of the relationship perceived by agents between history and action in the present. An archaeological ethnography differs from conventional anthropological ethnography in the attention paid to the historical constitution of society and of individual subjectivity. The little-explored possibility that indigenous conceptions of history, usually expressed in the Highlands in the form of oral history, might play an important role in the production of a genuinely historical ethnography is currently the subject of a study by Polly Wiessner and Akii Tumu in Enga Province. Their preliminary results suggest, for example, that the actual historical genesis of the Enga *tee* system of ceremonial exchange is accessible through oral history, and that such an approach has the potential to yield a far more complex understanding of Enga history and ethnography than descriptions of the *tee* written and conceived of in the "ethnographic present" (Wiessner and Tumu in prep.). The histories of specific groups offer both access to the complexity of the recent past, which is surely critical in the formation of modern societies, and an alternative perspective provided by a non-Western sense of history.

The final theme to be emphasised in the construction of an archaeological ethnography is the issue of scale. White's solution to the problem of identifying changes in the structure of Wahgi valley society turns upon the scope present in the archaeological record for

> greater predictability at more inclusive levels of analysis... [B]y looking at a concatenation of variables from a number of sites we may be able to see the changes over time that mark the evolution of Wahgi systems as we know them.
> White (1985:59)

Regional trends, such as the postulated Ipomoean revolution, can only be identified as such through the compilation of sufficient evidence from a wide range of sites. The challenge this poses for an archaeological ethnography is the need to model the relationship between processes operating on local and regional scales - to show, for example, how reclamation of a swamp relates not just to the immediate circumstances of the local population and environment but also to broader patterns of regional change.

The goals of an archaeological ethnography, then, are to explore the relationships that obtain between worlds of cultural meaning and their material expressions. The methods of archaeological ethnography include the employment of dual or multiple perspectives provided by different historicities, thus opening up for question the categories within which the past is conceived, and the extension of the temporal and spatial parameters of conventional ethnography in order to consider the relationships between phenomena observed on different scales.

CHAPTER A3 - APPROACHING TARI

A3.1 The Tari Region as a Field Site

My intentions in this thesis are to model the impact of the introduction and adoption of sweet potato on recent Highlands archaeological history, and to do so in such a way that the results of a study in a limited location can be made to illuminate similar processes at successively broader scales. In light of the issues identified for analysis in the previous chapter, the two principal requirements of this project were a wetland location in which to examine the relationship between changes in swamp drainage and their wider social contexts (the results from Kuk swamp representing the most significant source of comparison on a regional scale), and a tradition of oral history sufficiently rich and historically deep to allow independent access to the role of human agents in the historic past. The form of my approach is that of an archaeological ethnography, as this has been described in the preceding chapters.

My choice of Tari as a field site in which to pursue this project reflected both the ethnographic reputation of the local Huli-speaking community as oral historians, and the personal familiarity with the area of two of my supervisors, Bryant Allen and Jack Golson. A set of swampy intermontane basins in the Tari region similar to, if smaller in scale than, the Wahgi valley, had already been shown to contain both evidence for abandoned drainage networks (Golson 1982b:121) and a system of drainage still in operation in at least one of the major swamps (Powell with Harrison 1982). Unlike Kuk and the Wahgi valley swamps, the Tari region drainage systems appeared not to have suffered any interruption in use, at least since the establishment of permanent contact with the colonial administration in the 1950s. Tari thus presented an opportunity to investigate an agricultural system that incorporated a continuous tradition of wetland use.

Equally significant, for my purposes, was the reputation of the Huli-speakers of the Tari region as exceptional oral historians, known for their traditions relating both to the introduction of sweet potato (Watson 1965a:300) and to the Tibito ash fall (Blong 1979, Appendix A3), and for the unusual depth of their genealogies. I had developed an interest in the scope for articulation between archaeology and oral history while involved in the Yonki Archaeological Project in the Arona valley (Ballard n.d.a), where I had experienced the frustration of working with shallow genealogies which rarely extended three generations beyond the oldest living individual. Tari appeared to offer an ideal opportunity to consider the sorts of theoretical and methodological problems raised in the previous chapter.

Although it covers an area of some 25,600 square kilometres, the Southern Highlands remains one of the least archaeologically explored of the provinces of Papua New Guinea. In the course of a broader ethnoarchaeological project undertaken by Peter White in 1967, and later again in 1973-74 in conjunction with Nicholas Modjeska, on stone tool manufacture and use amongst Duna-speakers to the west of Tari (White and Modjeska 1978a, 1978b, White, Modjeska and Hipuya 1977), White dug a small number of test pits in the Tumbudu valley and Lake Kopiago basin (Figure A2), one of which yielded the only radiocarbon result from the province, a single, unpublished date of 430 ± 110 BP (NSW-100)[1]. The only other excavation in the province was the investigation by Mary-Jane Mountain, in collaboration with the ethnographer Buck Schieffelin, of a twentieth-century ritual structure amongst Kaluli-speakers of the Papuan Plateau in 1974 (see Figure A3); the results of this work also await full publication (Mountain 1979).

During 1985 and 1986, Jo Mangi, then a Master of Arts student at the University of Papua New Guinea, spent six months studying historical trade networks between Huli-speakers and their neighbours (Mangi 1988a). Focusing on the northern trade between Tari Basin Huli and Ipili-speakers of Porgera, Mangi excavated three rock-shelter sites on the high-altitude track that connected the two groups. No radiocarbon results were forthcoming from these sites (which technically rest on the Enga side of the provincial border). Subsequently Mangi revisited these sites and recorded a number of other sites of cultural significance in the Kare area, and excavated further rock-shelter sites in the Porgera area of Enga Province which form the subject of his ongoing doctoral research (1988b, 1988c). Sporadic trips to Tari and Mendi by artefact collectors from the National Museum in Port Moresby and brief reconnaissance visits to the Tari region by the archaeologists Gorecki, Golson, Lampert and Ambrose between 1969 and 1980 complete the known history of archaeological research in the Tari and neighbouring regions[2].

The dearth of local archaeological research is handsomely offset, however, by a wealth of published research in other fields. As much of this work has provided a important foundation for my own project, a further review is necessary[3]. Of central

1. This date derived from the sampling of a ditch feature exposed in section by a road cutting near the Apostolic Mission at Lake Kopiago (White 1974:3). White's investigations consisted otherwise of the exploration of a number of artefact find sites and rock-shelters, at least three of which were tested for depth, and a brief aerial reconnaissance of the abandoned drainage system in the swamp around Lake Kopiago.

2. Other than brief references, there are no published results from these visits, though the aerial photography of Haeapugua swamp by Lampert and Golson in 1972 and the inspection of ditch sections at Mogoropugua by Golson in 1980 play an important role in Part C of this thesis.

3. Full references to the works of the writers discussed here are contained in Ballard (n.d.b). Other ethnographies of Huli-speakers include the ethnomusicological studies by Bronwyn Peters (1975) and

importance are the publications of the three major ethnographers of the Huli: the late Robert Glasse, Laurence Goldman and Steven Frankel. Glasse, who worked near Hoyabia (Figure B1) in the Tari Basin in three periods (1955-56, 1959-60, 1979), is best known for his meticulous description of Huli residence patterns and warfare, and his controversial characterisation of Huli descent as cognatic (Glasse 1968). It is important to note that during much of this earlier fieldwork, a prohibition on the movement by Europeans other than administration officers further than two miles from the government station of Tari prevented Glasse from extending his enquiries beyond these confines[4]. Goldman's fieldwork, conducted in 1977 and 1978 in the relatively remote Yaluba basin, focused on disputes (1983). Frankel, a medical doctor, was based at Hambuali between the Haeaupugua and Tari basins from 1977 to 1979 (with short subsequent visits in 1982 and 1983), where he studied Huli illness beliefs[5].

My area of particular focus, the Haeapugua basin, was also the site of extensive agricultural and ethnobotanical research between 1968 and 1974 by Jocelyn Powell, formerly part of Golson's team at Kuk; the published results of this work (Powell with Harrison 1982) have provided an invaluable baseline for my own study. Similarly, doctoral research by Andrew Wood on the soils of the Tari region (1984), while broadly relevant to an archaeological study, also included a significant emphasis on the soils and productivity of the Haeapugua basin. Wood's account of the history of Huli agriculture draws on the work and models of Golson at Kuk and is discussed further in Part C. During the course of my own research, Simon Haberle, another doctoral student from the Australian National University, was also conducting his field study into the vegetation and sediment history of swamp sites in the Tari region. Where possible, our research interests were co-ordinated and some of the results of this work and of Haberle's doctoral dissertation are described in Chapter C3.

Finally, two major research teams have undertaken projects of relevance to my own in the Tari region: the Southern Highlands Rural Development Project (S.H.R.D.P.; reviewed by French and Walter (eds.) 1984), from which the work of

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Jacqueline Pugh-Kitingan (1982, Pugh 1975), an account of modern Huli forms of dance and decoration by Jaap Timmer (1993). Huli theological students have written on the topic of Huli culture, with contributions that include Andigi Kamiali's (1984) thesis on Huli compensation, an account of the gebe ritual by Benjamin Gayalu (1979) and a theological thesis by Damien Arabagali (1985) on the relationship between Huli ritual and Christianity.

4. Ethnographers working more recently in the Tari region and unconstrained by such limitations have found it necessary to trace connections over long distances in order to comprehend Huli society (see B2.6, B3.5)

5. Although these three ethnographic studies are impressive in their own right and are drawn upon extensively throughout this thesis, their specific research interests have resulted in the lack of an accessible general ethnography of Huli-speaking communities; though this thesis makes no such claim for itself, it has been necessary to provide a detailed summary of some of the main features of Huli society in Part B.

Bryant Allen on Huli nutrition, climatic history and land degradation (1989, in press), and that of Andrew Wood have developed; and the Tari Research Unit (T.R.U.), part of the Papua New Guinea Institute of Medical Research, which continues to monitor the health and demography of approximately 29,000 central Huli of the Tari basin and the eastern half of the Haeapugua basin. The complex Huli system of residence, described in B3.4, has prompted the development of a demographic database, continuously updated by 27 Huli reporters, in which the locations and movements of the study population have been documented since 1970 (Chung 1988), and which has been a vital reference for my own work.

A3.2 Field Methods

Following a very brief visit to Tari in September 1988, during which I identified the Haeapugua basin as a suitable location for research, I returned there for five months between August and December in 1989 for a preliminary season of mapping and test excavation. During this first period, I lived at Hiwanda Community School (Figure C5), a location that was not seen to be aligned with any one clan, thus enabling me to move and work freely amongst all of the different clans of the basin. During the second field season of twelve months, starting in October 1990, I was based at the Evangelical Church of Papua (E.C.P.) mission at Walete, again "neutral" territory, but nearer to my selected excavation sites. While this form of neutral residence made possible movement between clans, particularly when discussing sensitive matters such as genealogical claims to land, it had the obvious disadvantage of cutting off the opportunity for close familiarity with a small host community usually enjoyed by ethnographers[6]. This second season, in which the bulk of the excavations and the regional surveys were undertaken, was interrupted in November 1991 when I contracted typhoid and hepatitis and it was not until October 1992 that I was able to return for a period of six weeks to complete excavations started in 1991. Finally, in June 1993, I arranged for a visit of two weeks to Australia by my main assistant, Aluya Mabira, to complete the translation of taped narratives.

For the reasons outlined in Chapter A2, the need to relate variation at a local level to more encompassing regional patterns structured my approach to field research. This entailed the creation of a scaled series of nested models of Huli society and technology. The smallest of these is the residential group, or parish (*hameigini*); though I was never resident there, Dobani parish, on the eastern margins of Haeapugua swamp, was the basis for this model (Figures C5 and C9). My mapping of land ownership and

6. The tension which had been rising within the basin between various neighbouring communities during 1990 and 1991 had erupted in a major fatal war early in 1992 that completely devastated Telabo parish on the western side of the basin; since then, there have been wars involving most of the clans in the basin.

genealogical connections was most detailed in this parish and served as the model for my documentation of the other, less intensively mapped parishes of the basin. My understanding of the distribution of land and people throughout the Haeapugua basin, in turn, informed my briefer surveys of the other major basins of the Tari region. The confidence gained at the most detailed levels of enquiry, for example in eliciting genealogical knowledge within a smaller group such as the residents of Dobani parish, guaranteed to some extent that these wider forays (dubbed "Rapid Genealogical Appraisals" in my notes of the time) retained a sense of perspective on the scope for complexity otherwise unlikely to be appreciated during a short visit to another area. At the broadest scale, the history of the Huli people which these wider surveys allowed me to sketch then formed the grounds on which I have addressed the question of the Ipomoean Revolution in the Highlands region generally (see Chapter D2).

Most areas settled by Huli are distinguished by a dense grid of deep ditches, commonly two to three metres in depth, that cuts across both the dry and wet landscapes. One of the by-products of the S.H.R.D.P. was the production of complete low-level colour aerial photographic coverage of the Tari, Haeapugua and Koroba basins. Access to a set of these prints enabled me to map drainage systems and land tenure to a high degree of resolution, and the results of these surveys are discussed in Part C. Similarly, Huli social history, which is characterised by a singular cultural emphasis on precedence, is tied to a remarkably complex but nevertheless internally consistent genealogical framework. My initial task at Haeapugua then was to attempt to document the parallel networks of ditches and genealogies at a level of detail sufficient to permit the reconstruction of the relationship between changes in society and landscape.

I was very quickly disabused of my other initial intention which was to excavate on a grand scale similar to Golson's open excavations at Kuk. The same people who were quite willing to confide in me either sacred knowledge or the genealogical knowledge critical to the maintenance of their rights to land were not to be moved when I requested permission to excavate in their richest and most productive gardens; these were areas which, by no coincidence, were also those where the most complex sequences of use were exposed in modern ditch sections. Where Golson's team had enjoyed the freedom accorded expatriate researchers in the "late summer" of Australian colonialism and the opportunity to excavate in an alienated Government research plantation, I was thoroughly dependent on the good will of my hosts, a quality in short supply only where they felt that activities such as excavation threatened their livelihood. Consequently, although I was able in time to excavate at a number of different locations along the rich swamp margins, I directed my attention increasingly towards a more immediately threatened resource than buried ditches: the detailed historical and ritual traditions rapidly being lost with the death of older men and women.

As anyone who has attempted to interview large numbers of people living in a dispersed system of settlement can attest (e.g. Wohlt 1978:18-26), few days are free of frustration. Despite the best of intentions and the efforts of numerous Huli friends, I failed to achieve anything approaching fluency in Huli; this proved a serious drawback, as few older Huli men or women can speak Tok Pisin, which was my main means of communication. I thus worked throughout with paid assistants and was fortunate, in the latter periods of my fieldwork, to find a Huli-literate assistant, Aluya Mabira. A familiar routine developed, consisting typically of a pre-dawn start in order to find specific individuals before they left for distant gardens, followed by surveys of gardens and boundaries through the course of the day, with more formal interviews conducted during the regular interruption of rain each afternoon. Evenings were divided between the transcription of texts from tapes, their translation, and the writing of notes and further conversations. Longer interviews were conducted over a meal during the evenings in the relative privacy of my house.

Once I had completed the basic geographical and social "mapping" of the Haeapugua basin, I turned to alternating periods of excavation and regional survey, the length of each period dictated largely by climatic conditions. After an initial period of excavation from December 1990 until February 1991, the remainder of the first half of 1991, which had been set aside for the further excavations, was in fact devoted to regional surveys, as the Haeapugua swamp was repeatedly flooded, culminating in a flood event in August 1991 which exceeded the worst levels of flooding in living memory (see C4.2). These regional surveys focused on identifying the locations of Huli clans already known from oral historical accounts, and documenting regional variations in technology, crop inventories, and ritual knowledge.

A3.3 Course of the Thesis

The chapters of Part A have served to introduce my theoretical and methodological concerns and to sketch a regional context for the specific study whose results are described in Parts B and C. Part B is an attempt to trace relationships between the seemingly self-evident material world of Huli subsistence production and its foundations in a culturally and historically specific cosmology. Throughout, in describing the environment of the Tari region, Huli society and subsistence technology, emphasis is placed equally upon the ways in which Huli conceive of their universe and the material world, and upon the traces of the historical constitution of Huli society and the Huli universe. Part B is thus an historical ethnography in which the basic elements of the relationship between Huli people and their environment are described, and upon which the more specific interests of an archaeological ethnography can be developed.

Part C addresses the landscape history of the Haeapugua basin, with particular emphasis on the role in that history of the processes of reclamation and abandonment of the wetlands which lie in the basin's centre. A model of the history of wetland use is set out through the joint analysis of oral historical narratives and mapping of the local field system. This model is then combined with an archaeological and palaeoecological account of the history of the Haeapugua wetlands to produce an historical account of land use in the basin.

In the first chapter of Part D, the relationship between humans and environment, as it is expressed through the medium of Huli cosmology (Part B), is brought to bear upon the interpretation of the specific landscape history described in Part C, showing how an archaeological ethnography can introduce links in the understanding of a society's interactions with its environment that serve to enrich a conventional archaeological explanation. The final chapter concludes by exploring the regional implications of this local study, and the scope for wider application of the interests and methods of an archaeological ethnography.

A number of appendices are included, most largely in support of the argument of the thesis but others because some of the basic data collected during my field study is of interest to Huli people and to others in the Tari region.

PART B

CULTURAL LANDSCAPES

Anthropologists have long been interested in the relationships that link American Indian communities to their ecological settings. In the great majority of cases, however, these relationships have been described and interpreted exclusively in materialist terms... What have been ignored, in other words, are the cultural instruments with which American Indians fashion understandings of their environments, the ideational resources with which they constitute their surroundings and invest them with value and significance.

Basso 1990, p.132

CHAPTER B1 - A HULI WORLD OF MEANING

In Part B, I attempt to provide a model of the relationship between Huli people and their environment which focuses equally upon a conventional, materialist account of Huli interaction with the "natural" world, and on the ways in which their universe is given form and meaning by Huli-speakers. Yet the distinction between these two perspectives obscures the unitary nature of the relationship which is their object, described by Jones with reference to Australian Aboriginal conceptions of their landscape as 'a seamless integration of natural and cultural factors' (1991:23). Perhaps a more useful distinction for my purposes is that made between ontic and ontological states: things in an ontic state may exist materially, but have not been engaged or invested with significance by humans, while the ontological or existential world is that which has acquired structure and meaning through human action and reflection (Weiner 1991:13-14). Thus, while there may be a single material reality, no ontological understanding of it is necessarily privileged; but a specifically Huli view of the universe becomes a prerequisite for an analysis of the recent history of Huli land use that seeks to account for the intentional actions of historical Huli.

The role of language in this process, as the most explicit in the range of structured and structuring human actions, is critical[1]. Basso (1990:102) makes this point when he suggests that it is through language that

> Apaches negotiate images and understandings of the land that are accepted as credible accounts of what it actually is, why it is significant and how it impinges on the daily lives of men and women... With words, a massive physical presence is fashioned into a meaningful human universe.

Language, in turn, is not free of historically specific contexts, both in the sense that the material world influences the use and the semantic nature of the terms used to describe it (Shaw and Shaw 1973:160), and in that the 'shared economies of grammatical resources' (Basso 1990) of any language imply a particular historical genesis. Weiner's (1991:64) suggestion that our understanding of language be broadened to encompass 'all of our action that produces a spatial and temporal human world' is crucial for archaeological endeavour in allowing us to view the interaction between social beings and the material world as a process analogous to language.

1. This assertion finds unexpected support from the ethnoarchaeologist Gould (1990:13-14) who doubts 'that one can adequately study the operation of a cultural system and its material residues without learning the language or attempting to gain any kind of emic perspective with respect to that society's view of the past'.

Following Basso (1990:172) further, insofar as the

> resources of a language, together with the varieties of action facilitated by their use, acquire meaning and force from the sociocultural contexts in which they are embedded... the discourse of any community will exhibit a fundamental character - a genius, a spirit, an underlying personality - which is very much its own.

Is it possible, then, through consideration of Huli language and practice, to derive a sense of the spirit, or global logic, expressed through core tropes, that fundamentally structures Huli engagement with the material world? The dangers of establishing global constructs such as "worldviews" have been identified by, amongst others, anthropologists for whom 'such labels impart a false rigidity and abstract quality to ideas that are rather more acknowledged assumptions than articulated constructs' (Wagner 1972:108), and feminists who have drawn attention to the violence done to marginalised positions through globalising the discourses of the powerful (Harraway 1988). The core tropes employed in the following chapters provide a more flexible, discursive means of access to the sense of shared (and imposed) meanings that consitute a "worldview", and must themselves be regarded as disposable constructs, devices to assist in the task of gaining some initial purchase on a notionally unitary set of Huli perspectives, only to be interrogated in turn themselves and shown to be composed of a contested multitude of strands of thought and perspective (see Chapter D2).

In a similar vein, Frankel (1986:16) has suggested that Huli cosmology frames a set of basic assumptions about the world for Huli people, assumptions that 'supply a grid which orders some of the Huli responses to the changes of recent times'. There is, indeed, no single Huli word or phrase that matches the core trope expressed in Huli cosmology, identified here as entropy. This nebulous but all-pervasive theme in Huli belief is centred upon the notion of a world in a process of decline and decay, an assumption which underwrites Huli views of the world in general, and which neatly and somewhat ironically opposes the corresponding trope underpinning "Western" historicity, identified earlier as "meliorism" or "progressivism" (Chapter A1). Entropy articulates two principles of distinction that are keenly prominent in Huli discourse and that have previously been identified and discussed by ethnographers of the Huli: gender and precedence (see Chapter B3).

Together, principles of gender and precedence, articulated through the core trope of entropy, fundamentally inform the ways in which the Huli universe is constructed. An understanding of the relationship between the ways in which contemporary Huli conceive of and interact with their environment provides a model that both illuminates the recent history of that interaction and affords a "self-account" of the Huli past not readily accessible through conventional archaeological methods. Critical to my thesis is the assertion of a degree of continuity between past and present Huli society sufficient to warrant some confidence in this process of "reading the past from the present".

Appendix B1 provides a bare chronology of events in the Huli universe during the last eighty years which documents the recency of both initial contact between Huli and the colonial state and economy in 1934 and permanent administrative contact through the station at Tari from 1952 (Figure B1). This contact and the subsequent conversion of most Huli people to Christianity has resulted in dramatic changes in Huli society over a very short period of time. It is important, therefore, that careful distinctions be made between current conditions and beliefs and those in existence prior to contact. Use of the present tense in discussing Huli society thus indicates current or continuing beliefs or practices during the "ethnographic present" of 1989-92; the past tense is used to reserved for historical events or conditions, and discontinued practices such as rituals.

The following chapters of Part B provide an interpretative context for the archaeological study described in Part C, tracing the influence of Huli notions of gender, precedence and entropy through the juxtaposition of Western and Huli attitudes and practices relating to the landscape (Chapter B2), to settlement and society (Chapter B3) and to subsistence and production (Chapter B4). The final chapter (Chapter B5), addresses the clearest and most condensed expression of these tropes in the form of rituals that are explicitly conceived as a means of gaining some human purchase upon the process of entropy. The history of Huli ritual, which is addressed in Chapter D1, thus serves as a metaphor for the history of Huli society at large.

CHAPTER B2 - *DINDI*: ENVIRONMENT AND LANDSCAPE

B2.1 *Dindi, Dama, Agali*

This chapter introduces the Huli view of the land (*dindi*) as the product of spirits (*dama*), with whom the land's continuing stability and fertility has had to be negotiated[1]. Former rituals founded on the supplication of *dama* serviced a triangular relationship of exchange between *dindi*, *dama*, and humans (*agali*) that sustained the Huli cosmos. Failure of this relationship, which would result ultimately in an apocalyptic cataclysm, was assumed to be both inevitable and progressively closer in time (Chapter B5). In a largely aseasonal environment, it is "natural" disasters rather than seasonal cycles that have imparted a temporal structure to Huli existence. Droughts, floods, frosts and epidemics, all perceived to have increased in frequency during the last century, are interpreted by Huli as further tokens of the inherent instability of the relationship between *dama* and *agali* and of the imminent decline of the land.

In the account of the Huli environment that follows, the description shifts between Huli exegesis and conventional "Western" explanation in an attempt to bring to the fore the differences between the two perspectives and to generate a framework for their mutual interpretation. Huli attitudes towards such fundamental features of their landscape as the topography and drainage (B2.2), the geology and soils (B2.3), vegetation (B2.4) and climate (B2.5) can be seen as expressions of the central tenets of Huli cosmology, which is embodied in a "sacred geography" (B2.6), a ritual and largely subterranean cartography.

B2.2 Topography and Drainage

Perched on the southern rim of the Central Range of Papua New Guinea, and lying at the westernmost extreme of the chain of intermontane valleys that characterise the Central Highlands, the basins of the Tari region occupy an intermediate position between the Central Highlands valleys and the mid-altitude margins (Figure A1). Huli settlement extends from about 1200 m in the Lower Tagali valley through to approximately 2750 m in the E Mama basin. Huli horizons are dominated in the east by the high peaks of Ambua (Doma Peaks) (3360 m) and Gereba (3365 m) and in the west by Mbiduba (3420 m) and Galoma (3623 m). In the north, the Central Range rises to 3000 m, and in the south, a limestone belt, broken by the volcanic cone of Mt Haliago (2689 m), marks the southern fringes of Huli territory (Figure B2).

1. Appendix B2 describes the orthography used in this thesis for Huli terms and provides a glossary of those words used frequently in the text.

Within this ring of mountains lie a number of densely settled major valleys: the Tari, Haeapugua, Yaluba, Dalipugua (Koroba), Komo, Lebani, E Mama and Mogoropugua basins, the narrower Lower Tagali valley and the Paijaka plateau. To the east, Huli settlement has spilled over beyond these basins towards Margarima and Benalia. With the exception of the Lower Tagali, each of these basins contains swampy depressions at its centre. Low hills form a narrow band around the margins of these swamps, rising swiftly to the high limestone ridges that cut the landscape into discrete valleys. Valley floor altitudes fall into three broad categories that have significantly structured their histories of occupation (Table B1). Of these valleys, Haeapugua has been the focus of most of my research. This was supplemented by briefer surveys in each of the other valleys, with the exceptions of the Paijaka plateau and the largely unoccupied E Mama valley, neither of which I visited.

For Huli, the cardinal elements of the basins are not the ridges that bound them but the major water features, the rivers and lakes (both *iba*) and swamps (*pugua*), at the centre of each basin. All of Huli territory, with the exception of the Margarima, E Mama and Lebani basins, is encompassed within the watershed of the Tagali river, which drains south and east through the Haeapugua basin and Lower Tagali valley into the Hegigio and Kikori rivers and ultimately to the Papuan Gulf. The Dagia river, feeding into the Tagali river from the east, drains the Tari basin, while the Nagia, entering the Tagali from the west, drains the Koroba and Mogoropugua basins. The significance of these major rivers for Huli is suggested by the use of *kai mini*, honorific prefixes or literally "praise-names". Those rivers designated in this way are listed in Table B2, where a pattern emerges in the use of *Gu* as a praise term for Huli and Duna rivers and *Hona* as the corresponding term for rivers to the east of Huli territory[2]. Figure B2 identifies the major drainage features, including rivers, lakes and swamps, of the Tari region.

Six major swamps, listed in Table B1, dominate the basin floors. Historically, the relationship between the catchment areas of the major rivers and the swamps through which they pass has been critical for the nature of swamp exploitation in each basin (see Chapter C4). The Haeapugua, Dalipugua, Mogoropugua and Lebani basins all enjoy a broadly similar topography, with a central swamp hemmed in abruptly to the east by limestone ridges and to the west by more gently rising slopes. However, differences in drainage, as expressed in the ratio of swamp to catchment areas, appear to have contributed to radically different histories of wetland exploitation, a possibility explored further in Part C.

2. The latter term is also employed in reference to the sun, Hona Ni, and moon, Hona Hana, which are thought to reside at and rise from Mt Ambua, to the east of the Tari basin. *Hona* may thus be a standard praise term applied to subjects from the eastern margins of Huli territory.

Regional drainage provides the basis for one of the fundamental axes of Huli orientation, the distinction between *mane*, upriver or headwaters, and *wabi*, downriver or the lower reaches of any given river. For most Huli this represents a broad flow from north to south and is associated with the course of human life. The spirits of Huli dead (*dinini*) are thought to travel down the rivers to the Tagali and ultimately to a location beyond the known universe, identified as Humbirini Andaga[3]. The connection between water and mortality is explicitly stated in a common Huli myth in which water offered to a child is rejected by the child's mother in favour of her milk[4]. Water (*iba*) is closely associated with broader concepts of fertility, and forms the root of the term *ibane*, for semen, grease, sap or juice. Loss of water and the consequent drying of the landscape are the critical signs of a general decline in the earth's condition. In Huli eschatology, the final demise of the world will be signalled by the conversion of swamps, *pugua*, to dry land, *dindi kui* ("land-real") and a diminution in the roar of waterfalls such as the Hewai falls as the rivers slow to a trickle[5]. The permanently moist swamps, which appear to resist even the harshest droughts, are thus both centres of fertility and the focus of regenerative rituals. Much of Huli ritual has been concerned with this perceived process of desiccation:

> We cook *gebe nogo* [pork oblations for ancestral *dama*] to prevent famine. We try to stop the land from drying out, but now all the waters have left. Only the Piwa, Hulia and Alua rivers are left to us, and we look after them. If these are lost, and the Tagali river slows to a trickle, fire will destroy us all.
>
> Hubi-Morali, 4.11.92, 92/5A:0-368[6]

The spectre of an over-abundance of water is viewed as a comparable, though not equal, threat. Regular floods in most of the basins are a constant hazard and the presence of drowned forests at the base of ditches dug in the swamps is cited as evidence of apocalyptic deluges in the past. Flooding on the basin floors is often the result of tributaries backflooding from junctions with larger rivers[7]. This is held to be caused by blockages of flotsam at gorges or bends near such confluences, which are

3. The association between the lowlands (*wabi*) and mortality is compounded for Huli by the presence of endemic malaria (*wabi warago*: "the lowland sickness") beneath about 1400 m. A similar cardinality is expressed for regional drainage amongst the neighbouring Foi (Weiner 1988b:47) and the more distant Daribi (Wagner 1977:400).

4. See Narrative B9 and Section B5.4.

5. Many older people in the Haeapugua area claim that the Hewai falls are no longer as loud as they were formerly. This might be expected, given the propensity for limestone channels to be underpassed, a process already observed to be under way at Hewai (P.Williams et al. 1972:345).

6. References in this format refer to tape transcripts in Huli, translated into English: in this case 92 (for 1992), 5A (Tape 5 Side A), 0-368 (the tape meter count).

7. While the majority of permanent lakes in the tari region are less than 7 ha in area, much larger temporary lakes are formed by flooding on the basin floors. These flood lakes are each identified by name: hence Lake Yamama in the Lebani basin and Lake Yagaro at Haeapugua (which can attain a size of up to 5 km^2).

usually cleared by a form of *dama* known as *iba tiri* ["water-fool"] spirits, working in pairs (Goldman in press). *Iba tiri* were formerly encouraged and sustained in this work through the performance of rituals above river junctions, in the course of which propitiants would throw bundles of pork tied around an axe into the river (to assist in the work of cutting up the flotsam)[8]. On a grander scale, there are said to be *iba tiri*, the *dama* Muguali and Dabuali, and Ẹlabe and Kẹlabe, at the end of the Tagali river, beyond the boundaries of Huli territory; a failure on the part of these *iba tiri* to maintain a free flow at this point in the Tagali river would drown the Huli universe.

Individual, often ancestral, *dama* spirits are closely linked to specific water features such as deep lakes (*iba kuyama*) on a descendant clan's land, to the extent that they are identified as the substance of the lake or river. Ritual leaders from the landowning group regularly performed propitiatory ceremonies at these lakes to attract the support of these ancestral *dama* for their descendants. The nature of these ceremonies varied considerably from group to group but commonly consisted of an oblation of cooked pork, either thrown into the lake or suspended on a stick by the water's edge, which the lake would then rise to consume. The intimate association between groups and lakes occupied by related *dama* is dramatically evident in stories told of the movements of lakes in conjunction with clan migrations[9]:

> The rivers Ngubibi, Poro and Landa, Dumbiyu and Dolame, these were all up there. But now they are all finished, there are just hills where they were. The waters have all left. These waters were all the homes of *dama* spirits, but now they have left us.
>
> Hubi-Morali, 4.11.92, 92/5A:0-368

Rivers in the Tari region frequently disappear beneath the ground in huge natural tunnels and can be heard roaring beneath the limestone, an observation that has given rise to Huli beliefs about the connections made beneath the ground between different rivers and even different catchments. Huli interpreters entering Duna territory with the administration patrols of the 1950s asserted that the major river flowing through Duna into the Strickland, known to the Duna as Ipa Wapene, was in fact a continuation of the Tumbudu river, which surfaces in Huli territory as a northern tributary of the Tagali in the Lower Tagali valley but is held to flow beneath the land, through the Lebani valley (Figure B2). The similarly subterranean and largely upstream course of the sacred

8. A spectacular example of such a location is Hewai falls, the point from which the Tagali river backfloods into the Haeapugua basin. Here, axes, pork and even vegetables were thrown into the Tagali for the *wane labo*, female *iba tiri* who resided at Ambiuli, a crook in the river above the falls where logs and other flotsam gather. The re-enactment of a similar ritual in the Yaluba basin has been documented on film (Parer 1981).

9. In a widely known tale, Mabiali clan, evicted after fighting from the Haeapugua basin, took refuge in the Koroba basin. Shortly after this, a stream on their former land at Telabo, Iba Dabali, dried up and emerged on their new territory as Iba Hundia.

Girabo river is described in B2.6. Rivers, and water features generally, are thus critical elements of Huli sacred geography and serve as markers of identity (B3.5).

B2.3 Geology and Soils

The complexity of the networks of natural drainage in the Tari region, which may account in part for the subterranean form of Huli sacred geography, reflects the local predominance of Miocene limestones and siltstones of the Nipa group (Davies and Eno 1980). Though limestone forms much of the surficial geology of the northern region around Dalipugua, Mogoropugua and Lebani, Pleistocene volcanic activity from five local, but now dormant, volcanic centres - Ambua, Gereba, Ne, Haliago and Yumu (Löffler et al. 1980) - has infilled this earlier landscape in the eastern basins of Tari and Haeapugua (Figure B3). Further deposits of wind-borne tephra, presumed to derive from the volcanic centre of Mt Hagen, constitute the more recent major volcanic layers (Pain and Blong 1976). The extensive cover provided by the most recent major deposit, presumed to be Tomba tephra from Mt Hagen, has produced a largely uniform parent material for the Tari region soils. Basin floors throughout the region are dominated by Quaternary alluvials, with the notable exception of a distinctive set of fans flowing off the western slopes of Ambua and extending over much of the southeastern portion of the Tari basin[10].

In his major study of the soils of the Tari area, Wood (1984) describes the five major local soil types as alluvial, colluvial, rendzina, peaty and tephra or volcanic ash soils[11]. Figure B4 shows the distribution of these different soils over the Tari and Haeapugua basins. The most productive soils from an agronomic perspective are the colluvial and alluvial deposits restricted to river and wetland margins on the basin floors (B4.5). The colluvial soils of the southern Tari basin have developed on the mudflow deposits from Mt Ambua. The shallow rendzina soils on the limestone ridges and outcrops of the region are the least productive and, restricted to the steeper slopes where they are easily eroded, the least exploited of the Tari soils. Peaty soils are found in the swamps and are characterised by a high acidity, which is inimical to most crops, balanced to some extent by high phosphorus values and almost 20% organic content.

Topsoils developed on the volcanic ashes, characterised by Wood (1987) as humic brown soils, cover over 70% of the Tari and Haeapugua basins. Humic brown soils are notable both for their high levels of organic carbon and nitrogen and for the

10. The most recent of these fan deposits, the Alua mudflow, is discussed in further detail in Section B5.3.

11. Wood limited his field study to an area bounded to the north and west by the Tagali river (Figure B2), consisting of the Tari basin, the Paijaka plateau and the eastern half of the Haeapugua basin; this limited area is referred to here as "the Tari area" to distinguish it from the wider "Tari region" and the more specific "Tari basin".

speed with which they degrade, rendering them unsuitable for intensive exploitation over extended periods. Most of the soils of the Tari region are developed on Tomba tephra, which covers much of the region to a depth of 2 m. Tomba tephra, dated at greater than 50 000 BP, is the uppermost of a complex series of tephras, the three upper units deriving from the volcanic centre of Mt Hagen and the basal units presumed to derive from a closer source, probably Ambua.

Overlying Tomba are at least two thin Holocene tephras: Tibito, dated to 305 - 270 cal BP, and Olgaboli, dated to 1190 - 970 cal BP (see Appendix A3). The distribution of these last two tephras is extremely patchy, reflecting an original estimated airfall thickness of only 1.5 cm for Tibito for the Tari region (Blong 1982: Fig.29); Olgaboli has not yet been identified in the field at Tari and its presence there is only inferred by Haberle (1993:184) on the basis of a second peak of ferrimagnetic minerals lying just beneath Tibito in cores from Haeapugua. Tibito has been identified from several locations in the Tari region, where it is typically found as a discontinuous band of balled and partly cemented olive grey sand (Chapter C3).

Huli appear to distinguish soils on the basis of a wide range of criteria, including colour, texture, inclusions, water content, perceived productivity and even location. Though, as elsewhere in the Highlands region (Brookfield and Brown 1963:35, Landsberg and Gillieson 1980, Sillitoe 1991), colour is the most frequent referent, Huli soil classification employs a very shallow taxonomic hierarchy, with higher-order distinctions made only between sand (*mu*), soil (*dindi*), clay (*ibi dindi*) and stone (*tole*). Certainly there is no overriding consensus on soil terms; the list of Huli soil terms given in Table B3 has been compiled over time with different people, few if any of whom would agree on all of the descriptions. Instead, descriptions of soils are contingent upon the particular task at hand: principal amongst these, particularly when the question is posed standing in a garden, is the suitability of a soil for crops.

Garden site selection is based upon an appreciation of soil and vegetation qualities in combination, but certain soils are identified as uniformly favourable or unfavourable for specific crops. *Dindi mindi*, a rich dark brown to black humic topsoil, and *dindi kabi*, a yellowish brown alluvial clay, are universally preferred for sweet potato and mixed gardens. However, *dindi dongoma*, a hard white calcareous clay found beneath *dindi mindi* along the margins of Haeapugua swamp and said to be a poor soil for sweet potato, is particularly favoured for taro. Men with gardens at Haeapugua will often excavate garden ditches to a depth sufficient to enable them to heap the basal *dongoma* up onto the perimeter walls, which are then planted with taro. The production of *ndodobai*, a sticky grey clay formed by mixing *dongoma* and *mindi* topsoil, is also a technique commonly employed at Haeapugua to boost topsoil depth and reduce the acidity of the peaty topsoil.

The terms for certain soils, however, reflect ritual significance alone (see Ollier et al. 1971:40); typically, these are distinctively coloured clays. Although the favoured red, yellow, blue and white clays are quite widely available, only those clays from specific sources with intrinsic ritual significance are individually named and were formerly employed in ritual. Hence the term *ambua gaga*, given to a bright yellow ritual clay, refers to its source on the lower slopes of Mt Ambua[12].

Although there are no terms or phrases in the Huli language that identify soil profiles or sequences, there is a keen sense of stratigraphic position and an appreciation of the processes of soil loss[13]. Pedogenesis is usually expressed through reference to fluvial deposition. As one person observed to me, swamp peats, once drained, dry to become firm ground (*dindi kui*); but floods then strip the *dindi kui* from the surface, exposing clay (*ibi dindi*) beneath. Many older Huli can identify Tibito tephra, which they refer to as *mbi mu* ("darkness-sand"); as Huli myths state that this sand fell from the sky (as *da pindu*: "sky-stuff") and covered the surface of the land, some people have observed to me that the overlying sediments must have been washed down over the tephras.

No discussion of soils with Huli people is complete without a brief lament for the decline in the earth's fertility, often depicted in terms of declining crop yields, the vertical or lateral movement of soil types or physical changes in soil quality. The general concept of *ibane*, or grease, finds its complement in soils as *dindi ibane*, soil grease[14]. Over time, and not solely as the result of use so much as an integral characteristic of the earth as a whole, this grease is dissipated, leaving *dindi gabu* (literally "dry" or "barren" ground), greaseless soil in its place. Composting of garden mounds is a recognised means of restoring *dindi ibane*, but is seen as a stopgap measure in a process of environmental degradation that is largely beyond the control of humans (B2.6).

12. Huli use of the term *ambuabi* to denote the colour yellow generally implies a considerable antiquity for Huli occupation of the area, sufficient at least to permit lexical association between basic colour terms and prominent landmarks.
13. This absence of terms for soil sequences appears to be common amongst other Highlands languages (Brookfield and Brown 1963:35, Ollier et al. 1971:34, Sillitoe 1991:154).
14. See Section B5.4 for a further discussion of fertility. Huli attitudes to soil in many respects resemble those of the neighbouring Wola for whom Sillitoe (1991) describes the comparable notion of *iyba* or grease as it is applied to soil; apparent lexical correspondences between Huli (H) and Wola/West Mendi (W) are suggested for at least the following soil terms: *kolbatindiy* (W): *goloba dindi* (H), *tongom* (W): *dongoma* (H) and *iyb muw* (W): *iba mu* (H).

The physical evidence of land degradation is also attested by forced changes in crop composition in gardens as the crops less tolerant of poor soils fail to yield, and by the encroaching advance of poorer soils over areas once covered with rich soil. In the following passage, a man with gardens at Haeapugua comments on the loss of topsoil (*dindi mindi*) and the apparent rise of basal white clays (*dongoma*):

> We used not to see *dongoma*. Now that it has come up the land has gone bad. Before this land was good, but soon it will all be *dongoma*. *Dongoma* lies at the base, then soft clay [*ibi dindi*], and on the top is topsoil [*dindi mindi*]. When the ground dries, the top two soils turn to dust and blow away and then *dongoma* comes up to the top. If the surface soil is hard, you know that *dongoma* is close to the surface. If it is soft, *dongoma* is still down some way. When *dongoma* is everywhere, this land will be finished and everyone will die.
>
> Kamiali 26.8.91, 91/18B:502-535

Another Haeapugua landowner expresses the belief, encoded in a short *pureromo* adage, that the progress of gravel and firmer, drier soil conditions across the swamp forebodes the end of the earth:

> Before this gravel [*gi mu*] was above Mindira Togo [a bridge across the Tereba river in Haeapugua]. When the Tereba river carries the gravel down as far as [the junction with] the Tagali river, the ground will dry up completely and the world will end.
>
> Mbugua 29.7.91, Fieldnotes

B2.4 Vegetation

Huli distinguish between *irabu* (*ira*: tree; *bu*: core), forest, and *hama*, open areas of settlement which are synonymous with forest clearance. Deep forests at higher or lower altitudes, in which there remains little or no evidence for human occupation, are identified as *tayaanda* and associated with non-ancestral and typically malevolent *dama* spirits. Huli forest management can be summed up, to some extent, as an attempt to reduce *tayaanda* and *irabu* to open *hama* space and then, within this cleared area, to recreate the forest in the form of managed or carefully bounded groves (*te*). The vegetation of the Tari region basins, shown in Figure B5, thus bears a heavy trace of human interference[15]. Basin floor vegetation is now dominated by gardens and grasslands, with closed and open canopy forest representing only between 2.4% and 6.8% of cover in the central Tari and Haeapugua basins, compared with 84% forest cover on the steep inter-basin limestone ridges (Wood 1984, Vol I: Table 6.4).

The grasslands represent fallows of varying lengths, in which a continuously interrupted vegetation succession rarely permits the development of woody regrowth. Shorter grass fallows are indicated by the presence of *bolange* (Ischaemum

15. Extensive descriptions of vegetation in the Tari region are given by Powell with Harrison (1982), Wood (1984) and Haberle (1991, 1993).

polystachyum), which is replaced over time on poorer soils by *dangi* (Imperata cylindrica), *yagua* ferns (Pteridium aquilinum or Diplopterygium sp. or Histiopteris incisa) and *gambe* (Miscanthus floridulus). A survey of 52 swamp margin gardens at Haeapugua lists the most commonly occurring species in this rich soil area (Figure B6)[16]. On the swamps themselves, an initial cover of *dunduyame* (Leersia hexandra) gives way after cropping to fallows mixed increasingly with *bolange*, and over longer periods, with *hongo bandu* (Coix sp.). The high-altitude grasslands found in the E Mama valley and between the mountains Ambua and Gereba are probably maintained by repeated firing (Haberle 1993)[17]. The decline in soil fertility implied by this sequence of successively poorer grassy covers is a recurrent theme in Huli accounts of the earth's inevitable demise, such as the one below which envisages the invasion of the swamps, the fertile core of the Huli environment, by grasses and ferns characteristic of poor soils:

> Now the end is nigh... It is said that when *yagua*, *dangi*, *balimu* and *gambe* [grasses and ferns] come up at Urupupugua, Haeapugua... Dalipugua and Mogoropugua, if you see these you will know that everything is going to end.
>
> Timothy, 17.4.91, 91/6A:376-42

Similarly, the degradation of forest communities on the basin floors is expressed in terms of the replacement of *bai* (Castanopsis acuminatissima) by *bauwa* (Casuarina oligodon oligodon). A small grove of *bai* trees in the centre of the Lebani valley is all that remains of the forest cover after extensive clearance for gardens and the depredations of major bushfires during drought periods. The most spectacular instance of replacement is the regrowth and replanting of an almost exclusive cover of *bauwa* on the surface of the Alua mudflow fan in the eastern Tari basin. In most other areas, however, human selection and planting have created a more complex pattern. At Pureni, on the western margins of Haeapugua, *bai* is dominant on the borders of the swamp gardens, while *bauwa* is the major tree species on the dryland slopes; here, *bai* is deliberately replanted to strengthen ditch walls and effect claims to land amongst the swamp gardens, but the quick-growing *bauwa*, which is weeded out from the swamp gardens for use as firewood, is clearly preferred on the degraded slope soils[18]. The *bai:bauwa* distinction appears to express a complex of related observations: a temporal succession from originary to successory, a marker of ritual activity (*bai* trees are amongst the more common species in *te* ritual groves) and a perceived decline in soil quality. But it is, of course, largely a figurative distinction in which the two species

16. Appendix B3 lists those Huli terms known to me for grasses, herbs, shrubs, mosses, ferns and sedges.
17. Though I have not enquired after the origins of the name E Mama, a literal translation would be *e* ("garden cleared from forest") *mama* ("[by or of] ancestors" / "anciently").
18. The extent of the more recent mudlfow events on the Alua fan (Section B5.3) is clearly marked by the cover of *bauwa* Castanopsis and the absence of mature trees of other species.

come to stand for much broader vegetation communities[19].

Tree species that are currently significant on the basin floors include Casuarina oligodon (*bauwa*), Ficus copiosa (*poge*), Dodonaea viscosa (*lai*), Glochidion pomiferum (*mbuli*) and Homolanthus sp. (*embo*); Figure B7 lists the most commonly occurring species in a survey of 52 gardens at Dobani parish in Haeapugua[20]. It is doubtful whether there are any stands of forest on the floors of the major basins that have not been managed to some extent. Even on the steep ridge slopes, where the overwhelmingly dominant species is *Nothofagus*, there is considerable evidence of disturbance by pigs and of selective culling of certain woody species for house and fence construction (Powell with Harrison 1982). The most interesting and complex form of forest management occurs in the numerous *te*, ritual groves found in every clan territory. These are the *haroali tigi*, small stands of forest formerly reserved for members of the *haroali* or *ibagiya* bachelor cult, and the *gebeanda*, ritual sites marking the settlements of early clan ancestors. Both types of site were strongly associated with notions of fertility. The bachelor cult sites were centred around the maintenance of bog-iris lilies (*ibagiya* or *wiliaba*: Acorus calamus) in pools set in managed groves stocked with tree species associated with lower altitudes.

Gebeanda ritual sites, which varied considerably in size and significance, usually contained a core grove of *bai* (Castanopsis acuminatissima) or *guraya* (Araucaria cunninghamii) trees, commonly perched on ridgelines jutting out into the basins[21]. These are said to have been planted by the original ancestors who carried *guraya* seeds across the landscape[22]. The *guraya*, the tallest tropcial trees species, formerly towered over the surrounding trees and were visible across the length of basin floors[23]. Though the landowners at these sites are adamant that they never restocked or planted trees themselves at *gebeanda* sites, straight paths were maintained through the apparently self-seeding *guraya* groves by weeding out seedlings and removing even leaf litter along the course of the path (Plate 1). Almost all of the *gebeanda* groves were deliberately targetted and felled during the 1950s and early 1960s by the administration and the various missions, the timber being used to build Tari station and the mission

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19. Goldman (1993:318) cites the Huli adage: 'Where a Bai tree stands a Bauwa tree won't grow', though his interpretation of the significance of the two species differs from that offered here.
20. Appendix B4 lists those Huli terms known to me for different tree species.
21. The natural groves of Araucaria hunsteinii found in the Lower Tagali valley do not appear to be vested with the same significance as A.cunninghamii by Huli-speakers, though the former have ritual value elsewhere in Papua New Guinea (Enright 1982:384).
22. The attribution of the planting of Araucaria groves to ancestors is a common theme in the Highlands region (Healey 1988:117). A.cunninghamii also holds a particular significance for Wiru-speakers of the Southern Highlands who plant seeds of the tree (known locally as *wiru*) at new settlement sites to denote the "re-planting" of a community (Clark 1985:25).
23. A.cunninghamii are capable of growing to heights of between 60 m and 70 m (Enright 1982:386).

houses and churches. No surviving mature *guraya* tree, however, is without significance as a marker for some form of ritual site[24].

The planting of trees, for a variety of reasons, is a widespread and fundamental strategy for Huli. Trees are generally significant as historical markers or mnemonics. As markers of use and precedence, planted trees play a major role in disputes over garden ownership; parents take considerable trouble to point out to their children all of the surviving trees that they or their ancestors claim to have planted and people maintain a mental register of their tree holdings in other parish territories or even other basins. Trees are planted to mark specific events such as births, oaths or unavenged murders, and the health of these trees thus becomes a matter of note, being taken to represent the condition of the individual or the relationship associated with the tree. Individual trees are singled out in oral narratives as proofs (*walia*) of the events of the narrative[25]. Lastly, the age and species composition of trees on individual clan territories is remarked upon as an indication of that clan's success in warfare; a common tactic still employed during warfare is to overrun enemy territory for long enough to ringbark and destroy as many trees as possible. From some vantage points, it is possible to look out across basins and spot breaks in the height of trees that identify territories ravaged in wars over the last century. Tree species, size and location are all thus tokens of history for local residents.

B2.5 Climate and Seasonality

The valleys of the Central Highlands have been characterised as having circulations of air flow that are significantly independent of larger-scale air movements to the north or south (Brookfield and Hart 1966), resulting in a series of relatively localised climates. But the valleys of the Tari region also lie within a belt of aseasonal climatic conditions that extends along the southern slopes of the Central Range (McAlpine et al. 1983:69-72, Bourke 1988: Fig.2.2) and are thus amongst the few major valleys of the Central Highlands to exhibit marked aseasonality or perennial wetness. Temperature means vary through the day from 13 to 24 degrees centigrade

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24. Before it was logged in the 1960s, the *gebeanda* at Waloanda in Haeapugua basin apparently contained a range of other species, including A.hunsteinii (*yaluba*), Castanopsis (*bai*), Nothofagus sp. (*dagiruba*) and various ritually important shrubs and cordyline plants. With the collapse of the bachelor cult and the proscription by the missions of the rituals associated with the *gebeanda*, both types of ritual grove have been heavily exploited for firewood and house timber and probably represent the bulk of the average 9% clearance of forest across the Tari area between 1959 and 1978 reported by Wood (1984:158).

25. Certain trees are held to have been present during specific historical events, the most notable at Haeapugua being two ancient stumps near the resurgence of the Haeawi river which are said to have survived the ash fall (*mbingi*) of Tibito tephra. This is not entirely implausible: Read et al. (1990:200), in accounting for the composition of the Nothofagus-dominated forests of the Mt Ambua/Doma Peaks area, raise the possibility that common size structures evident amongst mature trees might reflect the levelling effects of the Tibito ash fall.

(Figure B8), but the annual range for these maximum and minimum mean temperatures is only about 1.5 degrees centigrade (Wood 1984: Fig.2.6), a strongly aseasonal condition. Mean annual rainfall for the Tari basin, measured at four stations on the basin floor, is between 2360 mm and 2870 mm (Wood 1984:37). The monthly means taken from the longest record available for the region, at Tari Station, illustrate the lack of a marked dry season (Figure B9) and provide tentative evidence for the double maximum characteristic of the southern slopes of the central cordillera (Fitzpatrick et al. 1966:193), in which monthly rainfall averages appear to peak marginally between February and April and then again between September and November. It should be stressed however that these peaks are neither distinct enough, nor is their occurrence sufficiently consistent between years, to be observed without the aid of long-term records.

There may be some evidence for minor local variation in rainfall within the Tari region, both in mean annual totals, with 3331 mm recorded for Koroba (McAlpine et al. 1983:180), and in the seasonality of rainfall. In a recent reclassification of rainfall seasonality in Papua New Guinea, Abeyasekera (1987) has identified two distinct patterns among the records from the Tari region stations. While the region generally shows an even rainfall distribution throughout the year, Abeyasekera interprets the results of a cluster analysis to reveal a more subtle distinction between the results from Tangi and Koroba on the one hand (Type B1) and Margarima, Pureni and Tari on the other (Type B2), suggesting that Type B2 patterns exhibit a slight fall in rainfall during June and July that is not evident in Type B1 patterns. In other words, it appears that the double maximum in monthly rainfall decreases from east to west across the Tari region. Mean monthly rainfall at Tari typically exceeds combined estimated evaporation and transpiration, yielding a high water balance estimate (Keig et al. 1979)[26]. This, and the broad uniformity of rainfall over the year, result in consistently high soil moisture storage, a fact that may have been significant historically in the development of the Huli agricultural techniques described in B4.4.

While the term *angi* ("when", "time of") serves broadly to denote recurrent events, such as *bai angi* ("acorn time"), or specific historic events, as in *mbingi* (*mbi*: "darkness"; *angi*: "time"), no terms exist to distinguish amongst seasons nor is there any explicit recognition of annual rainfall cycles. The fundamental significance that seasonality implies for Huli neighbours to the east, such as the Foi (Weiner 1991), Kakoli (Bowers 1968) and Wola/West Mendi (Crittenden 1982), is not evident in Huli life or discourse. Huli are quick to refer to the prolongation of a period of dry or fine

26. Wood's (1984:41) table of monthly evaporation estimates draws on results from nearby Mendi, which has an annual rate broadly similar to that of Tari (Keig et al. 1979:29).

weather (*gaea*) as a drought (*gaea timbuni*: "big dry"), or to a sustained period of rain (*dalu* or *iba*) as a deluge (*dalu timbuni*: "big rain"), and keenly observe the development of haze (*yagogo*), which is said to indicate the severity of an impending drought. They are rarely prepared to plan or to forecast conditions, however, on the basis of observations of annual cycles.

More significant in Huli life than the relatively uniform rainfall is the periodicity of annually fruiting trees such as *abare* (Pandanus conoideus; marita pandanus) and *anga* (Pandanus julianetti; karuka pandanus), the acorns from the *bai* (Castanopsis acuminatissima; oak) tree and the appearance of *nano* (unidentified species) mushrooms, the last being in season through August and September. Pig owners occasionally refer to a *bai angi* (fruiting of the Castanopsis tree) because their pigs go into the forests to forage for the acorns[27]. For those individuals with either direct ownership of pandanus trees or access to pandanus through kin or affinal ties, the year is to some extent structured by the karuka pandanus harvests, referred to as *anga angi* ("the time of karuka pandanus"), or *anga u lo dawaga* ("the time when all call out to cook karuka pandanus"). While pandanus seasonality is poorly understood, with yields appearing to vary considerably between years (Rose 1982), observations of karuka pandanus seasons at six highlands locations suggest that the Tari season, generally over a two-month period between January and March, is not atypical of the highlands as a whole (Bourke 1988: Fig.5.7). In the Southern Highlands region, marita pandanus fruits most heavily between October and April during yielding years, though the season contracts to between January and April at the higher end of the marita range, where most Huli marita trees are located (Bourke n.d.).

It is possible to construct cycles from these seasonal appearances. An older man at Haeapugua, when asked to attempt such a calendar, suggested a cycle running from the period when people begin to succumb to "seasonal" colds (*homama*), through the combined appearance of *nano* mushrooms and the new leaves of the *poge* fig tree (significant because the two are cooked together), to the fruiting of *bai*, *abare* (marita) pandanus and *anga* (karuka) pandanus. As he pointed out, however, *poge* and *abare* are virtually continuous phenomena; those without access to *poge* or *abare* know when they are in fruit anyway, because they still get *homama* colds. Certainly no one suggested to me that such a cycle was ever widely employed as a framework for planning, nor does the planting of the major staple crops appear to be seasonally structured, though planting rates obviously vary with perceived short-term changes in

27. Morren (1979, 1981) has proposed a seasonal rhythm to Miyanmin residence founded on the relationship between the fruiting of certain trees and the movements of wild pigs; this is contested by Bourke's (1988) criticisms of anthropological uses of data on seasonality generally, and by Gardner (1980, 1981, in prep.) specifically on the question of seasonality in Miyanmin.

soil moisture[28]. There are other indicators of seasonality available to Huli, such as the seasonal appearance of migratory birds or the changes in the precise location of the sun's rise and setting along the mountain ranges. It must therefore be significant in terms of the nature of Huli temporality that, despite this scope for the construction of a notion of seasonality, Huli life is not structured around annual cycles.

Longer-term variation in rainfall is more significant in the Tari region than seasonality, and it is the major floods and droughts that figure most prominently in Huli understanding of local climate. The frequency of occurrence of these events is seen to correspond, not to annual climatic cycles, but rather to a longer temporal cycle, monitored through the medium of a sacred geography.

B2.6 *Dindi Pongone*: Huli Sacred Geography

The notion of "sacred geography" has been developed within Mayan ethnography to address the means by which Mayan cosmology is formally encoded in the landscape (Gossen 1974, Vogt 1981; see Goldman 1983:112). Mayan ritual sites, on this view, are the geographical points of access between distinct human and sacred universes; the co-ordination of ritual over larger areas links these individual sites to form a regional sacred geography[29]. Ethnographers of the Huli have adopted the concept of a sacred geography to describe the vast corpus of beliefs known to Huli as *dindi pongone*[30]. While there is no suggestion that Huli subscribe to a distinction between sacred and profane geographies, the notion of a sacred geography is retained here as a useful heuristic device for drawing attention to the layers of meaning implicit in the Huli

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28. This is in marked contrast to the complicated calendar described for the neighbouring Enga-speakers by R.Bulmer (1960b:72), and particularly by Meggitt (1958a), which prompted me to trouble many old men and women at Tari for a comparable scheme. My lack of success in this can perhaps be explained by a personal communication from R.M.Bourke, who assures me that no other researcher in Enga has been able to replicate Meggitt's calendar and that Meggitt has himself admitted that the calendar owed much to an excess of enthusiasm on his part during early fieldwork. There are also climatic differences between the Enga and Huli regions which lie on opposite sides of the Central Range: Allen's (1989: Table 2) correlation analysis of rainfall records from stations in the Highlands suggests that the results from the Tari region stations are positively correlated with stations along the southern Papuan coast (Kikori, Itikinumu), but either negatively or not all correlated with station records from central Enga.

29. The subterranean location of much of this Mayan sacred geography is also a feature of what might be identified as Huli sacred geography, presumably reflecting the limestone setting common to both areas. More immediate and probably historically related parallels to Maya sacred geography are found throughout Mesoamerica and the American Southwest (Saile 1985, Taube 1986).

30. Though the various ethnographic accounts of *dindi pongone* recognizably refer to the same phenomenon, they differ considerably in detail, reflecting not only the specific interests of the different authors but also the difficulty of grasping this quite extraordinarily complex and geographically diffuse labyrinth of myths and associated beliefs and practices (Goldman 1983:113). The development of an understanding of *dindi pongone* can be traced through these different accounts from Glasse's (1965) territorially restricted comprehension, through Goldman's textually based description (1981a: Fig.4, 1983:112ff.), to the more comprehensive study by Frankel (1986:16ff.), who visited most of the associated ritual centres and interviewed the site custodians.

landscape that are not immediately accessible to non-Huli observers. *Dindi pongone*, literally the root or knot of the earth, refers equally to the presence of a sacred and largely subterranean landscape and to the body of related myths and *gamu* spells that constitute knowledge of this landscape. The broad outlines and distribution of this sacred geography are sketched here; a more detailed account of the *dindi gamu* rituals associated with the *dindi pongone* sites is given in B5.5.

The minimal components of Huli sacred geography are clan-specific myths (*dindi malu*) and associated *gebeanda* (*gebe*: ancestor; *anda*: house, place) ritual sites, which together describe the events of a clan's origins and situate them in the landscape. These clan myths identify ancestral *gebe* spirits (also referred to by the generic term, *dama*), who are individually associated with *gebeanda* usually located within the territory of that clan[31]. These ancestral *dama*, who are deemed to have first emerged on or migrated to the clan territory and are typically credited with having initially described its boundaries and named its salient features, were formerly the objects of propitiatory rituals, held at the appropriate *gebeanda* and designed to ensure their support for the fertility of clan land and the general health of the clan. Each of these *gebeanda* sites was owned by a particular sub-clan or family within the clan, known as *gebeali*, who assumed the responsibility for ritual performances. *Gebeanda* sites were formerly identified by the presence of thick stands of *bai* (Castanopsis acuminatissima) and *guraya* (Araucaria cunninghammii) trees. The margins of these groves, often delineated by ditches or streams, served to mark out the extent of *gebeanda* areas with their strictly observed borders that separated space identified as *hane*, or "without", from *habane*, or "within", the *gebeanda*. The acts of entering and exiting *gebeanda habane*, permitted solely to members of the *gebeali* family at each site, were synonymous with ritual performance[32]. Ideally, every Huli clan was uniquely linked with a different clan *gebeanda*, and most sub-clans with their own distinct minor *gebeanda*[33].

At a regional level, there is a distinct set of myths which correspond to a more fundamental stratum of *dama* spirits who are jointly responsible for the constitution of

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31. The generic term *dama*, literally "big" or "everything" (Goldman 1983:72), refers to a broad range of spirit "types", including cosmogonic *dama* such as the sun (Ni) and moon (Hana), *dama* generally unrelated to humans, such as most of the *iba tiri* (water fool) spirits, and deceased ancestors, referred to as *gebe* or *gebeali*.

32. Thus the *gebeali* at Gelote *gebeanda*, Yaliduma-Dai, identifies two ritual dances, *mali* and *gulu wambia*, with the inside and outside of Gelote, respectively: *'Gulu wambia ba anda tagi bialu, mali udu biago o li anda halu.'* [We danced the *gulu wambia* outside (*ba anda*) and the *mali* once we had come inside (*li anda*)].

33. Given the presence of more than 240 Huli clan names, and a very rough average of four named sub-clans within each clan (Appendix B6), this suggests that there may be more than 900 *gebeanda* locations in the Tari region; of these, I have so far been able to visit and identify only about 60 sites.

the Huli universe. The most widely known of these myths are essentially amalgams of elements of origin myths owned by specific clans, which refer to specific locations. Certain clan-specific myths, often by virtue of the significance of the individual clans or their sacred sites, have assumed a regional significance and become incorporated within a unified, almost linear, narrative form, though the identity of the mythical locations is usually preserved. Together, these myths recount the process of the stabilization, creation and division of the original, unstable landscape by ancestral figures. These regional cosmogonic myths (myths of universal origins) set out the cardinal features of Huli sacred geography and prescribe the attendant obligations of ritual. Their basic elements are widely known throughout Huli territory, in the form of narratives and *pureromo* or *pureremo* (Goldman 1983: Table 2), short formulaic chants that encapsulate knowledge (*mana*), often through the recitation of key sets of names (of people, places or objects).

The most common of cosmogonic myths amongst Huli opens with an original couple consisting of a woman, Tia Nangume, and an unnamed *iba tiri* spirit (Narrative B1). After the *iba tiri* tricks Tia Nangume into falling into the Tagali river below Hewai falls, thus quenching the fire or heat (*pobo*) within her, she gives birth to a boy and a girl. Following the girl on her daily walk to Luya Talete, near Bebenite, the boy observes his sister masturbating on a tree trunk and places a sharp flint there which cuts open her vagina (Narrative B2). After an incestuous intercourse, brother and sister return to their parents to find a horde of new siblings present, in effect the entire upper echelon of the Huli pantheon. Each of the siblings is them named in turn by the parents: the boy is told that he is Hona Ni, the sun; the girl that she is Hona Hana, the moon. Together, they leave their parents and walk east to Ambua, where they build Da Togo, a bridge across the sky, which they cross to Mt Mbiduba in the west.

The original ancestress, Tia Nangume, known as Dindi Ainya, Dangi Tene or Memeleme in other narratives, is also credited with bearing fire, the major *gebeanda* and the constituent elements of *dindi pongone*:

> She bore [the ritual sites of] Mbibi Bai, Terewale Muni, Hewari Gambeyani, [the mountains] Auyane Aungulu, Giginawi, Guale, Kaga, Ambua, Bari Aulua. She took the sun, Ni, from her netbag and placed him here on the ground for him to bear children... She bore fire, then she bore the big men [*agali timbu*] who established *dindi gamu* [the earth ritual]... Then she bore the ancestors [*gebeali*], performed *dindi gamu*, made the python [*puya*] and the cane [*gewa*].
>
> Yaliduma-Dai, 11.4.91, 91/5A:200-220

Dindi pongone is described as a root or vine which runs beneath the earth, composed of an intertwined python (*puya*) and cane (*gewa*), bound around a fluid core, referred to as water (*iba*), and capped by a layer of stone (*tole*). The python, usually but not exclusively identified as male, is said in more elaborate accounts to have ten heads, each head corresponding to one of the major *gebeanda* sites associated with *dindi pongone*, and a tail with two forks[34]. The first of these forks is tied to a cordyline plant of a particular variety (*payabu piru*), which extends from beneath the earth up into the sky, the second to the rear leg of a pig, *nogo tambugua*, which features in much of Huli myth. The action of *nogo tambugua* in scratching itself and thus tugging upon the tail of *puya* is held to provoke the earthquakes common in the Tari region.

At a number of points, *dindi pongone* rises close to the surface of the earth, where the stone cap becomes visible, often as limestone outcrops within which caves are identified as the open mouths of the snake's heads. The *gebeanda* sites at each of these locations have assumed a global significance for Huli that exceeds their (presumably prior) clan functions, and they constitute the major focal centres for ritual within Huli sacred geography. These major *gebeanda*, which are identified in widely known *pureromo* chants, are listed, together with their locations and owning clans, in Table B4a. A measure of the former significance of these major *gebeanda* sites is suggested by the frequent use of their names as toponyms for the entire area surrounding each site: the Pureni area, for example, is often referred to as "Gelote". Because *dindi pongone* was held by Huli to extend over the known universe, several of the major sites lie beyond Huli territory. Those non-Huli sites known and named by Huli are listed in Table B4b.

The regional network created from what were initially clan-specific *gebeanda* was by no means total in its incorporation of existing *gebeanda* nor was it uniformly conceived. There is a sense, expressed by Huli, in which *dindi pongone* was an uncompleted project. Different regional versions of the *dindi pongone* network are given, according to the narrator's geographical perspective, and the account given here must be seen as only one of a wide number of possible forms. It does, however, accord more fully than most with the versions articulated by the few major *gebeali* and their relatives whom I interviewed[35]. This version, illustrated in Figure B10, envisages two

34. Where the gender of the python (*puya*) is specified, it is usually male. Some narratives, however, suggest that *puya* is either female, a manifestation of the mother of the earth (Dindi Ainya), or both male and female together.

35. There is possibly only one *gebeali* still alive who has actually orchestrated ritual performances at a major *gebeanda*: Togola of Yamabu clan at the Tundaga site, whom I was unable to interview. Those *gebeali* whom I interviewed, including Hiluwa-Irugua (Duguba Bebe clan), Wara-Biagola (Duguba Kuare), Diwi Togola (Yamabu), Hubi-Morali (Bai) (see Plate 8), Uguma-Dagibe (Yangali) and Yaliduma-Dai (Dagabua) (see Plate 1), are all sons of the last performing *gebeali* at their respective major *gebeanda*. My understanding of the variation in practices at minor *gebeanda* draws on interviews with a number of former "practising" *gebeali*, including Yogona (Gigira) at Garaleanda, Ngoari-Mandiga (for Tani clan) and Dali-Andago (Baru) at Gunu. Frankel and Goldman also interviewed some

distinct routes for *dindi pongone*, running parallel with one another from sites controlled by Northern Bedamini and Etoro or Onabasulu communities to the south and west of Huli territory up to terminal sites amongst Enga and Ipili communities to the north and east; further details of *dindi pongone* are given in Appendix B5.

For both of these routes, the lowest site is regarded as the tail of *puya* and the highest, or northernmost site as the head. A further set of beliefs developed on this distinction have endowed *dindi pongone* with a conceptual unity. While each of the *dindi pongone gebeanda* was employed for clan fertility rituals, their incorporation within the *dindi pongone* network also involved them and their respective *gebeali* in a ritual scheme that projected these fertility rituals on a massive scale. The expanded concern of rituals concerned with *dindi pongone*, known collectively as *dindi gamu*, was the fertility of the known universe. The specific goal of *dindi gamu* was the provocation of an event designed to regenerate the earth. *Dindi gamu* is further described in B5.5 and in Chapter D1; here my intention is simply to stress the significance of the cardinality of *dindi pongone*, in which the conventional symbolism of life-force flowing from headwaters to lower reaches was reversed. Instead, the *dindi pongone* network took its cue from the southern sites, the tails of the snake, from which power flowed upstream to the northern headwater sites.

The landscape visible to Huli (and the sense of visible here refers equally to surfaces and to the public eye) was thus underpinned by a complex ritual landscape, a sacred geography that both embodied Huli cosmology and conceptually structured access between humans and *dama*. The instability of this sacred geography, evidenced by the occurrence of "natural" disasters such as earthquakes, volcanic ashfalls, droughts and floods, required the constant attention of humans working through the agency of *dama*. No Huli action that impinged upon the land was conducted beyond the bounds of this understanding and much of that action was directed, through this cosmological framework, towards the maintenance of the earth.

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of the same *gebeali*; both list the individuals with whom they worked (Goldman 1983:69, Frankel 1986:19).

CHAPTER B3 - *ANDA*: SOCIETY AND SPACE

B3.1 Introduction

If the "natural" environment and its sacred geography are represented by Huli as a single existential world constituted through the agency of both ancestral and unrelated *dama*, a further ontological dimension is produced by the actions of specifically human agents. This chapter sketches a model of Huli society, with particular emphasis on the ways in which Huli organize themselves in relation to the landscape; an emphasis which is itself evident in Huli discourse. Though the preliminary description of a process as complex as social structure requires some flattening of its temporal dimensions, some attempt is made to retain a sense of the dynamism of Huli society, along with the resilience of its structural features. While my particular interest is to elicit those features of Huli society that might assist in the interpretation of the oral historical and archaeological past, I have attempted to distinguish clearly between observations on contemporary Huli society and those reconstructions offered by Huli or by myself.

Huli society, in many of its aspects, has been extensively covered in the ethnographic literature (Glasse 1968, Goldman 1983, Frankel 1986), in which features that are regionally atypical within the broader context of Highland New Guinea ethnography have been described. These include the claims that Huli acknowledge a form of hereditary leadership (Goldman 1983:81,147), within the "type" region for "big-men" as the extreme form of achieved leadership; that Huli descent is cognatic (Glasse 1968), again within a region best known for agnatic forms of social structure; that genealogies commonly extend up to or beyond twenty generations in depth (Wood 1984, Vol.I:84), in contrast to the two- to three-generation genealogies of most other communities of the region; and that Huli practise multiple residence (Allen in press) where, elsewhere in the Highlands, movement between clan territories was formerly tightly restricted. These various claims are addressed here, together with their implications for the form of Huli society and its interactions with the landscape.

My approach, as in the previous chapter, involves the use of indigenous accounts of Huli society, usually expressed in terms of conventional knowledge (*mana*), or within the framework of genres such as genealogies (*malu*) and adages (*pureromo*) that express behavioural norms. These are employed here in conjunction with a series of models or typologies that find no direct expression in Huli discourse because they address issues or questions not explicitly posed in Huli society. No society has a monopoly on an understanding of itself, and there is a need, from an external perspective, to distinguish categories which Huli recognize contextually and those that they identify specifically. Particular attention is also paid to those features of Huli society upon which Huli themselves focus, amongst which the importance of contextual detail looms large. This accounts for the emphasis placed throughout this thesis on the specific names and locations of people and of places.

A brief introduction to Huli language and ethnicity (B3.2) provides the background to a general model of Huli society. Much as Wagner (1980:427-8) identifies 'two basic sets of symbolic distinctions... which form the organizational basis for Daribi kinship', the first being a contrast between gendered substances and the second centering upon the symbolism of Daribi exchange, I open with a short introduction to the ways in which gender and precedence are deployed more broadly as markers of identity and difference in Huli society (B3.3). The intersecting influences of the principles of precedence and gender on Huli descent ideology are outlined (B3.4), before consideration of the extent to which that descent ideology finds expression in the form of territories and residential communities (B3.5).

B3.2 *Hela Tene*: Huli Language and Identity

There are more than 70,000 primary speakers of Huli, the second largest single language in the Papua New Guinea Highlands[1]. Lomas (1988) has described a phonological boundary within Huli that divides the language into two dialects, corresponding roughly to the western and eastern halves of Huli territory (Figure B11). Further distinctive isomorphic variations within these two dialects reflect the influence of different neighbouring languages: speakers of the Huli isomorph set centred around Margarima, for instance, tend to omit word-final vowels, a feature of the speech of the Wola groups that border them to the south (Lomas 1988:30). These distinctions are founded on minor phonetic variations, however, and while the presence of dialect differences is apparent to Huli, the different dialects are certainly mutually intelligible across the full extent of Huli territory.

Historically, Huli is identified with the Enga Language Family, composed of Enga, Huli, Ipili-Paiela, Mendi, Sau, Kewa and possibly Wiru (Figure A3). Huli represents the westernmost extension of this Family, bordered to the north by speakers of Ipili/Paiela and to the east by speakers of Enga and West Mendi or Wola. There has

1. Estimates of the Huli population have fluctuated widely, from 41,067 (Glasse 1968:18-19) to 100,000 (Frankel 1986:38). The figure given here draws on the 1990 Census figure of 70,226 for the total population of the Tari Census District (CD02), the Koroba and Mogorofugwa Census Units of CD01, and the Margarima Census Unit of CD03, an area that incorporates what I perceive to be the boundaries of those communities speaking Huli as a first language. Although this 1990 figure represents a considerable increase upon the 1980 Census total of 62,013 for the same Census Units, it must still be considered an underestimate, particularly in light of the reported limitations of the 1990 census (Callick and Tait (eds.) 1993:23).

been little historical analysis of the Enga Family languages; Karl Franklin (1975) has proposed some Proto-Engan phonemes on the basis of a limited number of apparent cognate sets, and the Franklins (1978:90) have sketched a historical diversion from Proto-Engan on the basis of free pronouns from the member languages. This diversion, reproduced as Figure B12, relates Huli most closely to the Sau, Kewa and Mendi languages[2]. Foley (1986:280), in a speculative reconstruction, has argued that the extent of Austronesian loan words in Engan languages suggests an immediate origin for the group on the northern slopes of the Central Range, where extensive contact with Austronesian groups may have been feasible along the southern margins of the former Sepik inlet (Swadling et al.1989).

Non-Enga Family neighbours of the Huli include the Duna and Bogaya to the northwest, the northernmost members of the East Strickland Plains groups (Febi or Tinali and Agala) to the west, the Papuan Plateau groups (Bedamini, Onabasulu, Etoro, Kaluli, Kasua and Sonia) to the south and the Lake Kutubu groups (Foi and Fasu) to the southeast (Figures A3 and B11). Although Huli vocabulary shares between 18% and 32% of cognates with Duna (different estimates are provided by Wurm 1971:557, Shaw 1973:190, Modjeska 1977:12 and Lomas 1988:87), the latter has been identified as an unplaced family-level isolate within the Central and South New Guinea stock (Wurm, Voorhoeve and Laycock 1981). The extensive similarities between the Duna and Huli lexicons thus appear to reflect a relatively long period of contact between the two language communities, rather than a common origin. Bilingualism along each of the borders between Huli and its neighbours is extensive and the boundaries drawn for the Huli language in Figure B11 are thus, at best, an approximation, based on the self-identification of communities that I have visited.

Unusually, for so large a language community, Huli not only assume but actually seek to demonstrate a common origin and cultural heritage for all Huli-speakers. This conceptual unity promulgated amongst Huli is expressed in terms of a commonality of language, material culture, explicit social norms and ancestry. More exceptional still is the extension of this discourse of identity to Huli neighbours, with whom a more distant apical link is conceived and whose distinctive attributes are similarly legislated. Mythic narratives and normative *pureromo* adages that draw on the knowledge or *mana* of this discourse are known collectively as *hela tene*, the source or origins of the *Hela* peoples.

Hela is essentially an honorific prefix, or *kai* term, applied by Huli to themselves and some of their neighbours. Of the four most frequently cited of these terms, *Hela*

2. See Crittenden (1982:102) for a speculative reconstruction of Enga Language Family migration routes.

Huli refers to all Huli-speakers, *Hela Obena* to Enga-, Ipili/Paiela- and Mendi-speakers, *Hela Duna* to the Duna and *Hela Duguba* to the groups of the Papuan Plateau (Bedamini, Etoro, Kaluli and Onabasulu in particular)[3]. These four groups are thought by Huli to have a common ancestry and point of origin, from which the various language groups dispersed[4]. Myths associated with this diaspora vary considerably; recent versions, particularly those associated with the Hela Andaya or Damene Cultural Centre at Tari (Frankel 1986:30f., Hela Gimbu Association 1985), insist on the historical presence of an individual named Hela who fathered four sons, each the ancestor of a different ethnic group. Another version, which seeks to relate these events to the *mana* for *dindi pongone*, describes the travels of the Huli ancestress, Tia Nangume, from her home at Hewai Falls up to the ritual site of Hewari Gambeyani (Figure B10). There she gives birth, successively, to elements of *dindi pongone* and of the visible landscape and then to the four communities, the *Hela igini* ("sons of Hela") (Narrative B3). From Hewari Gambeyani the different communities, idealized as individual ancestors, then dispersed, the sequence of their departure commonly starting with *Hela Duna*, followed by *Hela Duguba*, *Hela Obena* and lastly *Hela Huli*. As each ethnic founder departed, he began to speak with a unique language and proceeded to "cut" (*podene*) or mark out the land now held by his descendants. *Pureromo* detailing the calls, styles of dress and decoration, house forms and languages characteristic of each group are still recited in formal speeches[5].

As the variations in *hela tene mana* suggest, it is a malleable genre of knowledge[6]. While there is usually agreement that such neighbouring groups as the Tinali, Bogaya and Kuare (Oksapmin) are not *Hela igini*, Hela Hewa (putative ancestor to the Foi and Fasu) is occasionally named as a fifth brother, exiled from Hewari Gambeyani with his sister, Wali Gogonabe, on account of his laziness (Narrative B3). The notion of a missing fifth brother has been taken up again with renewed vigour since the 1950s and many *hela tene* narratives conclude with an extended discussion of the possibility that the fifth brother was *honebi* ("light-skinned"), the ancestor of all white people[7].

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3. Use of these Hela <u>kai</u> terms is generally restricted to narratives that deal with the *hela tene* myth. The conventional Huli *<u>kai</u> mini* praise terms for Huli and their neighbours are as follows: Duguba: *Dugu Yawini, Mi Gilini*; Huli: *Hulu Gomaiya*; Duna: *Mi Duna, Mirilia*; Hewa: *Wana Hewa*; Bogaya: *Umi Bogaya*.
4. These beliefs are held by the neighbouring non-Huli groups only to the extent that they might be aware through contact with Huli of such a notion and might feel inclined to defer to Huli pronouncements on the matter.
5. One example of these *pureromo* is given in Narrative B4. Other versions have been documented by Goldman (1983:67-68, 297).
6. Alternative narrative versions of *hela tene* are documented by Glasse (1965:33-34), Frankel (1986:16) and Mangi (1988a:24-25).
7. 'The fifth to go was *honebi*. Now we are all here, together with the *honebi* who have returned. If

Two further important themes develop upon the *hela tene* myths. The first of these is the notion of order created by the correct disposition of the *Hela igini*; this requires that the Huli remain in the centre of the universe where their task is to maintain distance between the Obena and Duguba. In what is clearly a reference to *dindi pongone* (B2.6), Huli assert that if Obena and Duguba were ever to meet, the land would break up and the world would end; Obena and Duguba here represent the head and tail, respectively, of the python (*puya*) of *dindi pongone*. Reinforcing this theme are *pureromo* which stipulate appropriate boundaries for movement of Duguba and Obena within Huli territory: Obena were not permitted to travel further south in the Tari basin than Hoyabia and Duguba were ideally restricted to the south of Hambuali. As a somewhat cynical young Huli businessman suggested to me, this stricture was formulated by his ancestors precisely to maintain the monopoly enjoyed by Huli on the lucrative trade between Obena and Duguba groups of such wealth items as salt, tree oil and blackpalm bow staves[8].

This normative geographic order is reproduced in daily discourse through the use of ethnic labels as cardinal or directional terms. The term *duna* thus indicates the general direction of Duna territory; Huli south and east of the Tagali river frequently identify both the region and the people across the river as *duna*, even when referring to kin. Huli at Koroba, in turn, refer to the Mogoropugua basin and its Huli residents as *duna*. A phrase deploying the term *duna* in this sense would then refer to Duna-speakers or their territory as *duna ore*, true or real Duna. *Duguba* and *obena* operate similarly as directional terms, though the broad position of the Duguba and Obena groups at the lower reaches and headwaters, respectively, of the pattern of regional drainage, gives rise to the more common use of *wabi* (downriver) and *mane* (upriver) as terms for both people and areas to the south and north. Actual geography thus imparts to this cardinal vocabulary a sense of absolute, as well as relative, direction according to the speaker's position (Weiner 1991:73). Though *mane* and *wabi* can be used to refer to other Huli living upriver or downriver from the speakers, the same is not true for *duguba* and *obena* which, together with the term *hewa* which is used directionally by Huli to indicate the south-east and the Lake Kutubu region generally, are not used in reference to other Huli-speakers[9].

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they claim not be sons of Hela, not sons of the same father as ours, then my father's *mana* must have been wrong... We who live beneath the sun are black; you and your father, sleeping at the source of the sun, are white. I think you are the fifth brother, that is what I think.' (Maiya-Alua, 27.9.89, 89/3A:349-384).

8. I have addressed the relationship between trade and Huli sacred geography in more detail elsewhere (Ballard 1994).

9. *Hewa* appears to be cognate with similar terms (*ewa*, *kewa*) used throughout the Southern Highlands in reference to alien groups to the south; Leroy (1979:182) thus records the use by Kewa language

For Huli the focal point of this cardinality, the position from or towards which the entire vocabulary of direction is oriented, is a notional location of core "Huli-ness", centred broadly around the ritual site of Bebenite and the southern part of the Tari basin (Lomas 1988:27-28). This, for all Huli, is *hulihuli* or *huli ore* ("true/very Huli"), terms which are deployed as the reverse of the other cardinal terms[10]. Individuals or locations closer to *hulihuli* than the speaker are thus identified as *huli* relative to the speaker's self-identity and location.

There is, to conclude, both an absolute sense of Huli identity and geographic location, with notionally fixed boundaries and a legislated set of ideal standards, and a relative sense of location and identity, a moral gradient of "Huli-ness" radiating outwards from a specific area in the Tari basin, towards which all Huli, as Huli, orient themselves.

B3.3 Gender and Precedence

The two principles of gender and precedence provide the fundamental axes of distinction upon which Huli society is conceptually deployed. An understanding of the specific resonance for Huli of gender designations and claims to precedence is thus a prerequisite for any attempt to describe the broader universe of Huli belief and praxis.

The primacy of gender as a means of creating distinction has been widely documented throughout the Highlands region (M.Strathern 1988), but the deployment of gender distinctions in Huli society appears extreme even within this context. Goldman has described at length the assertion by Huli men of an 'uncompromising ideology of pollution that pervades all contexts of Huli behaviour, and articulates the social implications of female sexuality' (1983:10). Substances derived from women and associated with the dangerous inner "heat" (*pobo*) attributed to women, such as menstrual blood, breast milk, vaginal fluids and afterbirth, are regarded by men as sources of mortality and ill health (Frankel 1986). Goldman further demonstrates the presence, most strikingly in male discourse, of a series of gendered oppositions between

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speakers of the term *kewa* to refer to all southern trade partners, whether they speak Kewa or Sau, and a corresponding term, *merepa* (Melpa?), to indicate communities to the north. Merlan and Rumsey (1991:29,231) record the use of *kewa* by Nebilyer valley groups in reference to unknown "cannibal" groups to the south, but also to identify foreigners and Europeans in general, an extension of the term which Glasse (1955) has also suggested for the use of *hewa* by Huli.

10. Wood (1984 Vol.I:74) has employed the cardinal terms *huli* and *mane* as topographic category terms describing 'low-lying, wetter and more productive areas' and 'drier undulating parts of the basin', respectively; as his sources for these terms were residents at Piwa in the central Tari basin (A.Wood pers.comm.), it is possible that he confused the specific Piwa-based references to the lower-lying Bebenite area as *huli* (the core "*huli*" locale for all Huli-speakers) and to the upriver areas of the basin as *mane* with category distinctions for topographic features.

wali (female):*agali* (male), *homa* (death):*habe* (life), *darama* (blood):*kuni* (bone) and *anda* (private/home space):*hama* (public space) (1983:71). It is important, however, to distinguish between the sense of opposition implied in the discursive employment of these binarisms and a contrasting sense of complementarity between male and female. While female substances are identified by men as inimical to their growth, they are also a necessary component in procreation, the success of which hinges upon the correct balance of male and female substances. All people, for example, derive ultimately from the coalescence of both male and female substance: male semen (*wi ibane*) is held to form the bones (*kuni*), and female blood (*darama*) the fat and flesh of the body. The meanings and significance for Huli of gender and of gendered substances are not therefore fixed and immutable, but are instead subject to a process of continual negotiation, re-contextualisation and re-presentation[11].

Male denigration of women extends to claims that women have no capacity for the *mana* knowledge of men (Goldman 1983:99), thus excluding them from involvement in most of the public forums in which corporate decisions are taken and, in effect, from representation at a corporate level. Goldman's suggestion that Huli gender ideology is not open to contestation presumably reflects this restricted access of women to public debate. Prior to the impact of Christian missions, this gender ideology was formally inculcated amongst men in the *haroali* or *ibagiya* bachelor cult, through which young men were "grown" by senior initiates to a state of resistance to the polluting effects of women (Frankel 1986:55,103-4). The practical deployment of this ideology produced male and female universes that were largely distinct, with discrete bodies of knowledge restricted to each gender, and often separate worlds of action in which men and women gardened, harvested, ate and resided apart from each other (see B4.5). The fact that the corporate knowledge - ritual knowledge relating to clan ancestors, clan genealogies, origin myths and narratives about warfare - necessary for the reconstruction of Huli history is essentially a male preserve meant that most of my interviews were conducted with older men rather than women. To an unfortunate extent, this thesis thus operates within the prevailing gender ideology, as this is articulated by men[12].

The second critical axis of distinction, the notion of precedence, reflects Huli use

11. The issue of balance in male and female substances, and the tendency towards decline in a world where that balance is under constant threat through inappropriate human behaviour, are further explored in relation to the process of entropy in Chapter B5.
12. Numerous interviews were conducted with older women, but only rarely were women either knowledgeable or prepared to speak about the forms of corporate knowledge which I had identified as the focus for my thesis. Kyakas and Wiessner (1992) have also described the emphasis in the oral traditions of women in Enga Province on personal and private experience, rather than corporate history.

of the lexeme *tene*, a polysemous term applied to social categories, knowledge, intentions and causes, which is glossed variously as 'root, source, origin, base, cause, motive or real' (Goldman 1983:19, 1993:46)[13]. The privilege accorded to precedence in Huli society has yielded what Goldman (1983:78,93) describes as a cultural doctrine of causality founded on *tene*, a singular obsession with the identification of origins and sources which emerges as a constant theme in Huli discourse and significantly influences Huli practice. Thus land ownership is organised around the principle of association between an ancestor, as the "father of the land" (*dindi aba*) (Goldman 1981a:44), and an original specific territory (*dindi tene* or *dindi kuni*) or garden (*mabu tene*). Disputes are founded upon the distinction of opposed "sources of talk" (*bi tene*), and wars and compensation upon the identity of the original disputants, the "sources of the war" (*wai tene*). The full power of the concept of *tene* in Huli thought is suggested by Goldman when he asserts that *tene* 'is more than a statement of fact; it connected events in a manner which suggested their explanation. In the judicial context, it could be glossed as truth' (1981b:60).

The equation of "truth" with precedence and the correct divination of origins is related to the significance of ancestors in Huli society. Through their actions, which create enduring rights and obligations for the living, both male and female ancestors play a major conceptual role in the ordering of society. The earliest ancestors, referred to as *dama*, are held to have established primary territories (*dindi kuni*: "bone land") for their clan descendants through the action of "cutting" the land, usually in the course of mythic journeys. Ties to this land are confirmed and demonstrated through the possession and recitation of *dindi malu* ("land genealogies"), mythic narratives which trace the genealogical and transactional continuity from the original *dama*, through ancestors (*mama / mamali*) to current clan members. Though knowledge of *dindi malu* is often widely dispersed within and even beyond a clan, the "correct" source of that knowledge, and the only individual deemed appropriate for its public recitation, is the *agali haguene* (literally "head man").

Ideally, the *agali haguene* in each clan is an agnatic male, the oldest living eldest son in an unbroken line of direct descent through eldest sons from the founding ancestor; in cases where no such link remains, the "office" of *agali haguene* has been assumed by the descendants of the next most senior agnatic patriline. By virtue of his possession of the *mana* of *dindi malu*, the *agali haguene* alone has the full right to employ what Merlan and Rumsey (1991:95-98) have described as the "segmentary

13. Goldman (1983:78) has drawn parallels between *tene* and corresponding concepts of *pukl* in Melpa, *tse* in Duna and *page* in Daribi; the Nebilyer notion of *pul*, as described by Merlan and Rumsey (1991:44), also shares many of the features of *tene* in Huli.

person" pronoun in referring to the actions of clan ancestors in the first person singular[14]. In an important sense, all other clan members trace their connections to clan territory through the *agali haguene*. The significance of primogeniture is further emphasised in the recitation and discussion of genealogies.

Huli genealogies (*malu*), like the office of *agali haguene*, are atypical of the Highlands region in both their "vertical" and "lateral" extent. Some Huli can trace their genealogies to a depth of up to twenty-four generations, and across twenty or more clans. Functional explanations for this predilection for genealogies might perhaps be framed in terms of the relatively long-term stability of residence implied by Huli oral history and myth, but the relationship between extensive genealogical knowledge and success in disputes (Goldman 1983:152) suggests that Huli interest in genealogies reflects the broader cultural concern for establishing *tene* sources. Appendix B6 provides a fuller description of the form and nature of Huli genealogies; it is sufficient here to observe that genealogical recitation places particular emphasis upon precedence and gender, the two principal axes of social difference distinguished here.

As evidence for the privilege accorded to primogeniture, siblings are typically ranked in terms of birth order, from *wahene* (eldest) through *dombeni* (middle) to *heyogone* (youngest)[15], and individuals will often recite the personal genealogy of the *agali haguene* before proceeding to identify their own more immediate ancestors. Cutting across this distinction between elder and younger is that between male and female, as *tene* and *yamuwini* respectively. The pair *tene:yamuwini* refers strictly to a contrast in the status of residents within a parish territory (B3.5). *Tene* residents are those whose rights to reside in the parish are traced through an unbroken chain of agnatic links to the ancestral figure identified as the founder of the parish. *Yamuwini* are those residents whose genealogical links to the founder pass through a female *tene*. The terms *tene* and *yamuwini* and the categories they denote are often employed in other contexts as markers of gender[16]. Similarly, *tene* and *yamuwini* carry connotations of precedence: *tene*, by definition, are the "first" on the land; in corporate rituals, *tene* performants precede their *yamuwini* counterparts; and in disputes, a form of speech precedence accords *tene* the right to open the speech turn order (Goldman 1983:147).

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14. Thus the *agali haguene* of Poro Goya sub-clan refers to Goya, his direct ancestor thirteen generations back, in the first person singular: *'Poro honowuwa Goya i ala daba mbira'*; 'Of the offspring of Poro, I, Goya was the eldest' (Haea-Yoge, 23.6.91, 91/7A:0-52, extract).
15. Hence the following description of the three ancestral brothers of Poro clan: *'Wahene Goyago, ibu hamene, dombeni o Pebe, heyogone Ango*: Goya was the oldest, his middle brother was Pebo and the youngest was Ango' (Haea-Yoge, 25.6.91, 91/7B:0-30).
16. *Tene* and *yamuwini* are described as sitting in a parish together 'like a girl and a boy' (Haea-Yoge, 25.6.91, 91/7A:460-491); in the origin myth of Hiwa Poro clan, the brother/sister pair, Hiwa and Hiwa, are themselves identified as *tene* and *yamuwini* (Tugu-Bogoya, 8.12.89, 89/3B:0-45)

With some sense of the significance of gender and precedence in Huli belief established, it is now possible to examine the role these principles play in the conceptual structure of Huli society.

B3.4 *Hameigini*[l]: Descent and Affinity

The structure of Huli society, and in particular the nature of the relationship between Huli descent, kinship and residence, has been the subject of an anthropological debate in which Huli society has frequently been cited as atypical of the Highlands region as a whole (A.Strathern 1969:41, Feil 1987:164). Superficially, the problem rests upon the characterisation of Huli descent as essentially either cognatic or agnatic, but the implications of the differing perspectives on this question of descent extend more widely to differences in the understanding of the distinction between ideology and practice, and in the conception of the contrast between "native" and ethnographic models; these issues are significant here in terms of providing an understanding of land ownership and and of the structure of access to wetlands (Chapter C2).

In an illuminating review of the experience of his Huli fieldwork in the 1950s, Robert Glasse (1992) has described the difficulty he encountered in attempting to apply classical models of social structure derived from African ethnography to Huli society. His published thesis made the case for a system of cognatic descent, realised on the ground as cognatic descent groups, in which Huli view people 'as being related in the same way to both matri- and patrikin' (1968:138). Accordingly, Huli descent thus ideally confers rights equally via men and women, though statistical analyses of land holdings and residence patterns suggest that there is an agnatic "bias" in practice. Solely on the grounds of the evidence which Glasse himself presented, several critics questioned his conclusions (De Lepervanche 1967/68, G.Jackson 1971, Aijmer 1975), noting that Glasse had offered sufficient material to suggest that Huli descent is in fact agnatic. Glasse's characterisation of Huli descent as cognatic, and his questionable identification of "descent groups", appear to have stemmed from his conflation of Huli descent ideology and the actual statistical distribution of descent categories on the ground. Noting that "cognatic descent groups", which imply a perfect correspondence between actual communities and a theoretically unbounded kin, are not actually possible, G.Jackson (1971) drew particular attention to Glasse's mistaken attempt to define descent in terms of recruitment to social groups, effectively deriving ideology from practice.

Further ethnographic fieldwork has subsequently provided detailed evidence to support the view that Huli descent ideology is fundamentally agnatic (Frankel 1986:51, Goldman 1988:86f.), a position that I seek to demonstrate in the course of this chapter.

Insofar as there are finer distinctions to be drawn amongst the models proposed by Glasse's critics, I find my own view of Huli social structure most closely in sympathy with that expressed in a series of monographs by Goldman (1981a, 1983, 1988, 1993); his close attention to language and particularly to the idioms expressive of kinship, and his clear distinctions between ideology and practice and between ethnographic and indigenous models, appear to have yielded the keenest insights into Huli society[17]. My particular emphasis in the following account is on the significance for Huli of historic specificity, of the importance of the names of people and of places, evident in the central role in Huli discourse of genealogies and oral historical narratives; all features of the way in which Huli "practise" kinship that tend to be obscured in the quest for structure.

Marilyn Strathern (1991) has commented on the attenuated form of social taxonomy amongst the Kalam of Western Highlands Province, as contrasted with the elaborate taxonomies that they articulate for the "natural" world. As I seek to demonstrate in Chapters B2 and B4, Huli taxonomies for the "natural" world are fairly shallow, with emphasis placed instead upon the social and historical significance of a wide range of specific terms. There is similar evidence in Huli accounts of their society for this same "shallowness" of taxonomic structure, but this is offset by a concern for the specific names of individuals, clans and locations; names whose meanings derive their significance not from taxonomic position but from historical context.

Thus the considerable range of potential referents for the single term, *hameigini*, ("father-son(s)" after Goldman 1983:76), is narrowed to a single possibility for a Huli audience on the basis of contextual references and the use of specific names. From an external perspective, however, it is necessary to create taxonomies with which to apprehend the structure of Huli society. Two broad fields of reference for the single term *hameigini* are thus distinguished to discriminate between the significance of *hameigini* as a conceptual category of descent (*hameigini*^{I}), and the sense of *hameigini* as a coresident community identified with a particular territory (*hameigini*^{II}). The first may then be used to refer to a range of sizes of descent unit, such as clans, sub-clans and individual patrilines. The second is glossed here as a "parish", retaining the term used by both Glasse and Goldman which captures neatly the sense of association between a coresident community and its territory, but with the caveat that my use of "parish" is more restricted than Glasse's. Although there are important areas of overlap

17. Goldman summarizes his general approach to Huli social structure in the following passage: 'Structure [in his view] is a "becoming", not a "being", in accordance with, and sensitive to, agendas that are frequently politically motivated... Understanding Huli social structure is, then, very much a task that entails locating idioms and terms in their appropriate contexts of discourse, their appropriate levels of reference, and appropriate orientations in some speaker's viewpoint or strategy' (1993:23).

between these two senses of *hameigini*, they never correspond perfectly and much of the confusion in external accounts of Huli society has stemmed from a failure to sufficiently discriminate between them[18]. In the discussion that follows, the sense of Huli descent as a form of conceptual distinction (*hameigini*[I]) is addressed first, before turning to the more complex issues of practice refered to by the discursive use of *hameigini*[II].

Descent is one of a range of conceptual resources deployed by Huli speakers in the creation and negotiation of social distinction; but unlike the Nebilyer for whom, as for most other groups of the Highlands and adjacent regions, 'notions of descent and apical ancestor are of little or no relevance' (Merlan and Rumsey 1991:36), descent, as it is articulated through genealogy and oral history, is of crucial significance in Huli life. The past constitutes an enormous discursive field upon which contemporary Huli draw in negotiating the present and constructing possible futures. Seen in this light, *hameigini*[I] are indigenously articulated descent constructs to which reference is made in the practical negotiation of marriage, dispute and (formerly) ritual. Importantly, and almost certainly without exception, *hameigini*[I] have no physical presence. Only members of the smallest level of *hameigini*[I] might ever have performed rituals, gardened, fought wars or even lived together as a single group. Following Wagner (1974:107), the terms for Huli descent categories (*hameigini*[I]) are thus 'names, rather than the things named'.

As descent constructs expressive of the prevailing gender ideology, *hameigini*[I] are unambiguously agnatic, consisting of a core of individuals connected genealogically through common male ancestors. In a term whose full significance is realised only with respect to land ownership and residence, these individuals, whether female or male, are held to be *tene* in that *hameigini*[I]. Every Huli, regardless of gender, is *tene* in regard to one, and only one, *hameigini*[I]. *Tene* status is marked linguistically through the use by an individual, and by others in reference to that person, of a specific patronymic prefix. These prefixes identify an individual as *tene* within a specific *hameigini*[I]. A woman X or a man X who is *tene* in Tani *hameigini*[I], for example, will be identified as Ngoari-

18. See, for example, Frankel (1986:39-41). Glasse's (1968:23) promising initial distinction between "*hamigini*" firstly as 'a purely genealogical unit' and secondly as a 'de facto social group' is undermined by the fact that he then describes the first retrospectively in terms of the second. Allen (in press) has recently suggested that the Huli term *dindi hameigini* is used to distinguish 'group territory' from the 'sociopolitical group' (*hameigini*). He notes that none of the ethnographers of the Huli have mentioned the term *dindi hameigini*; neither Goldman (pers.comm.) nor I have ever heard it expressed by Huli-speakers. Whether the term *dindi hameigini* is employed beyond the context of interviews with outsiders or not, Allen's clustering of descent categories and social groups together as *hameigini* does not resolve Glasse's dilemma.

X[19]. The patronyms of most Huli clans are listed and further discussed in Appendix B6. Recognized use of a patronym thus links an individual both genealogically to a fixed and bounded core of ancestors and to a *hameigini* ' headed ideally by a unique *agali haguene*, and through them to a specific core territory, *dindi kuni* or *dindi tene* (Goldman 1983:76).

Hameigini ' can refer to a wide range of sizes of segmentary unit. Reference to the specific name of the designated unit, or to a senior member, living or historical, of the unit is usually sufficient for local Huli to divine the size of the unit. Where the distinction between unit size requires explanation, as to an outsider, use is made of the qualifiers "large" (*timbuni*) and "small" (*emene*); but the terms *hameigini timbuni* and *hameigini emene* are relative and neither are related in any fixed way to units of a specific segmentary level. Solely for the purposes of identifying broad differences of scale, a nested hierarchy of unit sizes is distinguished in this thesis.

The largest of these units are named clusters of clans related through descent, which are designated here as "phratries"; these are not, in fact, identified as *hameigini*, nor is there a generic term for them in Huli, but they constitute a recognisable, overarching category of unit within which the component units are *hameigini*. A list of Huli phratries and their component clans is given in Table B5, showing that phratry-level segmentary units are indigenously recognised and named, and that their component clans tend to retain a common patronym. Beneath phratries in size are "clans". These clans are also uniquely named, though the origins of these names are not always known and indeed seldom follow the names of clan-founding ancestors, as has been claimed (Wood 1984, Vol.I:89); most of the Huli clan names known to me are listed in Appendix B6. Clans contain named "clan sections" which consist, in turn, of named "sub-clans"; almost without exception, these names are held to follow the names of the apical ancestor of each clan section or sub-clan. The smallest descent units identified as *hameigini* are individual "patrilines", usually identified with the name of a living or recently deceased senior member. This hierarchy is illustrated with reference to Tani clan of the Yari phratry, the largest of the descent constructs based in the Haeapugua basin (Appendix B6: Gen.1).

If references to *hameigini* ' denote conceptual categories and only rarely correspond to the physical presence of groups of the smallest segmentary class such as patrilines, what purpose is conceived by Huli for units of the larger orders of size? Two principal "functions", relating to ritual and exogamy, are readily apparent.

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19. It is rare, however, to hear women being identified in this way, reflecting their diminished presence in the corporate contexts in which such patronyms are usually deployed.

Although the clan or corporate rituals are no longer performed, their importance prior to contact should not be underestimated. The relationship between clan origin myths (*dindi malu*), ancestral *dama* spirits (*gebe*) and *gebeanda* ritual sites as the residences of those spirits has been described in B2.6, where the distinction was also made between major *gebeanda* associated with the root of the earth (*dindi pongone gebeanda*) and lesser *gebeanda* that relate to individual clans or phratries. A more extensive hierarchy of minor *gebeanda* corresponding to different sizes of segmentary unit within clans can also be discerned. Thus most sub-clans had their own specific *gebeanda* sites at which ritual leaders from that sub-clan would officiate in rituals relating to the interests of the sub-clan[20]. Rituals would be performed at the *gebeanda* of the clan ancestor, on behalf of the entire clan, by the ritual leader of the senior lineage in the senior sub-clan. Members of segmentary units, identified as common descendants of an apical ancestor, were thus conceptually represented through ritual performance at the *gebeanda* of those apical ancestors.

Hameigini[1] are also exogamous units. Ideally, marriage is prohibited between individuals, male or female, who can trace agnatic descent from the same clan founder. However, individuals from different clans related as members of the same phratry can marry, which presumably explains why phratries are not identified as *hameigini*. The process of clan fission is clearly marked by the first few marriages amongst *tene* of different sub-clans within the same clan. In the case of Tani clan (Appendix B6: Gen.2), *tene* of Doromo and Hewago sub-clans have recently begun to inter-marry amidst a storm of debate with claims of incest and counter-claims that the two sub-clans are now distinct and therefore inter-marriageable units[21]. Ideally, exogamic restrictions are also extended to cognatic kin, but in the same way that Glasse's postulated "cognatic descent group" is a practical impossibility, so too is a restriction that extends to <u>all</u> cognatic kin, particularly given the genealogical depth and conservatism of descent-reckoning in Huli society. In the place of rigid category distinctions amongst non-agnatic cognatic kin, delineating marriageable and non-marriageable categories, a more feasible form of exogamy that bars only those cognatic kin that are "actively" recognised is practised. It is this scope for distinguishing "active" from "inactive" cognatic links that furnishes Huli descent with its "negotiable", and superficially cognatic, quality.

20. These smaller *gebeanda* are commonly identified as "*kamianda*", though there is no suggestion that this a category term.
21. Tani clan is unusual in that it is probably the largest single Huli clan. This inter-marriage between the Tani "sub-clans" suggests that these sub-clans should more accurately be designated "clans" in their own right, and Tani, which is still referred to in discourse as a clan, described as a "super-clan".

Minimally, kinship and exogamic restrictions are reckoned individually. This reflects the practice of polygyny in Huli society, a situation further complicated by high rates of divorce and remarriage (Glasse 1968:74-75). Thus only those individuals with the same father <u>and</u> mother reckon their kinship links in precisely the same way. At increasingly higher levels of segmentation, links with correspondingly larger affinal units are acknowledged as the enduring products of ancestral marriages. But only those consanguineal links created by ancestors that are still actively recognised and engaged in forms of exchange are acknowledged in this way, and it is this narrowed category of non-agnatic cognatic kin, together with one's agnatic kin, that constitute the effective exogamic unit for an individual (Goldman 1983:83-84). The nature of these consanguineal exchanges and of the relationships that they initiate and commemorate constitute the critical counterpart to descent in Huli kinship ideology.

Myths about the origin of the sun, Ni, and his sister the moon, Hana, describe a "moral progression" from the incest between Ni and Hana, to the direct or equivalent exchange of sisters between the son and daughter of Ni and a brother-sister pair from Tinali, and ultimately to the modern norm of brideprice payments[22]. Goldman (1983:84) has shown how the transfer and consumption of a specific category of pig given as brideprice (*wariabu*, from *wali*: woman + *abi*: compensation) serve to identify a category of affinal kin termed *aba*. As a category term, *aba* is then extended to all of an individual's non-agnatic cognatic kin as 'persons between whom reciprocal economic, ritual and social obligations exist' (Goldman 1983:234). *Aba* thus constitute a critical conceptual category of bilateral consanguineal kin, identified collectively as *aria* or *damene* (Goldman 1983:72) or *dame*, an ego-focused cognatic kindred[23]. Importantly, the term for these bilateral consanguines is distinguished only tonally from *ába*, the term for father or father's brother. The most significant affinal link for a male individual is his mother's brother, or *ababuni*, whose agnatic lineage becomes, in effect, a form of *tene* line for ego. The importance of the *ababuni*, rather than the woman who links the two patrilines, is suggested by reference to the status of the woman through whom the *aba* connection is traced as the *aba wandari* ("daughter of the *aba*")[24]. Individuals reciting the *malu* genealogy of their *ababuni*'s patriline will often identify themselves as 'born of' their *ababuni*[25]. *Aba* are therefore described as being 'like *tene*', in terms of restrictions on marriage.

However, this *tene*-like treatment of *aba* neither constitutes "cognatic descent"

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22. Dali-Urulu, 27.3.91, 91/3B:0-49.
23. *Dame*, the contracted form of *damene*, is presumably cognate with the term *yame*, which describes cognatic kindreds amongst the neighbouring Ipili/Paiela (Biersack 1991).
24. A usage illustrated in context in Narrative C3.
25. Gelaya, 28.6.91, 91/10A:0-25.

nor does it yield "cognatic descent groups". Although *aba* are initially an ego-focused category of kin, the obligations of the reciprocal *aba* relationships of ancestors are assumed by their agnatic descendants, producing enduring links between increasingly larger segmentary units related to each other as *aba*. However, only certain of these *aba* relationships are actively maintained over long periods of time, principally through either a history of co-residence or, in the case of distant *aba* kin, where mutually beneficial exchanges guarantee continuous contact[26]. In other words, there are no structural entailments for the selection of particular *aba* kin for these enduring corporate relationships. Much as ancestral bones and the performace of ancestor-focused rituals identify agnatic units, *aba* kin formerly engaged in a variety of rituals in which representatives from each kindred played complementary roles; the *homa haguene* rite, in particular, entailed the feeding, decoration and safeguarding by *aba* of skulls from each other's lineages. Crucially, the links between *aba* lineages are not, therefore, links between descent units at a comparable or higher level of segmentation. Those Tambaruma *tene* related to Tani thus stand as *aba* in relation to Agiabu, Eli and Yunda sub-clans alone and not to Tani as a clan or to any of the other Tani sub-clans; as a Tambaruma man put it, they are "joined" (*wayadago*) to Agiabu as the descendants of the Tani *tene* woman, Taya-Nano (*Taya-Nano igini*) (see Appendix B6: Gen.3)[27]. There is therefore no category term that refers to all of the *aba* lineages linked to a single clan and no basis for a concept of cognatic descent.

A summary of structural principles is insufficient however as an account of practice for, as Gardner (1983:84) notes, 'it is not the rules that explain what is going on but people's <u>commitment</u> to, or <u>observance</u> of the rules'; the social groups of Huli individuals who actually work together reflect the negotiated implications of normative principles. The full social and historical significance of the *aba* relationship is thus realised in terms of actual social groups: those communities that reside, produce, fight and, in the past, performed ritual as a largely unified group. Only in these contexts are certain *aba* lineages identified as a category with respect to the *tene* of a clan, and the following section illustrates the ways in which these *aba* links are exploited in the constitution of physical communities.

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26. A point made by Goldman (1988:91-92) in reference to the distribution of brideprice: 'a man will have more *aba* than pigs available so that an area of discretion exists which permits him to choose from amongst this class only those with whom he has current relations, or those with whom he wishes to initiate some exchange behaviour'.

27. Similarly, as their Poro *tene* explains, Dobani clan are resident at Haeapugua by virtue of their *aba* link to Goya sub-clan of Poro: *'Dobani ibu yamuwini, Poro daru bihende yamuwini ndo, Goya ibu hangu yamuwini*: Dobani is *yamuwini*, not to all Poro but to Goya alone' (Haea-Yoge, 25.6.91. 91/7A:275-310).

B3.5 *Hameigini II*: Territory, Residence and Social Groups.

If *hameigini I* are conceptual units, *hameigini II* refer to physical entities, both to the parish territories, and to the coresident communities or parishes living within their boundaries. The apical ancestors of *hameigini I* as descent units are essentially ancestors-in-place; the *dindi malu* narratives that underpin clans as descent structures also "ground" those clans in a particular locale. Parish territories are ideally the products of these original or early ancestors who are held to have marked out the boundaries by performing certain actions, such as dropping the leaves of trees or shrubs that now grow at these locations, digging ditches or river channels, or "cutting" the land into territories in association with the ancestors of neighbouring parishes. Parish boundaries are predominantly water features such as lakes, rivers or drainage ditches. Topographic features such as ridgelines are generally employed as boundaries only in the headwaters of a parish. Figure B13 maps the approximate boundaries for parishes in the Tari area. Parishes vary considerably in size, from 5 ha to 1800 ha (Wood 1984, Vol.II: Table A4.2), apparently in relation to variation in the local environment and in specific historical circumstances. Parish names usually correspond to the names of the resident agnatic clan though, in rare instances, the wholesale acquisition of parish land as a form of war indemnity has produced a situation where the parish name does not match that of the clan now held to be *tene* on the land[28].

To some extent, the spatial deployment of people maps the structure of Huli society onto the landscape. Parish territories are ideally divided into sub-territories corresponding to the higher named segmentary units of the *tene* clan. Thus the current ownership of individual gardens in Hiwa parish in the Haeapugua basin shows distinct internal boundaries between three descent-based groups corresponding to the three clan sections in Hiwa clan (Figure C19, Appendix C6: Gen.5); precedence is also inscribed on the land in this case, as the sections descended from the two older and thus stronger and more experienced siblings, Hari and Hiraya, are said to have been allocated the border strips, with the youngest (*heyogone*) section, Wamia, sheltered between them.

Gender distinctions are similarly employed in Huli spatiality, with a strict segregation of areas of male and female space. Formerly, men and women slept separately in men's (*agandia* or *balamanda*) and women's (*wandia*) houses within different garden areas. Formal *pureromo* adages enjoined the observation of social norms in relation to space:

Wandia agandiala

28. Parish territories are not generally, as Wood suggests (1984 Vol.I:89), named after the founding ancestors of the agnatic clan; a common expression denoting parish territories takes the form "X *andaga*" (the "real place" or "true home" of X clan).

There are women's houses and men's houses.
Wandia napaliabe, agandia paliabe
Don't sleep in the womens' house, sleep in the men's house.
Tagira e hongoleni mbabuha hangabe gana wowa hangabe
Clear swidden gardens outside, dig ditches and make real gardens within [the ditches][29].
Tagira nogonaga mabu agalinaga
Outside is for pigs, *mabu* gardens are for men [i.e. people].
Wandia walinaga agandia agalinaga. Ani lene.
Women's houses are for women, men's houses are for men. It is said thus.

Duliya, 17.8.91, 91/16A:400-403

The movement of women, in particular, was circumscribed by restrictions on entering men's garden areas or houses, all ritual sites and bachelor groves[30]. Since the 1950s and with the active encouragement of the missions, the proscriptions on male and female cohabitation have relaxed considerably and houses in which married couples live and sleep together are common (see Figure C9).

Conceptually, rights to parish land are derived from *tene* status, or through links to *tene* individuals as the "fathers of the land" (*dindi aba*), reflecting the genealogical link between *tene* and the founding ancestor. The gender ideology underwriting Huli descent also accounts for the relationship expressed between the production in conception of bone (*kuni*) from sperm, and the primary status of agnatic *tene* in relation to ancestral land (*dindi kuni*) (Goldman 1983:76). Possession of an agnatic patronym is matched on the ground by material evidence (*walia* or *muguni*) in the form of ancestral bones and ritual stones, the ditches dug and the groves of hoop pine (*guraya*) trees planted by the ancestors, and the locations of ancestral houses (*gebeanda*) and of the graves where their spirits (*dinini*) are held to be present[31]. Notably, where land is acquired as an indemnity for the deaths of ancestors in warfare, it is through reference to the bones of these dead ancestors that the new *tene* assert their status on the land.

If the ideal form of a claim to parish land is through agnatic descent from a parish-founding ancestor, it is also fundamentally an expression of the belief that rights to land are created through use, a practice literally en-shrined in the deference paid to

29. The distinction made by Huli between swidden (*e*) and "real" gardens (*mabu*) is described in Section B4.4.
30. Areas used by both men and women were subject to particular practices: crossing bridges, for example, bachelors would use *mbuambua* (Erichtites valerianifolia) leaves to grip supports that might have been held by women.
31. Goldman (1980:216) reports a speech by a Huli land mediator in which the ideal relationship between physical markers of ownership (*walia*), ancestral land (*dindi kuni*) and *tene* status is clearly set out: "The truth [about the ownership of land] should be said on the Casuarina trees, it will be seen on the drains, on the houses of both men and women, from the nut trees; these things are holding me. The ancestral land (*dindi kuni*) belongs to one only, you can't pull him out and leave another there."

the "cutting" actions of early ancestors through the performance of rituals at the *gebeanda* sites of their former residences. The same actions originally employed by ancestors in the initial demarcation of parish territory create new rights when performed by the living; planted trees and excavated ditches serve as *walia* evidence of rights developed through use, irrespective of one's descent status. One of the primary arenas for disputes over land is precisely this contest over ownership between land-owning *tene* and land-using non-agnates (Goldman 1983:169-170). Again, the exceptional case of the assumption of *tene* status by the owners of land gained as a form of mortuary compensation illuminates the broader relationship between agnatic status and land rights: here, the unbroken passage of use of the land by the conventional number of five generations of "new" agnates is usually deemed sufficient for them to assert their new status as *tene*. Critically, where other Highlands societies assimilate non-agnates by converting them terminologically to agnates, often over the course of two to three generations (Cook 1970), the force of appeals to the doctrine of *tene* amongst Huli is such that it is the name of the ground that changes, and not the identity or the patronyms of the new parish agnates or "owners". Thus, in another means of "parish conversion", non-agnatic cognates occupying a discrete portion of a parish territory over a period greater than five generations may attempt to assert their status as *tene* on that land[32]. This accounts for the fact that some clans claim *tene* status in several parishes. Dobani clan, for example, are *tene* at three locations in the Komo, Tari and Haeapugua basins[33]. The keenness with which claims are made to the status of parish agnate is suggestive of the symbolic power of corporate *tene* claims to land, but even agnatic claims to parish land are confirmed only through the actual use of that land (Glasse 1968:40); this, in turn, reflects upon the role played by the recognition of rights in a community in that *tene* status, or links to *tene* in a parish require both demonstration and recognition. "Recruitment" to a parish thus rests upon appeals to an amalgam of principles of descent and personal histories of residence and cooperation within a community.

The two major unit distinctions of *tene* and *yamuwini* that Huli employ to describe parish residential categories relate initially to the descent categories of *tene* and *aba*. Parish *tene* are those agnates of the resident agnatic clan who reside or maintain a residence in the parish. Note that not all of the *tene* of a clan (as a unit of descent)

32. This is not to suggest that the past names of that ground are forgotten: the efforts of the refugee Bogorali clan to remember and reclaim the names of their former territory at Haeapugua are described in Part C.

33. Dobani are also resident in Yaluba, where Goldman refers to them as "Tobani". Here, they appear to have a form of *tene* status on a discrete territory, but as *yamuwini* to another precedent *tene* clan (Duguba or Dugube) on an adjacent territory (Goldman 1983:121). Possibly, Dobani land in Yaluba is undergoing the process of territory conversion described here. The historical circumstances of Dobani's assumption of *tene* status in the Haeapugua parish are described in Section C2.4 and Appendix C2.

actually reside together in the same parish. The term *yamuwini*, meaning literally "placed (*wini*) by women (*yamo* or *yamu*)" (Goldman 1983:76), refers to those non-agnatic cognates who reside or maintain a residence in the parish by virtue of their links through a female *tene*. Both categories are thus defined partly in terms of descent and, as descent constructs, are not subject to change over time: *yamuwini* can never become *tene*, nor do they ever employ the patronymic prefix denoting the status of local *tene*[34]. Neither category corresponds perfectly to a descent unit because, in each case, the coresident community is composed of only some of the descent unit members. As Goldman (1988:90) stresses, the distinction between *tene* and *yamuwini* relates solely to residence in a particular parish; beyond this quite specific context, the label *yamuwini* has no meaning other than the general gender category connotation of female (B3.3). *Tene*, in Goldman's (1983:77) useful distinction, are not so much wife-givers as land-givers.

Effectively, the distinction between *tene* and *yamuwini* residents in a parish is the realisation on the ground of *aba* links between a single *tene* patriline and a variety of named *aba* patrilines related at different segmentary levels to the *tene* patriline - *yamuwini* are those *aba* who reside with a *tene* clan. To put the same point in a different way, the *tene* residents of a parish are only <u>some</u> of the total number of agnates of the clan which is *tene* in that parish, and the *yamuwini* are only <u>some</u> of the members of the lineages that stand in relationship as *aba* to the parish *tene*. It is important to stress that *yamuwini* residents do not form a single coherent unit. Rather, the category of *yamuwini* embraces a multitude of lineages of different segmentary sizes that are derived from different clans and attached to the single *tene* clan of the parish at a wide range of different segmentary levels. *Tene* and *yamuwini* thus behave in respect to one another as lineages related as *aba*. Prior to the post-contact cessation of public rituals, representatives of specific *tene* and *yamuwini* segments of the parish community performed complementary roles in parish-centred rituals such as *tege* and *homa haguene*. The concretising effect of cosponsored ritual and of cooperation in production, war and the financing of marriages and compensation produces a situation in which *yamuwini*, particularly where they have maintained residence in a parish for over five generations, are treated as "the brothers of *tene*" (*tene hamene*). The rights created over time through use of their land within a parish renders *yamuwini* almost as permanent a parish feature as *tene*, but it has to be stressed that *yamuwini* can, ideally, be evicted by *tene* (see also Frankel 1986:48, Goldman 1988:90). This is, of course,

34. In rare instances and for specific purposes such as disputes, individuals of particular renown, who are usually also *tene hamene*, will be "claimed" as *tene* and accorded the local patronymic prefix. Refugees are also on occasion "hidden" from their enemies by being referred to with the local patronym.

hotly denied by individuals committed to residence as *yamuwini* in a parish, and rarely voiced as an opinion even by uniresidential *tene*; like talk of group fission among the Wahgi (O'Hanlon 1989:31-32), discussion of even the possibility of eviction of *yamuwini* is not a topic that is lightly broached. Nevertheless, Huli history is replete with instances where particular *yamuwini* lineages have been ousted, usually by force and under some pretext, by the *tene* and other parish residents.

In a sense, the categories of *tene* and *yamuwini* are the only unit distinctions routinely made amongst residents of a parish, because they are the only category labels that identify corporate descent-related units within the parish community. A third "covert" category of non-cognatic residents in a parish is identified by ethnographers using the terms *tara* ("other") or *wali haga* ("women + continue to stay") (Goldman 1983:83). Individuals identified as *tara* or *wali haga* include friends, non-consanguineal affinal relations and refugees from war in other parishes. Although I have heard both terms used in reference to non-cognatic residents, the minor debate over preferred use of either one or the other term (Goldman 1988:158 n.2) appears misplaced in the context of parish residence insofar as none of the people so identified would employ the label to describe themselves, nor were there formerly any contexts, ritual or otherwise, in which *tara* behaved as a distinct unit. The term *wali haga* is more commonly used as a generic label for all clans other than one's own, as sources of marriageable females. *Tara* are attached to individual patrilines, usually to *tene* but also to *yamuwini*, through either of whom they derive their right to residence in the parish. While *tene* and *yamuwini* are enduring categories, in that the distinctions amongst them are reproduced over time and are held to be immutable, individuals or lineages identified as *tara* rarely maintain that distinction over time: as a source of marriageable individuals with respect to the parish *tene*, those *tara* that persist in residing in a single parish are usually swiftly incorporated as *yamuwini* through marriage[35].

The principles of cognatic kinship (but not cognatic descent) thus produce communities composed largely of cognatic kindreds (*dame* or *aria*). These consanginueal clusters of *tene* and *yamuwini* are described literally as people tied (*baile*) to one another (Goldman 1983:72), as distinct from those with whom one has no ties (*nabaile*), such as individual *tara*. The critical individuals in these linkages between broader communities, and particularly those whose *aba* relationships position them between adjacent communities, are literally "men in the middle" (*dombeniali*) or

35. This process is also suggested in an adage recorded by Goldman (1983:80) which observes that the clans and fathers (ie affines) of *yamuwini* are themselves *tara*.

men "tied between" (*bi bai*)[36]. These individuals play a critical role in mediating between different groups, embodying the third position (*dombeniali*) between two disputants (*tene*) in the normative structure of Huli disputes (Goldman 1988:94). The broadest possible appellations for a coresident community, incorporating both kin and non-kin, include the term *hameigini*, in the sense of *hameigini* ", and the general term, "we here" (*ina oali*) as distinct from others elsewhere (e.g. *uyuali*: "those up there").

If Huli principles of descent and affinity play a crucial role in the structure of relationships between people and land (and this is what was being expressed in Huli ritual), the scope for "play" between the two furnishes individuals with a 'negotiable face' to social structure (Goldman 1983:71). The more pragmatic factors of propinquity and coresidence appear to play a major role in the quotidian constitution of social groups - groups that actually garden, finance exchanges and conduct warfare together, but whose composition seldom corresponds to the classificatory boundaries defined by descent and affinity. Before proceeding to an analysis of the composition of these "labour" or "project" groups (B4.5), some account of the ways in which people deploy themselves across the landscape is required.

The wide range of *aba* links available to any individual provides considerable scope for men, in particular, to maintain gardens and even residences in a number of different parishes. This scope for multilocal male residence is further extended through the rights of women to maintain gardens and residence in parishes in which their parents have maintained rights to land; married men thus gain access to (but not ownership of) the land owned or used by their wives. The advantages of a widely dispersed suite of gardens were even more evident prior to contact than they are now, diminishing the exposure of an individual's holdings to natural hazards and the effects of war. During the period of Glasse's fieldwork (1955-1960), 42% of the adult men of the parishes Glasse surveyed maintained residences in more than one parish. Allen (in press) has described the results of a 1979 survey of 44 parishes in which an average of 9.7% of all residents claimed multilocal residences; multilocality in individual parishes varied within a range from 1% to 43%.

The complexity of the composition of Huli *hameigini* ", as parish communities, reflects the cumulative consequences of a system of access through cognatic ties to land combined with a rigid definition of descent that have historically yielded a high incidence of multiresidence. Statistical variation in the ratios of *tene*, *yamuwini* and *tara* in different parishes is thus a function both of the scope for multiple residence and

36. Haea-Yoge, 25.6.91, 91/7A:427-451.

of historical circumstance, in terms of the activation of specific *aba* links and the differential growth of lineages within a parish. Table B6 provides data on parish composition from five different surveys at nine parish locations, showing considerable percentage variations for the categories of *tene* (19.9%-50%), *yamuwini* (37.2%-58%) and *tara* (6.1%-37.2%). The change over a period of two decades in the composition of Toanda parish, where the percentage of residents who are *tene* has risen from 20% to 49%, is particularly interesting in the light of Glasse's method of determining descent rules from recruitment; obviously, it suggests that descent, as a conceptual resource, cannot be predicted from the statistical facts of parish composition. But, equally, if there are no prescriptive norms that dictate the necessity of multiresidence, how are we then to account for this distinctive practice?

The questions of the historical genesis and the role in Huli society of the practice of multiresidence have been addressed by several writers (Glasse 1968, Frankel 1986, Wood 1984, Allen in press). Glasse's (1968:83-84) original observations, that multiresidence reflected the paramount need for security and the advantage to be gained from dispersing the effects on crops of war and natural hazards, have not been challenged and are supported by Huli explanations for the practice. The forceful banning of warfare by the colonial administration and the introduction of a wider range of crops and imported foodstuffs are thus presumably responsible for the dramatic decline since the 1950's in the practice of multiresidence: adult male residents of Toanda parish who maintained residence in another parish constituted some 70.4% of the total in 1959 (Glasse 1968:30), but only 19% in 1978 (Grant 1979) and 17.6% in 1979 (Allen in press). The roles of warfare and of the desirability of prime agricultural land in the historical distribution of the Huli population are returned to in B4.5; but the relationship between Huli social structure and the practice of multiresidence is raised here as a problem that deserves further analysis.

On current evidence, the formal structure of Huli society appears as the precipitate of the cross-cutting influences of agnatic descent and cognatic ego-focused kinship, producing a system of widely dispersed agnatic clans residing in cognatic communities within individual parishes. In his concern to identify Huli society as either cognatic or agnatic, Glasse was firmly in step with the theoretical interests dominant in anthropology of the time, but it was an orientation that led him to confuse the distinction between descent and kinship, or *aba* and *yamuwini* (Keesing 1970:761, Goldman 1983:87-88)[37]. The importance of distinguishing between the conceptual

37. Glasse never publicly responded or even referred to the critique of his analysis offered by Jackson, Goldman and Frankel, though there is some evidence in his later work (Glasse 1975:349,357, 1992:247) of an element of doubt about his unitary description of what have been described here as two quite

categories of descent and the practical categories of residence is evident in comparing the Huli case with that of the neighbouring Enga.

Meggitt's (1965) account of the principles of social structure amongst the Enga, undertaken during the same period as Glasse's Huli work, made a case for agnatic descent, with 'clan-parishes' in which an average of 90% of the male residents were 'putative agnates'. A brief comparison, in the light of this redefinition of Huli social structure, suggests that the significant differences between Enga and Huli society are located not so much in terms of descent as in forms of residence and in the types of category distinction these entail. Frankel (1986:51) has made the point that Enga terminological conversion to agnatic status of non-agnates after two generations of co-residence produces a considerably more "generous" definition of agnate than the more conservative Huli system of category labels. He suggests that the application of terminological rules similar to those employed by Enga would see the percentage of agnates in a Huli parish (presumably Hambuali) rise from 29% to 69% and concludes that, '[p]aradoxically, it is the ideological significance which the Huli attach to agnation which causes them to appear cognatic in comparson with other highland societies' (1986:51).

Yet the terminological exactitude and genealogical depth characteristic of Huli kin reckoning is itself associated with (and might, in a functionalist account, be regarded as a consequence of) the practice of multiresidence. The differences between Enga and Huli social structure thus need to be located in regionally and locally specific historic circumstances, and the historical emergence of the practice of multiresidence emerges as a key problem within Huli history. The significance of multiresidence for an archaeological history is that it undermines the possibility of a straightforward correspondence between neatly circumscribed units of land and groups of people; the recognition of change in the relationship between people and land in Huli history becomes more complex and requires that different, and possibly qualitative means of access to that history be sought.

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different senses of the term ***hameigini.***

CHAPTER B4 - *MABU*: SUBSISTENCE AND PRODUCTION

> The Baruya, in addition to their empirical knowledge in considering soils as agricultural materials, attempt to explain with the help of their myths and legends the invisible origin and structure of the visible world. Their myths form the basis of agricultural practices that enable them to have a direct effect on the invisible. Thus an abundant yield of sweet potatoes is dependent not only on the skilful choice of the best black soil... but also on the efficiency of magic formulae inherited from the ancestors. The knowledge of the secret names of the sweet potatoes gives man power over them. Agriculture is thus a subtle combination of technical and magical skills and is lived and thought of as such.
>
> Ollier, Drover and Godelier 1971, p.41

B4.1 The idea of the garden

Much as the Huli accounts of their "natural" environment outlined in Chapter B2 draw upon and reflect a culturally specific metaphysics, the ways in which subsistence practices are imbued with meaning for Huli shed light on the broader field of Huli society and its historical constitution. Pursuing a similar line, Weiner (1991:5) has defined subsistence activity as 'all the daily intentional movements and activities through which the Foi inscribe their agency and identity upon the earth'. There flows from this perspective the possibility, which this chapter seeks to explore, that subsistence practices bear the inscription of much past activity, evident both explicitly in Huli discourse and also in ways not immediately apparent to Huli themselves. I also seek both to demonstrate the difficulty of distinguishing "techniques" from "beliefs" and to illustrate the underlying logic or logics that serve to relate the two.

This chapter documents the range of crops (B4.2), of domesticated animals and wild game (B4.3) and of subsistence techniques (B4.4) that are known and available to Huli. Running through this analysis is an emphasis on the imprint of earlier subsistence logics. Huli people of the Tari region are now heavily dependent upon a single food staple, sweet potato, the bulk of which is cultivated using a single technique, mounding. Yet, unusually within the context of the Highlands region, Huli retain a keen sense of the historical priority of other crops and other techniques and there is thus a discourse of the adoption and transformation of new crops, new techniques and new ideas. Though it is by now an ancient transformation, the historic development of an agricultural system founded on fixed gardens (*mabu*), understood here as the emergence of the "idea" of the garden, is traced as an illustration of the relationship between ideas and techniques. In conclusion (B4.5), the parts played by the organisation of labour and the demands of different forms of consumption in structuring the nature of Huli production are described. An account of the variable exploitation of different environmental zones within Huli territory sets the terms for an analysis of the role played within broader local economies by wetland use, which is the subject of a more specific study in Part C.

B4.2 Crops

As amongst other Highlands groups, crops are imbued by Huli-speakers with a significance that far exceeds their nutritional value. Prominent in myths, in metaphor and in general Huli discourse, the staple vegetable foods are classically "good to think with". The register of crop species grown by Huli people in the Tari region is extensive. Appendix B7 lists all of those crops of the region known to me from gardens and local-produce markets and through conversation. Figure B14, which illustrates the frequency of occurrence of all crops in 231 garden plots at Dobani parish in Haeapugua, gives some impression of the range of crops grown in a single locality. As a comparison of these two lists suggests, not all of the species and cultivars known to Huli are to be found in any one area, but local variation in the register tends to reflect altitudinal restrictions on availability or yield rather than localised preferences or differential diffusion; these altitudinal variations apart, it is thus possible to speak of a broad "Huli" crop register.

Figures B15 and B16, drawing on the results of Bourke (n.d.) and my own observations in the Tari region, show both "usual" and "extreme" altitudinal limits for most of the crops listed in Appendix B7, set against the altitudes of the major basin and valley floors. The usual limits are those within which crops commonly grow in the Highlands region, with viable yields. The extreme limits describe observations at heights below or above the usual minimal or maximal altitudes and represent atypical, isolated plantings, either as experiments with little expectation of success, or as instances of unusual microclimates. A further distinction is made between those crops available to Huli before (Figure B15) and after contact in 1934 (Figure B16). Of the observations to be made on these figures, the most significant for this thesis is the scope introduced by sweet potato for the extension of permanent settlement to higher altitude locations such as the Margarima and Lebani valleys. Of the major pre-contact crops available to Huli, only sugarcane, tobacco, Highland pitpit, rungia, oenanthe and karuka pandanus could have been grown safely within their altitudinal limits at these two higher valleys. Other crops that may have been significant at lower altitudes, such as Pueraria lobata, lima beans, gourds, Job's tears and, critically, taro, are all capable of producing at altitudes of between 2200 m and 2300 m, but not at viable yields or with sufficient reliability to be employed as staples. A further suite of pre-contact crops grown in the lower valleys, including banana, cucumber, Amaranthus tricolor, yams and ginger, is largely unproductive in the higher valleys[1].

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1. Single banana trees are present in individual gardens of the Lebani and Margarima valleys, but their

The contrast between the productivity of taro and that of sweet potato between 2000 m and 2700 m is critical for the history of high-altitude settlement[2]. Table B7 summarizes data on maturation rates for taro and sweet potato in the Highlands region; although taro generally matures at between 7 and 12 months in the intermediate valleys below 2000 m, estimates for the rate at which it matures above 2000 m range from a minimum of 12 to a maximum of 28 months[3]. Given the strategies described for sweet potato production at high altitudes, where regular crop-destroying frosts require a period of replanting with a crucial lapse before the first crops after a frost (Clarke 1989; see also B5.2), the long maturation rate for taro effectively rules it out as a primary staple candidate above 2000 m. There is also some evidence for a decline in taro yield at the highest altitudes, though relevant data is very limited: yields of between 10.4 and 24.8 tonnes per hectare per year (t/ha/yr) have been reported from altitudes between 1400 m and 1550 m, but Bayliss-Smith's (1985a: Table 5) experimental plots at about 2200 m in the Tambul basin yielded only between 2.2 and 5.2 t/ha/yr; Goodbody (in press: Table 35) records yields in Simbu Province of 17.8 t/ha at 1500 m, compared with only 11.4 t/ha at 2400 m. While pre-Ipomoean agriculture that employed taro as one of a suite of staples would have been feasible in the higher basins such as Margarima and Lebani, Bayliss-Smith (1985a:313) concludes from his Tambul study that, at such altitudes, it 'seems unlikely that a taro-dominated subsistence economy based on wetland drainage would be viable'. Bourke (n.d.) suggests a mean limit of 2250 m for pre-Ipomoean taro subsistence, but even this renders taro-based settlement of the Margarima (2200 m) and Lebani (2300 m) basins as marginal propositions.

Sweet potato generally matures approximately twice as quickly as taro; Huli people, when describing garden sequences, frequently identify the second sweet potato crop in a given stage as the appropriate time to harvest the first crop of taro (see B4.4). On the basis of the figures in Table B7, sweet potato appears to mature at between 5 and 8 months between 1500 m and 2000 m, and between 7 and 12 months above 2000 m; the consequences of this quicker rate of maturation for sweet potato by comparison with taro for high valley settlement have been interpreted by Clarke (1977:161) as an expansion in the scope for high-altitude production, if not an extension of settlement.

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poor productivity stresses the marginal nature of the "extreme" limits listed in Figure B15. Much of the wide range of uses for banana leaves and stems common at lower altitudes is assumed in these two valleys by cordyline.

2. Bourke (n.d.) nominates 2700 m as the upper limit for arable agriculture in Papua New Guinea, an altitude which covers all of the major valley basins under discussion here (listed in Table B1).

3. The range of these estimates is explained in part by the results of a brief survey in the Porgera valley, to the north of the Tari basin, which suggest that local variations in soil quality and in micro-climatic conditions can exercise a considerable influence over maturation periods in taro and sweet potato, with the full maturity of crops from sites at similar altitudes varying by as much as six months (Hughes and Sullivan 1990:273).

Since contact, the crop register at higher altitudes has been significantly enhanced through the introduction of the white potato, cabbage, Chinese cabbage, corn, pea and carrot, a revolution that has also had consequences for the security of food supply in the intermediate basins (B5.2).

My own surveys of the crop registers of the intermediate Huli basins (Haeapugua, Mogoropugua, Dalipugua, Benalia, Paijaka, Tari and Komo) suggest that they are fairly similar. However, the altitudinal range of these intermediate basins, between about 1500 m and 2000 m, also contains usual limits for a number of crops, introducing the possibility of signficant variations in the productivity of these species within and between basins. Yam (Dioscorea alata), lowland pitpit, diploid bananas and ginger of the pre-contact crops, and winged bean, pineapple, orange, peanut, cassava and aibika of the post-contact crops, all reach their upper altitudinal limits between 1700 m and 1900 m, a range of immediate relevance to settlements in the Dalipugua and Mogoropugua basins and on the Paijaka plateau. Another possibly significant source of variation appears to be in the distribution of cultivars of the same species, though the extent to which this is a function of local synonymic differences in identification, discussed below, is not clear. At the lower end of the altitudinal range of Huli settlement, the most significant threshold is that for sago; the staple for all Huli neighbours to the south, sago has been transplanted to lower-lying areas of the Lower Tagali valley where it is marginally above its usual altitudinal maximum. Sago is also harvested by fringe Huli groups scattered to the south and east of Benalia, towards Lake Kutubu[4].

Apart from the impact of sweet potato and subsequently of the post-contact crop introductions on the permanence of settlement above 2000 m, the other important variation in the altitudinal range of pre-contact staples relates to the distribution of the different pandanus species. The two key pandanus crops are marita pandanus (*abare*: Pandanus conoideus), and karuka pandanus (*anga*: Pandanus julianettii). The usual mean maximum for marita pandanus is about 1700 m, extending on occasion to an extreme maximum of 1980 m; this renders marita available to the lower-lying Huli settlements of the Lower Tagali, Benalia, Komo, Haeapugua and the southern part of the Tari basin, but not (at least in significant numbers) to Dalipugua, Mogoropugua, the Paijaka plateau or the higher altitude valleys. By contrast, the distribution of karuka pandanus, with a usual minimum of only 1800 m (extended in extreme instances to 1450 m), is effectively restricted to the upper slopes around the Paijaka plateau and Mogoropugua and to the higher altitude valleys of Margarima and Lebani. In these

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4. There has been extensive trade in sago between Komo Huli and Etoro-speakers of the Papuan plateau, described by Dwyer (1990:68).

higher valleys, karuka is cited as the primary attraction for settlement; indeed the history of pre-Ipomoean settlement above 2000m can perhaps be viewed effectively as a record of the fluctuating significance over time of karuka pandanus.

As most of the basins of intermediate altitude lie close to, or within, the gap left between the usual maximum for marita and the usual minimum for karuka, the vast bulk of the Huli population has to rely upon extended kin and affinal ties to gain access to the centres of production for both pandanus species. Marita and karuka harvests are of considerable significance for most Huli, but entail either trade or temporary migration for the majority, both of which involve activation of the necessary kin and affinal ties or trade links with the lowland Etoro and other *duguba* groups (Dwyer 1990:63). For Huli at Haeapugua, located within the "pandanus gap", the need for such links, both above and below, is keenly apparent:

> They call out to those who don't have karuka pandanus [*anga*] to come and eat. Those in the headwater regions [*manemane*] call out to us at Haeapugua. Those in the lower reaches [*wabiwabi*] call out to us at Haeapugua to come and eat marita pandanus [*abare*], or they bring it to us.
>
> Pudaya, 3.11.92, 92/4B:199-238

Thus, even though many Huli lack direct access to marita and karuka pandanus, the nature of local social structure permits their distribution throughout Huli territory and further reinforces the proposition of a single Huli-wide crop register.

As for other plants or animals, Huli taxonomies for crops tend to be shallow, with little emphasis on higher-order grouping[5]. There are no terms for unique beginners, for example, such as "plant" or "animal". With only a handful of exceptions, Huli "folk" generic labels correspond instead to scientific species terms: *hina* thus refers to Ipomoea batatas and would not be incorporated under any more inclusive term, other than *pindu* ("thing") or *tomo* ("food"). The few exceptions to this general observation are listed in Table B8, where there is some suggestion that the most common Huli generic identifications that incorporate more than one scientific species are those that group both domesticated and wild species under a single generic label. In place of a complex higer-order taxonomy, there is a wide proliferation in Huli of varietal, or more accurately, cultivar terms which are commonly combined with the superordinate Huli generic category (*dama hina* for the *dama* sweet potato cultivar, for example). The profusion of cultivar terms, with over a hundred terms for sweet potato cultivars and more than thirty each for taro, karuka pandanus and banana (Appendix B7), certainly

5. This emphasis on "terminal taxa" is a feature common to most Highlands plant taxonomies (Hays 1979, Sillitoe 1983:138f.).

reflects local variation in nomenclature. This is illustrated below with reference to sweet potato cultivars.

But the task of matching Huli and scientific taxonomies is probably less rewarding than the insights afforded by the ways in which crops and crop terms are deployed by Huli, the role of crops in the Huli imagination. Certain crops, for example, are accorded praise terms (*kai mini*) which are used in formal narratives and *gamu* spells. Table B9 lists a number of praise terms for crops either identified in narrative transcripts or elicited through interviews. Without exception, praise terms are reserved for crops known to the Huli before contact in the 1930s, reflecting the keen sense of historical precedence or *tene* discussed in B3.3. A "covert" taxonomic system for crops emerges in Huli discourse and praxis, founded on the relative antiquity of different species and expressed in terms of a moral gradient from earliest (*ala* or *bamba ore*: "before-truly") to most recent (*ayu ore*: "now-truly").

While post-contact crops have, in the more recent past, clearly been excluded from ceremonial contexts, finer distinctions between pre-contact crops of differing antiquity were formerly evident in ritual performances. The *gebe hagama* rites performed at major *gebeanda* ritual sites such as Gelote involved the reconstruction of what was deemed to have been the lifestyle of the earliest female ancestor, Memeleme[6]. This rite required the performing ritual leaders to refrain from eating historically recent foods such as sweet potato and subsist instead upon taro and sago, the latter imported for the rite from the Papuan Plateau. This identification of historical sequences for the introduction of different species and cultivars is a common element in discussion about crops. Usually, differences in crop antiquity are expressed in relative terms through reference to crop pairs: taro precedes sweet potato, cucumber precedes pumpkin. A broader historical framework is in fact articulated by Huli people, drawing on these simpler temporal oppositions to construct a sequence running from the earliest time, *ira goba naga* ("wood-rotten-time" or "wood-rotten-eaten") or *dama angi* ("the time of *dama* spirits"), a period when ancestral *dama* are held to have eaten the decayed woods found deep in the main swamps, together with both karuka and "wild" pandanus, *nano* mushrooms and an unidentified wild tuber (*homa bawi*; ?Dioscorea nummularia / ?Pueraria sp.)[7]. These crops, all considered to grow without human assistance, are

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6. Memeleme is a synonym used widely in the Haeapugua area for the Huli ancestress, Tia Nangume or Dindi Ainya (see Narrative B1).

7. Another temporal sequence constructed around crop staples employs the metaphor and vocabulary of a genealogy, with the fern *yagua* bearing an unidentified wild tuber (*homa bawi*: ?Dioscorea nummularia / ?Pueraria sp.), which bears yam (*nandi*: Dioscorea alata), which in turn bears sweet potato (*hina*: Ipomoea batatas). Taro (*ma*: Colocasia esculenta), on this account, is "descended" from wild taro (*tumbu*: Alocasia spp.).

designated as wild (*pariwali*) and are explicitly associated with *dama* spirits[8].

Following this period is a second, *ma naga* ("taro-time"), in which people now recognized as fully human ate taro, cucumber (*bambo*; Cucumis sativus), bottle gourd (*mbagua*; Lagenaria siceraria) and yam (*nandi*; Dioscorea alata), but dug no *gana* ditches for proper *mabu* gardens (see B4.4) and raised no pigs[9]. The relative antiquity of taro is a recurrent theme in Huli culture and the term for taro, *ma*, is possibly the root of an important lexicon which includes such words as *mabu* (garden), *malu* (genealogy, charter), *mamali* (ancestor), *mame* (father), *mamabuni* (mother's father) and *mana* (custom, precedent) (see Goldman 1981a:65). Most of these terms, evidently, refer to qualities or states associated with maleness or to knowledge that is notionally the preserve of men; there is a tendency for sons to inherit their father's taro stocks and men will sometimes refer to their older stocks as their father's taro. Taro itself was used in significant rituals, such as the *gebe hagama* rite mentioned above and the *ma hiraga* rite performed to ensure the strength of newly born infants (Frankel 1986:54). By comparison with other Highlands groups where taro has more recently been a dominant staple, such as the Bimin from whom Bayliss-Smith (1985b) has recorded at least 108 cultivar terms, the knowledge of fewer than 40 cultivar terms for taro by Huli-speakers is probably an accurate reflection of the diminished importance of taro as a subsistence staple in the Tari region. Nevertheless, many people nominate the *tirima* and *gihagua* cultivars, which are often identified in myths as being associated with early ancestors, as the two earliest cultivars of taro. Specific directions of origin are also recalled: *tirima* is said to have been introduced from the Duguba of the Papuan Plateau, and *bogaya*, as its name suggests, from the Bogaya of the lower Strickland Gorge area. Two cultivars, *miti* and *simbu* ("Chimbu") or *dandayi* ("police"), are explicitly identified as post-contact introductions.

Ma is often referred to in discussion as an earlier counterpoint to the current Huli staple, sweet potato (*hina*). As the earlier staple, taro rather than sweet potato was employed in ritual contexts, but the historical and current significance of sweet potato is such that it is well incorporated in figurative speech (e.g. Goldman 1993:388) and has its own praise term for use at formal occasions[10]. So important to the Huli economy is

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8. Though Huli evidently associate these wild "early" crops with ancestral *dama*, the equation of wild bush foods with wild spirits is a common theme throughout the Highlands; Marilyn Strathern, for example, discusses comparable beliefs held by the Melpa (1969:190-191).
9. *Ma naga* is also described as *ma angi* ("the time of taro") or *ma nga* ("[when] taro [was] present"). A further epochal distinction, intermediate between *ira goba naga* and *ma naga*, is occasionally made: this is *anga naga* ("karuka time"), a time when karuka pandanus was eaten, an observation that reflects the symbolic and dietary significance of the crop, but one which is seldom elaborated upon within epochal schemes (Pudaya, 27.9.89, 89/3A:32-51).
10. Sweet potato was excluded from ritual sites such as Gelote, within which officiants ate only taro or sago, the latter in commemoration of the lowland origins of the earliest ancestress, Memeleme.

sweet potato that no meal is considered complete without it, and it has assumed the status of a generic term for all food. Famine is thus described as *hina gari* ("sweet potato-lack/hunger"); as with similar terms describing famine in terms of temporary shortages of preferred staples such as taro among the Telefolmin or at Wamira, *hina gari* refers more accurately to a deficiency in the supply of the one crop[11]. Appropriately, the concept of ancestral famine is referred to in terms of a lack of taro (*ma gari*).

Hina is clearly understood to have emerged or to have been introduced to the Tari region within what might be described as the temporal scope of Huli history (see Appendix B6). Informal recitations of genealogies are often punctuated with references to the first individual to have "held" sweet potato vines. Although *ma* serves in some genealogies to denote the emergence of human, as distinct from *dama* ancestors, many genealogies explicitly equate human-ness with the advent of *hina*, and the emergence of successively newer sweet potato cultivars is identified with the passage of different generations: '*hina mbira, daba mbira*' ("for each sweet potato [cultivar], a generation"). While I have encountered no myths of any length that account for the origins of *ma*, the origins of *hina* in the Tari region are widely associated with the ancestors of Digima *hameigini*[12]. In Narrative B5, a Digima *tene* sketches the outlines of this myth. No external origin is identified for this first cultivar, which is known either as *muguba* (hence the praise term "*alu muguba*" for all *hina*) or *digi hina* (after Digima clan); Wood (1984, Vol.I:232), however, records Huli origin myths for sweet potato that trace its diffusion into the Tari basin from the north and west (see Chapter D2). Yam (Dioscorea alata), an unspecified bean and the bottle gourd are all identified as having been present at this time, though the narrative intention of this scheme is clearly to provide a context that explains why people should have attempted initially to trail sweet potato vines up sticks, following a practice appropriate to the other three crops[13]. As another man put it, sweet potato was only recognised as such, in a sense only became *hina*, when it was correctly planted in the soil:

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11. 'Hungry times [for the Telefolmin] are those in which one eats sweet potato because the supply of taro is short' (Jorgensen 1981:55); 'the difference between times of abundance... and times of scarcity... hinges upon the amount of taro available' despite the relative dominance at Wamira of sweet potato and cassava (Kahn 1986:34); 'hunger for the Wola starts with a shortage of staple sweet potato, whatever happens to the yields of other crops' (Sillitoe 1993a:175).
12. L.Goldman (pers.comm.) reports that he too, has never head of an origin myth (*tene te*) for taro.
13. Marilyn Strathern (1969:197) has recorded a very similar myth from the North Melpa area in the Wahgi valley. The bean said to have been present prior to the introduction of sweet potato in the Tari region is invariably named as *paboro* (*Paboro ibu ala*: "*paboro* is ancient"); this is currently the term used by Huli to identify the common bean (Phaseolus vulgaris), which is thought to be a post-contact introduction (R.M.Bourke pers.comm.). Other candidates include the hyacinth bean, though this is usually termed *wiru* in Huli, and the winged bean (Psophocarpus tetragonolobus), which has been described as present prior to contact in some parts of the Papua New Guinea Highlands (Khan 1976) but which does not appear to have been known or widely used in the Tari area before contact.

> *Dindi dugu dambi hayagola, ba timbuni, digi hina, digi hina lenego*
> When it was covered with soil, it grew large and it was said that this was [really] *digi hina*
>
> Digi-Malingi, 13.6.91, 19/9A:382-end

In narratives of varying degrees of complexity, most other clans then trace the acquisition by their ancestors of *digi hina* from Digima clan. At Haeapugua, Miniba and Wenani clans are held to have been the first to receive *digi hina* from Digima; the other clans of the basin acknowledge their receipt of the first *hina* through these two clans. Narrative B6 tells of a Miniba woman who returned from Digima carrying *digi hina*, and comments incidentally on the preceding staples and the ensuing sequence of introductions of other sweet potato cultivars.

The possibility of dating the arrival of sweet potato through estimates of the antiquity of those ancestors who are said to have been the first to "hold" sweet potato was explored during the documentation of clan genealogies. The Digima ancestor, Digiwa, who first cultivated sweet potato, lies ten generations above the narrator, Digi-Malingi. Given Malingi's estimated date of birth (EB) in 1925, Digiwa's genealogically estimated date of birth (GEB; see Appendix B6), assuming average generational lengths of between 30 and 40 years, would appear to lie between ?1625 and ?1725 AD, suggesting that his active adult life spanned between an absolute maximum of ?1645 and an absolute minimum of ?1780. At these generational depths it is difficult to be more accurate than this, but the records from other clan genealogies of generational depth above the adult narrator show a considerable degree of concordance with the estimate of ten generations' depth for Digiwa. At Dalipugua, estimates ranged from 8 to 11 generations (from 10 clans), at Mogoropugua from 8 to 10 generations (5 clans), at Lebani from 8 to 10 generations (7 clans), at Haeapugua from 7 to 10 generations (8 clans), at Margarima 9 generations (1 clan) and at Komo 10 generations (1 clan).

In his review of Wiessner and Tumu's (in prep.) attempts to date the arrival of sweet potato using Enga genealogies, Jorgensen (in press:27-28) has wisely cautioned that

> the location of sweet potato towards the end of the mythological period may function semiotically to mark the assumption of culture and the passage from non-human to human ... in this way Enga history may be said to begin with the sweet potato, but this is probably best understood in a broadly metaphorical sense.

Huli clan origin narratives differ as to whether possession of sweet potato marks the historical transition from *dama* to human ancestors, or whether sweet potato was adopted by taro-eating ancestors who had already been human for some generations.

All are in agreement, however, on the fact that the adoption of sweet potato was instrumental in the transformation of ancestors into "modern" humans, with "modern" forms of exchange such as the use of pigs in bridewealth[14]. Jorgenson's argument develops a circularity under these conditions: sweet potato marks the transition to modernity and its adoption is thus correctly identified as a metaphor for the emergence of human modernity; yet, as Huli have it, it is only with the adoption of sweet potato that their ancestors were able to engage in intensive pig production and to transact and otherwise behave as modern humans. Similarly, the elaboration of Huli genealogies from ten generations above the current adults could be taken either to reflect the maximum temporal extent of Huli history or a post-Ipomoean increase in population and the creation of the need for detailed genealogical recall.

The list of sweet potato cultivars given in Appendix B7 contains cultivar terms recorded throughout Huli territory. It should be stressed that no individual would be able to recall all of the terms listed here, let alone identify the different named cultivars. In practice, a far narrower range of cultivars is actually employed in any one area: in a 1991 survey of 231 garden plots at Dobani in the Haeapugua basin, four cultivars were found to dominate overwhelmingly the range of planted cultivars, and only a further seventeen named cultivars were present (Figure B17). As Heider (1969) has pointed out, the range of cultivar terms for sweet potato in the Highlands, while reflecting the importance of the crop and its propensity for somatic mutation (Yen 1974), owes much to the proliferation of synonyms for the same cultivars. Experiments by both Heider (1969) and Sillitoe (1983:141) suggest that there is little agreement in the application of cultivar terms, either between people or by the same individual on different occasions[15]. Powell (Powell with Harrison 1982: Table 4) has described cultivar characteristics for sweet potato in the Haeapugua basin, but the limited success of my attempts, in conjunction with Jill Clapin at replicating these descriptions even when working with some of the same people who originally assisted Powell, would appear to support the conclusions of Sillitoe and Heider. This is not to imply that cultivar terminology is totally inconsistent in the region; many people are aware of the existence of synonyms for the same cultivar, but the problem may have been compounded since contact by the extensive replacement of pre-contact cultivars by a large number of higher-yielding cultivars introduced to the Highlands region by European plantation owners in the Wahgi valley and directly to Tari by government departments, and will obviously require a more intensive study than any attempted so far[16].

14. Modjeska (1991) has already introduced the term "post-Ipomoean modernism" to describe the emergence of essentially modern forms of Duna exchange and leadership.
15. Kocher-Schmid (1991:96) suggests that even the terms for modern cultivars, such as the apparently ubiquitous *wanmun*, are not applied consistently to the same cultivar between regions.
16. Appendix B7 lists some of the terms identified as synonyms. A nice illustration of the origins of a

A more certain distinction, at least in Huli discourse, is made between earlier and later sweet potato cultivars. Table B10 lists the responses of nine older men from four different basins to questions about the relative antiquity of different cultivars. The responses generally distinguished between four gross phases of introduction: the earliest cultivar (*muguba*); those introduced subsequently, but prior to contact with the administration; a handful of new cultivars introduced either deliberately or incidentally by early administration patrols prior to 1950 (see B3.2); and those cultivars introduced through government agencies, markets or the travels of Huli people to other areas of Papua New Guinea. Finer distinctions are made within each of the three latter phases, usually in connection with specific individuals in clan genealogies.

These three major historical "staple phases" identified by Huli (*ira goba naga*, *ma naga* and *hina naga*) surface in a much wider range of contexts than the discussion of crops, invoking or articulating connections with notions of temporal progression, such as entropy (Chapter B5), and change in such matters as agricultural technique, the status of pigs and pork and the nature of sociality. In each case, the perceived staple comes to stand for a specific complex of techniques, forms of exchange and other, less significant crops. Most of the other crops listed in Appendix B7 are also located temporally within this scheme; Table B11, a compilation of observations made in both formal and informal contexts, provides a historical register of these crops, with the addition of a finer temporal division employed by Huli in describing changes to the crop register since contact.

Although the continuing importance of *hina* remains unquestioned, there is little evidence for any broad current commitment to other pre-contact crops of the kind described for taro amongst Telefolmin by Jorgensen (in press). A few older men and women persist in growing early cultivars of sweet potato, claiming that they prefer their familiar taste, but the introduction of new cultivars and new crop species since contact has radically altered the emphasis placed on other "traditional" crops. Seed was deliberately carried on early patrols of the 1930s and 1940s to Tari (see Appendix B1) and other crops spread rapidly from the government posts established during this period at Lake Kutubu and Wabag. Corn, in particular, made a notable early impact, recounted in a rather quaint "myth" by a patrol officer in the 1950s[17]. The frequency of

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cultivar synonym is *aliga hina*, the term given for a cultivar said to have been introduced to Haeapugua through the Wabia area to the east, which is a synonym for *barabia hina*, the same cultivar introduced from the Duna to the west.

17. 'Within the past ten years several European crops have been introduced to the area, down the Wabaga trail, and of these, the natives have shewn increasing interest. The first new crop to be introduced was corn, which, from a small start, has developed into a second major crop. The story goes that the first corn was thrown away by Mr Taylor's party during his visit to Hoiyevia [Hoyabia, referring

occurrence of crops in a 1991 survey of 239 Dobani garden plots (in 52 gardens) gives a very rough indication of the relative contemporary importance of different crops (Figure B14). The nature of the data severely understates the actual dominance of sweet potato, by number, weight of yield or area planted, but may give a more accurate impression of the increasing popularity of some of the post-contact crops: Xanthosoma taro appears as frequently as the pre-contact Colocasia taro, and pumpkin, corn and choko have also been widely adopted. There is also some evidence in Figure B14 for the decline of Rorippa, cucumber and yam, with the last two crops each appearing in only one of the 239 plots surveyed. Though coffee is probably the most significant cash crop in the Tari region, problems of distribution and the small size of holdings have prevented the development of an industry of the scale evident in other Highlands provinces[18].

While there is a pragmatism about innovations, and perhaps even a willingness to experiment in the Tari region which might account for the speed of diffusion of novel crops and the corresponding decline of former staples, successive famines appear as watersheds in the broader history of the adoption of new crops by Huli. The causes of these famines are considered in more detail in B5.2, but their consequences for the crop register are clear. In the course of a major drought and famine during 1941 and 1942, two new sweet potato cultivars, *bo* and *dambera*, are said to have been passed rapidly throughout Huli territory and to have yielded spectacularly well for a few years; men and women walked between the various Huli basins carrying bundles of the new vines back to their gardens (see Narrative B6; also Agiru, 10.3.91, Mogoropugua Fieldnotes). Again, during the 1972 frosts and famine (B5.2), crop failures led to the wholesale

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to the 1938 Taylor/Black patrol]. On his departure a solitary stalk sprang up. Being naturally superstitious, this was placed under a "taboo" and until the time it came to fruition, it was left alone. At this stage, however, one native, more forward than his friends, tried a small piece of corn, found it sweet and good - and lived. From this meagre start developed the growth of corn throughout the nearby area. On the return of natives from the Wabaga area, more corn was imported, and spreading, is now available in greater or lesser quantities, as far south as Pai [Bai]. As mentioned before, this is now being grown on a major scale, being planted along the edges of the potato gardens, and is gaining an assured place in the native diet. Gardens of some 5 - 10 acres have been seen, not as sweet potato patches, but as fields of waving corn.' (A.T.Carey 1952:46).

18. The major cash crop of the 1970s and 1980s in the Tari region has been coffee, notwithstanding the efforts of successive agencies to promote such varied projects as silkworms and cardamom (French and Walter (eds.) 1984). A 1965 survey counted 5293 coffee trees in the Tari region, of which only 180 were in the Haeapugua area (Hunter 1964/65: Appendix A). The coffee "boom" of the late 1970s and early 1980s, and the establishment of a road link between Tari and the rest of the Highlands, saw a rapid increase in coffee production in the Tari region. Almost all coffee production has been at the level of individual households; a map of land use in the Tari and Haeapugua basins shows clearly the fragmented distribution of coffee gardens in 1978 (Wood and Allen 1982). Subsequent attempts to establish larger plantations on communal land, as in the swamp at Mogoropugua, have all failed. In 1991 at Haeapugua, there were 2232 coffee trees at Dobani parish (62 trees per hectare of dryland garden, 15 trees per person), though most were poorly tended and owners were reluctant to harvest given the depressed coffee prices of the time.

replacement of the existing range of sweet potato cultivars by new cultivars and by European potatoes flown in by the colonial government (Oberia, 15.3.91, Lebani Fieldnotes; J.M.Powell pers.comm.)[19]. Great emphasis is placed on the selection of new cultivars, and Huli continue to travel long distances, by foot prior to contact and more recently by vehicle, in order to acquire new cultivars and new crop species. Although narratives about events such as the 1941/42 famine assert that the new food crop species and cultivars only emerged (literally "came out": *tagira*) during the famine, it is conceivable that they were already present beforehand but only assumed their new significance when the existing staples failed.

This adoption of new cultivars after the 1941/42 drought may serve as a model for the initial adoption of sweet potato in the Highlands region. Corlett (1984:109-110) has documented a major event of forest clearance at high altitudes in the vicinity of Mt Wilhelm at about 300 BP; he relates this to increased human activity at higher altitudes during an exceptional drought event at that date but notes the absence of similar impacts during pre-300 BP drought events. This situation, Corlett suggests, reflects the adoption of sweet potato immediately before the 300 BP event and the establishment of permanent human settlement at higher altitudes. The threat posed to taro by drought is well-documented, Morren and Hyndman (1987:312) recording the Mountain Ok practice of transferring taro stock to swamps during drought events. It is possible to speculate that an extreme drought event following the initial introduction and availability of sweet potato could have promoted its prospects as a staple across much of the Highlands region almost instantaneously (R.M.Bourke pers.comm.)[20]. Indeed, Wiessner and Tumu (in prep.) have recorded several Enga oral traditions in which the initial adoption and widespread distribution of sweet potato is said to have occurred during a great famine, when the existing staples failed.

In much the same way that crops are employed as temporal markers in Huli history, they are also deployed in the process of negotiating the structure of Huli society more generally. The concept of *tene*, which informs Huli historicity through the privilege accorded to precedence, is also implicated in gender distinction. Ideally, each domesticated crop is opposed to, but also preceded historically by, a wild or

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19. One of the few studies of the process of cultivar replacement in the aftermath of the 1972 frosts was by Freund (1973) at Sirunki in Enga Province, who recorded that only 6% of gardens were replanted with local vines; 57% were replanted with vines from the adjacent Ambum, Lai and Lagaip valleys, and 44% with vines supplied by the government (planting with cultivars from more than one source accounts for the odd percentage total). Waddell (1975:260) observed that the loss of vines through drying formerly limited the maximum carrying distance for vines to one day's walk.
20. Brookfield (1989:313) has documented a series of dates for drought events during the 18th and 19th centuries, demonstrating the frequency with which major droughts are likely to have occurred, then and earlier.

undomesticated counterpart: *anga mundiya* (Pandanus brosimos) thus came before "true" *anga* pandanus (Pandanus julianettii), *hima* or *gili* (Saccharum edule) before *du* (Saccharum officinarum); *hai garo* preceded edible bananas; and "wild" taro (*tumbu*: Alocasia spp.) was present before people began to eat "real" taro (*ma*: Colocasia esculenta)[21]. These historical distinctions correspond to a strongly gendered contrast between domesticated crops, equated with the mythic domesticating acts of men, and their wild, feminine counterparts. These wild crops, which are held to have first been planted by the originary ancestress, Memeleme, are known by a collective term, *pariwali* ("?-woman"). In an important sense, then, all wild forms of plant food are feminine versions of the domesticated male species.

B4.3 Fauna

No single Huli term exists that encompasses all animals. As with crops, an important distinction is made by Huli between wild (*gabua*) and domesticated animals; the latter are often but not exclusively designated by the prefix *nogo*, which is also the specific term for the pig. Like crop plants, the major animal species domesticated prior to contact have wild counterparts: the domesticated pig (*nogo*) is distinguished from wild or feral pigs (*nogo gabua*), the domesticated dog (*biango*) from wild dogs (*biango dudu*) and tame cassowaries (*biyu*) from wild (*yari*). This distinction between wild and domesticated amongst fauna assumes the significance of distinctions amongst crops founded on historical precedence, though the explicit association between wild animals and *dama* on one hand and domesticated animals and humans on the other is also effectively an historical division. *Dama angi*, the time of the *dama*, was also a time before pigs; cuscus and possums (*tia*), in particular, are referred to as *dama nogo* ("pigs of the spirits") and many former rites required an opening sacrifice of a possum to attract the attention of *dama* (see D1.3).

Appendix B8 lists some of the local fauna known to Huli people[22]. While cuscus, possum and various rat species are still widely available, together with feral pigs, the larger wild fauna species in the vicinity of the major basin floors were already severely depleted prior to contact and the introduction of shotguns, and they appear to have constituted an insignificant proportion of the diet of most Huli other than those fringe communities with access to less disturbed forest areas. What knowledge Huli have of the larger vertebrate fauna derives from hunting and trading trips on the margins of Huli territory. Tree kangaroos (*tia andaya*; Dendrolagus sp.), which used to figure

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21. Frequent discoveries, at the base of deep swamp ditches, of matted layers of organic material containing what are identified as the seeds and leaves of *mundiya* and *tawa* (Pandanus antaresensis), are referred to as proof of the precedence of these wild pandanus species.
22. This list draws extensively on the work of Peter Dwyer (1990, 1992) among Huli-speakers of the Komo area and neighbouring Etoro-speakers.

prominently in *dindi gamu* ritual, are still obtained through contacts to the south. Large Southern Cassowaries (*yami*; Casuaris casuaris) are also occasionally traded into the central basins from the southern lowlands and are reared, but not bred, around houses (Reid 1981/82). Long-beaked echidnas (*dindi borage*; Zaglossus bruijni) are occasionally caught in the alpine grassland areas of Ambua and the E Mama valley, but have not been seen wild in the vicinity of the Haeapugua basin in living memory.

The local avifauna are also depleted within the central basins, though a considerable range of species is still to be found in the surrounding hills (C. and D.Frith 1992) and more than 200 bird species have been identified in the Tari region as a whole (those identified by Huli terms are listed in Appendix B9). Within the central basins smaller birds are hunted by boys, and ducks are occasionally taken from the lakes and rivers. Larger pythons (*puya*) are caught on the forested ridges around the basins, but their consumption is said to be a practice adopted only recently from the lowland *Duguba* and there is some ambivalence about the handling of snakes generally, possibly reflecting the cosmological significance of pythons described in B2.6[23].

Although Cantonese carp (Cyprinus carpio) and rainbow trout (Salmo gardneri) are now found in the lakes and rivers of the Tari region, these were all introduced during an intensive stocking program between 1964 and 1973 (West and Glucksman 1976). Only a single species of small fish, the twinspot goby, Glossogobius sp. (G.Allen 1991:184-5), is claimed to have been local in origin and is now distinguished from the introduced fish (*honebi wena*) as *huli wena*. Crayfish, frogs, tadpoles and eels were all available prior to contact and continue to form a minor part of the diet of women and younger children. Eels (*ibia*: Anguilla ?marmorata; G.Allen pers.comm.) were formerly restricted to the Tima, Alua, Debi and Lower Tagali rivers, all *iba tole*, or stony rivers, and were not found in the swamp at Haeapugua.

Domesticated pigs, sheep, goats, cattle and chickens, together with store-bought tinned meat, are currently the major sources of protein for most Huli living in the central basins. Goats are relatively scarce, being restricted largely to members of the Seventh Day Adventist missions. Cattle and sheep were introduced in the 1960s by the Department of Agriculture to those communities with access to larger cleared areas of potential pasture such as the basin floor swamps of Haeapugua and Mogoropugua, but their ownership appears to be heavily concentrated in the hands of a few individuals; as a consequence, and because they are relatively difficult to transport or secrete, cattle in

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23. Again reflecting their ritual associations, pythons are commonly identified either with the unfamiliar lowland forests or high alpine areas, though they are apparently rare at higher altitudes (Pybus 1974).

particular have often been an early target in the recent spate of clan wars, a factor likely to discourage any future cattle projects in the region. Chicken-raising has been particularly successful and is seen as a dependable short-term means of raising finance; at Dobani parish, in 1991, three different groups were raising chickens (*ega masin*; "machine chickens") flown into Tari as day-old chicks.

Of these various domesticates, only pigs and cassowaries were available before contact in the Tari region, and the latter in apparently insignificant numbers. As the enduring principal medium of exchange, pigs are definitive of Huli sociality, both in terms of the structure of that sociality and in the way that Huli talk of the historical development of socialised beings. The scope for domestication of pigs, which is not to be found in any other of the larger pre-contact fauna, perhaps accounts for the significance of pig-taming as a feature of myths about the early socialisation of "wild" humans, and even as a metaphor for the "tethering" of women by men and the "domestication" of Huli by the colonial administration[24]. There are no common myths that account for the origins of pigs, but a clear association between the introduction of sweet potato, the development of ditched gardens and intensive pig husbandry emerges in many narratives. While there were pigs present during the time of taro (*ma naga*), it was only when people received sweet potato and emerged as fully socialized humans, that different breeds of pig are said to have been introduced from neighbouring groups and husbanded in a recognizably "modern" manner. Narrative B7 identifies these breeds and their sources. People at this time were recognizably "human": men are said to have been carrying bows, and women making skirts; pigs were being tended and ditches dug. Yet the new breeds of pig are explicitly associated with the spread of new forms of exchange, such as bridewealth and the *tege* ritual (D1.3) and the outward migration from the central Tari and Haeapugua basins of Huli groups. If we reflect back upon the narrative process of "recognition" of sweet potato through use of a "correct" or modern garden technique described in the previous section (B4.3), this historic introduction of new breeds of pigs might also be interpreted not so much as the novel presence of different breeds, as the adoption or development of novel techniques of pig husbandry.

Following the permanent establishment in 1952 of an administration presence at Tari, a further wave of new breeds was introduced; the first of these, *nogo gebe* ("kiap [colonial officer] pig"), was remarkable for being considerably larger than local breeds, by comparison with which the former also appeared almost hairless. Successive post-

24. Frankel (1985:159) cites a Huli man declaring that 'We tether a pig with a rope, but women we tether with children'; in the context of colonial contact: 'In the same way that we tamed wild pigs with the smell of sweet potato rubbed into our armpits... the whites who came tempted and tamed us with red paint and shells' (Elera Alendo, 1991, Interview Notes).

contact introductions by government agencies and missions have seen a rapid loss of the characteristic features of the pre-contact breeds, remembered by Alan Sinclair (17.8.91, Interview Notes), one of the earliest missionaries at Tari, as uniformly small, "runty" pigs with straight tails, long snouts and sharply tapering rears[25]. Indeed, these features are now considered characteristic of *nogo gabua*, the wild pigs of the forest. It is tempting to see these earlier breeds as the hybrid Sus celebensis / Sus scrofa vittatus form identified by Groves in his revision of regional pig phylogeny (1983), with the later introductions increasingly breeding out the celebensis characteristics. The difference in size between pre-and post-contact pig strains has been further exaggerated by the introduction from the late 1950s of a new earthworm species, Pontoscolex corethrurus (*kau ngoe*) (Rose and Wood 1980); unlike the indigenous earthworms, these are highly attractive to pigs and have radically transformed both the weight-gain capacity of pigs (Rose and Williams 1983/84) and the nature of forage routines (see B4.5). Whatever the taxonomic status of the different pre-contact breeds of pig, these dramatic changes in pig form and size, evident to Huli as well as foreign observers, must be taken into account in modelling pre-contact pig husbandry.

Domesticate pigs, and not game, are thus the main source of protein from fauna for Huli. As we shall see in B4.5, the emphasis in Huli subsistence on agriculture rather than hunting or gathering is also compounded by the fodder requirements of these domestic pig herds.

B4.4 Agricultural Techniques

The techniques employed in Huli subsistence agriculture have been well documented by both Powell (Powell with Harrison 1982) and Wood (1984). This section, which differs from these earlier accounts only in matters of detail, employs Huli terms to describe the tools, methods of enclosure, specific crop technologies and garden sequences in common use, now and in the recent past. Distinctions founded on concepts of gender and historical precedence are traced in an attempt to identify the ways in which subsistence techniques are conceptually deployed in Huli discourse on the past.

Tools

Three common tools, the steel spade, the steel axe and the bushknife, now constitute virtually the full agricultural toolkit in the Tari region. Steel spade blades are bought at roadway stores in the townships of Dalipugua and Tari, and are used, and

25. A similar process has seen the replacement of pre-contact dog breeds (*biango*) with introduced breeds (*honebi biango*: "white people's dog"): 'Now they are another kind. The old dogs have all gone and there are only *honebi biango* here' (Mabira Walahuli, 23.10.92, 92/1B:250-276).

often shared, by both women and men. The hafts made by men for the spade blades are generally much longer than store-bought hafts, measuring up to 190 cm in length; this, people say, affords them both increased leverage in shifting soil and added reach in shearing the faces of ditch walls. The blades, continuously honed, are worn down to the socket before being replaced. Steel axe blades are also given longer hafts to increase reach. It is evident that these three modern tools have effectively assumed the functions of what was, prior to contact, a much wider range of tools. This earlier toolkit resembles closely those known from other areas within the Highlands region, reviewed by Golson and Steensberg (1985), who identify a common core toolkit consisting of larger (men's) and smaller (women's) digging sticks, paddle-shaped spades and grass-cutting blades and rakes. This core toolkit was supplemented in different areas by locally specific variants.

The testimony of older Huli, and occasional finds of wooden tools in the local swamps, allow at least a partial reconstruction of the pre-contact wooden agricultural toolkit of the Tari region, summarized by Powell (Powell with Harrison 1982:54-56), and in Table B12[26]. The range of Huli tools is very similar to that described for the ethnographic and archaeological toolkits from the Wahgi swamps (Powell 1974), with the one local addition of the *ma habono*, a heavy-based club used to plant taro. The length of the large paddle-bladed *ayaga keba* digging sticks suggests that these were used in the same way that longer-handled steel spades are today, to renew the faces of wetland ditch walls from a standing position above the wall. It is possible that these longer-handled spades, together with the *iba wango* hooked rakes, shown in use in Plate 2, were restricted to wetland use[27]; but the other tools listed in Table B4.6 were apparently used in all environments.

A more significant division in the use of wooden tools prior to contact was that made between tools properly owned and employed by either men or women. While men, who are said to have been the exclusive owners of stone axes, made all of these tools, their use was fairly strongly restricted to either male or female tasks: the excavation and maintenance of ditches, the initial clearance of gardens and the planting and harvesting of taro by men; and the internal garden work of planting, weeding and harvesting by women. Digging sticks (*nama*) were thus properly female and spades (*keba*) properly male; the heavy digging sticks used by men to clear gardens of the

26. The stone component of the toolkit (adze-axes and flaked artefacts), in use until the 1960s in the Tari region, is described in Appendix C7.

27. This resolves part of the problem raised by an earlier claim, cited by Golson and Steensberg (1985:358), that Huli people were unable to recognize an *iba wango* hook excavated during drainage of the swamp at Mogoropugua. Although I have not seen *iba wango* in use specifically at Mogoropugua, there is no doubt that people there are still aware of its function.

stronger roots and to harvest taro were not, therefore, described as *nama*, but as *homabu*. A similar distinction is made in the production of two different tools for the identical function of extracting food from fires: folded bamboo tongs (*pero*) are strictly reserved for male use and short digging sticks (*hina nama*) for female use. There is little explicit discussion of the relative antiquity of the different wooden tool types, though *ma habono* are assumed by Huli to derive from *ma angi*, the time of taro, and women's *nama* digging sticks feature regularly in myths of the Huli ancestress, Memeleme.

Enclosure and Drainage

The act of ditching is virtually constitutive of Huli identity; clan origin narratives all refer to the initial creation of ditches, the "cutting of the land" by ancestors, as their primary claim to parish territories. Although fences are constructed around swidden gardens in areas that have not previously been ditched, in the Tari region ditches effectively fill the function served elsewhere in New Guinea largely by fences. The major *gana* ditches, up to 5 m in depth (Plate 3), which form a grid across much of the occupied Huli landscape, signal fully "modern" human-ness, as an integral component in the historic emergence of *mabu* gardens; male-ness, in that only men are said to ditch and fence, either literally or metaphorically; and Huli-ness, as an explicit marker of ethnic identity. Along the Highlands Highway between Margarima and Nipa, an obvious boundary between ditched and unditched gardens coincides neatly with the boundary between Huli- and Wola-speaking communities and, in the Wahgi valley, the gardens of immigrant Huli labourers are clearly identified by the presence of encircling *gana*.

A dense network of *gana* ditches covers each of the central basin floors, with single *gana* often extending uninterrupted from the swampy centres through the dryland margins and up into the surrounding hills, where there are ditches 2.5 m in depth dug into the slopes at altitudes of up to 2100 m. Only in areas with shallow soils or large stones, such as the steep inter-basin limestone ridges, or the Benalia area on the boulder-strewn slopes of Mt Gereba, are *gana* replaced by *pabe* fences. With so wide a distribution, *gana* encompass a range of different functions. According to their size and location, *gana* are said variously to serve: as the boundaries of gardens (and thus markers of ownership from the level of the individual through to that of the clan); to drain excess water from slopes or in swamps; to irrigate during drier periods; as the major form of pedestrian access in most areas; to prevent pigs from entering gardens; and as a defence during war. Most *gana* serve most of these functions simultaneously. The more common features of the *gana* network are illustrated in Figure B18.

Given the importance, wide distribution and range of functions of *gana*, it is initially surprising to find that there is no complex taxonomy associated with different *gana* forms. The basic distinctions made amongst *gana* are between:

iba puni ("water-drain"), which principally serve to drain water and are found largely in wetlands, but vary in size from small conduits through to the largest artifical channels;

mabu gana or *gana* ("garden-ditch"), the ditches that enclose each garden block; and

de gana, the small ditches dug within a garden block essentially marking off plots and contributing only marginally to drainage of the garden surface; the depth of *de gana* appears to be determined by the area of garden surface requiring upcast from them, rather than by drainage requirements.

Table B13 lists all of the different terms for *gana* known to me, illustrating the lack of taxonomic elaboration applied to ditches. Instead, specific *gana* are known by the names of the historic individuals who first dug them. A *gana* dug by Hege will be referred to in conversation as *Hege gana*; consequently, the names of ditches are themselves the subject of dispute in competing claims to land. It is this historic knowledge, which is vital in claims to the land encompassed by ditches, rather than lexical discriminations founded on *gana* form or size, that is of critical importance to Huli[28].

Ditch networks now cover the central basin floors, and most ditch-digging work in these areas thus consists of the cleaning or re-excavation of earlier, abandoned or partially infilled *gana*. At Haeapugua, the only new ditches added to the network since 1959 have been those associated with the sub-division of existing blocks to accommodate vehicular roads and church buildings (see C2.3). If the initiation of a new *gana* is an open declaration of a claim to the enclosed land, the re-excavation of an existing *gana* is thus a historically conscious act, the re-affirmation of an ancestral claim to that land; hence the significance of the boast, 'I made my gardens there along the ancient marks'[29]. In swamplands such as Haeapugua, the act of digging *gana* is sufficient in itself to serve as the basis for rights to produce from the enclosed land; thus a team of young men clearing the major *iba puni* in the swamp within Dobani

28. It is of course possible to generate a hierarchic taxonomy for *gana* founded on location, function or size; Section C2.2 attempts such a taxonomy for the ditch network at Haeapugua.
29. *Ogoha e hangaro laga ibu bamba muguni* (Haea-Yoge, 25.6.91, 91/7A:497-502).

parish in 1991 (see B4.5) declared to the former swamp garden owners that they now held the right to plant and eat the produce from the swamp gardens. *Gana* represent the single most common form of land boundary between segmentary groups such as clans or sub-clans as well as amongst individuals[30]. To cross a *gana* uninvited is regarded as an act of extreme provocation and the infilling of enemy *gana* during war is an important symbolic as well as practical measure. *Gana* are both materially strengthened and further invested with significance as markers of ownership by the planting of cordyline plants, taro and various tree species along the crest of the *gana nene* wall[31].

Wetland and dryland garden (*mabu*) "blocks" are defined through their enclosure by *iba puni* and *mabu gana* ditches respectively. Garden blocks vary considerably in size and shape according to the antiquity of local settlement and the corresponding history of the sub-division of blocks (see Part C). At Haeapugua, blocks are commonly about one acre in area and usually rectangular in shape. *Mabu* blocks are divided into smaller garden areas either temporarily, through the use of *de gana*, to distinguish areas with different users or permanently, through the excavation of additional *gana*, to denote separate ownership or a new function for the enclosed land.

Three types of block other than the basic *mabu* were distinguished prior to contact, defined in each case by the excavation of encircling *gana*: ritual enclosures, such as *gebeanda* or *liruanda* ritual sites, or *haroli tayanda* bachelor groves; *mabu* that had been converted into settlement blocks with their associated *gama* kitchen gardens; and *mabu* blocks sub-divided to create *nogo dugudugu* ("pig-lead") thoroughfares to permit the movement of pigs without the danger of their intruding on garden areas. There are no narratives that identify specific origins for *gana* as a technique; ancestral figures in every clan are credited with having "cut" *gana* along the boundaries of their parish. It is tempting to speculate that the high water retention properties of the deep tephra soils (B2.3), combined with the loss of access to sufficient timber in the central basins, may have encouraged the development of ditching in the place of fencing. There are, however, clear indications in Huli discourse of a historical progression in garden form from *e* swidden gardens, without *gana*, to *mabu* gardens marked out by *gana*. Two developments identified as more recent are the deepening of existing *gana* in the central basins to form war ditches (*wai gana*), regarded as a historic response to the rise in the frequency and intensity of warfare; and the excavation of parallel sets of *gana* to create pig droveways (*nogo dugudugu*) as forage areas in the major swamps

30. In the Wahgi valley, location of the Kuk swamp site, O'Hanlon (1989:32) has also recorded references to ditches as metaphors for clan segmentation.
31. Tree species commonly planted on *gana nene* include Glochidion pomiferum, Dodonaea viscosa, Ficus copiosa, Wendlandia paniculata, Macaranga pleiostemona, Homalanthus sp., Casuarina oligodon, Gymnostoma papuanum, and Lithocarpus rugovillosus (Figure B7, Powell with Harrison 1982:34).

contracted.

Details of these historical processes at Haeapugua are provided in Part C; the intention here is to emphasise the role of *gana* as the primary physical means of the human inscription of space, of the creation of meaningful distinction within the Huli landscape. As such, *gana* are also subjected to aesthetic evaluation; comment is frequently passed on the capacities of an individual or a community on the basis of the straightness of their *gana*, the uniform smoothness of the mud finish on the *gana* walls, or the care with which different cordyline or tree species have been planted and spaced along the crest of the *gana nene* wall. Older men and women deplore the collapse of standards evident in the appearance and upkeep of modern *gana*; indeed, the one context in which these standards are considered to be upheld still is where compensation for a death is being sought and large groups of kin and affines construct immaculate *gana* alongside roads to contain the newly erected grave (*homalianda*) (Plate 4).

Crop Technologies

Specific crop technologies, like the crops themselves, are imbued with historical significance, as illustrated by the contrasting treatments of taro and sweet potato. The historical precedence perceived for taro (*ma*) is reflected in the technology associated with the crop. A distinctive planting technique employs the *ma habono* planting club described above, which is common to the entire Huli region (and apparently restricted to it). The round-based *ma habono* is plunged vertically into a cleared soil surface, to a depth of up to 30 cm. The stick is twisted and worked from side to side to free it from the soil and a single taro sett is then placed in the hole, or *ma uli* ("taro-hole") (Figure B18; also visible in Plate 6). Soil is not usually deposited on top of the sett, lest the cover impede the tuber's growth; only where there is a chance that water will invade the hole and waterlog the tuber are the holes lightly infilled. The dimensions of individual *ma uli* tend to reflect the specific size of the *ma habono* club used; as these sticks are generally discarded after each major taro planting venture, considerable variation, even amongst holes made by the same person over time, is to be expected.

Table B14 gives the dimensions of *ma uli* from a range of locations within Dobani parish at Haeapugua. Although, as this table illustrates, the spacing between *ma uli* is fairly even, their distribution is apparently random. Nowhere have I seen gardens in which taro is the dominant crop; it is usually found planted along the wetter margins of gardens dominated, as are all Huli gardens, by sweet potato. Favoured locations for taro include the edges of larger *gana* ditches, the bases of the shallower *de gana* ditches, within small *iba ganarua* channels beneath the driplines of house roofs, along the crest of *gana nene* walls and, in what is apparently an increasingly common practice, on the lower edges of sweet potato mounds. Occasionally, poorly drained plots up to 100 m^2 in area within sweet potato gardens will be devoted to taro; these are referred to as *gama*, the same term applied to the "kitchen" gardens found within residential blocks. In each of these instances, taro is planted using the *ma habono* technique. An alternative but less common technique is found, most often in dryland gardens, in which individual setts are planted in small mounds, 10 cm in height, created with *habono* digging sticks; the covering soil of these mounds is then loosened sporadically over time to encourage growth of the tuber. While the *ma habono* technique is said to have been used for the earliest cultivars of *ma*, the use of *habono* to create taro mounds is said to have begun only in the generation of the parents of today's older people, that is, in the early part of this century.

Techniques associated with the production of sweet potato vary according to garden age and location. In swidden gardens, or *e*, freshly cleared of bush, individual vines are dibbled directly into the garden surface with *homabu* sticks (the *e dindini* technique). After an initial mixed crop, up to four vines are then planted into small mounds, 20-50 cm in height and 40-100 cm in diameter, composed of ash, leaves and soil clods gathered during the clearance of fallow regrowth (the *e panamondo* technique). Subsequent use of the same garden will see the introduction of larger composted sweet potato mounds. These plano-convex mounds, or *mondo*, are found in both wetland or dryland gardens, and on slopes of up to 30 degrees, throughout Huli territory. The mounds are formed initially by men, using either steel or wooden *keba* spades, by excavating sods of earth or peat and heaping them over a core of compost (*e da* or *e bora*) in new gardens or by reforming old mound material around fresh compost placed between two former mounds; reforming of mounds in later stages of a garden sequence is undertaken by women. Table B15 describes the sequence of construction and use of a mound.

Compost composition also varies with garden age and location, but usually consists of old sweet potato vines together with the grass, leaf or shrub cover cleared to make the garden; banana and karuka pandanus leaves are also used. Rates for compost in the Tari region range up to 20 kg per mound (approximately 16.7 t/ha) (Wood 1984, Vol.I:104)[32]. Dramatic increases in crop yield with increasing compost rates, from sweet potato yields of 5 t/ha for uncomposted mounds, to experimental yields of 17 t/ha for mounds composted at a rate of 100 t/ha, have been demonstrated at the Kugu agricultural station in the Tari Basin (Floyd et al.1988). Huli are well aware of the

32. The figures from the Tari region fall well short of the 30 kg of compost used per mound in wetland margin gardens of the neighbouring Kandep basin (Wohlt 1986a:32) (Figure A2).

yield benefits of composting and ascribe them jointly to the nutritive substance, *dindi iba* or *ibane* ("grease"), generated by decomposing compost and to the space created by the lighter compost into which tubers can more easily grow[33].

Three mound types are recognised: *mọlọ* (round), *luni* (elongate) and, the most common, *hondene* (oval) (Figure B19). The dimensions of *hondene* mounds, summarized in Table B16, are fairly uniform across Huli territory. There is some variation in shape with increasing slope, as mounds tend to elongate downslope, and a tendency for mounds to be larger in wetland gardens than on dryland slopes, though whether this reflects the need to raise tubers above possible flood levels (Plate 5) or simply the much greater availability of topsoil on wetland sites is unclear (Wood 1984, Vol.I:189). No clear correlation between mound size and altitude is evident from the available figures, though the sample size for each location is too small to be significant; but a much larger survey of mound dimensions co-ordinated by Wohlt in Enga Province has also failed to identify any significant association between mound dimensions and altitude (Bourke et al. n.d.).

Mounds are usually planted solely with sweet potato vines. Vines, bound with grass in sets of three, are inserted at an angle into the surface of the mound in rows of planting stations along either one (*dugu mbira*: "one row") or two (*dugu ki*: "two rows") concentric circles around the crest (*hondene*). While vines are almost invariably planted in sets of three on *mondo*, the numbers of planting stations on a single mound can vary from six to thirty-six. Larger mounds tend to accommodate other crops, including corn, taro, Highland pitpit, rungia, amaranthus and common beans, in addition to sweet potato. These other crops are generally planted on the lower margins (*angene*) of mounds, below the circles of sweet potato vines.

Sweet potato mounds appear to serve a number of technological functions, perhaps the principal of these being to contain compost[34]. Yet they also raise tubers above the level of floodwaters in swamp and river flat gardens, protect the tubers from some of the effects of frost at higher altitudes (as in the Lebani valley), increase the depth of the topsoil on thinly covered slope gardens, retain moisture during dry periods and channel the effects of erosion (Wood 1984, Vol.I:116-7, vol.II:208)[35]. In terms of

33. Wood (1984, Vol.I:118) lists increased soil temperature and improved soil moisture holding capacity as further benefits of compost in mounds; he also provides a detailed analysis of compost nutrients, in which the presence of potassium is identified as the key element in the contribution of compost to yields.
34. The debate over the function of sweet potato mounds (see Waddell 1972a, Wohlt 1986b) has been reviewed most recently in Bourke et al. (n.d.).
35. The net effect of mounding on soil erosion is unclear: Wood (1984, Vol.I:151) has documented the dramatic increase in soil loss from mounded gardens on steeper slopes. While *goda banga*, the act of

yield, mounds not only have the effect of evenly distributing and separating vines and thus promoting vine growth, but also increase the actual planting density of a garden. Wohlt (1986b:7-8) has shown that the larger composted mounds in Enga offer planting densities of between 35,300 and 53,500 vines/ha, while the smaller *yukusa* mounds (equivalent to the Huli *panamondo*) average around 24,500 vines/ha; however, the impact of increased vine density on overall yield weight appears limited[36].

This gradient from less- to more-intensive sweet potato techniques is held by Huli to match the historical sequence in which these techniques were adopted: thus the least intensive sweet potato technique (*e dindini*) is also regarded as historically prior to the small *panamondo* mounds, which in turn precede the use of *mondo*. Each "new" technique is described as having introduced a further element in the aesthetic order of modern gardens; in the monocropped sweet potato gardens on reclaimed wetlands, which are the most intensive form of Huli agriculture, the random pattern of mound distribution of the dryland gardens (*goda pebe*) is replaced by straight rows of mounds neatly aligned along both their short (*tagalene*) and long (*duguni*) axes (Figure B19). The form, planting methods and patterned distribution of mounds are employed in the short-term planning of both labour and consumption. Individual mounds (always referred to as *hondene* for these purposes) are used as the units of reckoning in determining construction, planting and harvesting schedules. Women discuss their daily work in terms of the numbers of *hondene* they intend to weed or have harvested. In the same way, the concentric rows (*dugu*) of vines on a mound are used to describe the quantity of vines to be planted or tubers harvested. On a larger scale, the rows of mounds are used both to mark off longer-term planting schedules and to identify ownership; in gardens where *de gana* ditches have not been dug to distinguish between plots with different owners, or where finer levels of distinction amongst the plantings of individual owners are required (within families for example), mound rows are employed.

<u>Garden Sequences</u>

Instead of a range of named types of garden, such as those of the neighbouring Wola (Sillitoe 1983:193), Huli gardens appear to reflect a common logic of use, with

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creating longer *luni* mounds that run across the slope is recognized as a means of trapping soil, moisture and *ibane* "grease", *luni* mounds often run both across and down the slope, even within the same garden; owners of such gardens are adamant that this mixed positioning of *luni* mounds is largely an aesthetic matter.

36. Bourke (1985) describes the results of experiments on sweet potato which suggest that major increases in vine density are not matched by corresponding increases in the weight of yield. There is however a more significant increase in the size distribution of tubers, with greater numbers of small tubers (fit only for pigs) produced as vine density increases. In other words, variations in vine planting density may be related to consumption strategies involving fluctuating pig herd sizes.

differences in garden form and composition representing different stages along what is, with one possible exception, essentially a single continuum of increasingly intensive use. Two key axes of differentiation within this garden sequence are identified by Huli: the first is between swidden (*e*) and permanent (*mabu*) gardens; the second between wetland (*pugua*) and dryland (*kui*) gardens. Most gardens evolve along the first axis from *e* to *mabu* as they are brought back into use, while those wetland gardens whose drains are continuously maintained over time ultimately stabilize to become dryland gardens. A third axis, also acknowledged by Huli but not easily identified by contrasting terms, runs between gardens with a complex crop composition and those virtually devoted to sweet potato. Again, this reflects a developmental sequence, as soil quality diminishes and the range of crops contracts to the point where only sweet potato and sugarcane are still viable. Huli garden sequences have been described in some detail by Powell (Powell with Harrison 1982) and Wood (1984), both of whom draw the distinction between dryland and wetland sequences. The description offered here follows this distinction, but attempts to elaborate on the logic underwriting both sequences and Huli attitudes towards garden development more generally.

Table B17 is an idealized sequence of use for a dryland garden, composed of terms commonly employed by Huli people. Neither the structure of the sequence nor the terms appear to vary, at least within the major valley basins[37]. Following initial clearance from either primary or secondary forest or tall grass cover, the critical transition within the sequence is the progression from non-intensive (*e*) to intensive (*mabu*) crop techniques, which marks the introduction to a given garden area of ditched boundaries and increasingly comprehensive tillage and composting with a corresponding decline in crop composition. A large suite of crops is planted during the earlier *e ima* and *o dabia* garden phases, including sweet potato (dibbled or in small mounds), taro, amaranthus, Highland pitpit, rungia, oenanthe, corn, cabbage, ginger, various beans, cucumber, banana, Cyclosurus ferns, pumpkin and Xanthosoma taro. The crop range diminishes subsequently to the point where established *mabu* gardens are overwhelmingly dominated by mounded sweet potato, with cordyline, sugarcane and Highland pitpit planted between the mounds, a dominance that is reflected in the high frequency of occurrence of these crops in Figure B14. There is considerable variation in the length of fallow periods, depending on the specific soil and moisture properties of the garden, fluctuations in demand, and the range of the owner's or user's other holdings. Observations on declining yields from a particular garden are couched in terms drawn from the cropping of sugarcane and a number of fruiting trees such as

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37. Wood (1984, Vol.I:114) notes that wetland *e lara* garden techniques are not practised in the Wabia area in the south of Tari basin, possibly due to drier local conditions; but this does not invalidate the observation that all Huli have available to them knowledge of a common range of techniques.

banana and karuka and marita pandanus: gardens, like these tree crops, are said to progress from initial high yields (*hini*), through moderate intermediate yields (*bagu*) to a final state of exhaustion (*le*). Garden owners also often cite the diminishing presence of green vegetables such as rungia, oenanthe, beans and cucumber as the principal factor determining the need for new dryland gardens.

The idealized wetland garden sequence, summarized in Table B18, can be seen as a transposition of the dryland sequence, with appropriate modifications, to wetland conditions. The key differences between the two have to do with the nature of ground preparation and the techniques employed in the early phases. There is also a "delayed peak" in the range of crops in wetland gardens, as few crops are viable in the waterlogged conditions of a new wetland garden: taro performs well and is amongst the first crops planted, but yields from the first sweet potato harvests are not as large as subsequent harvests and the introduction of additional crops such as corn and pumpkin is deferred until the *tabu* or *mabu* stages in the sequence[38]. The key factor determining the sustainability of wetland gardens is the ability of the gardeners to maintain the *gana* and *iba puni* ditches. Wood (1984, Vol.I:168) has demonstrated that sweet potato yields from wetland gardens at Haeapugua, after peaking within the first ten years of garden use, decline only very slowly thereafter. Wetland gardens created on the alluvial levees around the major drains flowing through Haeapugua have remained the most productive gardens in the basin, despite near-continuous use of over a century (Appendix C6); where short fallow periods have been skilfully managed, there is no evidence for a decline in crop range on these levee gardens. Swamp gardens at some distance from such levees suffer from the lack of alluvial soil and their crop composition narrows rapidly to sweet potato, Highland pitpit and, in far fewer numbers, taro and Xanthosoma taro; they are also more prone to flooding and tend to last for a maximum of approximately ten years before the depradations of invading pigs and successive floods force total abandonment of the drainage ditches and gardens[39].

The one named garden type which can be distinguished from this general sequence for wet and dry gardens is the *gama*, or mixed kitchen garden[40]. After intensive use, garden blocks are often turned over to settlement, frequently with several houses on the same block. Individual house plots within these blocks are surrounded by planted perimeters of cordyline and Casuarina oligodon. Small plots of mounded sweet

38. This is an observation supported by experiments on the rooting behaviour of taro and sweet potato, on the basis of which Vasey (1983) suggests that while taro root systems develop normally under waterlogged conditions, sweet potato root growth and tuberization is severely retarded.
39. Further details on the process of abandonment of wetland gardens are given in Section C4.2.
40. Wood (1984, Vol.I:105) uses the term *e gama* to designate all mixed gardens; my impression is that the only true mixed gardens are those associated with house plots, though houses may have been abandoned and the gardens maintained for some period afterwards.

potato and sugarcane are planted beyond this perimeter but the kitchen gardens within the house plots, fertilized with hearth ash, food scraps and (inadvertently) faeces, contain the richest diversity of crops of any garden type or stage.

In Huli discourse, the processes of garden transformation, from swidden plots (*e*) to fixed blocks (*mabu*) and from an emphasis on dryland gardens to the reclamation and conversion of wetlands to "dry land", are also historical developments. The act of enclosure by *gana* ditches plays a major role in this putative historical sequence and it is thus of considerable interest that *gana* ditches and fixed *mabu* gardens are commonly identified explicitly as a "time of taro" development, preceding the introduction of sweet potato[41].

Garden technology during the "time of taro" (*ma naga*) is held to have progressed from the exclusive use of dibbling techniques in dryland swidden plots (*e ma*, *ma e* or *e ima*), unbounded by *gana* ditches as no pigs were kept, to the development of *e lara* techniques on wetland margins, producing *ma lara* plots:

> *E ma* plots were cut for *paboro* beans, yams, gourds and cucumber on the dry land. Down below [in the swamp]... we planted *ma* taro in *e lara* plots.
>
> Piwa-Ngai, 4.9.91, 91/19A:229-281

A Tani man tells of how one of his early ancestors, making *ma lara* gardens at Haeapugua, 'would stamp down the grass with his feet and then plant straight into the swamp'; later, the descendants of this ancestor 'made paddle spades (*mbada keba*) and took these into the swamp to dig *gana* ditches and make *mabu* gardens' (Pudaya, 31.10.92, Interview Notes). An earlier "foray" strategy of unditched *ma lara* plots on wetland margins is thus held to have been replaced by the digging of *ma gana* (literally "taro ditches") to create semi-permanent *mabu* gardens safe from the depradations of domestic pigs. The modern Huli concept of *mabu* is thus linked in Huli exegeses to the twin "taro time" developments of permanent ditched enclosure of dryland gardens and drainage on the wetland margins and the historical emergence of pig husbandry. There are few contemporary Huli gardens in which taro remains the dominant crop and which thus might afford us some idea of the form of pre-Ipomoean *mabu* gardens; the only example known to me comes from an encounter in 1979 between Bryant Allen and a man from Aroma clan in the Tari basin, Madiabe, who had constructed a taro garden in what he claimed was its former conventional form (Plate 6).

The introduction to Huli by Digima clan ancestors of the first sweet potato

41. There are occasional exceptions to this rule: Narrative B6, for example, identifies *mabu* as having spread from Digima and Miniba clans only after the introduction of sweet potato.

cultivar, *digi hina*, initiated the "time of sweet potato" (*hina naga*). If we follow the Huli assertion that ditched *mabu* gardens were a "taro time" innovation, then sweet potato would appear to have displaced *ma* taro from its existing position of dominance in *mabu*. Narratives about the introduction and spread of sweet potato (as in Narrative B5) imply that the crop preceded the introduction or the local development of *mondo*, the composted mounding technique now virtually synonymous with sweet potato production. The last major development in Huli garden technology prior to contact is described, both at Mogoropugua and at Haeapugua, as the extension of permanent drainage networks and mounded sweet potato techniques to the wetland centres. Part C addresses this claim for the Haeapugua wetlands.

B4.5 Labour, Production and Consumption

A familiarity with the structure of Huli production is critical for an understanding of the history of Huli engagement with their environment. Production, which constitutes the nexus between labour and consumption, is the analytic field in which the relationship between culturally specific demands and the organisation of resource use is most clearly articulated. The account given here of the nature of labour organisation and the composition of labour or project groups as the primary units of production in Huli society is followed by a brief analysis of the relationship between these units and corresponding units of consumption. An understanding of the range of forms of consumption permits the modelling of change in the relationship between labour and consumption in such a way as to bring to the fore the meaningful constitution of production (Brosius 1988:108). In Huli society, this is most clearly addressed through consideration of the ways in which pigs, as the principal "surplus" product, are and have in the past been produced and deployed.

Labour, Project Groups and Leadership

The significant line of division in Huli organization of labour is gender. As elsewhere in the Highlands region, labour roles appropriate for men and women are distinguished. The creation of the conditions for gardening, including clearance of forest cover, fencing and ditching in dryland gardens and drain excavation in wetland gardens, is held to be a male task. Either men or women, and often both together, then prepare the garden surface, men tending to form mounds in the initial stages and women tending to clear weeds and detritus by hand and reform subsequent mounds. From this point in the garden sequence, however, Huli gender division of labour departs markedly from the more common regional pattern. Where other Highlands communities identify crops that are properly planted, tended and harvested by either men or women as "male" or "female" respectively (R.Bulmer 1960b:65ff.; Sillitoe 1983:172ff.; Meigs 1984), Huli distinguish between male and female garden areas.

Within these areas, most crops are planted and harvested by both men and women; the exceptions include yam, which formerly was planted and eaten only by men, and taro, which only men harvest (Powell with Harrison 1982:57,68). All other crops are planted by both men and women, either independently or in co-operation with one another. At this point, the senior man or a senior male relative of the garden owner divides the planted garden into discrete male and female portions. Thereafter, men and women weed, tend and harvest their own garden areas[42]. Women return to male areas of the garden only after men have harvested all of the larger tubers for their own consumption, to gather the remaining smaller tubers for themselves and the children and pigs they feed. However, with the widescale abandonment since the 1960s of the *haroali* bachelor cult and the relaxing of many of the conventions surrounding male and female behaviour since contact, many of these gendered distinctions in garden practice are now increasingly blurred.

Pigs are owned independently by men and women, though the scale of female ownership is said to have achieved significance only since contact; prior to contact, few women owned pigs in their own right. As with gardens, bachelors formerly assumed the full labour responsibility for their own pigs. Married men either rear pigs in conjunction with their wives, or agist their pigs out to other women but not to other men[43]. The ratio of pigs to people in the Tari and Haeapugua basins varies with local conditions from between 1.08 to 2.17 pigs per person (Table B22), falling within the upper range of such ratios for the Papua New Guinea Highlands region (Bourke 1988: Table 2.3).

Formerly, strict proscriptions on the entry of pigs into men's *balamanda* houses ensured that men's pigs were housed separately in pig huts (*nogoanda*). Pigs reared by women were usually stalled at one end of the women's house, with a separate entrance to the house and independent external access to the house block. The more common practice currently is for all pigs to be stalled in *nogoanda* on a block separated from the house block. Pigs are left to forage by day, for worms in the swamps or for small sweet potato tubers in abandoned gardens; their diet is usually augmented by fodder in the form of sweet potato, fed to them by their individual owners in the late afternoon.

Labour inputs were not systematically recorded during this study, though figures

42. Formerly, those gardens belonging to bachelors, whether younger *haroali* bachelor club members or older unmarried men, were entirely forbidden to women and were gardened by men only.
43. On a regional scale, Dwyer (1990:56,60) has documented a form of agistment between Huli-speakers resident at Komo and Etoro-speakers of the Papuan plateau in which Huli shoats are reared to maturity amongst the Etoro and then traded back to the Huli, but this represents only a fraction of the total production of pigs by Huli (Ballard 1994: Table 5).

contrasting male and female labour inputs across a range of tasks amongst neighbouring Duna and Wage Enga groups are available (Modjeska 1977, Wohlt 1978). Of more immediate relevance to my focus on wetland use are figures comparing the labour requirements of dryland and wetland agricultural systems. Modjeska's (1977:154) comparative study of different agricultural systems in the Highlands region which revealed that, despite their higher initial inputs of labour, intensive cultivation techniques involving short fallows were more than twice as efficient in terms of energy expenditure as extensive techniques, was the prompt for his reevaluation of the significance of wetland cultivation (A2.2).

Citing the work of Pospisil amongst Kapauku of the Wissel Lakes area of Irian Jaya, Modjeska (1977:153) contrasted the labour required (in hours per hectare per year) to produce one harvest cycle under intensive swidden cultivation (1997 hrs/ha/yr), extensive swidden cultivation (2928 hrs/ha/yr) and intensive wetland cultivation (3674 hrs/ha/yr). In keeping with his focus on labour inputs, Modjeska considered these figures in terms of productive efficiency, the measure of the hours of labour required to produce a tonne of sweet potato, showing that Kapauku wetland production, at 217 hours of labour per tonne (hrs/t) was more efficient that extensive dryland cultivation, at 360 hrs/t, but less efficient than intensive dryland cultivation, at 145 hrs/t; why the Kapauku should have had only 1% of their total area under intensive dryland cultivation, compared with 8.5% for wetland cultivation and the remainder under extensive dryland cultivation was, under the terms of comparative efficiency, 'seemingly irrational' (Modjeska 1977:155). But if one inspects the figures from Kapauku for actual yields of sweet potato per square metre (Pospisil 1963: Table 24), wetland cultivation is shown to produce 1.69 kg/m^2, compared with 1.38 kg/m^2 from intensive dryland cultivation and only 0.81 kg/m^2 from extensive dryland cultivations; this suggests that Kapauku interest in wetland cultivation is attributable, in part, to the sheer productivity per unit of area under this system of cultivation[44].

The comparison of dryland and wetland intensive cultivation systems is complicated in the Tari region because of the Huli practice of digging deep ditches in both dryland and wetland environments; indeed, as dryland ditches are generally deeper and wider than wetland drains, the volume of soil excavated is greater. Offset against this practice are two considerations: first, dryland ditches need only encompass a single block to render an area available for gardening, whereas wetland blocks require the presence of an extensive network of larger drains to be viable; and second, the

44. Bayliss-Smith (1985a) has suggested in his study of taro cultivation that while wetland taro cultivation requires three to four times the labour per hectare of forest swidden, crop yields from wetland gardens are between two and three times greater than those from forest swidden gardens.

requirements of ditch and drain maintenance may actually require more labour over time than their initial excavation. An attempt to estimate the gross quantity of labour required to establish (but not maintain) the wetland drain network at Haeapugua is made in Chapter C2.6.

Just as the conceptual units of Huli descent find no expression on the ground as coresidential parish groups (B3.5), the smaller labour or project groups of individuals who actually produce together do not necessarily correspond to parish or sub-parish divisions. Family units, normatively composed of a male household head, one or more wives and those of their unmarried offspring living in the same parish, are the minimal but perhaps also the largest enduring group units of labour and consumption; even here, co-wives and their coresident kin and offspring often operate as largely independent units. The composition of labour groups larger than family units reflects the multiple intersection of ties of descent, affinity and friendship with pragmatic factors such as propinquity and the nature and duration of the task at hand. In practice, these groups tend to form for specific garden projects, disbanding upon their completion; it is rare for the composition of such a project group working in the same garden block, for example, to remain constant between different projects. Garden projects are defined here as major subsistence projects, such as coordinated wetland drainage or forest clearance, requiring labour groups larger than individual family units. Other group projects include warfare and the co-ordinated production of pigs for brideprice and compensation exchanges. In each case, project groups form around one or more individuals as the "source" or *tene* of the particular project: opposed *wai tene* ("war source") are thus conceptually the leaders of respective warring groups while *mabu tene* ("garden source") or *mabu anduane* ("garden owner") co-ordinate garden projects. Leadership, in this respect, is both group- and project-specific.

The nature of project groups can be illustrated by reference to the composition of the labour groups formed for two recent wetland drainage projects at Haeapugua: a wetland garden in Dumbiali parish known as Mabu Gobe, and a project focused upon the reclearance of the Iba Haeawi and Iba Hagia *iba puni* drains (Figure C4). At Mabu Gobe, a project described in further detail in Appendix C6 (Case History 4), a fairly closely related group of eight to ten men, consisting of a mixture of *tene* and *yamuwuni* from the Dindiago and Angarere subclans of Tani Doromo clan (Appendix B6: Gen.2) and led by a Dindiago *tene*, excavated the encircling drainage ditches around the garden block; in so doing, these individuals variously confirmed or created rights for themselves to the drained garden area. The subsequent garden project group at Mabu Gobe thus consisted of these individuals, their families and three further individuals from, or related to, other Tani sub-clans and invited to use plots within the garden block.

The re-clearance of the Iba Haeawi and Iba Hagia drainage channels (Appendix C6: Case History 1) was a much larger and more ambitious project in that it involved a wide cross-section of the basin's community who, by contributing to the drainage of a large portion of the swamp, established their claim to the use of a significant area of land. Here, a labour pool of 32 men, mostly aged between 16 and 30, of whom only 10 to 12 worked on the project at any one time, was drawn from the residents of three different parishes; other than ties of common agnatic descent, the links between these individuals and the project's Dobani clan coordinators were largely those of *aba* kinship and friendship between age mates. If garden projects proceed from this initial drainage project, the composition of their labour groups will presumably reflect the composition of the drainage project group, expanded to encompass their immediate families and, in some cases, others of their relatives and friends.

Labour groups in Huli society thus appear to be highly flexible, capable of expanding in size from the smallest family unit through to major inter-parish communities to meet the demands of specific project goals. But the links binding these groups together also become more fragile with increasing size. The largest project groups, those associated with inter-parish warfare, are also the most ephemeral, often disbanding amidst acrimony either in the course of a war or during the consequent process of negotiating compensation. Similarly, one of the key limits to the size of a project group is the ability of the project's leader or leaders to marshal and maintain a labour group and to convince others of the worth of the project.

The only enduring forms of leadership in Huli society are the ascribed roles of *agali haguene* ("head man") and *gebeali* or *dindi pongoneyi* (ritual leaders); these individuals are identified as such on the basis of their descent status and position within a particular lineage. All other recognized leadership types are context-specific and reflect their achieved, rather than ascribed, nature and their need for continuous validation through appropriate action. Table B19 lists some of the terms used to describe men regarded in one way or another as leaders[45]. Women are not commonly identified by men as leaders, although some individual women are recognised as *homogo wali* ("rich women"). In the case of each of the achieved types, application of the term is context-specific and is reserved to individuals who have achieved renown for their ability to harness the efforts of others towards some particular end or goal. While *agali haguene* are rarely *gebeali*, as these roles tend to be retained by different

45. These leadership terms are contrasted with a set of terms denoting lower social status: *dari* ("quiet man, coward"), *iba tiri* ("rubbish man"), *mago* ("filthy, disabled") and *yagibano* ("poor, worthless").

lineages within each clan, either can attain any of the achieved forms of status. Individuals without the requisite relationship to a *gebeali* or *agali haguene* lineage cannot attain such status, but there are no limits, amongst men, to the range of other forms of status that an individual can achieve. Surveys amongst most of the older men in each of the Haeapugua clans with which I worked revealed a high level of agreement over the identity of individuals alive during their lifetimes who had achieved different forms of leadership status.

The changing role of individuals described in these leadership terms in the history of Huli production is elaborated upon in D1.3. Much of the status of Huli leaders revolves around their ability to marshal and deploy pigs as the critical medium of Huli exchange; the following discussion thus addresses the role of pigs in the structure of Huli patterns of consumption and demands on production.

Consumption and Demands on Production

Familiar distinctions founded on concepts of gender and precedence emerge in the structure and regulation of Huli consumption where, formerly, a fairly rigid and explicit code of *ilili* proscriptions identified the different foods appropriate or restricted to different social categories of person. Table B20 lists some of these proscriptions. Though the list is far from complete, the proscriptions appear to have discriminated as much on the basis of seniority as on that of gender. Old men in particular, but also old women to some extent, were largely free to eat whatever they wanted (and could obtain). In dietary terms, the significant proscriptions were probably those that regulated the apportioning of different cuts of pork, of which women were assured of the tail, the intestines and parts of the head such as the ears, while the neck and backbone were reserved for men. As the dismemberment of pigs and the distribution of pork were usually performed in public, these proscriptions were generally enforced. Section B5.4 addresses the broader significance for Huli society and cosmology of *ilili* proscriptions on consumption and other forms of behaviour.

Production models commonly employ a notional unit of subsistence consumption as a means of gauging the relationship between the demands of subsistence and other forms of consumption: individual adults or families are typical units for such analyses. For most Highlands communities, any model of consumption must also make allowance for the fodder requirements of domesticated pigs, which consist largely of sweet potato and sweet potato leaves, supplemented to varying extents by leaves and peelings of other foodstuffs such as Setaria.

As Rappaport (1984) has observed, pigs and humans in many Highlands societies are thus in direct competition for the same staple. Figures for daily sweet potato production per person in the Highlands are typically 3.0 to 3.8 kg/person/day (Waddell 1972a, Hide 1981). According to their age and size, pigs consume between 0.6 and 2.6 kg/day (Hide 1981:363). Estimates of the proportion of the total locally produced sweet potato harvest consumed by domesticated pigs include 53% for Sinasina (Hide 1981:368) and 64% for Raiapu Enga (Waddell 1972a:118), where pig:person ratios at the time were roughly comparable (1.8:1 for the Sinasina, 1.7:1 for the Raiapu Enga); similarly, Rappaport (1984:61) estimates that pigs were fed 40.7% of the total root crop harvest brought home. The impact of this fodder requirement on overall sweet potato production is partly offset by feeding pigs with substandard tubers, which can comprise some 20% of tuber numbers and which are not otherwise consumed by humans (Hide 1981:372-7). Nevertheless, the proportion of the sweet potato harvets required by pigs does suggest that an increase in commitment to pig production requires a corresponding increase in the relative area of gardens devoted to the production of tubers, rather than other human consumables.

Historically, fodder requirements suggest that the development of pig production on the scale witnessed at contact in the central Highlands basins must have been accompanied by the emergence of garden types in which tubers were a virtual monocrop. Rappaport (1984:43-44), for example, notes that during periods of low pig numbers, Maring gardens were of a single mixed type, dominated by taro and yams. As pig numbers and fodder requirements increased, a second garden type would be brought into production, usually at higher altitudes and dominated instead by sweet potato and sugarcane[46]. The relationship between pig production and the historic emergence of novel garden types and tuber monocropping is further explored in Part C.

In Huli society, pigs are the principal immediate goal of "surplus" production, reflecting their pre-eminent role as the standard medium of exchange (Ballard 1994). Few of the forms of exchange in which Huli formerly engaged did not involve pigs; minor transactions such as the purchase of *gamu* spells were conducted using cowrie shells, but even here the shells were reckoned in terms of their exchange value against pigs and might fairly be considered as "pig fractions"[47]. Certain ritual forms of exchange with ancestors or other *dama* spirits that sought deliberately to invoke the qualities of earlier, "pre-modern" eras employed possums in the place of pigs, as "spirit

46. Maring, in common with many Mountain Ok groups, grow both taro and sweet potato, but recognise the preference of pigs for the latter; pigs do eat taro, but it often requires pre-cooking before it can be used regularly for fodder.

47. Sows (*angibuni*) are the most commonly cited standard of value and also, in Huli eyes, the most significant component of any compensation payment such as brideprice; from interviews about actual exchanges during the 1950s, it appears that a single sow was roughly equivalent to one stone axe blade, one pearlshell or eight pairs of cowries.

pigs" (*dama nogo*). But the use of pigs in most rituals at contact is reflected in the verb for performance, *ba* ("to kill" or "to sacrifice"), with pigs almost invariably conceived as the sacrifice.

In subtle contrast to the famous Enga declaration that 'Pigs are our hearts!' (Meggitt 1974), Huli men identify pigs as the underlying basis of their ability to transact with one another as "modern" humans, expressed as the ability to perform the *tege* ritual (D1.3), to pay brideprice and to "talk" in public forums (Ganabi, 9.11.90, 90/1A:73-89). An understanding of the ways and the numbers in which pigs are deployed is thus crucial as a means of relating changing patterns of land use to transformations in Huli society; in many respects, the structure and scale of pig production constitute an index of the flow and volume of Huli sociality. If the emergence of "modern" society is associated in Huli historicity with the adoption of the sweet potato, this must in large part reflect upon the contribution of sweet potato to pig production and the role that exchange of pigs and pork contributes to Huli modernity.

Though, as elsewhere in the Highlands region (Hide 1981), Huli women appear to contribute more than men to the labour involved in the production of pigs, the public distribution of pigs and pork is conducted entirely by men. Private consumption of pigs by their owners is not uncommon, but the vast majority of pigs are deployed in one or more of a range of forms of exchange before being consumed. Table B21 sets out the major contexts for pig exchange and consumption[48]. Though the compensation forms of exchange are all still current, as is the payment of brideprice, most of the ritual forms are no longer practised and have been subsumed within an informal category of celebratory occasions for pig kills (but not exchanges), including national holidays and school and church openings; another popular innovation has been the replacement of the *ma hiraga* ceremony for young children by the mission-sanctioned "birthday".

Estimates of the numbers of pigs involved in each type of exchange are provided in Table B21, comparing the sizes of payments in the immediate pre-colonial period (the 1940s and early 1950s) with the scale of payments current in the 1980s and early 1990s. While a number of former types of payment that required the exchange of pigs are no longer practised, there is evidence for dramatic inflation in the numbers of pigs required for major compensation payments such as *dabua*, *abi* and *timu*, and the *wariabu* brideprice. Compensation for deaths in war rarely exceeded 30 pigs per person prior to the 1950s; but the recent revival of warfare has also seen a rise in

48. This table confirms and expands upon an earlier list compiled by Goldman (1981b), which also includes possible etymologies for the Huli terms and describes in detail the composition of a number of specific compensation payments.

compensation, with up to 750 pigs being demanded and received for a single death in Haeapugua[49].

Inflation in brideprice can also be documented through recall of the size of particular payments at fairly specific dates in the past. Brideprice payments in the 1930s and 1940s typically consisted of between 14 and 17 pigs, together with shells; the critical component of these payments were the 4 to 5 sows (*angibuni*) which made up the core of the brideprice. By the 1950s, brideprices paid in the Haeapugua area had risen to between 18 and 31 pigs. In the early 1990s, brideprices typically consisted of 30 to 36 pigs, with 200 to 300 PNG kina in place of the former shell payment; the highest recorded brideprice in the Haeapugua basin so far included 45 pigs and a cash payment of 1000 PNG kina.

Much of the value of pigs in the history of Highlands society derives from the scope for flexibility in their production. Numerous studies in the region have demonstrated that, even within the same community, the size of pig herds varies considerably over time <u>in anticipation</u> of the demands of specific events such as marriage, warfare or ceremonial exchange (Hide 1981). Feachem (1973:29, Table 1), for example, has demonstrated that a range of pig-person ratios between 1.1:1 and 3.1:1 documented for a series of adjacent Raiapu Enga clans directly reflected their respective states of readiness for a forthcoming cycle of *tee* ceremonial exchange. The envelope of potential production, bordered at one end by the minimal subsistence or caloric requirements of human beings and at the other by the as yet undetermined and untested maximum carrying capacity of the Tari region, is considerable. A common observation on the economies of small-scale societies is that production is immediately constrained not so much by caloric or environmental factors as it is by the availability of labour, and often female labour in particular (Modjeska 1977, Spriggs 1981, Sillitoe 1993b:251). But, given the flexible constitution of Huli project groups, it might be more useful to suggest that the supply of labour for the purposes of particular production projects in the Tari region is governed to an extent by the ability of project leaders to marshal and coordinate support.

Finally, the role of pigs as the key exchange medium in Huli society raises problems for an analytic approach to production that requires a distinction between "subsistence" and "social" demands of production. All or most pigs are consumed by people and are thus a form of subsistence production. Yet most pigs are also deployed within a "social" arena of exchange. Obviously, the need to distinguish "social" from

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49. No recent payments of the *mabura* and *palipalo* were recalled, hence their status as defunct categories in Table B21; this does not, of course, preclude the possibility of their return.

"subsistence" derives from the requirements of comparative analysis, where the ability to rank different societies according to their varying emphases upon production for exchange has been deemed necessary (e.g. Feil 1987); but it is, I think, a mistake to attempt to understand the production regimes of individual societies with categories or tools designed primarily for comparative analysis. There is, instead, an internal logic to the processes of Huli production that transcends the social:subsistence dichotomy and that can, at least for the pre-contact past, be perceived most clearly through the lenses of cosmology and ritual, the central topics of Chapters B5 and D1.

Inter-Local Variation in Production

Given the aseasonal climatic conditions described for the Tari region in B2.5 and the absence of any emphasis on seasonality in Huli discourse, it is not surprising to find, as has one recent study, that there is no significant seasonal pattern to gardening activity in the Tari region (Crittenden et al. 1988:51). Although there are minor fluctuations in planting or harvesting that correspond to climatic variation, these are not the result of cyclical patterns of production or long-term planning in anticipation of climatic change[50]. A more consistent source of variation in production in the Tari region relates to location and primarily to the variability of soil conditions in different locales.

On the basis of his analyses of soil type and natural vegetation cover, geology and landforms, Wood (1984, Vol.I:64f.) has identified 12 environmental zones, each associated with a particular locality in the Tari and Haeapugua basins; the distribution of these zones, as illustrated by Wood, is reproduced here as Figure B20[51]. In order to apply some of the implications of Wood's analysis to the entire Huli territory, I employ a generalised version of his scheme that focuses on the major settled basins and takes gross soil characterisation as the principal discriminant. Three broad land types reflecting soil categories are distinguished: colluvial/alluvial plains (along the banks of the major rivers and in the southern Tari basin), peaty/alluvial wetlands (listed in Table B1), and volcanic ash plains and slopes (such as the northern and eastern parts of the Tari basin and the Paijaka plateau). Considerable variation between these land types in agricultural potential is reflected in such variables as crop yield and the sizes of the human and pig populations that they support.

50. Perhaps the one significant seasonal variable in Huli production is karuka pandanus (Pandanus julianettii), which fruits most heavily on an approximately triennial basis; smoke treatment of pandanus nuts renders them edible up to 12 months after harvesting, however, and serves to spread the consumption of the harvest.

51. The zones identified by Wood include Haibuga [Haeapugua] swamp and the Iumu [Yumu] hills in the Haeapugua basin; the Debi river floodplain and the Yangali, Tari, Wabia, Andowari [Andobare] and Poro plains in the Tari basin; and, to the north of the Tari basin, a series of limestone ridges (Huriba, Peda and Lagale Mandi), Porame ridge, the Paijaka plateau and the upper Tagali valley.

Employing figures provided by Wood (1984), Table B22 describes sweet potato yield, human population density, pig/person ratios and relative area under wetland for seven of Wood's environmental zones, grouped under the three different land types. Mean sweet potato yields from the different land types range between 13.8 t/ha/yr (tonnes per hectare per year) from the Haeapugua peaty wetlands, 10.3 - 13.0 t/ha/yr from the alluvial/colluvial plains, and 5.1 - 8.2 t/ha/yr from the volcanic ash plains (Wood 1984, Vol.I:167). The Huli population is distributed in rough accordance with these yield figures, with up to 196 persons/dryland km² on the colluvial Debi river floodplain, 137 - 166 on the peaty and alluvial wetlands of Haeapugua swamp and the Wabia plains, and a wide range from 39 - 138 in the different volcanic ash plain zones. The size of parish territories is also a useful proxy indicator of variation in population density and soil quality. Figure B13 shows parish territories for the Haeapugua and Tari basins, with the smallest territories clearly concentrated in area of the Debi floodplain and the Wabia and Tari plains, and the largest territories to the north on the Paijaka plateau and the limestone ridges; the large size of parishes in the Haeapugua basin reflects their inclusion of uninhabited swamp area. Finally, the relationship suggested between high ratios of pigs to people and greater access to wetland underscores the roles that wetlands play in pig production. Although the ratio of pigs to people might not appear to vary greatly between the different zones, the differences in the yield of the sweet potato used in the production of pigs implies that different orders of labour commitment are required to sustain comparable pig/person ratios in, for example, the Debi floodplain and Tari plains zones.

The evidence for inter-local variation in agricultural potential is further augmented by Wood's work on the long term sustainability of agricultural production under the conditions of the different zones. Decline over time in the yields of sweet potato varies considerably between land types (Wood 1984, Vol.I: Figure 5.18). Very high initial yields on peaty wetlands of up to 20 t/ha/yr are followed by rapid declines to 10-14 t/ha/yr; but these latter yields are then sustainable over exceptional periods of time[52]. The same is true for the colluvial/alluvial plains, which are capable of maintaining a steady yield of 10-15 t/ha/yr almost idefinitely. In sharp contrast, the volcanic ash plains show dramatic declines from initial yields of 8-13 t/ha/yr, dropping to 2-6 t/ha/yr; the Paijaka plateau zone shows the steadiest decline, reflecting the poor quality and depth of soils in the area. By plotting yields against the logarithm of garden

52. Wood's estimates of decline in yield were derived from an innovative use of genealogies to determine the length of time since the initial clearance of individual garden blocks (Wood 1984, Vol.II:17ff.). While his necessarily brief genealogical interviews and his use of 25 years as a standard generational length have probably resulted in underestimated periods of use, consistency in the application of his methods suggests that the results of his comparative analyses of the agricultural potential of different zones are still valid.

age, Wood was able to derive linear correlation coefficients which provide a means of comparing the broader angles of trajectory of yield decline of different zones (1984, vol.I:167-170). Predicted average declines in annual yield after 10 years of cultivation are listed in Table B22, where the contrast between the lower angles of decline on wetland and colluvial/alluvial plains and the steeper angles of decline for volcanic ash plain zones such as the Andobare plains and the Paijaka plateau are starkly evident.

Another measure of the longer term sustainability of agriculture in the different environmental zones is the rate of soil loss. Wood (1984, Vol.I:151) shows that soil loss in the Tari region relates fairly directly to slope, with slopes between 1 and 5 degrees losing an estimated 0.1-0.7 t/ha/yr, compared with losses of 9.1-13.6 t/ha/yr on slopes between 18 and 25 degrees. In terms of the land types and environmental zones, this would suggest lower levels of erosion on the wetlands and level alluvial floodplains, and higher levels of erosion on slopes mantled in volcanic ash such as the Paijaka plateau, where the highest soil loss figures were recorded. Finally, decline in soil quality, as it is reflected in the extent of vegetation degradation which Wood (1984, Vol.I:158-9) expresses in terms of the relative proportions of grassland fallows to primary or regrowth forest vegetation, shows similar trends amongst the different zones to those already observed: degradation indices (the relative proportion of grassland fallow to forest vegetation) for the volcanic ash plain zones range from a low degradation index of 0.91 for the Andobare plains, through indices of 1.36 and 1.63 for the Tari and Poro plains respectively, to a high index of 3.10 for the Paijaka plateau where the total area under grassland cover is more than three times that under forest. As we shall see in Parts C and D, the extent of forest clearance and land degradation on the Paijaka plateau may have both reflected and influenced other trends in regional land use.

In conclusion, the role of wetlands within the broader Huli economy appears to hinge upon their potential for high crop yields, which are exceptional initially and sustainable at high levels over the long term. Swamps are also critical in terms of their value in the production of pigs, either as low-intensity forage areas or as areas of high fodder yield and controlled and more intensive pig production. Set against these benefits are the higher minimum labour commitments required in wetland areas due to the need to invest in the construction of a drainage network (Wood 1984, Vol.I:16). The history of wetland use in the Tari region might thus be regarded in part as a document of the changes in the tension between demands on production and the ability of community leaders to marshal sufficient labour to initiate wetland reclamation.

CHAPTER B5 - *MBINGI*: THE DOCTRINE OF ENTROPY

B5.1 "Natural" Hazards and Huli Temporality

In an environment where seasonality is neither strongly evident nor, as argued in B2.5, the focus of much attention, it is instead the extreme climatic and geomorphic events that Huli employ to structure their accounts of the past and their strategies for the future. These "natural" hazards, which serve as the major events of significance in Huli conceptions of time, emerge also as critical moments in the history of Huli subsistence. As such they offer considerable insight into the entire engagement of Huli with their environment, reflecting a view of the world founded upon a notion of entropy. Huli describe the universe in terms of a state of continuous decline, a reversion to the formless and unfixed landscape first stabilized and imbued with meaning through the actions of the original ancestors. Subsequent depletion of the ritual knowledge imparted to their descendants, combined with breaches of the norms established by the ancestors, are held to account for the pace of decline in the fortunes of the land and its people.

For the purposes of this discussion, I distinguish between two broad orders of hazard: famine-inducing events (*hina gari*), such as drought, flood and frost (B5.2), and the rarer but more profound threat posed by the basic instability of the Huli cosmos (B5.3). Huli accounts of these events are considered and the history of their occurrence during the twentieth century is documented. An analysis of Huli aetiology, of the causal explanations offered for these "natural" hazards, reveals an explicit body of beliefs about the nature and direction of environmental and social change as a process of continual decline and decay that draws upon what I identify as a "doctrine" of entropy (B5.4) (see also Frankel 1986:18,26-27). That Huli regard these events as something more than "natural" is suggested by the actions that they have taken in the past to stall or redress the effects of the process of entropic decline; actions that might conventionally be set apart and designated as ritual, but whose consequences formerly permeated the full scope of Huli activity. A description of these rituals (B5.5), known collectively as *dindi gamu* ("earth spells"), sets the terms for an understanding of the history of Huli wetland use (Part C) and of a fundamental transformation in Huli history (Chapter D1).

B5.2 *Hina Gari*: Soil Moisture, Frost and Famine

The relationship between soil moisture and crop yields is keenly appreciated by Huli people. Minor variations in soil moisture within gardens are exploited through the variable deployment of crops with different moisture tolerances and requirements; but extreme variations in soil moisture are capable of producing conditions of famine within the central Tari basins. The events of specific historic droughts and water surpluses constitute an important if diffuse body of knowledge, or *mana*, that has significantly influenced not just agronomic practices but the entire structure of Huli production and of marriage and other alliances.

Bourke (1989:326) has identified three forms of soil moisture extreme: drought, extended periods of water surplus, and shorter events of extreme water surplus. Of these, the most prominent in Huli explanations for famine is drought; short periods of fine, clear weather (*gaea*), welcomed as a respite from the regular diet of daily rainfall, can extend into drought (*gaea timbuni*; "big dry weather"), the only warning being the appearance of haze (*yagogo*). This valuation of the danger of drought is initially perplexing because the current staple, sweet potato, is essentially tolerant of drought, showing little decline in yield between soil moisture capacity conditions of 50% and 25% (Bourke 1989:322). However, severe moisture stress below 20% of field capacity does affect yields, particularly when it occurs late in the growing period, during the tuber bulking phase. Sweet potato is in fact much more susceptible to waterlogging, which significantly reduces the development of tuberous roots (Bourke 1989:327). By contrast, taro is highly susceptible to low soil moisture conditions (Spriggs 1981:14-15, Appendix 2), which threaten tubers that are in the second half of their growth (Reynolds and Netram 1977) and, most importantly, planting stock[1]. The relationship perceived by Huli between drought and famine may reflect the historic significance of dry conditions for taro as the presumed pre-Ipomoean staple; a further explanation draws on a sophisticated model of food supply shortages recently proposed by Bourke (1988).

Working from observations on the danger posed to sweet potato crops by waterlogging as 'the most important climatic constraint on tuber initiation and development', Bourke (1988) has demonstrated that the more severe food shortages leading to famine conditions in the Highlands region are the result of a complex interplay of climatic extremes and cycles of planting rates. The model that he proposes is initiated by an extended period of high soil moisture, which interferes with normal sweet potato tuber initiation by reducing the numbers of tuberous roots and limiting their size; the lapse of time (often four to six months) between this wet period and the resulting poor harvest has the effect of obscuring the role in this process of high soil moisture. When the initial wet period is followed closely by a drought of several months' duration, a common manifestation of El Niño-Southern Oscillation (ENSO) climatic events in the Highlands (Allen and Brookfield with Byron (eds.) 1989), the larger part of the sweet potato harvest is caught in the midst of its bulking phase and,

1. Morren and Hyndman (1987:312) report the former Mountain Ok practice of transplanting taro stock to swamps during major droughts.

with the limited and more shallow tuberization resulting from the wet period, overall yields are severely depressed. Not surprisingly, the cause of famine is then associated with the immediate event, the drought, though Bourke is able to show that long periods of drought that are not preceded by a wet period have had relatively little impact on food supply. A further effect of wet periods is a compensatory increase in the rate of planting to meet the ensuing shortfall in production; the period of abundance created by this burst of activity then leads to a sharp decline in planting rates and, in turn, an "echo" famine up to two years after the initial wet period, with no immediate climatic cause apparent.

The immediate effects of severe rains (*iba dama*) and heavy flooding (*iba li*), on sweet potato crops in particular, are obvious to Huli, and play an important role in the use of wetlands (considered in detail for Haeapugua in Part C); but it is the spectre of drought, of an absence of moisture, that most alarms people, associated as it is with the more dramatic hazards of fire and frost. The worst droughts of this century have been accompanied by widespread grassland fires, both in the higher areas of the Lebani and Tari Gap, and across the swamps of the central basins. During the major drought of 1925 the peat on Haeapugua caught fire and the Lebani basin was engulfed in a firestorm which destroyed everything on the valley floor[2]. Fires during the major droughts have probably accounted for the more significant transformations in forest extent and composition: large swathes of regrowth still visible amongst the Nothofagus forest on Lagale Mandi ridge in the Haeapugua basin are attributed to a fire during the 1941 drought, and Kalkman and Vink (1970:94) recount tales of a fire (presumably either in 1925 or 1941) which devastated the forest on Mt Ambua, an event repeated during the 1972 drought shortly after their field study (Brown and Powell 1974:4).

Frost is a common risk associated with dry periods at altitudes above 2000 m in Papua New Guinea, where it can perhaps be viewed as 'a relatively regular and normal event' (Allen et al. 1989:280); less frequently, but possibly with greater effect, frosts extend on occasion to as low as 1500 m (Brown and Powell 1974:5). Within Huli territory, Lebani and Margarima and, to a lesser extent, Mogoropugua and the Paijaka plateau are most clearly exposed to frost (Figure B2). The severity of frost varies considerably with topography, cold-air drainage and forest cover (Brookfield and Allen 1989:204-206), but most above-ground vegetation is killed by severe or repeated frost events: vegetation on level ground that is unprotected by canopy forest, which includes most garden plots, is particularly vulnerable. Sweet potato vines and tubers near the

2. The dramatic quality of fire events in the higher valleys has given rise to a chronology used widely in the Lebani valley that is centred upon the three major fires of this century (1925, 1941 and 1972), rather than the more frequent but probably equally devastating frosts. Of course, frosts tend to occur under dry, clear weather conditions and the fire events thus coincide with most of the major frost events.

surface are frozen and rendered inedible, while deeper tubers suffer a delayed maturation and are often of a poor, watery quality when harvested. Taro leaves and above-ground stems are affected by frost, but there is some evidence that taro corms resprout and can survive frost relatively unaffected (Clarke 1989:239). However, the critical impact of frost upon food supply is not the slight immediate decline in supply so much as the lag period between the last of the crops planted before the frost and the availability of new planting vines, typically no earlier than six months after the frost unless vines are imported from areas unaffected by frost; this lag period is compounded by the 12 month maturation rate for sweet potato at 2400 m to 2600 m, resulting in a period of post-frost shortages and 'reverberations' lasting for at least 18 months (Clarke 1989:239), with up to a maximum of three years before there can be a return to major reliance on local gardens (Wohlt 1989:232). The most disastrous frosts are thus those in which a series of frost events prevent planting for four or more months. While the impact of frost on taro production is poorly understood, application of this "lag-period" model to a pre-Ipomoean situation suggests that taro, which usually takes 14 to 24 months to mature above 2000 m, may never have been viable as the primary staple at that altitude. The loss of taro planting stock in pre-Ipomoean frost events may effectively have prevented the resettlement of high-altitude valleys for up to three years after each major frost.

Those Huli regularly exposed to frost (*pibiya*) have developed a body of knowledge (*mana*) that outlines strategies to be pursued in the event of frost. In many respects this frost *mana* closely resembles broader strategies adopted by all Huli in the face of food shortages. These include short-term responses, such as the agistment of pigs with relatives or trade partners in more favourably placed communities or full-scale migration to these communities to wait out the inter-harvest lag period. Longer-term responses include the adoption of specific techniques (for example, the mounding of sweet potato to reduce exposure to flooding or frost), the maintenance of gardens in a range of ecological zones to spread the impact of any single hazard event and the development of links through marriage or trade exchange with better placed groups[3]. In the most dire situations, a specific register of famine foods is exploited (these are listed in Table B22; see also Sillitoe 1993a: Table 1)[4].

Allen, Brookfield and Byron (1989) and Glasse (in press) have already

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3. Most individuals in the Lebani, for example, maintain links with kin and affines in the lower Mogoropugua and Tumbudu valleys; these same links are more regularly exploited by their frost-time hosts during the karuka pandanus harvests. Wohlt (1978) provides a very detailed study of a similar system in the Enga-speaking Yumbisa area, immediately bordering Huli territory to the east.
4. There does appear to be some correlation between extended dry periods and subsequent good karuka pandanus harvests (Bourke 1988), which become an important part of the immediate post-famine diet (Allen et al. 1989:287) but are not necessarily associated with *hina gari* by Huli.

demonstrated the value of Huli oral accounts in reconstructing the sequence of major hazard events of the past 70 years. Cross-checking of these sequences with known dates for contact events, such as administration patrols, aerial reconnaissances and region-wide extreme climatic events, has allowed the generation of a reasonably accurate absolute chronology from at least 1925; with minor modifications based on my own enquiries, this chronology is reproduced here as Table B24, to which the following accounts of the most significant events for Huli refer. Allen's (1989) analysis of rainfall records from stations throughout Papua New Guinea for the period 1891 to 1982 has provided a baseline for understanding the geographical extent and local magnitude of the major wet, dry and frost events in the Highlands region. Through comparison of the Papua New Guinea rainfall records with the available data on ENSO events, Allen distinguished a series of what he termed Class A dry events (Allen 1989: Table 5), likely to have been manifested as extreme dry conditions throughout the Highlands region. In chronological order, unambiguous Class A events have occurred in the following years of this century: 1914, 1941, 1965, 1972, 1982. While the 1914 event was felt to be beyond accurate oral recall, Allen expressed confidence in his ability to identify each of the other events in Huli oral accounts of past famines; one additional event, dated between May and December 1935, corresponded instead to an extended wet period, confirming Huli claims that this famine, the worst in living memory, followed a long period of heavy rains.

In the course of most interviews with older men and women, I enquired after floods, droughts and the events of early contact as a means of estimating people's ages; their memories focussed noticeably upon the sequence of major famines, rather than sequences of major wet or dry events. The 1914 dry event certainly proved beyond the firm personal recall of any of the oldest Huli people whom I was able to interview between 1988 and 1992. Many, however, were alive during the 1925 event (remembered by the Huli of the Koroba area as "Ambuamo" because it came from the east, the direction of Mt Ambua) and were able to describe the differences in their own size and apparent age between this event and the advent of the Fox brothers in 1934 (Ballard and Allen 1991, Ballard 1992b). Their descriptions of the famine and its aftermath are harrowing:

> When I was small, there was a very big dry (*gaea timbuni*), with a red sun. We thought that the sun had come down close to the earth and was sitting near the mountain peaks. People were very careful with their hearth ash and with fires, but despite this there were big bushfires. The peat on Haeapugua swamp caught fire, as did the forest on Lagali ridge.
> Nogo-Yagari, 31.1.91, Interview Notes

> Many people died, so many that we coudn't bury them, and pigs feasted on their bodies. People's ribs and shoulders stuck out, their eyes sank into their heads, their stomachs disappeared inwards and they fought

> over bamboo shoots, sweet potato leaves and pueraria... People were so weak that they staggered around like drunks.
>
> Ganabi, 25.9.89, Interview Notes

Yagari, Ganabi and four other of the oldest men whom I interviewed clearly distinguished between this event and the next major famine which, like Allen, I assign to the period between May 1935 and February 1936. This was probably the result of a major wet period in mid-1935, following a drought in late 1934. The 1934 drought, which appears to have been locally restricted to the area of Enga and the Southern Highlands, was described by the Fox brothers, who undertook a major traverse of the entire area between Mt Hagen and the Strickland River from August to December 1934[5]. When the Foxes entered the Tari basin in November 1934, they blundered unwittingly across a series of boundaries of clans engaged in wars exacerbated by a developing food shortage (Ballard and Allen 1991:10). Interestingly, this dry period rated a mention in interviews with Huli people only by virtue of its connection with the Fox brothers; by May 1935, when an administration patrol led by Jack Hides crossed the south-eastern corner of Huli territory from near Komo to Margarima, any problems with food supply had apparently eased (Allen and Frankel 1991). The real damage was caused instead by a massive wet period, presumably shortly after Hides had left the area, which destroyed crops throughout the central Huli basins; a dry-then-wet sequence that reversed the usual wet-then-dry model identified by Bourke. Although the precise local rainfall history for the period cannot be known, the consequences for Huli were devastating, resulting in a famine at least as bad as the 1925 event and certainly worse than anything since[6]:

> People threw corpses into the Tagali river because they were too weak to bury them. Lots of people from the southern Tari basin (*hulihuli*) came down to the Lower Tagali valley for *homa bawi* (Pueraria sp.? / Dioscorea sp.?).
>
> Andagali Giwa, 19.1.91, Interview Notes

A Haeapugua man describes the famine within the context of an explanation for his family's self-sufficiency, compared with the suffering experienced by immigrant *tara* without extensive land holdings:

> When the big *hina gari* came we were not hungry; we had many pigs and much sweet potato. Others died of hunger and some men stole

5. Though their handwritten diary of the trip (Fox n.d.a) suffers from selective omissions (Ballard and Allen 1991), the Foxes recorded 'droughty looking' gardens in the Upper Lai valley of Central Enga (3rd September), 'native foods scarce owing to droughty weather and poor soil' in the Duna area (25th October) and, in the Tari Gap, on 22nd November 1934: 'hail laying thick on the ground 3 inches all leaves and small branches stripped from trees hail as big as big marbles in places'. Two days later, big patches of hail were still visible on the mountains. The implication of a significant, if localized, drought is strengthened by the boast made on their return that, 'We went through the whole trip without getting a wet shirt' (Fox n.d.b: 1).

6. Further eyewitness accounts by Huli of this event have been recorded by Allen et al. (1989:289-290).

> sweet potato. G-Mu, G-Mi, G-D [names deleted here] and his daughter - we found them stealing, held them and tied them together. The garden owners tied their hands together so tight that their hands swelled up, until their stomachs stuck to their backs. G-D's daughter and her mother slept up at Giliaba with Gangoea's mother. When the famine came people ate the inflorescence of Highland pitpit, ferns, kudzu and fig leaves. This woman was carrying these things up to Giliaba Biangonga. A flash flood came up and washed her down to just behind my house and stripped her of her food. She died, but we didn't bury her - we took her body down to the Haeawi *iba puni* drain and threw it in there. It was too hard to make burial platforms, so we put her in the river. After this her mother was really starving so she went up to the bush, made a pillow of her *nu* bag, took two *tǫ* umbrellas, putting one beneath her and one over her, and fell asleep and died. We took her and buried her. G-Mi's wrists had developed great sores [from being tied] and he died of them, so we buried him at Waloanda. G-D kept on stealing sweet potato and sleeping in *gana* ditches, till someone killed him for stealing and threw his body away. G-Mu too kept on stealing. Each time he was caught, his hands would be plunged into fire. This happened so often that he had no hands left... Later some others killed him for theft.
>
> Dimbabu, 23.10.92, 92/2A:421-541

Although detailed accounts such as this of the 1935 event describe incidents like flash floods, the disposal of corpses in flowing rivers, and the poor tuberization of sweet potato and vigorous vine growth that suggest surplus soil moisture, and some individuals clearly link the ensuing famine with the heavy rains, many still associate the 1935 famine with the classic symptoms of drought and frost. All, however, agree upon the timing of the famine, which began after the Fox and Hides parties had passed through and concluded in February 1936 when the first full harvest after the famine was brought in, just as the first airplane flew over the Tari and Haeapugua basins (Appendix B1); both the airplane and Fox events are remembered by almost every individual alive at the time (Chapter B1).

The next of Allen's "A" events, in 1941 and 1942, is unequivocally identified by both Enga (Meggitt 1958b:255) and Huli (Allen et al. 1989:288-9) as a famine induced by drought, said by Huli to have occurred between the visit of the 1938/39 Hagen-Sepik patrol to Hoyabia and the passage of wartime airplanes over the region in 1943/44. Severe frosts at higher altitudes caused the Lebani valley settlements to be abandoned en masse and there were major bushfires in each of the basins.

> The Tagali river dried up completely! People were cooking on the river bed. The river itself shrank until it was just a few isolated pools. People had to go under the swamp mat at Haeapugua to get water...
>
> Maiya-Alua, 7.11.90, Interview Notes

Although the crops at medium altitudes did not suffer in 1941/42 as they had in 1935, immigration into the Tari and other central basins from the frost-affected higher valleys, including those of the Wage or Waga Enga-speakers at Yumbisa (Waddell

1975:263, Wohlt 1989), appears to have stretched resources to the point of a general famine. After a hiatus in contact with the administration since the start of the Second World War, Warrant Officer Danny Leahy entered the Tari basin in October 1943 and described the effects of a heavy wet period that had followed upon the 1941 drought[7]:

> After what had been heard of the WAGA and TARI areas from Major Taylor it was difficult to realise how vast a change could come over an area in so short a span of years. I had looked forward to seeing large populations and extensive gardens; but all that I found were very few natives and merely indications of large abandoned cultivation areas. This applied expecially [*sic*] to the WAGA area. The natives informed that the transformation was the result of severe droughts in 1941 which were followed by heavy frosts, resulting in the devastation of cultivation areas as well as vegetation over a vast area. In the TARI area, which is much lower than that of the Wa[ga?] WARA, the heavy rains of past months had saturated the ground to such an extent that the sweet potato vines failed to bear as of old. For this reason it was diffic[illegible] to obtain sufficient food for my carriers. The population of the TA[illegible], while still large, is undernourished, and quite a number have migrated to areas distant as far as from 20-30 miles from their own territory. The destruction and failure of food crops by drought frosts and heavy rains have left the WAGA and TARI people, previously known as verile [*sic*], numerous and [of a] happy disposition, in a pitiable plight. Their desire appears always to have been one of "Share with each other". When the drought and frosts denuded the WAGA gardens of food they found ready refuge with their neighbours and friends of the TARI. The failure of the TARI sweet potato crops as a result of the heavy rains left the both peoples to share and face their problems together. Both the WAGA and TARI peoples made pressing appeals that the Government should come into their midst and assist them with their original holdings and [*sic*] the crops appear to be coming back to normal, but it is evident that it will be some years before they are back to their former prosperity. We could do much, when the time comes to assist these natives by introducing food crops which would withstand frost.
>
> Leahy (1943:2)

The vision contained in Leahy's final words has been borne out in the three "A" class events since the war: those of 1965, 1972 and 1982, of which the first had only a

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7. This report, "lost" for some years, is here quoted at length for the first time. The significance of "wet" events, usually obscured in Huli discussions much as it is in the broader national media by the more dramatic frosts and droughts, is attracting increasing attention (Allen et al. 1989:303). As a further contribution, there is the following comment (Murdoch 1954:4) by a patrol officer stationed at Tari in the 1950's: 'Questioned about the famine informant and others said that at times the Tagari valley experienced famine conditions. The course of the famine is that near Tambera and in the Duna area the gardens failed to produce and the people moved out of these areas into the general area between the Tagari river and the Humphries range. Following the famine in the outlying areas, the inner area also experienced a food shortage and a general evacuation to places as far away as Wabaga tockplace [sic] [ie Enga-speakers]. The people remained in these far areas until the famine ended and the gardens were producing again. The description of the crop failure is that the sweet potatoes were very thin and fibrous and that the leaves died off sometimes leaving only a few tops... A bystander remarked when a pit being dug filled with water from a spring, "That is how the water comes up in the gardens in the famine time". This would indicate that a possible cause of the crop failure is... heavy rains resulting in waterlogging of the soil. The last famine in the area is reported to have occurred about 1943, this being the time that "Masta Danny (Mr.D.Leahy) came here".'

minor impact in the Tari region (Allen et al. 1989:287-288)[8]. Although the 1972 and 1982 events, which have been described in some detail (Wohlt 1978, Allen et al. (eds.) 1989), were at least as extreme climatically as the earlier events, the adoption during the intervening period of the suite of post-contact crops described in B4.2 substantially alleviated their effects on high altitude settlement and the Huli in general, as an older Haeapugua man, comparing the pre- and post-war events, suggests:

> Famines came once every year in those days - small and big... But this was before. Since the government came, there have been no famines. Onions, pumpkins, potatoes - our gardens are full of them. Now we eat sweet potato only as a part of our diet, and there are no famines.
> Dimbabu, 23.10.92, 92/2A:421-541

B5.3 *Mbingi*: an Unstable Cosmos

There emerges from Huli accounts of past "natural" hazards the suggestion of another order of hazard event, distinct from the extreme moisture and temperature events associated with food shortages: a series of events, such as earthquakes, mudflows, deluges, eclipses and ash-falls that, by virtue of their nature or magnitude, recall to Huli a sense of the unstable origins of the Huli cosmos and of the fragile nature of the exchange relationships with *dama* that serve to guarantee stability (B2.1, B2.6). These region-wide catcalysms, whose effects are potentially universal, were related to the fortunes of *dindi pongone*, the root of the earth, and were thought to reflect the success or failure of *dindi gamu* rituals. The term *mbingi*, literally "the time of darkness" (*mbi*: darkness, (*a*)*ngi*: time of), which refers to a specific historic fall of volcanic ash, has assumed the status of a generic label for all of these forms of major physical turbulence. While the extreme soil moisture and temperature events associated with *hina gari* are unreservedly catastrophic, *mbingi* events are regarded with a degree of ambivalence, as potentially either dangerous or beneficial. Through the medium of *dindi gamu*, which the next section addresses, Huli ritual leaders have actually sought to gain a measure of control over the effects of *mbingi*.

The Tari region is a local centre of tectonic and solfataric activity, with the highest recorded rate of earthquake events in Western Papua (Dent 1974). The strongest of these recorded earthquake events are listed in Table B24. Of these, the most notable are probably the 1922 and 1954 earthquakes; the first because it was almost certainly the prompt for a particularly energetic period of Huli ritual performance, and the second because the local consequences and reactions were recorded by colonial administrators and missionaries in the Tari region at the time. Earthquakes (*dindi dumbidumbi*) are explicitly attributed either to the scratching of the

8. Minor food shortages in the Tari region between 1952 and 1974 have been summarized by Bourke (1988:Fig.7.11, Table A7.2).

tethered pig, *nogo tambugua*, that constitutes an element of *dindi pongone* (see B2.6) or, in versions that may reflect an even more ancient stratum of belief, to two *dama dindi tene* ("spirits of the origins of the earth"), Dindi Hu and Dindi Hulabe, also associated with the root of the earth[9].

Landslides and mudflows, also common in the Tari region, have had a more direct impact upon people, particularly in the densely settled basins. A useful illustration of the scope of these events and of their significance for Huli is the Alua mudflow, a large fan of material extending from the crater bowl of Mt Ambua, through the breach on its western side, into the southern Tari basin. Partially mapped by Taylor (1971), Blong (1979) and Allen and Wood (1980), the flow appears to be comprised of a series of individual events, some overlain by Tomba tephra and thus presumed to be older than 50 000 BP, with others dated variously at about 10 000 BP (SUA-1280, SUA-1280x) and at about 800 BP (SUA-1275, SUA-1276) (B.J.Allen pers.comm.). A distinctive vegetation cover heavily dominated by Casuarina oligodon, with few stands of older trees, clearly marks the extent of the most recent flow. On the basis of an oral narrative related in Kenya parish, Allen and Wood (1980:344) have suggested that the most recent event associated with the Alua flow occurred between AD 1860 and AD 1880[10]:

> A landslide blocked the Arua [Alua] River in its headwaters, the river slowed down to a trickle for about 35 years as a lake formed behind the landslide. When this dam broke it released a large amount of water which, together with debris, including large boulders, flowed down the constricted upper Arua Valley and spilled out over the lower slopes of the mountain.

Bursting out onto what is still the most densely settled part of the Tari basin, the flow had a devastating impact. Although this was not an area in which I did much work, I was able to interview two older men who offered contrasting explanations for the flow. The first, Hoyamo Hilira (see Frontispiece), linked the flow to a performance of the *dindi bayabaya* ritual at Bebenite *gebeanda*, which lay on a ridge immediately in the path of the Alua flow; in this account, the mother of a sacrificial victim at Bebenite invoked the flood, which swept away the body of her son:

> As they watched, she sent the Alua river down. When the Alua river

9. The neighbouring Ipili have a similar understanding of the cause of earthquakes, possibly reflecting their incorporation within the regional extent of *dindi pongone* beliefs: 'Earthquakes are caused by Isini's brown pig which occasionally rubs its back on the tree which props up the earth' (Gibbs 1975:81). Further afield but, again, possibly related to the same common set of regional cosmological themes, Brumbaugh (1987:27) reports the belief of the Mountain Ok Feranmin-speakers that the subterranean python, Magalim, provokes earthquakes.

10. Although my means and methods of dating this event are quite different from those used by Allen and Wood, my own estimate for the last Alua mudflow, on the basis of the ages of various narrators and their ancestors (see Appendix B6), also falls between 1860 AD and 1880 AD.

came, it covered everything. The parts of his body were carried away and covered with sand by the Alua river. It was an enormous flood, covering everything.

Hoyamo, 23.5.91, 91/6B:525-601

The second account, thick with allusions to specific *dama* whose clan affiliations and indvidual histories are not known to me, relates the flood to a war between two *dama*, and further illustrates the point made earlier in B2.2 about the equation of individual *dama* with specific water features[11]. The identification of the Alua mudflow or flood as a manifestation of the sacred river Tade is a clear attempt to attribute the flood to the workings of *dindi pongone*, the root which extends between the two *gebeanda* at Bebenite and at the Tuandaga, on the opposite eastern side of Mt Ambua (Figure B10). In both of these accounts, a connection is traced between the flood and *dindi pongone*: in the first instance through a failed performance of *dindi gamu*, and in the second through the ability of an individual *dama* to provoke a powerful surge along the route of *dindi pongone*. Taken together, the two accounts provide a sense both of the necessity to engage in *dindi gamu* rituals as a means of negotiating with capricious *dama* and of the often dangerous and unforeseeable consequences of such exchanges.

The definitive *mbingi* event almost certainly refers to the seventeenth-century fall of ash from a volcanic eruption at Long Island (Blong 1982), off the north coast of the New Guinea mainland (Figure A4). The tephra deposits from this ashfall, distributed across much of the Highlands region, have been identified archaeologically in the Wahgi valley as Tibito tephra (Blong 1982), and the grounds for assigning this event to the period 305 - 270 cal BP (1645 - 1680 AD) are discussed in Appendix A3.

Huli identify this tephra material, where it is exposed in their ditches, as *mbi mu* ("darkness-sand"), *mbi dindi* ("darkness-earth") or *da pindu* ("sky-stuff"). As the ash probably fell with an original thickness of 1-2 cm in the Tari region (Blong 1982:

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11. 'Hari Ambua Pogoba and Hibira-Aliabe fought... Pogoba left and entered the water Pogoba [unclear here whether this is a lake or a river]. The Pogoba water moved to Gambe Hugu, where Iba Tai Dundiya [Yundiga ritual site at Mt Kare - Figure B10] is. Hari Ambua Pogoba said Hibira-Aliabe had been the cause of this [i.e. the loss of the Pogoba water to the Kare area]. He took two waters: Homa and Dage, and all of these waters: Hunu Anda, Hunu Andaba, Huli Yamabu, Hona Anda Buali, Gubi Kaubi, Yali Hobe, Hubi Kemu, Dumbiyu Dolabe. Leme and Mabe came down carrying trees from Ambua Pele; these waters were all gathered, he pulled them together. The people saw Leme and Mabe coming down carrying the trees and called out that they were coming to eat them. There was a man, Alu-Dumbiyalu, said to be from Alua. The water took him and carried him to a *tawa* [Pandanus antaresensis] tree where he stuck fast in the roots. All of Hibira-Aliabe's land was eaten by the water; so Hibira-Aliabe said that he was leaving and he gave his land in parcels to Bolange-Bebe [grass], Bai-Tola [stones], Hura-Egane [reeds], Hongo-Angi [Job's tears]. When the water broke all of this land, the seeds of these weeds took root and grew on the banks of all these rivers. Where Hibira-Aliabe had lived, the rivers Kaubi and Gangalubi came up. The water came from the Tuandaga. This Tade river goes in at the Tuandaga and then emerges [on the Tari side] as the Kaubi and Gangalubi rivers.' (Hubi-Morali, 4.11.92, 92/5B:0-186).

Fig.29), it is found only where it has been reworked, and its distribution within most soil profiles is discontinuous. There is thus little current interest in its properties as a soil, though older men describe its use as a gritty matrix, rubbed into the beard in order to pluck out hairs.

Despite the distance of the Tari region from Long Island, and its location at the furthest extreme of the presumed distribution of the tephra, the narrative accounts of the Huli and their immediate neighbours are perhaps the most detailed and complex of those known[12]. One possible explanation for this is that the event held a deeper significance for the Huli than it did for other, more heavily affected groups, due to the specific nature of existing Huli beliefs. These beliefs emerge through the body of formal narratives known as *mbingi mana*, a codification of knowledge not unlike the formal prescriptions relating to frost in the higher valleys (Wohlt 1989:228).

Like the *mana* for frost, *mbingi mana* is predicated on the assumption that *mbingi* is a potentially recurrent event. The narratives, of which Narrative B8 is an example, provide a graphic description of an ash-fall, based presumably on oral accounts of the Long Island event, and a series of prescriptions for appropriate behaviour during *mbingi*. *Mbingi* is foreshadowed by a number of portents, including a rise in the level of the rivers and a gathering of clouds on the eastern horizon, accompanied by great thunder and lightning[13]. In preparation for *mbingi*, acting under the direction of specified *manayi* ("*mana*-holder") leaders, people move to high ground and build houses (*mbingi anda*) perched on low stilts with steeply pitched roofs of split timber[14]. Firewood and food are gathered ("ten bags of sweet potato") and placed in the houses, in-married women are sent back to their natal parishes ("send your wife back, bring your sister into your house") and internal partitions are built to separate male from female sleeping spaces. Tall sticks are planted upright in mounds of ripe sweet potato and then people gather in their houses and pull the doors shut. When *mbingi* comes, the rivers overflow their banks, the day sky darkens until it is as black as night and then the skies break and fall down to earth as *da pindu*, sky stuff[15].

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12. A number of authors have documented Huli *mbingi* accounts, including Glasse (1963, 1965, in press), Blong (1979), Allen and Wood (1980), Frankel (1986) and the authors of the reports collected by Blong (ed. 1979).

13. The repeated association in *mbingi* narratives between the appearance of the *mbingi* clouds and the occurrence of lightning and thunder possibly reflects the abundance of thunder and lightning discharges reported for volcanic ash clouds (McGlone 1981:85; Blong 1982:152,170-171).

14. This is the only instance where Huli construct raised houses; of their neighbours, only the Papuan Plateau and Lake Kutubu groups to the south build houses on stilts.

15. An association between mountain peaks and the sky, evident in *mbingi* narratives, is reflected in the incorporation of the term for mountain (*hari*) in such terms as *hari dabale* ("lightning"), *hari kulu* ("thunder"), *hari alungi* ("cloud") and *pobo hari* ("sky"); when *mbingi* falls as earth from the sky, it is thus the mountain peaks themselves that are falling, only to re-ascend and re-assemble at the end of the *mbingi* event. This perhaps accounts for the description of the Alua mudflow, emanating from the

During the first day of darkness, only singletons, those individuals with no siblings, are permitted to leave the houses to forage for food (*mbingi hina*) from the marked sweet potato mounds. They find the earth covered by hot, light-coloured sand and ash; exposed crops have been cooked through. By the second day of darkness, people with only one sibling may also come out briefly for food, which they feed to those still in the houses. In each case, only men are allowed to come outside, lest men and women should engage in unlawful intercourse; different individuals are charged with feeding either the men or the women of a household, but not both together. Successively larger sibling groups emerge until either the fourth or the eighth day, when the rivers revert to their proper courses, the mountains that have broken rejoin and ascend, and the sky grows clear (*gaea*) again[16]. Any transgression of these strict codes results in the annihilation by *mbingi* of the offender's entire clan:

> *Ogoni mebia haribiyagua [hondo], libu kebigo homai holebira.*
> If this [code] is broken [*mebia*], all will die.
> *Mebia hari aria hameigini haruago aria homai,*
> Whoever breaks it, all their clan will die:
> *Tanime mebia heneyagua [hondo] Tani,*
> if Tani break this law, all Tani will die;
> *Dobanime mebia heneyagua [hondo] Dobani.*
> if Dobani break the law, all Dobani will die.
> *Nde ibu ka dagua hanguhangu haruago homaruagoni.*
> Whoever stays outside will die.
>
> Walubu-Mabira, 5.1.91, 90/2A:36-75

Other than details such as the duration of the period of darkness, there is little variation apparent in *mbingi mana* throughout Huli territory[17].

As suggested above, use of the term *mbingi* is extended to refer to a broader class of "cataclysmic" events such as earthquakes, landslides, floods and even eclipses. In the weeks leading up to the 1962 solar eclipse, the administration and the missions at Tari

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peaks of Mt Ambua, as a *mbingi* event. I was unable, however, to elicit any coherent theory to account for this association, such as Modjeska (1977:96) reports for the Duna, who hold that the sky is 'an inverted land of mountains'.

16. Goldman (1981a:118) suggests that the numbers 4 and 8 hold a particular significance for Huli, which he describes in terms of a complementary opposition between eight:male:fruition and four:female:sterility. The possibility that the duration of the period of darkness may correspond to its effect is not a topic that I considered sufficiently while at Tari.

17. Some Huli advocate the presence of a distinct *mana* other than *mbingi mana*, referred to as *da pindu*, in which the flight of a cloud of *tapaya yuwi* birds (an unidentified species) from Duguba in the south to Mbibibaite in the north signals the impending arrival of the darkness; but the *da pindu* accounts known to me resemble those of *mbingi* in all other respects and probably represent little more than a locally specific strand of *mbingi mana*. The close correspondence between Huli *mbingi mana* and the accounts documented by Blong (ed. 1979) of the time of darkness amongst Oksapmin (pp.56-57), Duna (pp.58-59), Wage Enga (pp.84-86), Paiela (pp.109-111) and Kaluli (pp.52-53), specifically in their references to the possible recurrence of the event, presumably reflects the regional extent of the *dindi pongone* network.

combined in an attempt to defuse any possible anxiety about the forthcoming event; at Benalia, where the E.C.P. mission had only just been established, at least four "time of darkness houses" (*mbingi anda*) with split wood roofs were built in anticipation of *mbingi* (A.Sinclair pers.comm.)[18]. Similarly, the discovery in 1991 of alluvial gold at Peda parish, to the north of Tari station, led to the construction of *mbingi* houses by parish residents because the find site was held to be directly along the path of *dindi pongone* between the ritual sites of Gelote and Tai Yundiga (Figure B10)[19]. The gold being mined was regarded explicitly as a substance exuded by the *puya* python, and tampering with *dindi pongone* in this way was felt to run the risk of provoking the python and inducing a destructive *mbingi* in the form of a flood.

The definitive *mbingi* event is clearly regarded by Huli as a historical event. All known narratives specify *mbingi* as having taken place after the introduction of sweet potato. While the tendency in most Highlands communities to endow ancestors with contemporary, or at least immediately pre-colonial, attributes and equipment might suggest that the identification of sweet potato as the staple during *mbingi* is a post hoc assimilation, the emphasis placed by Huli on distinguishing between ancestors from the times of taro (*ma naga*) and of sweet potato (*hina naga*), and the specific injunctions about the quantity of sweet potato (*mbingi hina*) to be gathered and the manner of its collection and distribution, strongly suggest a post-Ipomoean date for *mbingi*. Certain specific ancestors are nominated as having been alive, or born, during *mbingi*; Appendix B10 documents the genealogical proofs for these individuals. The wide spread of genealogical dates for the event, between ?1770 and ?1853, is open to several interpretations (see Appendix B6). Of these the most probable are first, that the genealogies are themselves malleable and inaccurate; secondly, that more than one *mbingi* event is being identified in this way. In particular, there seems to be a common tendency to identify any ancestors whose names contain the morpheme *mbi* ("darkness") as having been born during the original *mbingi* event[20]. While this is not implausible, given the Huli practice of naming infants after events, it does introduce the possibility that (non-ashfall) *mbingi* events such as solar eclipses have also been identified in this way.

But if, as the Peda community feared, *mbingi* is potentially disastrous, tales of the consequences of the last ash-fall also offer the prospect of a possible renewal of the earth's fertility. In the aftermath of the last ash-fall, there was a time of plenty in which

18. Du Toit (1969) records a very similar reaction at Akuna village near Kainantu in the Eastern Highlands, where the same eclipse was interpreted in terms of local time of darkness narratives.
19. Plate 7 shows one of the Peda *mbingi* houses, sited appropriately on a ridgeline.
20. Frankel (1986:18) also cites a claim from Hambuali parish for an individual, Mbi, born during *mbingi*, whose descendants now number eleven generations; however, no detailed genealogy is offered, nor is it clear which clan Mbi was from.

everything grew spectacularly:

> The taro and banana were huge. The pitpit grew as thick as a man's calf, and the rungia leaves were the size of men's feet. Pigs grew as large as cows are now.
>
> Maiya-Gane, 31.1.91, Interview Notes

Similar comments have been made about the vigour of vegetation regeneration following ash-falls elsewhere in Papua New Guinea, at Rabaul in 1938 and at Mt Lamington in 1951 (Blong 1982:169,186), suggesting that those plants and crops that survive the immediate impact of a tephra fall flourish on the additional nutrients supplied by the ash[21]. While the perception amongst Huli of the benefits of the original *mbingi* event may reflect an actual improvement in soil quality, it draws more significantly upon the cosmological role that Huli have conceived for *mbingi* and the notion of its possible recurrence. A richer understanding of the significance not just of the original *mbingi* event, but of the other hazards subsequently identified as *mbingi* and of the causes of *hina gari*, requires that these events be set within the broader context of Huli beliefs about fertility and entropy.

B5.4 The Doctrine of Entropy

The temporal framework created by Huli around the occurrence of *hina gari* and *mbingi* events is morally invigorated and furnished with a sense of an overall trajectory by an explicit doctrine of entropy, a set of beliefs about the nature of fertility, inculcated both formally and informally, that emphasizes the "natural" tendency in all things towards loss and decline. The extent to which the theme of entropy pervades Huli explanations for change has been noted by previous writers (Wood 1984 Vol.I:173-5, Frankel 1986:18,26-27, Goldman 1993, Glasse in press). Here, against the background of a brief review of similar beliefs held elsewhere in the Highlands region, Huli notions of entropy are described. What appears to be an internally contradictory set of beliefs about social and environmental change is linked to a series of myths that imbue specific fluid substances - water and blood - with meaning, whilst rendering ambivalent the roles of male and female in explaining the processes of growth and decay. These myths outline the moral field within which relationships between men and women, and between people and *dama*, are negotiated, a process notionally structured through the observance of customary or conventional knowledge (*mana*) and

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21. There appears to have been little research into the variable impact on different crops of ash-falls, though records from Bali suggest that sweet potato was more successful than other staple crops after the 1963 eruption of Mt Agung, occasioning a minor "Ipomoean" revolution: 'The eruption of Mt Agung affected the chemical balance of the soil in the area. Giant tubers were grown in the fields of the village during the years immediately following the eruption. In Yeh Kori, today, sweet potatoes are grown almost to the exclusion of other crops, because they produce well without much fertilizer. At the same time, local farmers claim that other crops do less well than they did prior to the eruption.' (Poffenberger 1983:136).

restrictive tabus (*ilili*).

A general belief in decline and dissipation, rather than increase and accumulation, as the fundamental direction of history is common to many Highlands groups[22]; but the only detailed exploration of entropic beliefs in a Highlands society is Jorgensen's analysis of the concept of *biniman* amongst Telefolmin or Telefol people (1981, 1985). Jorgensen employs entropy as a general gloss for the Telefol verb *biniman* meaning 'to finish, to run out, to dissipate, to become nothing', which he identifies as 'the chief preoccupation of Telefol cosmological thought' (1981:304), a concept that finds close parallels in Huli thought, despite the absence of a single corresponding Huli term, and that provides a model for my understanding of Huli accounts of entropy. Jorgensen explicitly deploys the concept of entropy as a heuristic device, exceeding Telefol applications of *biniman* in his identification of features of Telefol society that reflect the broader workings of the concept. Acknowledging the formal origins of the concept of entropy in thermodynamics, Jorgensen cites Whitrow, for whom entropy is 'a measure of the amount of disorder in a physical system, [though] it is now clear that a more precise statement is that entropy measures lack of information about the structure of a system' (Whitrow, in Jorgensen 1981:33); yet the image of entropy that emerges from Jorgensen's work is far more powerful for his purposes than the narrower definitions available from the field of thermodynamics[23].

The origins of Telefol entropy are to be found in a myth in which Umoim observes his sister, the Telefol ancestress Afek, drawing forth taro, sago and wild pigs from her vagina; shamed, Afek kills Umoim and ceases to produce these things, which people now have to produce for themselves. Mortality and labour are thus introduced to a world in which order is a state towards which Telefol strive in the face of a ceaseless tendency, evident in society as well as in the environment, towards decline. The pursuit of endogamous marriages, the strict maintenance of numerous tabus and the re-incorporation of dead ancestors through ritual are all means towards the same end: the attempt to hold the "natural" tendency to entropy at bay. Entropy is discernible as both a leakage or attrition from the centre and a diminution over time in the size of people, of taro plants and of pigs, 'a gradient of progressive decline and decay in both spatial and temporal dimensions' (Jorgensen 1981:303).

Huli commentary on the theme of entropy is a persistent refrain running through

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22. These include (in order of geographical proximity to the Huli): Duna (A.Strathern 1991), Ipili-Paiela (Biersack 1991), Wola (Sillitoe 1993a), Etoro (Kelly 1977), Bimin (Poole 1986), Mendi (Puri 1982), Wiru (Clark 1989) and Agarabi (Watson 1992).
23. As the physicist Zernike (1972) observes, reconciliation of the divergent scientific and non-scientific uses of entropy is both futile, given the mathematical complexities of scientific models, and unnecessary, insofar as entropy "works" as a concept for each field.

both formal narratives and general discourse. The most common expressions of belief about decline are assertions that the land has gone bad (*'dindi mo ko haya da'*, Cheetham 1979:88), or has dried up (*'dindi gabu haya da'*), or that, like old fruit-bearing trees, it is exhausted (*'dindi le haya da'*). Observations made in this vein on the "natural" world, on the loss of ground moisture and soil quality and the invasive spread of grass and tree species associated with poor soils, have already been described (Chapter B2). In its fullest form, this discourse of entropy extends to encompass all aspects of Huli life and the Huli universe:

> Before, bananas, pigs, taro, *tigibi* (Oenanthe javanica), everything grew better. The swamps were all brimming with water, but now they are dry and the saplings die for want of water; they just don't grow, their heads hang down towards their roots. Before, everything was large, but now it is all small. For this reason we think that the land is going to finish. The long memories of yesteryear have grown short [*manda luni timbuni ore winigo tubagi hara*]. Distances have grown smaller. Now young men refuse to look after pigs, people marry too quickly and women bear children too early. Our *mana* is finished and another has come out in its place [*inanaga mana bago bihende biba halu ai nalene tagira ibiyadago*].
>
> Mabira Walahuli, 23.10.92, 92/1B:546-574

But these descriptions of a world in decline are at odds with observations, often made in the same breath, on the visible improvements in pig stock, in the yield of the latest sweet potato cultivars and in the health and size of children[24]. These apparently glaring contradictions in the perception of change have been interpreted elsewhere as expressions of a universal tendency to nostalgia, a yearning for a better past, or as post-contact responses to the impact of colonial administration and the corresponding loss of local autonomy (Clark 1989, Watson 1992). Yet, as Jorgensen (1985:208) notes, 'it is a mistake to view these notions as epiphenomenal, for they are in fact part of the foundation of the Telefol view of the world. It is not simply that history conforms to the pattern of entropy, but that this sense of the world's trajectory is invoked when experience would seem to run counter to the pattern'. In the Huli case, the inconsistencies in this discourse of entropy can be traced to a fundamental ambivalence in the status of women and female substance in Huli cosmology. A brief review of the mythical foundations for the beliefs that Huli men, in particular, have held about fertility and the nature of female sexuality serves to illustrate this point.

One of the more common and widely known Huli myths, reproduced here as Narrative B9, provides an illuminating introduction to the relationship posited by men

24. A nice illustration of the internal contradictions that are characteristic of this entropic discourse is contained in the following account by Tugusup Puri of Mendi: 'The *kaukau* [sweet potato] in the olden times was ten times bigger than what is produced now, and many of the old sweet *kaukau* have disappeared. About twenty varieties I know have disappeared: only two are surviving. New varieties have been introduced and they seem to do better than the ones that have disappeared' (Puri 1982:161).

between gender, fluids and entropy[25]. The prospect of immortality in the form of water is offered by the sun, Ni, to the original woman, who fails to respond appropriately; in place of the water of life, she feeds her child instead with milk from her breast, condemning it and all people thereafter to mortality. In other versions, the water spilt on the ground is consumed by a snake, thus ensuring immortality for snakes which shed their skin but never die of old age. Much as Umoim's death looses entropy upon the Telefol world, Huli men hold that it is the breach of norms by women and the mortality introduced to infants through their mother's breastmilk that initiate decline in Huli people and the Huli world.

Female sexuality is identified by Huli men as the source of most of the polluting substances (*dodo*) that are inimical to growth and fertility; women are explicitly equated in male discourse with social disorder (Goldman 1983:97) and entropy is thus regarded as a condition of existence for men in a world with women. Emanating from the inner "heat" (*pobo*) and the taint (*ngu*) of women, secretions of vaginal fluid (*hugu*) and menstrual blood (*pugua*) are identified as the immediate sources of decay and decline in men (Frankel 1986, Goldman 1983:94-96); Table B25 lists these and the other fluids that play a role in Huli fertility beliefs. Women's heat and menstrual blood are typically held to be "dry" (*gabu*) and to cause "dryness" through contact. This is equally true for female fluids in a moist state, such as parturition fluids, and in the form of a dried precipitate[26]. Men ascribe the "drying" of their skin, and the drying up of the water in the bamboo containers of the former *haroali* bachelor cult, to the polluting effects of contact with women. Desiccation induced through female pollution is thus a classic motif of Huli entropy beliefs and this perhaps accounts for the specific resonance for Huli of drought, rather than deluge[27].

Yet, if female substances are identified as the source of death and decay, they are also equated with fertility and growth. Thus the term for breastmilk (*andu ibane*), which is considered essential for the growth of a child, incorporates the common generic term for nutritive fluid or "grease" (*ibane*), itself formed upon the root term for water (*iba*) (Goldman 1981a:49). Similarly, the term for menstrual blood (*pugua*)

25. Of the several documented versions of this common myth (Goldman 1983:93, Arabagali 1985:101, Ballard 1991 and 1992 Fieldnotes), Narrative B9 reproduces the earliest, recorded by a patrol officer in the Komo area in 1953.

26. The former use of *tomia* poison required the collection of menstrual blood in a bamboo container, which was then left to dry and reduce for maximum effect. 'When they wanted to kill someone, they would mix a little water with the contents of the bamboo. They would take a stick and dip it into the mixture and tap some drops onto food or onto sweet potato leaves. When you touched the leaves your hand would dry up, drain of blood and you would die. If you ate it your tongue would dry up and you would die. This *tomia* came from women' (Gomengi, 26.10.92, 92/3A:163-179).

27. Bedamini-speakers, Huli neighbours to the south, also identify heat and the state of dryness as female qualities; but Bedamini cosmology resolves an apparent paradox in Huli thought (where the hot, drying sun is male) by identifying the sun as female (Sørum 1993:115).

differs only tonally from that for the swampy wetlands (*pugua*) that operated as the focal sites of fertility in Huli sacred geography and ritual[28]. The same female substances regarded in certain contexts as dangerous for men and inimical to growth generally were deployed in other contexts as components of fertility rites: bamboo lengths containing menstrual blood were formerly buried together with umbilical cords (also inimical to growth through their association with parturition fluids) in sacred swamps at the ritual sites of Gelote and Irari in the *agau wandia* rite[29]. In the myth which describes the origins of the *haroali* bachelor cult (also documented by Goldman 1983: Appendix 6, and Frankel 1986:99), the magic plants with which the bachelors ensured their health and vitality are all identified as having sprung from the blood of a young woman. Neither are male substances universally beneficial: an excess of semen can threaten both a pregnant woman and the development of a foetus, which is formed through the commingling of menstrual blood and semen (Frankel 1986:100); male substance can also convert to become polluting, as in the case of corpse fluids (*pipini*)[30]. In their analysis of the very similar beliefs held by Hageners, A. and M. Strathern (1971:163) conclude that we 'cannot simply argue, then, that semen is regarded as pure and menstrual blood as polluting. Each can be polluting, in particular contexts'.

This apparent conflict in the profusion of meanings attached to fluids can perhaps be resolved by considering the role accorded to women in Huli cosmogony. Here, women clearly emerge as the source of all things. The Huli ancestress, Memeleme, Tia Nangume or, as she is sometimes known, Dindi Ainya ("mother of the earth"), literally gives birth to the elements of *dindi pongone* and to the features of the Huli landscape (B2.6). Women and women's fluids are also identified in *tene te* origin myths as the source of substances such as fire, mineral oil, sago and pandanus (Goldman 1981a:51-52). In each case, however, the value of these substances, and of the world at large, is realised only through the domesticating actions of men. Men tame the potentially destructive powers of women's "heat" (*pobo*) (Narrative B1), open women's vaginas to release the build-up of polluting blood and allow for the passage of children (Narrative B2), and harness the latent fertility of the *haroali* woman through the correct exercise of *mana*[31].

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28. *Pugua* is also the term for the verbs "to cut" and "to break a rule", suggestive of an internally referential lexicon constructed around the single term which invokes both the creation of *ilili* proscriptions through the primordial cutting of Memeleme's vagina and issue of menstrual blood, and the act of transgression.
29. 'From this menstrual blood [*wali darama*] and this child's umbilical cord, many children would be born,' (Yaliduma-Dai (Dagabua), 12.4.91, 91/5B:61-88).
30. *Pipini* corpse fluids were held to be severely dangerous for soil fertility (*dindi ibane*), accounting for the Huli practice of exposed burials in raised box coffins; these were said to have been preceded by an earlier practice of exposure in tree forks. Both have been superseded by the Christian practice of burial, an innovation whose symbolic consequences I have yet to enquire into.
31. My argument here follows closely that developed for the corresponding bachelor cult of the Ipili-Paiela by Biersack (1982), who lucidly exposes the female basis for fertility in the cult and describes

Much as men have domesticated women in myth, so too men seek to negotiate the complex meanings of fluids, by restricting the flow of pollution from women, whilst retaining the nutritive value of female substance and controlling the effects of their own fluids. The means whereby men render safe or productive the polluting potential of women, and thus check the process of entropy, centre upon the observance of the structures of *mana* customs and the strictures of *ilili* tabus. A common example of this is the conventional timing of intercourse within a restricted period of four days during the menstrual cycle, which protects the man from "bad" menstrual blood while ensuring the presence in the woman's womb of the "good" reproductive blood required to form a child. Strict observance of such codes is essential: in light of the harmful effects of an excess of sperm, while 'sexual intercourse on less than four days is said to be insufficient to produce conception, to continue beyond four days is said to prevent conception' (Frankel 1986:100). Similar conventions, encoded as *mana*, ideally governed the behaviour of men and women in such a way as to limit the mutually deleterious potential effects of their union. Through both the domesticating power attributed to *mana* and the formal transmission of *mana* between generations, beliefs that articulated the relationship between fertility and pollution and that established the link between sexuality and entropy have emerged as a doctrine, a formal and gendered body of instruction.

There are specific *mana* for every aspect of Huli life, though some are more formalized than others. As Goldman (1983:66) describes it, Huli conceive a role for *mana* as 'both to order - as a normative repertoire - and to explain - the raison d'etre for routine action - their lives'. If *mana* thus provide the rationale for conventional or appropriate behaviour, *ilili* tabus hedge such behaviour around with specific proscriptions. Ritual performances, in particular, were surrounded by *ilili*, usually pertaining to food and sexual contact: ritual leaders (*gebeali*) performing *dindi gamu* would abstain from sexual contact over long periods prior to and during the performance and eat only a limited range of foods. Similarly, *mbingi mana* sets out general instructions for behaviour, such as the construction of houses of a specific type, together with strict *ilili* proscribing sexual contact under pain of death (see B5.3). Failure to observe *ilili* undermines the success of any project conducted under the guidance of *mana* and this failure, critically, is what Huli identify as the cause of the world's decline. The danger latent in women's sexuality or, more accurately, in <u>uncontrolled</u> sexuality can be contained through the correct observance of *ilili* and the accurate application of the principles invested in *mana*; but unadmitted breaches by

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the transactions amongst men through which the transmission of fertility is negotiated. Elsewhere, Biersack (1987) has also explored the significance of fluids for the Ipili-Paiela (where the terms *ipa*, *ipane* and *andu ipane* find obvious cognates in the Huli fluid substance lexicon in Table B25).

men and women break down these controls, allowing uncontrolled and hence dangerous substances to seep out into the world (see Jorgensen 1981:35). The scope for breach of *ilili* tabus is exacerbated by the belief that the complete and perfect knowledge of *mana* handed down to people from the earliest ancestors has, through the generations and with the untimely death of knowledgeable "*mana*-holders" (*manayi*), been depleted (Frankel 1986:25). As a limited and finite resource, the transmission of *mana* was a difficult process, fraught with anxiety: giving one's *mana* too widely or too early was detrimental to the well-being of the owner, but the consequences of delaying transmission were equally as dangerous for one's surviving kin[32]. Huli ritual, seen in this light, was an attempt to recover "full" *mana* through experimenting with the depleted pool of transmitted knowledge.

In the wake of the loss of this "full *mana*" there has developed a *mana* that is itself concerned with the process of entropy, a profoundly pessimistic repertoire of formal *pureromo* adages that foretell, through the description of a series of portents, the end of the world. Central to these accounts of impending doom is the failure to observe *mana* and *ilili*:

> All that our fathers told us not to eat we now eat. All that our fathers told us not to see we now see. All that our fathers told us not to say we now say.
>
> Pudaya, 3.11.92, 92/4B:199-238

> It is said that the ground has gone bad [*dindi ko haya da*] because laws have been broken.
>
> Yaliduma-Dai, 11.4.91, 91/5A:364-385

The specific signs of the approach of a total failure in the earth's vitality are widely known and well documented (Frankel 1986:24)[33]: Narrative B10 is one example of the many narratives that describe these portents. The formal nature of the narrative is suggested through the presence of stylized or poetic phrases that rely heavily upon rhyme (*Haeapuni... hayala, Mogorowadapuni... momogo, Daliwali ... dai* etc.), suggesting a degree of determination by aesthetic considerations (Goldman 1983:119), but the markers of decline carry at least the impression of being specific in terms of content and location. Omens of the degrading environment, such as the appearance of poor-soil weeds and grasses on the swamps, are clearly posted, as are the corresponding signs of a decline in society (Frankel 1986:24).

32. In an unusual metaphor, an older Haeapugua man suggested to me that *mana* and *malu* are to humans as fuel is to a car and as batteries are to a torch: if he were to tell all of his *mana*, he too would "run down" (Maiya-Alua, 26.9.89, Interview Notes).
33. Despite the wide distribution across the Highlands of a belief in entropy, this relation of entropy to specific portents of the world's end appears to be restricted to the Huli, Duna, Ipili-Paiela and some of the Mountain Ok communities such as the Bimin (Poole 1986) and Telefol, for whom Jorgensen (1981:237) describes portents such as the twenty-seventh rebuilding of the Telefolip spirit house.

One of the more interesting features of this discourse of entropy is the relationship that is implied between "grease" (*ibane*) and the very root of the earth (*dindi pongone*), in which the latter is regarded, in some sense, as "pure" *ibane*, the ultimate source of all fertility:

> Before, everything - pigs, sweet potato, taro, greens and bananas - was bigger. The source of this was beneath the ground. It was Python (*puya*), Worm (*ngoe*), Cane (*gewa*) and Water (*iba*) [i.e. the root of the earth (*dindi pongone*)]. Above these, and because of [literally "from"] these, people and crops grew well. Now everything is bad because Python is stricken, Worm has grown old and Cane has rotted through. Maybe this is why things are bad.
>
> Pudaya, 3.11.92, 92/4B:158-198

Disruption of the root of the earth intervenes directly in the flow of *ibane* within this fertile core of Huli sacred geography. The oil and gas being removed by British Petroleum from the Hides well to the south of Tari (R.Jackson 1991, Ballard 1992c) has recently been reinterpreted as the *ibane* of *dindi pongone*, in such a way as to confirm the association between entropy and desiccation[34]:

> When they take out all of the gas, water will enter the area vacated by the gas and the land will become dry, crops will fail and the soil will turn to dust. The earth will be destroyed, coffee and trees will all wither and die and the land will become as cold and dry as dust.
>
> Pudaya, 21.10.92, 92/1A:135-154

The perceived social and environmental effects on the Tari region of the minerals boom of the late 1980s and early 1990s are the most recent in a long chain of events which Huli have interpreted, in the light of this doctrine of entropy, as presaging the imminent arrival of the world's end.

The pace of revelation of these portents is felt to have accelerated during the course of this century. Events that are cited include an apparent rise in the frequency and severity of famines, particularly during the first half of the century when failures in food supply presumably had a greater impact on a steadily growing population settled increasingly in more marginal environments; note, however, that this perception is contradicted by most observations made on the impact of recent major climatic events, whose effects have been considerably reduced by introduced crops and foodstuffs. The spate of epidemics of influenza, pneumonia, dysentery and malaria amongst humans

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34. The extensive reinterpretation of these narratives since contact and the introduction of Christianity is a topic that would itself require a thesis; preliminary statements include those by Frankel (1986:30-37) on the role conceived for the Damene Cultural Centre at Tari and on Huli attitudes towards Christianity, by Clark (1993) on the incorporation of gold in Huli mythopoeia and by myself (Ballard 1992c) on Huli perspectives on mineral exploration, evangelical missions and the Christian apocalypse.

and of anthrax among pigs that accompanied the contact period (Appendix B1, Table B24) is also regarded as proof of the gathering storm; Frankel (1986:24,27) notes that these epidemics were interpreted as the onslaught of a host of new, un-named *dama*, whose horrendous impact reflected the difficulties encountered in correctly identifying and negotiating with them. Chapter D1 seeks to link the proliferation of new cults during the first half of this century to the sense expressed by Huli of a loss of control over the process of entropy during the same period, an observation that reflected the apparent crescendo of famine, *mbingi* portents and outbreaks of new, less accessible and more virulent *dama*.

If entropy was, and in many respects still is, considered by Huli to be part of the condition of life, its consequences have been negotiable to some extent. Strict accordance with ancestral *mana* and observation of the associated *ilili* served to diminish or forestall the effects of entropy and maintained order in the world, a function now largely assumed by Christianity. While the significance of tabu restrictions in the maintenance (or perhaps contest over the meaning) of order has been widely noted elsewhere in the Highlands region (Jorgensen 1981, Biersack 1987, G.Jackson 1991), the degree of control over fertility which Huli men conceive for themselves has extended historically to the possibility of causing a total renewal and replenishment of the earth's vitality through the provocation of *mbingi* (Glasse 1963:271). The role of *dindi gamu* rituals in this project is the topic of the following section.

B5.5 *Dindi Gamu*: Ritual and Fertility

I hope to have demonstrated that, for Huli people, the sight of *dangi* (Imperata cylindrica) grass growing across the swampy wetlands at Haeapugua, or of the encroaching spread of gravel along the length of the Tereba river within Haeapugua, has a far greater significance than the simple inference of a loss of wetland moisture or of erosion in the catchment headwaters[35]. Huli perceptions of entropy, which extend to all aspects of their lives including such "mundane" or "pragmatic" areas as subsistence and settlement, were formerly co-ordinated through the practice of ritual. Indeed, it is possible to view most Huli rituals, particularly those at a more inclusive level, as having been concerned primarily with the negotiation of fertility. Given the pervasive nature of beliefs about fertility, it is difficult to identify boundaries in daily life between ritual and profane practices: how, for instance, should the act of planting a taro sett while reciting a *gamu* spell be designated? Instead, there appears to have been a range in the scale of practices designed to influence the balance between fertility and entropy, from individual acts such as the planting *gamu* above, through to what, for convenience, are

35. Here I paraphrase an observation made by Jorgensen (1981:240) on the sight of grass overrunning a Telefol village plaza.

designated here as rituals. These rituals varied in the scale of their significance, from rites performed minimally on behalf of coresident communities by ritual specialists representing specific patrilines, through to the *dindi gamu* rituals, which were of regional or universal significance and were co-ordinated by ritual leaders at major *gebeanda* ritual sites.

Gamu spells, 'verbal formulae that mediate between an actor's aims or purposes and their attainment' (Goldman 1983:39), range from short pairs of phrases uttered, for example, to hasten tedious garden work, through to the highly complex and secretive knowledge of *dindi gamu*, held by a handful of individual men, those ritual leaders at the major ritual sites, known as *dindi pongoyi* ("holders of [the knowledge of] the root of the earth")[36]. In each case, *gamu* operate as keys that unlock and initiate processes outlined within the structure of *mana*, leading towards a desired outcome[37]. For every *mana*, there are *gamu*, and where the appropriate *mana* is felt to be complete and accurate, the efficacy of *gamu* hinges upon its correct verbalization, reflecting the importance attached by Huli to the potency of language (Glasse 1965:39, Goldman 1983:281). At the most basic level, the formulae and corresponding knowledge of *gamu* relating to such goals as increasing the size of crops, restoring vitality to the body or hair and attracting partners or preventing their becoming attracted to others, are exchanged between individuals. These *gamu* are then recited as required, usually out of earshot of others to prevent "theft". One example of such *gamu* addresses the need for rain during a short dry spell[38]:

> *puya te*
> Fall like the *puya* python
> *daria te*
> Fall like the *daria* snake
> *nogombi te*
> Fall like the *nogombi* snake
> *dalu te*
> Fall as heavy rain
> *Gu Tagali muni ngo*
> For I, the Tagali river, am now sand
> *Himuni ngo*
> I am dust
> *waruni ngo*
> I am mud
> *pandani ngo*
> I am covered with dry leaves
> *u la*

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36. Frankel (1986:92) comments usefully on the scope for confusion in translating the term *gamu*: 'Spells are referred to as *gamu*, but the meaning of *gamu* is wider than this, for it may also refer to the ritual of which the spell is but a part. One means of distinguishing the spell from the whole ritual is by referring to the spell as *gamugamu*'.
37. Goldman (1983:39-41) provides a detailed linguistic analysis of Huli *gamu*.
38. This text was described to me as a *gamu* though L.Goldman (pers.comm.) suggests that it is structurally more similar to *bi mo* songs than to conventional *gamu* formats.

Cry *u* [as you fall]
e la
Cry *e* [as you fall]

Here, the rain is directly addressed through its *kai* or praise identity as a series of snakes, in reference to an association between snakes, *iba* (water or rain) and fertility noted earlier and further considered below[39]. But the potency of such *gamu* is a function solely of their accurate reproduction and not of any intervening or mediating agent. These "personal" *gamu* are still widely used and exchanged amongst Huli.

Gamu of a different nature and function, distinguished here as "corporate" *gamu*, were formerly deployed within the context of "public" ritual performances. These "corporate" *gamu* are now known only by a scattered and rapidly diminishing number of former ritual specialists who possess and formerly performed these *gamu* on behalf of groups of people, ranging from individual families to sub-clans, clans and phratries. *Gebe* rites were typical of ritual at this scale; these were commonly performed at minor *gebeanda* ritual sites and directed explicitly towards ancestors (*gebe*) whose antiquity varied with the size of the supplicant group (the larger the group, the more distant the common apical ancestor invoked). Usually, these rituals were performed as a response to a calamity affecting individuals within the group, or the group as a whole, such as an unexplained death, a decline in the yield of the group's crops, diseases amongst humans and pigs, or war. While the exchange of "personal" *gamu* was usually accompanied by minor payments between individuals, the performance of rituals such as *gebe* involved both payment in valuables like shell, ochre and pigs to the performing specialist, the *gebeali* ("ancestor-man") or *gamuyi* ("gamu-holder") and the supply of oblations in the form of pigs to the *gebe*. Further details of *gebe* rituals and their attendant transactions are provided in D1.3. My intention here is to sketch the relationship between these smaller-scale attempts to influence fertility and the altogether larger project of *dindi gamu* in which the structure of fertility beliefs was played out on a grander scale.

The distribution of *gebeanda* noted in B2.6, in which each named sub-clan was ideally associated with its own unique *gebeanda* but also sponsored and attended performances at a single clan *gebeanda*, was matched by the performance of rituals at increasingly higher levels of corporate inclusion, and requiring increasingly larger payments. Phratries, in turn, performed *gebe* rituals at *gebeanda* held in common by all of the member clans; in a distinct but lexically unmarked rank above these, there were the *gebeanda* associated with *dindi pongone* (which I designate here as *dindi pongone gebeanda*). The historic use of an ascending sequence of ritual sites by Tani clan

39. Appendix B11 documents some of the *gamu* that address specific crops; *gamu* that focus on interpersonal relationships and personal attributes have been extensively documented by Goldman (1983), Frankel (1986) and Timmer (1993).

illustrates this hierarchy of ritual sites and performances: in 1951, during the major war between Tani and Tigua clans that was ultimately interrupted by administration patrols in the following year, Tigua appeared to have the upper hand, with many Tani and their allies wounded. Tani performed rituals initially at Birimanda, the *gebeanda* common to Tani and the related clans of their phratry, but a lack of any notable improvement in their position led them to sponsor a ritual performance at the *dindi pongone gebeanda* at Gelote. A Tani delegation, with numerous pigs, crossed the Tagali river, gave the pigs to the officiating Dagabua *gebeali* and returned to enjoy a series of notable victories over Tigua.

These *dindi pongone gebeanda* were also the sites of rituals of universal significance: the *dindi gamu*, or earth rituals. Calamities on a regional, or on what was perceived to be a universal, scale were addressed through *dindi gamu* at the most important *gebeanda* within each basin. The inspiration for performances of *dindi gamu* included events such as the major famines, earthquakes, epidemics and the largest wars, events that were symptomatic of entropic decline on a universal scale:

> *Dindi gamu* was performed for wars, which would then end; for famines, which would then finish; and for dysentery epidemics (*ti darama*), which then ended.
>
> Pali-Dagibe, 9.8.91, 91/13A:0-93

> We did *dindi gamu* when the ground became bad (*ko hayadagola howa*); when the sweet potato became poor; for the pig coughing epidemic (*ke kenekene*); when people died of pneumonia or influenza (*homama*). *Gamu* for the earth (*dindi gamu*) were said and offerings (*pupu*) were made for this.
>
> Dali-Urulu, 27.3.91, 1991/3B:0-49

There was thus no "natural" cyclic pattern evident in the conduct of *dindi gamu*, but rather a chronologically random and irregular sequence of responses to specific events. Strong opposition from the missions during the 1950s saw the abandonment during the 1960s of the performance of all corporate ritual in most Huli communities. At most of the *dindi pongone gebeanda* in the central Huli basins, the last performances of *dindi gamu* appear to have been conducted during the 1940s, in the aftermath of the 1941/42 famines and the epidemics of 1944/45; at the more isolated Tuandaga ritual site, *dindi gamu* was most recently performed during 1972 in response to the frosts of that year.

The focus of *dindi gamu* performances, the structure for which they operated as a key, was *dindi pongone*, the root of the earth (B2.6), and an appreciation of the substances that constituted *dindi pongone* is thus critical to an understanding of Huli fertility beliefs. Of the various components of *dindi pongone*, the single element that stands on occasion for the whole is the python, *puya*; there is a sense in which the other elements such as *tole* stone and *gewa* cane serve primarily to bind (Goldman 1983:117-8), contain or shield *puya* as the core element[40]. Pythons and snakes in general, as we have already seen, are potent symbols of immortality, closely identified with the fertile substance of *iba* ("water, rain") and with the appearance of rainbows[41]. The *puya* of *dindi pongone* is also described in terms of fluid: the sacred Tade and Girabo rivers, which conceptually run upstream along the route of *dindi pongone*, are manifestations of *puya*. *Puya*, as *iba* or *ibane*, is the fertile core of *dindi pongone* and, by extension, of Huli sacred geography and of the Huli universe, a contention that is supported by the role that mineral oil seeps play in *dindi gamu* and in *dindi pongone*.

Seeps of mineral oil (*mbagua yole*) are found in numerous locations within Huli territory. The best known of these, prior to contact, were the seeps in the Lebani valley controlled by Garua, Ligabi and Humiya clans (Figure B10). Origin myths for these seeps relate to a Lebani woman married to a man from Dagabua, the clan that controlled the *dindi pongone gebeanda* at Gelote. In an illuminating event, Dagabua ritual leaders visiting the Lebani seeps early this century proclaimed the oil to be associated with *puya*, a claim repeated recently by their successor: 'a man, *wai puya* [*wai* being the *kai* honorific prefix for *puya*] himself, is at the real base of this, where the oil comes out' (Yaliduma-Dai, 11.4.91, 91/5A:351-364). These and other oil seeps are identified as manifestations of *dindi pongone* and most of the *dindi pongone gebeanda* are located close to seeps[42]. It is possible to speculate that the presence of oil seeps or sites of solfataric activity has historically determined the incorporation of clan-specific *gebeanda* within the network of *dindi pongone*. Thus the *gebeanda* at Bebealia Puni, itself an impressive natural tunnel into which the river Dogayu descends, is accompanied by seeps of oil, which was collected and lit at the *gebeanda* in a rite known as *uru wagia hale* [*uru wagia*: *kai* prefix; *hale*: torch][43]; an oil exploration base camp, now abandoned, had been established downstream of Bebealia Puni to prospect

40. The *gewa* cane of *dindi pongone* appears to refer to the binding function of *gewa* cane belts worn by men, in the sense that it binds *puya*, and *gewa* and *puya* jointly are held to bind the land together (Hiluwa-Irugua, 25.8.91, 91/18B:46-81). In light of the statement by the *dindi pongoyi* at Bebealia Puni *gebeanda*, that '*Gebeali* is *gewa*, *dindi pongone* is *puya*' (Hiluwa-Irugua, 25.8.91, 91/18B:0-24), a possible interpretation of the relationship between *puya* and *gewa* would reflect the fencing and domesticating function of male ancestors (*gebeali*) in Huli mythology, where *gewa* binds, encloses, and "domesticates" or harnesses the potential of the fertile root of the earth, *puya*.

41. The association between snakes and water is repeated in the lexicon of the *tege* ritual (*tege bi*) in which *puya* substitutes as the term for water (*iba*) (Goldman 1983:257), and in the use of *puya* as a *hege* swear word in response to requests for water (Goldman 1983:266). Brumbaugh (1987) has made the case for an explicit association in Mountain Ok Feranmin thought between the underground python, Magalim, rain and rainbows.

42. Oil seeps are also incorporated within the sacred geographies of the neighbouring Wola (Sillitoe 1993a:179) and the Bimin (Poole 1986); Bimin identification of the oil as the "semen" of the ancestress Afek and relation of the oil to sacred sites linked by underground passages bears a particularly close resemblance to *dindi pongone*.

43. 'The gas they have now found at Gigira [the British Petroleum Hides gas well] is *uru wagia hale*' (Hiluwa-Irugua, 25.8.91, 91/18A:373ff.).

the source of this seep. An oil seep has also been identified at the Tuandaga *gebeanda* itself (Rogerson 1981:2.2) and I saw and lit a smaller gas and oil seep some four kilometres to the southeast of the Tuandaga in 1991[44]. Located near to, and associated with Dabereanda *gebeanda* in the Tari basin, there is the solfataric spring of Yage Ibi Iba ("Yage-salt-water"), said to smell 'like the exhaust of a generator' (Pali-Dagiabu 10.8.91, 91/13B:358-524) and visited and described by Allen and Wood (1980). Similarly, Tai Yundiga *gebeanda* at Mount Kare consists of two gas seeps (Davies 1980).

The properties of the mineral oil at these sites are invested with considerable significance and reflect a feature of *dindi pongone* that has not previously been documented. The dangerous propensity of the oil to convert into fire draws on its association with the sun, Ni, who enters the earth each night at Mt Mbiduba, to the west of the Lebani basin, and returns under the ground along the route of *dindi pongone*, to surface each morning in the east behind Ambua[45]:

> He crosses *gewa* and *puya* [i.e. the root of the earth] as a bridge. At night he goes across this bridge, by day he comes out amongst us here. At night when we sleep he goes inside over there at Mbiduba and goes burning along [*dama nana pora*] beneath the ground [*dindigoha*].
>
> Ngoari-Mandiga, 1.8.91, 91/14A:333-363

In other accounts, this association is extended to identify the sun, Ni, as *puya*:

> By day he [Ni] is a man, by night he is *puya*.
>
> Hubi-Morali, 4.11.92, 92/5B:0-186

Dindi pongone is thus revealed as a nocturnal and subterranean parallel to the "bridge" (*ni domo*: "sun-crossing" or *da togo*: "sky-bridge") along which the sun travels by day[46]. *Ni domo* is also the term for rainbow, completing the circle of connection between *puya*, *ibane* and Ni, between pythons, water or fertile substance and the sun. It is this unstable and potentially dangerous quality of *dindi pongone* as a subterranean

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44. This "discovery" of the connection between oil seeps and *dindi pongone gebeanda* was made jointly with Akii Tumu of the Enga Cultural Centre and Polly Wiessner during discussions at Tari and a visit to the Tuandaga site in 1991. Their research into the Enga end of the *dindi pongone* network will be published shortly (Wiessner and Tumu in prep.).
45. As a speculative aside, Huli use of the term "*ni*" as an adverb meaning "down there" may reflect the cosmological implications of a sun "*Ni*" which moves "down there" as much as it does "up there". Biersack (1991:259) describes a similar conception of the sun's movement by night held by neighbouring Paiela-speakers: 'At dawn he [the sun] "comes outside", brightening the outer ground; but at dusk he "goes inside", journeying to the underworld and bringing daylight to the dead'.
46. A further illustration of the identity of the substance of *dindi pongone* as fire is the observation made of the lake, Iba Habodaya, in Haeapugua swamp at Dobani (Figure C4): 'Iba Habodaya has a stone beneath it which is *dindi pongone*. If the *dama* [i.e. *puya*] says "Give me an axe", throw it an axe to drain the water away. But if it says "Give me fire", do not give it fire, for fire will erupt from *dindi pongone*' (Pudaya, 31.10.92, Interview notes).

"night's sun" that strengthens the strict interdictions on activity in the vicinity of the route of *dindi pongone*. As recently as 1991, older men at Haeapugua prohibited the construction of a new house in a particular garden beneath which *dindi pongone* was felt to pass; the digging of ditches or gardens that intersected the route was also forbidden:

> It is said that if you cut [*gandulariyagua*] where *puya* goes, blood [*darama*] will come out. Women are not to make mounded gardens, men are not to dig ditches or to clear swidden gardens... or the good things [that flow from *puya*] would be cut.
> Timothy, 17.4.91, 91/6A:171-253

The clear implication, underscored by the threat of a fiery apocalypse, was that disruption of *dindi pongone* threatened the passage of the sun and the flow of the complex of nutritive substances associated with *puya*, and thus the structure of the universe[47].

The need for *dindi gamu* rituals was a consequence of the process of decline in *puya* itself, evident to ritual specialists observing the conventional markers of entropy. A signal feature of *dindi gamu* performances was the application of fluid substances such as oil, blood or water to *dindi pongone* in an act of replenishment. Bamboo tubes with oil were buried in the mud pools surrounding the gas leaks at Tai Yundiga; at Gelote, oil from the Lebani sources was poured out within the limestone cave covering *dindi pongone*; at Hari Hibira, 'the central feature was a cave in which a pool of water was said to cover the liane of the root of the earth. As the fertility of the earth declines, so the water level in this pool falls. It can only be replenished by the performance of *dindi gamu*' (Frankel 1986:19-20); at both Bebenite and Gelote, a specific *dindi gamu* rite known as *dindi bayabaya* involved the offering of blood, again as a means of reinvigorating *dindi pongone*. Swamps, as cores of fertile substance, are thus described by a Haeapugua resident as 'breasts which give milk to people and to pigs, but which need to be sustained by being "fed" with pork' (Ngoari-Edai, 1991, Tani Notebook).

If *dindi gamu* was concerned at one level with the incremental restoration of vitality to *dindi pongone* and thus to the universe in general, it also harboured a more ambitious and potentially dangerous project: the possibility of provoking a recurrence

47. The sacred site known to the local Onabasulu of the Papuan Plateau as Malaiya (Figure B10), which features in the Huli conception of *dindi pongone*, is also described in terms of a fiery apocalypse: '"Malaiya," Onabasulu people told me, was not a place but a fire that burns eternally by the water at Dobanifofa... it is important that it never go out - and that it never flare up. If the fire dies out, it is believed, so all the fires in the world will extinguish, together with the sun, and the world will die. On the other hand, if the fire ever flares out of control, it will roar out over the plateau and burn up the world' (Schieffelin 1991:65). The conclusion might be drawn from this, the only documented description of the site, that the fire at Malaiya is a flare from a natural oil or gas seep.

of *mbingi*. The benefits of *mbingi*, of a "new earth" from the sky (Frankel 1986:32), and the dangers of an uncontrolled apocalypse brought on by breaches of *mbingi mana* and *ilili*, were equally evident. Success in past attempts is claimed: the *dindi pongoyi* Hubi-Morali (Plate 8) ascribed a past *mbingi* to the ritual actions of his ancestor, Hubi-Yabe (Appendix B10: Proof 6), but said that he himself decided during the 1941/42 *hina gari* not to attempt *mbingi*; one reason for his decision was the increasing difficulty of bringing *mbingi* about:

> Before, *mbingi* came often. Now there is little *mbingi* left, perhaps enough for once, but after that there will be no more *mbingi*.
> Hubi-Morali, 4.11.92, 92/5A:0-368

This is indeed a gloomy prospect, in which the means of restoring full health to the land are themselves in decline; but, as the context for this particular discussion made clear, Morali was referring also to the political difficulties of co-ordinating *dindi gamu* in the current climate of opinion fostered by the Christian missions. The specific histories of *dindi gamu* and other Huli rituals are taken up in D1.3.

In the course of providing a model of Huli society and its interactions with the landscape, I have identified entropy as a key theme or trope in Huli historicity, a notion of decline that has structured Huli perceptions of temporality and provided a telos, or trajectory for history. In the two Parts that follow, I seek to demonstrate the historical contingency of this model and to specify the history of its constitution by focussing on the history of wetland agriculture as an index to the history of the broader economy.

PART C

HAEAPUGUA: A LANDSCAPE HISTORY

What once covered the earth is no longer above but beneath it: a mere excursion does not suffice for a visit to the dead city: excavation is necessary also. But we shall see how certain fugitive and fortuitous impressions carry us back even more effectively to the past, with a more delicate precision, with a more light-winged, more immaterial, more headlong, more unerring, more immortal flight, than these organic dislocations.

Proust, 'The Guermantes Way', 1983 (1954), vol.II, p.90.

CHAPTER C1 - THE HAEAPUGUA BASIN

C1.1 A Wetland Focus

In this Part, I attempt to document in detail the history of land use in the Haeapugua basin, with a particular emphasis on the use of the wetlands at the centre of the basin. There are several grounds for this emphasis. The first of these has to do with the excellent quality of wetlands as a form of open-site sediment trap; unlike dryland slopes which, as Gorecki (1982) discovered in his study of the dryland margins of Kuk swamp, are subject to progressive erosion and deflation and thus to a tendency for archaeological traces to be effaced over time, wetlands are sites of material deposition and accretion. In ideal circumstances, such as those encountered across much of the Kuk wetlands, this produces an archaeological record whose formation is accompanied by depositional processes that clearly separate, and allow for distinction between, successive phases of use.

Secondly, within the altitudinal tolerances of the major staples, wetlands are also a focus for intensive subsistence activity throughout the New Guinea Highlands, generally requiring relatively high inputs of labour (at least initially) in return for relatively high yields. As such, wetlands have been approached as potential barometers of changes in society and in subsistence practices on the adjacent drylands, though the nature of the link between dryland and wetland use cannot be assumed to be constant across either time or space and requires qualification according to local circumstance.

Thirdly, an emphasis on wetlands at Haeapugua provides the basis for direct formal comparison with other wetland sites such as Kuk, which constitute the bulk of the open-site archaeological record for the Highlands region (see A2.2).

Finally, a focus on the Haeapugua wetlands finds a parallel in Huli thought, in which wetlands figure prominently as centres of fertility and fertile substance within a sacred and moral geography (Chapter B5). The history of Huli use of the wetlands is thus sensitive not only to broader economic conditions but also to changes in the fundamental structure of Huli engagement with their cosmos.

The brief accounts which follow of the historical formation of the Haeapugua basin and wetlands (C1.2) and of the model proposed by Wood for the history of land use in the area (C1.3) set the parameters for the rest of Part C. In Chapter C2, the oral accounts which describe the recent history of wetland use at Haeapugua are set within the material framework of a mapped field system. Chapter C3 then describes the results of archaeological and palaeoenvironmental enquiry into the regional contexts and local circumstances of land use history at Haeapugua, concluding with a summary account of that history that meshes the oral historical, archaeological and palaeoenvironmental evidence. Finally, in Chapter C4, the problem of explaining why wetlands have been used in particular ways at particular times is addressed.

C1.2 The Formation of the Haeapugua Basin

Though high limestone ridgelines to the northeast and west and volcanic hills to the south mark the perimeters of the Haeapugua basin, its defining features, as they are for all Huli basins, are the wetlands, which extend over approximately 17 km^2 in the centre of the basin floor (Plates 9, 13, 14, 16). Settlement of the basin is concentrated along the wetland margins, with more dispersed settlement of the lower reaches of the surrounding slopes. Figure C1 illustrates the basic topography of the basin, identifying the key features of the contemporary landscape and locating place names that play a critical role in the following chapters.

The steep ridges that hem in the Haeapuguga basin along its northeast and southwest margins reflect the presence of basal Miocene limestones which have been deformed by uplift and compression to produce a parallel series of anticlinal ridges running from northwest to southeast (Hill 1991). The extinct volcanic cone of Mt Yumu in the south is the presumed origin of a lava flow covering much of the southern part of the basin; this flow, dated to approximately 850 000 BP, is held to have dammed the Tagali river in the southwestern corner of the basin, leading to the formation of a palaeo-lake (Williams et al. 1972). Subsequent infilling of this palaeo-lake by successive tephra falls and periods of organic stabilisation and peat formation has produced a sequence of interlain layers of reworked tephra and heavy organic materials that extends from a minimum depth of 9 m in the swamp to more than 15 m above the present swamp surface. The perched position of these upper deposits is presumed to reflect the final breach of the Yumu flow dam by the Tagali river at Hewai falls, leading to erosion of the infill deposits and a lowering of the swamp surface to its present position (Williams et al. 1972).

The infilling tephras, which blanket the basin generally, are thought to derive from a variety of different volcanic centres, including recently active (0.2 - 0.3 myr BP) sources such as Mt Giluwe and Mt Hagen to the east and possibly Mt Bosavi to the south; local sources such as Mt Haliago, Mt Ambua, Mt Ne and Mt Gereba may also have contributed to the infill, as potassium-argon samples from volcanic rocks at Ambua date to periods as recent as 492 000 BP (Löffler et al. 1980). The most signficant of these major tephra falls for my purposes is the most recent, tentatively identified by Pain and Blong (1976) and Wood (1984) as Tomba tephra from Mt Hagen, which is dated in excess of 50 000 BP (Haberle 1993:129-130). Thus the presumed Tomba tephra caps the bulk of the pre-human landscape and serves as a useful chronological marker, distinguishing all of the known finds of extinct megafauna in the Tari region (Williams et al. 1972, Flannery and Plane 1986, Rich et al. 1988, Menzies and Ballard 1994), for example, as pre-human. Tomba tephra also provides the basic parent material for the development of most of the surficial soils in the Haeapugua basin (Wood 1984).

The principal drainage channel for the basin is the Tagali river, which drains a catchment over 1000 km² in area above Haeapugua. The Tagali river enters the basin from the north, cutting through a series of low limestone hills (identified here as the Munima hills, though there is no unitary local designation for them) before meandering between natural levees across the Haeapugua swamp and exiting dramatically to the south through the Hewai falls. The fact that the current course of the Tagali appears to transect a number of closed karstic depressions, evident as ponds in the north of the basin, suggests a process of channel migration post-dating the karstic development (Williams et al. 1972:345). Another volcanic damming event in the north of the basin has been proposed to account for lacustrine terrace deposits high above the Tagali bridge area (Williams et al. 1972). The Tagali appears subsequently to have breached the low Munima hills, creating a series of tunnel passages through the limestone, before developing preferentially along its current course; the former tunnel passages, which include the ritual cave sites of Kamianda and Kalate (Appendix C10: LOT site), are now at least 6 m above the level of the river.

The Tagali river also plays a dominant role in the hydrology of the perennial Haeapugua wetlands[1]. The hydrology of tropical riverine wetlands is poorly understood, but the general character of the Haeapugua wetlands can be broadly described as a perfluent basin system in which water recharge is predominantly telluric (and thus chemically minerotrophic) and swamp production is soligenous (Gore 1983, Ingram 1983); that is, the water content of the wetlands is recharged largely through surface and subsurface flow from adjacent mineral soils and parent rocks, and the chemical and production characteristics of the wetlands thus reflect the nature of the

1. Wetland ecologists express a preference for the term "mire" as a generic label for the broad range of different waterlogged features. Amongst mires, two basic types are distinguished: fens, which depend substantially upon telluric recharge (inflow from adjacent mineral bodies); and bogs which are raised mires recharged meteorically (largely through direct precipitation) (Gore 1983, Ingram 1983). Haeapugua, under this system, would thus be classed as a fen. My purpose in this thesis, however, is largely to oppose dryland and wetland components of Huli subsistence practices, rather than compare mire types. Haeapugua and the other mires of the Tari region are thus described here either as "swamps" (a perfectly acceptable synonym for "mires") or, where the contrast with drylands is being stressed, as "wetlands".

surrounding landscape. The relative contributions to the Haeapugua wetlands of the Tagali river and its Haeapugua tributaries, the largest of which on the eastern side are the Garai, Tereba, Hagia and Haeawi rivers, have not been determined; it is possible, however, on the basis of superficial observations and the testimony of local landowners, to suggest that the contribution of the Tagali river is restricted largely to flood events, and that the continuous process of wetland recharge is dominated by the contribution of the local Haeapugua catchment. The critical role played by the balance between these two sources in the history of wetland use at Haeapugua is further considered in Chapter C4.

The vegetation and stratigraphy of the swamp have been described most recently by Haberle (1993). The swamp surface contains a limited range of grass and sedge species, dominated by Leersia hexandra. The uniformity of this Leersia swamp cover, particularly in areas of the swamp closest to the Tagali river, presumably reflects uniform peat soil characteristics promoted by sheet flow during flood events (Gosselink and Turner 1978:66). The swamp sediments consist of a sequence, greater than 9 m in depth, of peats, layers of massive woody remains representing drowned swamp forests, laminated calcareous clays and lake muds (Haberle 1993). The historical genesis of this sequence is discussed further in Chapter C3.

Huli accounts of the formation of the wetlands at Haeapugua reflect general beliefs about the relationship between *dama* spirits and the constitution and maintenance of the landscape (see Chapters B2 and B5). The notion that the Tagali formerly followed a different course, cutting through the Munima hills and flowing in a southeasterly direction along the base of the eastern limestone ridge before turning towards Hewai falls, is a common reference in a variety of different myths recounted widely in the basin[2]. These myths differ in detail, but agree that at an unspecified point during the "time of rotten wood", when only *dama* lived in the land, the Ilu and Kaibia hills on either side of Hewai falls blocked the passage of the Tagali. The river backflowed into the basin, covering it entirely and drowning its inhabitants (see Narratives B9 and C1). Ancestral *dama* spirits are said to have approached the *wane labo*, a female water spirit, resident at Hewai falls; different narrative versions tell how the *wane labo* either parted her legs to allow the Tagali to flow out, or struck the blocking mountains with her digging stick, freeing the river[3]. After this, all agree, the Tagali changed its course and where there had either been no channel at all, or only a

2. Two strands of this former course of the Tagali river in the Munima hills area are named as the rivers Kumuli and Yagali (Haea-Wabago (Poro *tene*), 7.11.90, Interview Notes).
3. This action of the *wane labo* created the subsequent ritual obligation to throw pork, axes and food into the Tagali river to assist the *wane labo* and ensure that the river remained free from blockage (see Section B2.2), rites that were regularly performed when floods threatened the basin.

small stream, the Tagali flowed, cutting brothers apart from one another and dividing the gardens of Miniba clan[4]. Other oral narratives describe a period when the Haeapugua wetlands were covered in a swamp forest of Pandanus and Dacrydium, but disagree as to the cause of the forest's disappearance, some citing the Tagali river flood and others clearance by humans of such antiquity that no genealogical links can be traced between them and the modern population[5].

C1.3 Wood's Model for the Evolution of Huli Land Use

In the absence of any relevant archaeological evidence, Wood (1984) has proposed a model for the evolution of land use in the Huli region and for the role of the wetlands in that history. As I sought to demonstrate in Part A and in Appendix A1, this form of speculation has an important role to play in the process of generating accounts of the past. Wood's model serves a critical function here, in that it represents a skilful and explicit application of the ideas employed to account for the history of land use at Kuk.

Wood's schematic representation of his model is reproduced here as Table C1. As at Kuk, the principal factor invoked in explaining the relative intensification of production in wetland and dryland environments is environmental degradation. In light of his demonstration of the resilience and sustained productivity of wetland soils in the Tari region (Wood 1984), wetlands emerge in Wood's Phases 1 and 2 as the natural sites of intensive production. Population pressure is not held to be directly responsible for wetland intensification, which is the consequence of an appreciation of variable yields from different environments, but is manifested in brief periods of dryland intensification, each doomed to fail under poor soil conditions. Only in Phase 3, with the advent of sweet potato with its tolerance of poor soils, are intensive techniques of production extended more permanently to dryland environments and the labour-intensive wetlands largely abandoned[6]. Finally, in Phase 4, from about the period of first contact, the trends of Phase 3 are in turn reversed, as dryland degradation and the effects of colonial pacification combine to encourage resettlement of the open wetland basin centres.

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4. The emergence of rivers which divide brother pairs is a stock theme in Huli mythology. An example from the Haeapugua basin is documented in Appendix C2.
5. The degree of correspondence between these myths and environmental conditions of the historic past described in Chapter C3 is intriguing, though there are no means of determining whether the myths represent a continuous narrative tradition extending back over 3000 years, or latter-day observation and speculation on the occurrence of swamp forest woods within the wetland stratigraphy.
6. 'Thus many of the environmental constraints on crop food production in dryland environments were relaxed with the sweet potato, and [dryland] intensification occurred' (Wood 1984:232); 'In wetland environments, the sweet potato probably had an opposite effect on intensification as people were no longer forced to use wetland soils for sustained cropping of taro, and could move out into the dryland environments' (1984:233).

Haeapugua emerges as an anomaly in Wood's discussion of his model where he notes that local residents insisted that the wetland centre was too wet to drain in earlier periods and 'that the first attempts at major swamp drainage were not made until about the time sweet potato was introduced' (1984, Vol.I:231). While elsewhere in the Tari region, wetland production was experiencing "disintensification", a major drainage network was initiated at Haeapugua. Wood advances the twin attractions of high sustainable yields and the scope for increased pig production on a mixture of swamp forage and sweet potato fodder to account for the situation at Haeapugua. In so doing, he matches Golson's explanatory shift at Kuk in suggesting that social demands on production led certain individuals or communities to invest in the initial labour inputs required for wetland production in return for high, sustained yields. In the remainder of this thesis I attempt to expand upon this model and to bring particular emphasis to bear on the relationship between population growth, "social" demands on production and wetland use.

CHAPTER C2 - WETLAND USE AT HAEAPUGUA

C2.1 Perspectives on Wetland Use

Tari is one of the few regions within Highland Papua New Guinea where wetland drainage has been practiced continuously over the period of contact[1]. This technological continuity is complemented by Huli oral traditions that recall changes in the social contexts for wetland use over the recent past. There is thus an exceptional opportunity to examine in considerable detail the relationship between those changes in wetland use that might be visible archaeologically and the broader social contexts within which decisions about wetland use have been made. This chapter employs a variety of different perspectives, including the results of previous research, aerial photography and both written and oral historical records, to describe the structure and recent history of wetland use in the Haeapugua basin.

Previous research into wetland use at Haeapugua consists of the studies by Powell (Powell with Harrison 1982) between 1970 and 1975, and by Wood (1984) between 1978 and 1980. Their descriptions of the practice of wetland agriculture have provided a baseline for my own field research and for the account of wetland technology given above (B4.4). However, other than Wood's attempt to correlate the antiquity of use of certain specific garden blocks with their soil characteristics, neither he nor Powell directly addressed the areal extent or history of the wetland drainage system.

The aerial photographic series commissioned in 1978 during the course of Wood's research and used by him and Allen to map parish boundaries and land use is a remarkable resource (Allen, Wood and Vail 1990 (Figure B13), Wood and Allen 1982), displaying at a scale of approximately 1:10 000 both the current field system at Haeapugua and evidence for an even more extensive network of abandoned drains. Appendix C1 documents the range of aerial photographic coverage of the Tari region, noting variations in scale, extent of coverage and quality. The ability not only to map the drainage network from aerial photographs but also to compare differences in use across a time series between 1959 and 1992 provides an important independent means of estimating rates of change in the landscape.

A further resource and, again, one not previously exploited to this extent, is the oral history of the Haeapugua basin. From both formal narratives and informal observations or interviews, a composite history of land ownership and use in the basin can be derived. This chapter is concerned largely with attempting to relate this history

1. The handful of other such regions, including the wetlands of the Kopiago, Kandepe and Marient basins, are all immediately adjacent to Huli territory (Figure A2).

of wetland use to the evidence of the aerial photography, using the two sets of information in concert to arrive at a broad model of changes in land use which might in turn serve to structure archaeological investigation of the same landscape and assist in the reconstruction of both short- and long-term histories of land use at Haeapugua.

A description of the structure of the field system at Haeapugua, visible as a network of dryland ditches and wetland drains, furnishes this study with a basic framework (C2.2). The historical analysis of this network opens with a brief review of changes to the landscape effected since 1952, for which photographic and documentary evidence is available to supplement the oral testimony of local residents in the basin (C2.3). There follows a general oral history of the basin which accounts for the historic movements and modern distribution of individual clans and for changes in the ownership of land (C2.4). This broad history then provides the basis for approaching the more specific oral history of wetland ownership and use (C2.5). In conjunction with a historical analysis of the field system, this oral historical record is subsequently employed to generate a model of sequential developments in the use of the Haeapugua wetlands (C2.6) which can be tested against, but also used to interpret, the archaeological evidence presented in Chapter C3.

C2.2 The Field System

The initial requirements of a landscape history are the establishment of some baseline against which change can be identified and a model of land use through which the reasons for change can be interpreted. As described in Chapter B4, the network of wetland drains and dryland ditches that covers the Huli landscape provides a relatively stable set of features within which certain changes in land use are clearly registered; this constitutes an ideal framework for analysis in which the units of land use employed strategically by historical agents correspond broadly to the units of archaeological or historical observation (Fleming 1979:121). Maps and a formal description of the visible ditch network within a limited area of Haeapugua, identified here as the "map study area", provide the basis for an historical analysis of local landscape change.

On aerial photographs (APs hereafter) from sorties at altitudes of 25 000' or less, the network of main *gana* ditches is clearly visible as a fine lattice of polygonal blocks; Plates 10, 11 and 12 reproduce frames from the 1978 Mapmakers sortie, taken from an altitude of 9950', showing parts of the Haeapugua wetlands in the Dobani and Tani (Taibaanda) parish areas. Dryland ditches tend to be marked by the lines of trees planted along the ditch walls. In the more densely occupied areas, with longer histories of continuous settlement and smaller garden blocks, tree cover often obscures the precise positions of ditches which must be mapped on the ground. The real value of

APs for mapping emerges in the wetlands, where abandoned *iba puni* drainage ditches are covered by swamp grasses and virtually invisible at ground level. Soil moisture variations promote this grassy cover differentially, providing clear AP signatures visible in Plate 12 as faint lines, darker in shade than the surrounding swamp, that permit a distinction between the respective surfaces of former gardens and drains.

The method employed in producing the ditch network map (Figure C2, Figure C3) consisted of transcribing the AP-visible network from the 1978 Mapmakers sortie onto tracing paper (in 1989) or clear plastic overlays (in 1990-1991) and then traversing each of the defined blocks on foot to ground-check the transcription. Problems raised in the course of the ground survey were referred back to the APs and then rechecked on the ground. Most of the area shown in Figure C2 was ground-checked on at least three different occasions (twice in 1989 and once during 1990-91). A limited area in the very centre of the swamp proved inaccessible by foot and has been mapped solely on the basis of the AP evidence.

The mapping study focused from the outset on the wetlands along the eastern bank of the Tagali on the grounds that these eastern wetlands, including the major Haeapugua swamp but also a number of smaller swamps such as Lambarepugua and Abagopugua that were formerly linked to Haeapugua, offered a much larger area for analysis (Figure C4)[2]. Within the eastern portion of the basin, emphasis was placed on mapping the wetlands and then extending coverage as far as possible onto dry land. The map study area thus extends between the slopes of Lagale Mandi ridge to the northeast and the Tagali river along the southwest, but corresponds to no particular environmental or political boundaries along its northwestern and southeastern margins; Figure C5 shows those parish boundaries represented within the map study area. Within this limited mapping study area, the network of ditches and drains is almost unbroken, extending over all environments and onto the surrounding ridges at slopes of up to 15 degrees. The most significant variation in the form of the ditch/drain network occurs between wetland and dryland environments; the following account provides a brief formal description of the nature of these differences. There is, of course, no clear or permanent boundary between wetland and dryland at Haeapugua; reclaimed wetland blocks consolidate to become dryland over time and revert to wetland upon abandonment. Nevertheless, a working definition of the wetland boundary is employed here, based on the maximum extent of the Haeapugua wetlands over the period between

2. This selection of the larger area was not, in retrospect, an advantage. I suspect that a similar study of the smaller Emepugua wetlands on the western, Pureni side of the Haeapugua basin would have revealed much the same information at a considerably smaller cost in time and energy; land ownership was mapped for Emepugua and also for the wetlands of the Dalipugua, Mogoropugua and Lebani basins, though in less detail than for Haeapugua.

1959 and 1992 (described in C2.3).

The variation in size of the garden areas (distinguished here as "blocks") defined by *gana* ditches and drains is often a good indication of the nature of the hydrological environment: as a general rule, the larger the block at Haeapugua, the wetter the soil conditions. This contravenes expectations generated in studies of planned or massively co-ordinated wetland drainage systems (McGrigor 1973:3, L.Johnson 1986:151-2), where the "tightness" of the ditch grid is held to reflect the requirements of drainage, with more closely spaced drains laid out in the wettest areas. The Huli practice of ditching in both dryland and wetland environments produces an overall pattern in which block size is related instead to the antiquity of land use, where a greater degree of "infilling" of existing blocks with internal ditches reflects a longer period of use. In the Haeapugua wetlands, block size increases with increasing soil moisture; here, the relative ease of drainage tends to determine the frequency of reuse and subdivision, and those areas of the swamp that are most easily drained thus appear to have been used more frequently. Areas for the wetland blocks show a mean average of 6456 m^2 compared with the mean of 3917 m^2 for dryland blocks, though the respective median class averages of 5000 m^2 for wetland and 4000 m^2 for dryland blocks, which compensate for the bias introduced by the massive blocks of the wetland centre near the Tagali river, give a more telling impression of the difference[3].

Block shape also appears to vary according to environment. Almost all of the wetland blocks are rectilinear and generally symmetrical in form, with angled rather than curved corners. This is in contrast with dryland blocks, which take a much wider variety of forms, being generally asymmetrical and often curvilinear. Blocks in the most densely infilled dryland areas appear as an amalgam of rectangular and "lobate" shapes forming clusters of truncated ovals.

Evidently, the shape of individual blocks is closely related to the overall alignment of the respective wetland and dryland field systems. The layout of the dryland blocks is essentially random, with no easily identifiable focus in their alignment. In contrast, the wetland blocks are clearly oriented along common axes in a formation identified by Fleming (1987, 1988) in his analysis of the Dartmoor reave field systems as "coaxial". In the Haeapugua wetlands, these common axes of orientation are the major *iba puni* drainage channels. Most other wetland drains run

3. These calculations use the block area measurements for the maximum extent of wetland and minimum extent of reclamation (Figure C15); mean averages taken from the areal measurements for the minimum extent of wetland and maximum extent of reclamation (Figure C16), which thus emphasize the characteristics of the wettest blocks, are still more extreme: 8617 m^2 for wetland and 4127 m^2 for dryland blocks.

either parallel or at right angles to these *iba puni*, creating a rectilinear grid pattern.

A simple hierarchy for the wetland drainage channels at Haeapugua can be generated along the lines of the distinctions made by Huli (see B4.4). The largest artificial drainage features are the *iba puni* drains excavated to channel the flow from existing streams and rivers, entering the swamp from the surrounding drylands, through the wetlands and out towards the Tagali river. These extensions of the natural drainage network are a necessary condition for use of the wetlands insofar as they control the diffusion of stream flow into the wetlands. However the largest of the major *iba puni*, such as the Garai and Tereba channels, may contribute little to the direct drainage of the wetlands. Many of the wetland drains that appear to articulate with the Tereba channel, for instance, are actually "blind" drains, separated from the Tereba by walls of earth and draining water away from the Tereba levee area into the surrounding wetlands where they articulate with minor *iba puni* channels; this prevents flooding by the Tereba of those gardens immediately adjacent to the channel.

No clear distinction is made by Huli between major and minor *iba puni* channels, but it is evident that only the largest *iba puni* actually articulate with the Tagali river; minor *iba puni* are thus those channels which serve as the principal means of drainage in a given area and as the dominant axes for the surrounding field system of drains, but which themselves flow into other, major *iba puni*.

Those smaller drains that feed into *iba puni* are *gana* ditches, the basic units of block definition. Almost all of the ground- and AP-visible *gana* and *iba puni* drains in the Haeapugua wetlands are shown in Figure C2. Where major and minor *iba puni* generally respect hydraulic gradients, running perpendicular to the dryland margin, *gana* drains run both parallel and perpendicular to the *iba puni*. The smallest form of wetland ditch, the *de gana* ditches which create internal divisions within blocks defined by *gana*, are not identified in Figure C2; the principal function of *de gana* is not to contribute to drainage so much as to mark out the ownership of plots, though they do serve to even out the level of the water-table within individual blocks. Figure C6 illustrates this drainage hierarchy.

A range of AP-visible features other than drains and ditches were also mapped and recorded on the ground within the mapping study area. These include the modern road network (shown in Figure C3), pre-contact walkways (*hariga*) and pig droveways (*nogo dugudugu*) (Figure C7, Figure C8), ritual sites such as ancestral sites (*gebeanda*) (Figure C18) and, for limited areas, house and pig hut locations (e.g. Figure C9).

C2.3 Post-Contact Change in the Landscape

Before attempting to reconstruct the longer pre-contact history of land use at Haeapugua, changes in the social and physical landscapes over the more recent and accessible post-contact period from 1952 to 1992 must be sketched. Although the earliest useful aerial coverage of Haeapugua dates only to 1959, government patrol reports and local eyewitness accounts of the period document the changes between 1952 and 1959 in some detail. The technique of "landscape stratigraphy" or "topographic analysis" (T.Williamson 1987) is also employed to identify the impact on the field system of the construction of a vehicular road network.

By 1959, when the first AP sortie over Haeapugua was undertaken, the basic vehicular road network was already in place[4]. By following a simple set of procedures employed by British landscape archaeologists (T.Williamson 1987, Fleming 1988), it is possible to "remove" the vehicular roads, account for their effects and reconstruct the 1952 field network virtually in its entirety. Landscape stratigraphy is founded upon a set of assumptions about the nature of field systems and particularly the details of field boundary articulation. Working from a known dated feature in a field system, such as a Roman road, the simple observation that field lines coeval with that feature tend to be laid out either parallel or perpendicular to the feature allows for the generation of a relative chronology of elements of the field system. Further, the 'imposition of a continuous linear feature upon an earlier system of land-division will produce irregularly and awkwardly shaped fields immediately adjacent to it, while over a wider area the layout of the landscape will have a separate coherence which proclaims its earlier and independent origin' (T.Williamson 1986:242).

This last point can very simply be demonstrated with reference to the vehicular road network at Haeapugua; Figures C3 and C2 illustrate the AP-visible field network with and without the vehicular roads, respectively. The reconstruction in Figure C2 of

4. Although the first motor vehicle in the Tari region was not imported until November 1955, when a dismantled landrover was carried from Wabag and reassembled at Tari (Crellin 1955/56), the administration embarked upon an ambitious road-building programme from as early as 1953, extending roads outwards in each direction from the new station at Tari. Government Patrol Officers, working through appointed Village Constables, surveyed, pegged and routinely patrolled the routes for the roads which were constructed in sections by local parish residents under a system of corvée labour. During 1955 and 1956, an unsealed vehicular road was built between Tari and the site of the Tagali river bridge, skirting the narrow eastern margin of the Haeapugua basin (Grafen 1955/56; Lang 1956/57). Completion of the Tagali river bridge late in 1957 linked the administration stations at Tari and Koroba. A series of "rest houses" for government patrols were established in the basin at Hiwanda and Halimbu and near the Tagali river bridge. The last element in the local road network, the extension from the Tari-Koroba road to the Hiwanda rest house and thence to the Tagali river, was completed in November 1957 (Hiatt 1957/58). A section of road linking Wenani parish in the northwestern corner of the map study area to the main Tari-Koroba highway was constructed during the 1980s but, lacking any bridges, has never been used by vehicles.

those field boundaries obscured by the vehicular road suggests that the road network appears to have had remarkably little effect on the pre-existing ditch and drain network. A sense of the ownership of the smallest stubs of land separated from the bulk of the block by a road is retained by local landowners; there are only a few cases of amalgamation of these stubs with adjacent blocks, generally where the same individual owns both blocks, or has paid the original owner of the stub for its incorporation and use.

There has been relatively little land alienation on the eastern side of the basin. The largest alienated areas are the community schools at Hiwanda and Walete, the E.C.P. mission station at Walete (begun in 1956 and opened in 1957), the Health Centres at Hiwanda and Walete and the Department of Primary Industry post at Hiwanda (Figure C3). The initial enthusiasm with which Haeapugua residents agreed to land alienation has cooled over time and efforts are being made to reclaim or renegotiate the value of most of the alienated blocks. Efforts on the part of the E.C.P. during the 1960s to alienate a large strip of land along the wetland margins south of Walete for use as an airstrip were strongly resisted, reflecting the particular value attached to this environmental zone. In every case, the process of land alienation followed existing block boundaries, linking two or more blocks where required; in these instances, the traces of the infilled intervening ditches are still evident both on the APs and on the ground. Land alienation has thus had little impact on the overall structure of the field system. The most significant effects have been the relocation of buildings and the rerouting of walking trackways to articulate with the vehicular roads. Buildings or areas related to most aspects of local business development, such as the locally owned trade stores, social clubs and market areas are thus located in blocks alongside the modern roads.

By comparing the evidence from a series of aerial sorties between 1959 and 1992 it is possible to gain some idea of the rate and extent of changes in land use and land division over a 33-year period. Of the aerial sorties listed in Appendix C1, the only sorties in which coverage is of sufficient detail and extent to identify individual blocks and specify their land use status are the 1959 Adastraphoto series, the 1972 Lampert/Golson obliques, the 1978 Mapmakers series and my 1992 obliques; to these are added the results of my 1989 ground surveys, in the course of which the basic forms of land use were mapped. Two results of particular interest emerge from this process of comparison: the first concerning the rate of addition of new ditches to the existing network and the second addressing the rate of change in the extent of wetland reclamation and use.

A striking observation is that there have been no instances identified, either on the APs or in the course of my ground surveys between 1989 and 1992, of perimeter ditches dug for gardens that did not consist of cleaning out or recutting earlier ditches. The only positively novel ditches have been those dug during the 1980s along the route of the road to Wenani, but these are hardly representative of ditching for conventional land use purposes. There is thus a considerable degree of conservatism in the Haeapugua field system, with change consisting largely of further elaboration of the ditch network through the further sub-division of existing block features, a process designated here as "infilling".

If the structure of the field system has basically remained unaltered since 1959, there is ample evidence for quite dramatic change in its use. The series of maps in Figures C10 to C14 illustrate the extent of wetland reclamation at the time of each of the five AP coverages identified above. Any block enclosed by *gana* ditches that were being maintained at the time of the AP coverage has been identified as dryland or wetland under use, irrespective of the status of the block surface in terms of the wetland fallow sequence described in B4.4.

Of the five AP coverages only three (those for 1959, 1978 and 1992) are complete, in the sense that they extend over the full map study area, and thus directly comparable. Table C2 lists the calculated extent of wetland area for these three coverages, showing that total wetland reclamation increased by approximately 1.2 km^2 between 1959 and 1978 and then declined by about 0.5 km^2 between 1978 and 1992. By incorporating the incomplete 1972 and 1989 coverages, composite images of the maximum and minimum extents of the Haeapugua wetlands between 1959 and 1992 can be derived; these are illustrated in Figures C15, C16 and C17[5]. The disparity between the total areas under wetland for the composite maximum and minimum extents is over 4 km^2; the cumulative maximum area of wetland reclaimed during the 33-year period between 1959 and 1992 has thus accounted for almost half of the calculated maximum wetland area for the same period of 9.35 km^2.

It should be noted that these minimum and maximum compilations are both "minimum" figures, given the lengths of time between each coverage and the incomplete nature of the 1972 and 1989 coverages. If the estimate of 10 years for the maximum life of most wetland garden blocks can be said to hold (calculated below in C2.5), the gaps in coverage of 11 years between 1978 and 1989, 13 years between 1959

5. The composite minimum extent of wetland reclamation shown in Figure C15 represents all land that has been under swamp at some point between 1959 and 1992. The composite maximum extent of wetland reclamation shown in Figure C16 represents all land that has been reclaimed for garden use at some point between 1959 and 1992.

and 1972 and 19 years between 1959 and 1978 (for those areas not covered in 1972) could well have contained periods of more extensive wetland use or abandonment which are not identified here. But the point to be made is that a time series of coverages exposes dramatically the cumulative effects of the "palimpsest" nature of wetland use postulated earlier by Golson (see Appendix A1). If we are to understand the structure of these changes in wetland use, however, we must turn to the historical relationship between particular social groups and specific areas of wetland.

A final and crucial point to be made is that these sizable fluctuations in the area of wetland under use at Haeapugua between 1959 and 1992 have not been accompanied by corresponding increases and decreases in the size of the population. The population of the Haeapugua basin is notoriously difficult to determine, given the high mobility and scope for multi-residence characteristic of Huli society. Appendix C5 discusses the problems of census results from Haeapugua, which show clearly the extent to which a poor understanding of Huli social structure and patterns of residence, combined with the practice of multi-residence, have hampered the efforts of census-takers under both the colonial and independent states. Nevertheless, life histories of each of the older men and women of Dobani parish and detailed genealogies of the residents of Tani, Dobani, Hiwa and Dumbiali parishes in particular suggest that there has been constant growth in the population, certainly since 1959, and no dramatic losses in number that might correspond to observed contractions in the area of reclaimed wetland. The area of wetland reclaimed and under use does not appear, therefore, to be linked directly to gross population size. Quite why people should choose to commit their labour to wetland reclamation at certain periods but not at others is a topic I return to in Chapter C4.

C2.4 An Oral History of Land Ownership

Local land ownership has played an important role in the historical development of wetland use at Haeapugua. As a general rule, the flexibility and rate of change in Huli land ownership decrease as one moves from smaller to larger units of land. The ownership of specific garden plots and blocks of land within the basin is disputed at each of the three weekly sessions of the local Village Court at Hiwanda; on occasion, such disputes escalate to outright war, as in 1986 when two lineages within Lebe subclan of Tani Hewago embroiled the entire basin in a fatal war, initially over disputed ownership of a single garden plot. But the transfer through war of major areas of land such as entire parish territories, known to have occurred in the past, was brought to an abrupt end in 1952 when the war between Tani and Tigua in the Haeapugua basin, in which Tani threatened to over-run and permanently occupy Tigua parish, was cut short by armed administration intervention. As elsewhere in the Highlands region, the "Pax

Australiana" froze the social landscape, permanently disinheriting certain refugee clans from their former lands (K.Read 1952:443, Salisbury 1964:3). No *tene* clan has been evicted from a Huli parish since 1952, although the resurgence of large-scale warfare does not preclude the possibility of dislocation of entire clans in the future (see C2.5 below).

The scope for a detailed history of land ownership is greatly enhanced by the relative stability of the ditch network and of the shape of the blocks that form its interstices. Neither the wetland drains nor the big dryland ditches, which are up to 5 m in depth, are easily effaced. Changes in the ownership of land tend to be marked not so much by changes in the form of blocks or, on a larger scale, of parish territories, as by changes in the names of those areas and in the identity of the resident *tene* lineage. A member of Tambaruma clan, which lost its Haeapugua parish territory to Tani, makes the observation that, as Tani entered their land, 'they gave new names to all of the mountains, gardens and swamps' (Endeli, 2.11.92, 92/3B:485-543). Though the identity of the residents in a parish can be fairly fluid, the physical boundaries of parish territories are thus relatively stable over long periods of time.

Figure C5 expands upon the Haeapugua portion of the parish territory map produced by Allen, Wood and Vail (Figure B13), providing more detailed boundary mapping than was possible at the scale of the original map. In the course of producing the ditch network map, I was accompanied by a Village Councillor from each parish in turn and endeavoured to meet as many of the individual block owners as possible. On the basis of information from these individuals, I identified each of the mapped blocks as belonging to one or more specific lineages. In the majority of cases, the identification of ownership was widely known and not subject to dispute; land whose ownership was contested was generally identified as such by both claimants and marked accordingly.

I should stress here that the resulting maps were produced as tools for historical analysis, with far more attention paid to the identity of "titular" land owners than the complexities of actual use of the land and the process of developing rights that such use entails. As a form of annotation to accompany interviews about the historical past, this and other land tenure maps in this thesis are not intended and should not be used as a means of identifying actual current land ownership in the basin.

Parish territories at Haeapugua form a recognisable pattern, described elsewhere as a "catena" formation (Fleming 1985:134), in which individual territories running parallel to one another traverse a range of different environmental zones, usually perpendicular to the slope contours; this has the effect of providing each residential group with at least comparable access to each environmental zone[6]. At Haeapugua, a significant outcome of this form of distribution is that most of the parish territories in the basin incorporate some wetland area. However, this similarity in parish territory form is not matched at the level of sub-clan holdings within territories. Figures C19 and C20 show the structure of sub-clan holdings within Hiwa and Tani (Taibaanda) parishes. As described above (B3.5), the disposition of the territories of the three Hiwa sub-clans maps a hierarchy of precedence onto the land, with the two "elder" sub-clans on the borders and the "youngest" in the centre; equal access to different resource zones is guaranteed in the case of Hiwa parish by "catena" sub-clan territories that mimic the overall form of the parish territory.

However, the Taibaanda parish of the superclan of Tani, immediately adjacent to Hiwa parish, reveals a much more complex distribution of clan and sub-clan holdings. As in Hiwa parish, the senior Tani lineages within the senior Tani clan, the sub-clans of Hebaria and Hagu of Hewago clan, occupy the strips of land along the outer borders of the parish[7]. Although the wetland holdings within Taibaanda parish give the appearance of an ordered distribution along "catena" lines, this is largely a reflection of the extension of dryland rights onto the adjacent wetlands. The situation along the thin dryland strip is considerably more complicated, and particularly so in the vicinity of the two centres of ancestral residence at Waloanda and Taibaanda (Figure C20), where rights to small parcels of land or even the same block are held by all four of the Tani clans[8]. To account for this variation in the integrity of lineage holdings within parishes, we need to turn to the specific evidence of oral history.

The oral history of land tenure in the Haeapugua basin is set out in a series of narratives about clan origins (*dindi malu*) and about the causes and conduct of past wars (*wai tene*). Clan origin narratives were documented in the course of interviews with leading spokesmen from most of the clans resident, either now or in the past, in the Haeapugua basin. War narratives, which are far more widely known, were sought from as many members of the protagonist clans as possible; in the case of clans such as Bogorali, this involved interviews in the adjacent Tari and Dalipugua basins where the

6. Strikingly similar clan territory distributions are found elsewhere within the Tari region, in the Dalipugua and Mogoropugua basins (Ballard Fieldnotes) and also further afield in the North Wahgi (Burton 1988), Lai (Meggitt 1977), Tumbudu (Haley 1993) and Kaugel valleys (Bowers 1968) (see Figure A2), suggesting that this catena pattern may be common across much of the Highlands region.
7. Although Hagu lineage are in fact Tani *yamuwini*, they are linked as *aba* to Hebaria lineage through the marriage of Hebaria's eldest full sister to a man from Hagu clan (see Appendix B6: Gen.3).
8. This situation finds a close parallel amongst Enga-speakers at Yumbisa, whose land holdings have been shown convincingly by Wohlt (1978) to map the history of land clearance, with increasingly larger garden blocks radiating outwards from the settlement site of the earliest ancestor to have lived in the valley.

refugees from Haeapugua now reside. In both clan origin and war narratives, the interlacing of genealogical references (*malu*) and physical evidence (*walia* or *muguni*) plays an important role: the deaths and bones of individual ancestors and their current locations are cited as justification for the seizure or continued possession of land; the locations of ritual sites established at the former dwellings of ancestors or of trees planted by those ancestors feature repeatedly as the bases for claims to the ownership of land. To debate land using *dindi malu* is to assert the continuity of one's lineage on the land. References to *wai tene* are often counter-claims whose moral logic rests instead upon the un-compensated grievances experienced by one's ancestors.

As a comparison of two narratives about the expulsion of Bogorali clan suggests (Narratives C2 and C3), narratives about the same war recounted by descendants of the original opponents are usually in close accord on the events, if not the full interpretation, of the war. The names of the historic individuals involved tally between accounts, as do the proximate causes, sequences of events and consequences of wars. Relative chronologies for the sequences of wars and group movements are fairly easy to establish and the scope for identification of named individuals in genealogies from a wide range of current sources provides a means of estimating approximate genealogical dates for the events (see Appendix B6 for details of these methods). Finally, there are the material forms of evidence for the past which Huli cite in association with narrative contexts, such as the skulls of named individuals, the presence of trees or ditches of significance and the names of places and topographic features. Together, the narratives, the genealogies and the physical evidence constitute a dense and strikingly coherent historical resource upon which disputants draw in negotiating ownership of land in the present. What follows is a skeletal review of such a history for the eastern half of the Haeapugua basin, some of the evidence for which is contained in a series of accompanying narrative summaries.

The first of the social landscapes considered here is that established by the clan origin narratives which describe the process of migration of the different clan ancestors to the basin and the circumstances of their acquisition of land. Figure C21 illustrates the disposition of each of the clans historically present in the basin in the immediate aftermath of this process of land division. If the earliest clan ancestors are held to have been *dama*, this figure maps both a historic moment in time and the conceptual point at which ancestors have transformed from *dama* to human. A collective image of an original basin environment different from its current form also emerges from the clan origin narratives. The Tagali is regarded as having assumed approximately its current channel by the time of human emergence but there were no drainage channels connecting the major tributaries such as the Tereba, Garai and Haeawi rivers to the

Tagali; instead, these rivers diffused into the swamp from their points of entry into the wetland zone. The Haeapugua wetlands also extended to incorporate Lambarepugua swamp to the south.

Each of the clans whose territories are shown in Figure C21 claims an ultimate origin in either *duguba* (the southern lowlands, including Lake Kutubu) or *obena* (the northern highlands). Few Huli clans, and none of those in this part of the Haeapugua basin, claim an *in situ* origin. Befitting their southern and western position relative to the Huli centre of the Tari basin, most of the Haeapugua clans identify themselves as ultimately *duguba* in origin. While this serves to link them all with routes of trade and exchange towards the south (Ballard 1994), a finer distinction is engaged to discriminate amongst the two phratry-level groups that dominate this early social landscape: the member clans of the paired Yari and Yami phratries, which include Poro, Yumu, Tani, Telabo, Mbuda, Dagima and Hiwa, identify themselves as "true" Huli, albeit with ultimate *dama* origins in *duguba*, whilst the clans descended from the *duguba dama* ancestors Dabura Yale and Haguanali, including Luguni, Tambaruma and Tigua, still identify themselves as "Duguba". The Tereba river, in its abbreviated early form, is held to have been the boundary between "Duguba" and "Huli" within this Haeapugua context[9]. Of the early Haeapugua clans, only Bogorali claimed an ultimate origin from the Porgera area in the *obena* highlands, though they were resident at Haeapugua as *yamuwini* to Poro clan of the Yami phratry. Genealogies and summaries of the *dindi malu* narratives detailing these origins and phratry relationships are set out in Appendix C2.

There is little debate amongst the descendants of these original clans over the form of this early social landscape. All freely acknowledge the former presence of the other clans, though there are minor differences evident, such as the precise location of the former boundary between Poro and the Yari phratry. Material evidence for the continuing or former presence of these clans includes assocations with landmark features and with ritual *gebeanda* sites. *Tene* of both Bogorali clan and the member clans of the Yari phratry are identified by the patronym "Ngoari-" after the mountain Hubi Ngoari[10]; Yumu still reside beneath Mt. Yumu and Poro maintain access to the

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9. The virtually contiguous early distribution of the clans of these two phratries matches the "phratry integrity" of current clan distributions in the less densely settled Dalipugua and Mogoropugua basins; this suggests that the degree to which clans of the same phratry still reside in contiguous parishes reflects the recency of their settlement of an area and the extent of subsequent population increase, warfare and migration.

10. This is one of the very few instances of clans that are unrelated either genealogically or mythically possessing the same patronymic prefix: no explanation for this situation was offered by either Bogorali or the Yari clans, and it must be assumed that both groups have been in the vicinity of the Hubi Ngoari ridge peak for a considerable period of time.

peak of Poro Nene. The key *gebeanda* ritual sites on this side of the Haeapugua basin are those associated with the ancestors of these original clans and include Biangongoanda (Yumu), Waloanda and Terekamianda (Yari phratry), Pogeanda (Tambaruma), Yalemali (Bogorali), Haguanali (Luguni) and Birimanda (Figure C18); this last site was of exceptional importance in that it was the locus of performances by member clans from both the Yari and Yami phratries together, in association with the myth of Dandali and Dambali (Appendix C2). The process of adoption of *gebeanda* ritual sites after the evacuation of the original owners illuminates the broader process of adoption of parish territories. As described in Chapter B3, most lineage rituals involved the co-operative participation of representatives of both *tene* and *yamuwini* lineages; while the *tene* were said to "own" the site and the ritual, *yamuwini* officiants were able to take the place of *tene* in their absence. The case of Yami representation at Birimanda rituals illustrates this point nicely. As Poro *yamuwini*, Bogorali assumed the role of officiants at Birimanda when Poro left the Haeapugua basin. Then, when Bogorali in turn were ousted from Haeapugua, Munima, as Bogorali *yamuwini*, became the Yami officiants at Birimanda.

A further point of interest relating to *gebeanda* ritual sites is the possibility that they describe an early pattern of settlement location. *Gebeanda* are essentially the house sites of early ancestors, and a brief review of those locations of *gebeanda* known to me suggests a fairly common pattern, evident at Haeapugua in the locations of Pogeanda, Taibaanda, Hagunali, Biangongoanda, Hagodanda, Waloanda and nearby at Dama Tege (the Haro clan *gebeanda*) and the former Mbuda *gebeanda* of Geberubali. All of these sites are located on prominent ridgelines extending from the perimeters of the basin[11]. Though there is no suggestion in the historical narratives that the form of early settlement was other than the current norm of dispersed houses (see Figure C9), it is tempting to speculate that the overall pattern of early settlement consisted of more closely clustered settlements along these ridgelines.

One possible means of access to the antiquity of these *gebeanda* sites is to date the large Araucaria cunninghamii (*guraya*) trees common at these site. Enright (1982) has suggested that A.cunninghamii growth rates can be used to estimate tree age; the age of an individual of 120 cm dbh (diameter at breast height) is estimated at 305 years. Few mature *guraya* are still standing in the central basins, but dbh measurements of three *guraya* at the Yumu parish *gebeanda* of Biangongoanda in the Haeapugua basin of 175 cm, 220 cm and 260 cm are suggestive of an antiquity well in excess of 300 years. The stumpss of felled trees considerably larger than these are still visible both at

11. This matches closely the pattern of modern settlement described for the topographically similar but comparatively sparsely occupied Marient basin in Enga province (Clarke 1989:235).

this and other *gebeanda*.

The first major transformation in this social landscape reported in local oral traditions followed upon a war between Tambaruma and Tani clan of the Yari phratry. Tani are said to have long suspected Tambaruma of paying for the assassination of Hebaria, the *agali haguene* for Hewago, the senior Tani lineage; when a Tani *yamuwini*, Ari-Magola was killed by Tambaruma in about ?1835 AD, Tani took the opportunity to launch a war of revenge (the basis for this genealogical estimate of the date of the war is set out in Appendix C3). Supported by a large gathering of allies from Tari basin, Tani and the other Yari clans routed Tambaruma and their Luguni allies in a series of engagements, chasing them south as far as the Lower Tagali river. The Yari clans, originally distributed widely over the area between Taibaanda on the eastern edge of Haeapugua and the small swamp at Dibinipu in the adjacent Munima valley to the east of the Haeapugua basin, occupied the former territories of Luguni and Tambaruma on the grounds that compensation had not been paid for the deaths of Hebaria and those Yari members and allies killed during the war. Tambaruma, unable to muster sufficient support either to reclaim their land or to pay the required compensation, dispersed to the Komo basin, the Benalia valley and the Dauli area of the southern Tari basin. Luguni parish was taken by Telabo clan, and Tambaruma parish by the Tani sub-clans of Agiabu, Eli and Yunda; in each case, these lineages stood in *aba* relationships to the former *tene*, Telabo to Luguni and Agiabu, Eli and Yunda to the children of a Tambaruma man, Hangube, through his marriage to their sister Daya-Nano (Appendix B6: Gen.3). In the Tambaruma case, Hangube's children, Pago, Urubu, Gurubu, Piliabe and Paladia, were called back by their *aba* Agiabu and Eli, and their lineage descendants are still resident in the former Tambaruma parish, now known as Dumbiali parish.

At some point soon after or, more probably, just before the rout of Tambaruma, Poro clan, whose numbers appear not to have been great, evacuated their lands at Haeapugua and retreated to the portion of their parish around lake Alibu, to the east of the Haeapugua basin. The immediate circumstances of this flight are unclear and difficult to fix genealogically because of the absence of formal *wai tene* narratives naming individuals alive at the time. It appears that, in the aftermath of a war between Mbuda and Hogoreiba clans in which Tani and Poro entered as allies on opposing sides, Poro, not without reason, feared that they would be the next of Tani's neighbours to be attacked. Poro land between Halimbu and Waloanda was assumed by a mixture of Tani sub-clans, while Bogorali appear to have assumed title to Poro land as far south as Poro Dangi and the lower reaches of the Haeawi river. Dobani clan refugees from fighting in the Tari basin had long been resident between the Hagia and lower Haeawi rivers as *yamuwini* to Poro and remained in place, initially "holding" the land in the absence of Poro but eventually, after the flight of Bogorali (see below), as *tene* in their own right. Figure C22 illustrates the social landscape of Haeapugua as it appeared after this first phase of war and displacement.

Much of the fighting that followed in the period after the rout of Tambaruma occurred within Yari phratry, as Mbuda, Telabo, Tani and Hiwa jostled for position in the basin. Mabiali clan, ousted from the land they held in Dumbiali and Tani (Taibaanda) parishes as Tani *yamuwini*, were amongst the casualties of this period. However, there were no further changes in parish boundaries or *tene* status until the war between Bogorali and Tani during the early 1890s, described in Narratives C2 and C3; the basis for this estimated date is set out in Appendix C4. Following accusations from Tani that Bogorali had poisoned their pigs, a minor war lasting four days was fought without fatalities on either side. Honour satisfied, an attempt was made to conclude hostilities with compensation but this was thwarted in mid-feast by disgruntled Bogorali *yamuwini* who successfully reopened the fight. An old Tani man, Ngoari-Luni, was soon killed and from this point the war escalated dramatically. Tani called again upon their allies in the Tari basin and, when Bogorali's own *yamuwini* from Munima clan turned upon them from their rear, Bogorali, surrounded and overwhelmed, fled under cover of night across the Tagali river to take immediate refuge with their kin on the Pureni side of the basin. Tani then seized most of the Bogorali land in the Haeapugua basin, again citing the non-payment of compensation for the death of Ngoari-Luni and others. As former *yamuwini* to Bogorali, Munima assumed *tene* status on the portion of Bogorali parish on which they resided. Dobani, who had acted throughout the war as mediators (*dombeniali*) remained in place south of the Hagia river, also assuming *tene* status on their newly distinct parish territory. Like Tambaruma before them, Bogorali were denied all means of regaining their land and dispersed, with individual lineages seeking refuge with their *aba* kin in the Komo, Benalia and Dalipugua basins, the adjacent Munima valley and the Pureni side of the Haeapugua basin.

The disposition of Haeapugua parishes since the flight of Bogorali has remained essentially as shown in Figure C18, with Yari phratry clans now owning approximately 79% of the Haeapugua basin wetlands east of the Tagali river in contrast to their estimated maximum holding of 35% prior to the wars with Tambaruma and Bogorali (Table C3). A number of minor wars between Tani and Dobani during the 1920s threatened to escalate in a fashion similar to the Tambaruma and Bogorali wars, though in each case Dobani managed to avert the fate of their predecessors through timely payments of compensation. Two further episodes since initial contact in the 1930s suggest that Tani's encroachment over the entire area is a continuing process.

The first of these episodes is well-documented, for it coincided with the colonial administration's decision to establish a permanent patrol post at Tari in 1952. A war that had begun in 1951 between Digima clan on one side and Haro and Pi on the other had escalated to the point where thousands of warriors were engaged on either side; Tani, with Peda, Poro, Dobani, Bogorali, Munima, Karida, Yobiya and Arua, entered the war on the side of Haro, while their neighbours Tigua supported Digima along with Piribu, Hambuali, Bai, Yangali, Yumu and Baibuali. In August 1952, after the deaths of more than 28 men and women, Tani over-ran Tigua and most of Hambuali parish and were threatening to seize these lands as war reparation. At this point, a government patrol, guided by their Huli interpreter, Piri-Pungua (whose mother happened to be a Tigua *tene*), arrived from their newly established Tari post to intervene[12]. After a show of force, accompanied by instances of rape, the theft of pigs and the destruction of houses on the part of the police, a large group of Tani men were taken into custody and led back to Tari[13]. The war ended abruptly with government-enforced compensation payments made by both sides.

After thirty years of government embargo on clan warfare, enforced by armed police, the resurgence of large-scale warfare in the basin during the 1980s has seen a renewal of the scope for major changes in the social landscape. The second of the two post-contact events mentioned above occurred in March 1992, when a dispute within Telabo flared up into a war with Tani and Telabo Hogobia pitted against Telabo Naliba and their Pureni allies; though fighting concluded with the eventual flight of Telabo Naliba across the Tagali river to Pureni, all of the parish residents had fled during the war. When I returned to Telabo in October 1992, the parish was still abandoned and eerily silent, with almost every building burnt to the ground; all of the gardens that I had mapped in 1989 and 1990 were over-run with weeds and whole groves of whitening ring-barked trees were shedding their leaves. In 1994, after the payment of the last outstanding elements of compensation, Telabo appear set to return to their parish, but the threat of the total eviction of entire parishes has surfaced again throughout the region.

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12. A number of expatriate accounts of the 1951/52 Tani/Tigua war are available for comparison with Huli testimony (Anthony 1952/53, Carey 1952, Simpson 1955). Comments by Arthur Carey, the officer leading the patrol, on the state of Tigua parish in the aftermath of battle shed some light on the ferocity of Huli warfare on this scale: 'For about four miles at a width of two hundred to three hundred yards, every living thing had been destroyed. The pit-pit [grass] was flattened as if by a roller, trees were either cut down or ringed, gardens were uprooted, houses burnt to the ground, and the big ditches broken or filled in. It left one with a feeling akin to awe at the savage force behind it all' (reported in Simpson 1955:189).
13. The Tani prisoners served out their sentences constructing the airstrip at Tari which is still referred to on occasion as "Tani *gana*" ("the Tani ditch").

Without wishing to engage in the voluminous debate on warfare in the New Guinea Highlands (e.g. Meggitt 1977, Sillitoe 1977, Vayda 1976,), the long view provided by the oral history of change in the social landscape of Haeapugua suggests that wars of a certain magnitude, whatever their publicly cited proximate causes, have been allowed to develop with the intention of gaining land. The following Tani boast, ostensibly reporting a historical *damba bi* speech delivered by the Tani fight-leader, Ngoari-Bualu, is explicit about the historical circumstances of Tani's current position in the basin:

> In the past we have fought and put to flight the clans of Mabiali, Dabu, Bogorali, Poro, Wanga, Tameya, Honomani, Baibuali and Tambaruma... Now we shall defeat you too in the same way.
>
> Ngoari-Mandiga, 1.8.91, 91/14B:33-46

The justification for the seizure of entire parish territories is invariably the uncompensated death of kin. After the 1992 Telabo war there was a concerted attempt on the part of Telabo Hogobia's Tani allies to claim the abandoned Telabo land to compensate for the deaths of two men, Dani and Eganda; the following narrative from a speech by a Tani ally asserts the continuity between this act and historic claims to land "for the bones" of dead men:

> This land [Dumbiali parish] was taken for the bones of Dali-Yabe. Those lands [Bogorali parish] were taken for the bones of Ngoari-Luni [*Ngoari-Luni kuni mini*]... These lands were taken for the bones of these men. Now the bones of Dani and Eganda will take that land [Telabo parish].
>
> 23.10.92, 92/1B:0-249

Bogorali refugees, scattered in individual lineages amongst their respective *aba* kin across the Pureni area of Haeapugua and in the Tari, Komo and Dalipugua basins, still bitterly accuse Tani of refusing to accept compensation for Ngoari-Luni and preferring instead to retain the rich wetland margins of their former parish lands at Haeapugua. Narrative C4 is a plaintive Bogorali lament for their lost parish that cites the names of its familiar features. Even now, almost a century after the eviction of Bogorali, Bogorali children are taught these narratives and the names of streams and hills that they have seen only at a distance.

The desire of the scattered Bogorali for the restoration of their land reflects not just the quality of historical and ritual ties between Huli and their agnatic parishes but also the evident richness of the wetland margins at Haeapugua and the wealth associated with possession of this fertile centre. Following the description of the historical sequence of land ownership and thus access to wetlands at Haeapugua, it is possible now to turn to the more specific oral history of wetland use.

C2.5 An Oral History of Wetland Use

It might be assumed, given this history of successive changes in land ownership in the Haeapugua basin, that local oral traditions of wetland use would also be discontinuous. Yet the significance in Huli historicity of the action of "cutting" or dividing the land, which extends to the excavation of wetland drains, ensures that the names of the early diggers of wetland drains and the locations and names of their gardens and drains are closely monitored and carefully transmitted; new names may be given to a parish by its new owners, but the old names are not forgotten. This is further reinforced by the tendency for *aba* kin to maintain residence in a parish after the original *tene* have been put to flight (as in the cases of the original parishes of Poro and Bogorali described above); a form of continuity in residence and oral tradition is thus evident even where the original *tene* are no longer present. Further, the validity of claims made by Bogorali or Tambaruma refugees to their original lands rests in part on the general or "public" recognition of the veracity and detail of their oral traditions; this perhaps accounts for the surprising concordance in testimony between the current wetland owners and the historically dispossessed. On the basis of these oral traditions, supplemented in the post-contact period by the evidence of APs, the following chronological summary of the process of wetland exploitation at Haeapugua can be advanced.

There is widespread agreement amongst all of the clans originally inhabiting the basin (those shown in Figure C21), that their ancestors of this early period had no gardens in the wetlands but instead cleared the surrounding slopes for *e ma* swidden gardens or (more rarely) drained small areas immediately bordering the swamp for *ma lara* gardens. The Yari phratry ancestors clung to a thin strip of dryland at the base of Lagale Mandi ridge and the low hills around Taibaanda. Across the wide gulf of swamp surrounding the diffuse flow lines of the Tereba river, Yumu and Tambaruma ancestors lived and gardened solely on the dryland slopes. Bogorali and Poro ancestors, similarly, lived along the fringe of low hills at the base of the ridge between the peaks of Hubi Ngoari and Poro Nene. Other than as a source of game, the principal use of the wetlands during this period was for pig forage. Parish boundaries were marked in the wetlands by stands of the tall pitpit variety, *gambe kolo* (Miscanthus floridulus var.), planted in rough lines down towards the Tagali river. All sources agree that this pattern of land use persisted until as recently as the eviction of Tambaruma in approximately ?1835.

Historically, the Tani-Tambaruma war and the ensuing process of wetland reclamation throughout the basin mark a rapid conversion in the valuation of wetlands;

this is a point made with some irony in narratives about the jockeying for land amongst the different Yari clans. When the Yari land at Dibinipu in the Tari basin was to be divided amongst them, Hewago, Doromo and Telabo seized the rich valley flats around the small swamp area, leaving the soil-poor ridges to Egago and Dabo. Unsatisfied with this division, Egago and Dabo left for the Yari holdings at Taibaanda, above Haeapugua, where they settled the bulk of the dryland slopes. Later, when Hewago, Doromo and Telabo followed these two to Haeapugua, Egago and Dabo took their revenge and gave them a narrow dryland strip and the adjacent waterlogged wetlands on which to live. However, at about the time of the war with Tambaruma, Hewago and Doromo began to drain the margins of their swampy tracts and to exploit the rich potential of the reclaimed wetland soils; in turn, they then barred Egago and Dabo, and their descendants since, from access to the wetlands (see Figure C20).

Although partial drainage of small areas along the wetland margins is held to have been practised prior to the Tambaruma war as a means of improving the removal of floodwaters from the gardens along the wetland margin, the initial step in the process of large-scale drainage of the wetland centre reflected a hydrological imperative: the channeling of the diffuse natural flow lines of the major tributaries feeding into the Tagali river. Of the four major catchments contributing to the Haeapugua wetlands, the largest in terms of catchment area appear to be those of the Tereba and Garai rivers. Figure C23 shows catchment areas for these two rivers, and for the Hagia and Haeawi rivers, illustrating and tabulating the considerable disparity in area between the first and last pairs[14]. Effectively, no wetland drainage for gardening could have proceeded at Haeapugua, other than along the existing wetland margins, until the throughflow from the Tereba and Garai and, to a lesser extent, the Hagia and Haeawi catchments had been channeled and prevented from diffusing into the swamp. The remainder of this section will focus on the oral history of drainage within the Tereba, Haeawi and Hagia catchments, opening with a history of the extension of the Tereba channel[15].

Oral traditions throughout the basin uniformly insist that the Tereba river

14. Note that all of the catchment areas are determined on the basis of topographically defined watersheds. In this limestone environment with its extensive scope for underground flow, there is a considerable chance that catchments defined in this way do not accurately represent the true catchment areas for each river. The catchment areas identified in this thesis are thus very rough approximations; the Haeawi catchment, in particular, is probably underestimated here as Poro refer to the Haeawi as "Alibu Iba Puni" ("the Lake Alibu drain") implying that Lake Alibu is the source of the Haeawi resurgence.

15. My sense of the history of drainage in the other major Haeapugua catchment, that of the Garai river, is limited by the impossibility of confirming locations by fieldwalking the area with Bogorali individuals; the very few Bogorali narratives documented that relate to drainage claim that Bogorali ancestors began to channel the Garai river at the wetland/dryland margin at a Genealogically Estimated (GE) date (see Appendix B6) of approximately ?1745, much earlier than for any other area of Haeapugua.

originally flowed along its current course as far as the current Hiwanda road bridge from which point it proceeded towards the base of Lagale Mandi ridge, descending into the cave of Poro or Pagu Egeanda in what is now Tani Wangane territory (Figure C4). When the Tani ancestors Lebe (GEB: ?1779), Yanga (GEB: ?1763-1773) and Hebaria (GEB: ?1765) were alive, they dug a new *iba puni* channel for the Tereba, forcing the flow in towards Haeapugua swamp and reclaiming the area at the base of Lagale Mandi; together, these GEBs suggest a date for this event after about ?1800. A widely cited tradition is that Dewaria (Tani Wangane *tene*; GEB: ?1818 AD) and his eldest son Agibe (GEB: ?1853 AD) were the first then to extend the Tereba channel into the swamp itself and to drain and garden the wetlands on either side of this extended channel. This process could presumably have begun no earlier than ?1838 AD, when Dewaria attained adulthood and more probably, if cooperation between father and son is being implied, after about ?1868 AD, when Agibe was approximately 15.

All narratives emphasize the novelty of this drainage project; Dewaria's father, Layuni (GEB: ?1778 AD), and his generation are said to have gardened solely on the thin strip of dry land between the swamp and the ridge. This process of channeling of the Tereba river continued, with Agibe's sons Haio (GEB: ?1878) and Pore (GEB: ?1883) extending the channel as far down river as those of the Wangane blocks currently lying deepest into the swamp (see Figure C20) and draining garden blocks laterally along the northern side of the Tereba; given their GEBs, a date after about ?1898 can be estimated for this phase. Only late in the lives of Haio and Pore, in the 1920s or early 1930s, did the Tereba channel finally link up with the course of the Tagali river.

Narratives describing this process stress that the Tereba was too large to be controlled and that once the process of channeling had been initiated, the river tended to develop its own course[16]; ancestors are described as having "followed" the river with their gardens. The contribution of human agents in this process presumably included the stabilization of river bank levees through the planting of trees; the inadvertent promotion of soil erosion and contribution to levee formation through clearance in the catchment headwaters; and the simultaneous channeling of the other streams entering the swamp, thus increasing the efficiency and volume of flow through to the Tereba river from its tributaries. The extent of development of the levees along the middle section of the Tereba channel within Haeapugua enabled Wangane and other land-holding lineages to establish permanent gardens in the area, threatened only by the largest floods. Other than the occasional long-grass fallow, these gardens have apparently been in permanent use since about the turn of the century, and are still

16. The Tereba channel is 4 - 5 m wide and 2.5 - 3 m deep at the LOU site location (Figure C28).

regarded as amongst the richest soil locations in the basin. Another consequence of the initial channeling of the Tereba was the scope this allowed for drainage of the large swampy area south of the former point of diffusion of the Tereba river. Tani Hebaria and Tani Tabayia proceeded to drain and garden this area, separating Lambarepugua swamp from the main body of Haeapugua.

While those Tani sub-clans around the Tereba extended their gardens into the wetlands on either side of the new channel, residents of the parishes of Telabo, Dumbiali, Hiwa and Dobani were also channeling the streams that flowed through their territories. On the southern side of the Tereba, the Gobe and Darama rivers were extended gradually towards the Tereba; Dumbiali and Telabo residents co-operated in channeling the Gobe river, which marked the boundary between them, and Hiwa and Dumbiali residents worked together on the Darama river. North of the Tereba, Dobani and Tani residents dug channels into the swamp from the Iba Hagia, Iba Haea and Iba Bombo sources along the base of Lagale Mandi ridge. Case studies of the chronology of wetland use in four areas of Haeapugua are described in Appendix C6. The chronologies generated through the genealogical estimation of the ages of named ditch-diggers are summarized in Figure C24.

The results documented in Figure C24 show a considerable degree of correspondence between all four areas in the timing of the initiation of channel extension and the use of wetland centre blocks for gardening. The range of sources employed in the genealogical estimates for these events suggests that these correspondences are not simply a local expression of general antiquity, particularly in light of the welter of other events, such as wars and migrations, which are placed in chronological sequence relative to the events of wetland drainage. In summary, the oral historical evidence implies that drainage of the immediate strip of swamp land along the wetland margins began across the basin during the 1840s and 1850s. This was followed, during the late 1880s and early 1890s, by the initiation of channel extension for the main Hagia, Haeawi, Bombowi, Gobe and Darama rivers. The use of the swamp centre for cultivation can be assumed to date from this period. This Haeapugua chronology finds an interesting parallel on the west bank of the Tagali, where Gobiya, Haliali and Arua landowners claim that the first major *iba puni* channels to be extended through Emepugua swamp were dug with the assistance of labour from Bogorali refugees immediately after the Tani-Bogorali war, which is estimated in Appendix C4 to have occurred during the early 1890s.

Between about 1932 and 1942, the vast majority of the garden blocks in the swamp were then abandoned (with the exception of the gardens along the Tereba levee and a few isolated individual blocks, often with houses). It is difficult to discern a general cause for this abandonment. Explanations proffered for individual wetland areas at Haeapugua often nominate the disruption of increasing warfare during the 1930s but more usually specify (without necessarily attributing as cause) concurrent events such as drought or earthquake; Chapter C4 returns to consider in more detail the possible causes of wetland abandonment at Haeapugua.

The next major phase of use in the Haeapugua wetlands appears to have begun shortly after contact in the early 1950s, under the conditions of the Pax Australiana, lending support to the argument that warfare had played a significant role in the abandonment of the wetlands in the 1930s. From the 1950s until the present, wetland use has consisted largely of the sporadic reclamation of sections of the existing drain network in projects seldom co-ordinated above the level of the sub-clan. The disparity evident in Figure C16 between post-1959 drainage to the north and south of the Haeawi channel is intriguing; I was not fully aware of this during fieldwork and made no effort to identify the reasons for this apparent lack of post-contact use of the wetlands in Tani (Walete) parish, but it is also possible that this simply reflects the lack of AP coverage for this area between 1959 and 1978. An interesting development has been the initial reclamation and use of the numerous minor swamps such as Lambarepugua, Abagopugua and Hagiapugua[17]; the proscriptions preventing use of these swamps, which formerly played an important role in *dindi gamu* fertility ritual, were overturned almost immediately after 1952.

Little interest in wetland use was shown by the colonial administration, though drainage projects at unspecified locations in Haeapugua were observed and commented upon in patrol reports in 1955 and 1956[18]. Instead, administration officers sought to implement a number of cash-crop projects that could exploit either the rich soils or the cleared expanses of the wetlands; the Department of Primary Industry thus sponsored the manual excavation of new drainage systems for cattle projects at Telabo in Haeapugua and for coffee at Mogoropugua. This final phase in the construction of the major *iba puni* at Haeapugua took place during the late 1950s and early 1960s when,

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17. Although the centre of Abagopugua was not in use at the time of any of the AP coverages, the drains visible within Abagopugua were apparently excavated shortly after 1952.

18. 'The local natives have put into operation a crude form of drainage in order to reclaim some ground on the eastern edge of the marsh, and the whole marsh could with some considerable amount of work be properly drained into the Tagali River. The marsh would cover an area of some six square miles and at the present is used only as a pig area, the pigs appearing to be plentiful and thriving in this area... It would be interesting to see what an officer of the Department of Agriculture would think of the possibilities of rice growing in the Haibuga Marsh area, or for that matter agricultural development in general' (Esdale 1955:11). 'Whilst at Tani I noticed a large group of men constructing a huge drain well into the Haibuga swamps. They said they intended to reclaim the marsh where possible for garden use' (Claridge 1956:4).

under the leadership of local leaders such as Waribi of Telabo, the Gugubalu and Teletele *iba puni* (Figure C4) were dug through to the Tereba in order to drain the wetlands sufficiently to graze cattle.

One further feature of wetland use at Haeapugua deserves particular attention. This is the change described in local oral history in the technology of pig husbandry. Pigs were formerly banned from entering all garden areas; one reason cited for this is that those earthworm species locally present prior to contact (named as *hagoli* and *guriya*; neither species has been identified) were valued for their contribution to the quality of garden soils and every effort was made to ensure that their numbers were not depleted by pigs. Possibly this proscription on the movement of pigs through gardens also reflected the fact that fully domesticated pigs were quartered within or near women's houses and were thus potential agents of inadvertent contamination of male food. Only since contact and, specifically, since the introduction from the late 1950s of a new earthworm species (Pontoscolex corethrurus; *kau ngoe* or *honebi ngoe*) which is said to prefer drained soils, have Huli tethered pigs in their gardens; a practice developed to counter the tendency for the soil to "harden" under the influence of these new earthworms. Pigs are now tethered in gardens after the final sweet potato harvest to forage for both unharvested sweet potato and Pontoscolex worms, loosening and aerating the soil in the process.

Prior to contact, pig-owners loosed their pigs in the swamps by day to forage for *hagoli* and *guriya* earthworms, before enticing them back to their stalls with sweet potato in the evening. Access to forage grounds was gained by droving pigs either within the *gana* ditches or along discrete trackways (*hariga*: "tracks" or *bambali hariga*: "ancient tracks" to distinguish them from vehicular roads), separated from garden blocks by *gana* ditches. These tracks, which can still be traced across the landscape (though in most instances they have recently been re-integrated with garden blocks), varied considerably in size and length. The largest and usually widest tracks connected entire basins and provided a reasonably neutral means of movement between parish territories and over long distances. Shorter lengths of track were excised from garden blocks to permit access to communal sites such as ritual centres, or even specifically to move pigs to forage grounds from their night-time stalls near women's houses.

As wetland drainage progressed and the wetland-dryland margin advanced into the former swamp area, the distance between the ungardened swamp and the pig stalls situated near houses on properly drained soils extended to the point where the ditches providing access to forage were inundated and new trackways connecting the dryland residences with the swamp were required, if pigs were to be excluded from the new wetland margins gardens[19]. These droveways or *nogo dugudugu* ("pig-lead"), excised from the wetland margin garden blocks, were devoted solely to the movement of pigs; unlike most *hariga* trackways, droveways tended to be confined <u>within</u> parish territories, running perpendicular to the parish-connecting *hariga*; and thus did not serve for human movement. Figures C7 and C8 identify, but do not attempt to distinguish between, trackways (*hariga*) and droveways (*nogo dugudugu*) within the Haeapugua basin. The apparent breaks in the continuity of this network of track- and droveways are accounted for by the practice of walking <u>within</u> the larger dryland *gana* ditches between sections of *hariga* trackway.

The droveways occupy a brief but critical moment in the history of wetland use at Haeapugua, marking the point at which pig production attained sufficient significance for parts of the richest garden land along the wetland margins to be sacrificed simply to move pigs across the landscape: an estimated total of 7371m^2 of the map study area was turned over to drove- and trackways. Droveways at Haeapugua appear to have been constructed simply by digging a second drain parallel to a block boundary drain at a distance of approximately 5 m. Chronologically, droveways might be expected to follow the development of the initial wetland drainage network. This is tentatively supported by the GE dates for droveway construction, though such events are much harder to date than the excavation of *iba puni* channels as droveways were generally constructed within existing gardens and usually created no further rights and provoked little dispute. Droveway construction is said to have been undertaken south of the Tereba by Darama-Ayu (Pi *tene*, Tani Lebe *yamuwini*; GEB: ?1864), and north of the Tereba by Ngoari-Buruli (Tani Lebe *tene*; GEB: ?1889) and Ngoari-Dili (Tani Eli *tene*; GEB: ?1867); at Dobani, Walubu-Warulu (Dobani *tene*; GEB: ?1860) is said to have begun the construction of droveways. It is difficult to assess so small a number of GEBs over so large an area and perhaps the only observation to be made is that they correspond broadly to the GEBs documented for the diggers of the first phase of wetland margin drainage (Appendix C6), implying that droveway construction proceeded apace with the extension of garden blocks into the swamp.

Droveways leading into the swamp at Haeapugua were still being constructed during the late 1930s by individuals such as Walubu-Mabira (Dobani *tene*; EB: 1915) at Dobani, and Pali-Gelo (Hagu *tene*, Tani *yamuwini*; GEB: ?1915) in the Hagu wetlands. However, the droveways were largely abandoned from the 1950s, both with the cessation of major warfare after contact, as pig-owners now felt free to construct pig-

19. An alternative response, two instances of which are documented in Appendix C6, was for pig-owners to relocate houses to drained blocks in the very centre of the swamp and thus guard their herds from close at hand.

stalls (*nogoanda*: "pig-house") along the edges of the swamp at some distance from the houses, and with the post-contact emergence of the practice of tethering pigs in dryland gardens.

C2.6 A Preliminary Model of Wetland History

The accounts of the development of wetland use contained in oral narratives and the ability to map both the formal character and the distribution of ownership of the field network can be employed, in combination, to generate a model of the recent history of wetland use at Haeapugua. A preliminary sense of something like the model given here, developed both during and between field seasons, was instrumental in structuring the archaeological investigations described in the following chapter.

The oral histories of land ownership and wetland use outlined above provide an independent account of developments at Haeapugua over at least the last 160 years. They allow for an interpretation in which the process of wetland reclamation was initiated as recently as the 1830s and full use for gardening of the wetland centre began only in the 1890s. Other than a hiatus in wetland use between the 1930s and early 1950s, which appears to have been common across the swamp, use of the Haeapugua wetlands has been essentially continuous, if sporadic, up to the present. The absence of wetland gardens and, indeed, the impossibility of gardening in the swamp prior to the construction of the major channels are stressed in narratives from a wide range of sources. This posited recency of wetland use is contrasted with histories of continuous use of the surrounding dryland areas and the immediate margins of the wetlands that extend unbroken back to the mythic eras of the times of taro (*ma naga*) and of rotten wood (*ira goba naga*).

Analysis of the formal characteristics of the field system provides another means of identifying possible sequences in the recent development of land use at Haeapugua. By contrast with the conditions available to analyses of most relict systems, for which the evidence is often patchy, the Haeapugua field network offers the advantages of a "complete" system in which virtually the full extent of the network in use during this century is visible[20]. This allows patterns to be discerned on a broader scale, improving the scope for distinguishing historical sequences amongst the different elements of the field system. Differences in field size, shape and environmental location and in the nature of articulation between field elements can be explored with a view towards constructing a rough relative chronology for the development of the current form of the

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20. Fowler (1983) contains numerous examples of such partially recoverable relict field systems in Britain and Hayes (1981) illustrates some of the difficulties in interpretation encountered when working with fragmentary evidence for a field system.

entire field system. What follows is a brief review of some possible lines of access to historical change in the Haeapugua field system, based largely on analysis of the structure of the field system itself.

There is some evidence for a tendency for block sizes to decrease over time, insofar as older blocks under continuous use are progressively reduced in size through sub-division. This is suggested, in part, by the distinction between the small, heavily sub-divided blocks on the long-settled dryland areas and the larger, and presumably more recently delineated, wetland blocks. It is possible that this is simply a function of the differences between wetland and dryland conditions and technologies: houses are more likely to be constructed on well drained soils, and dryland sub-division may thus reflect the restricted distribution of settlement. But if these putative earlier, larger dryland blocks are reconstructed, an interesting relationship emerges between size and shape.

Where it is possible to discern larger field structures that encompass the small modern dryland blocks, they are invariably composed of curvilinear ditches, forming incomplete oval or lobate shapes (Figure C25). The process of subsequent subdivision of these larger curvilinear fields appears to be predominantly rectilinear, with straight ditches either bisecting or even intersecting the existing fields. In contrast, the wetland fields are almost universally rectilinear; the few dryland areas shown in Figure C17 (which illustrates the minimum extent of reclamation between 1959 and 1992) in which large, rectilinear fields predominate are those which oral traditions suggest were the first areas of wetland to be reclaimed: the best example of this is the strip of blocks between the main body of Haeapugua and Lambarepugua swamp, where the layout of the fields, in their current rectilinear form, is ascribed to the actions of Tani individuals since the 1830s. Note, however, the presence of abandoned curvilinear field forms in the wetlands of Wenani parish, in the northwestern corner of the map study area; this would appear to deny an exclusive relationship between wetlands and rectilinear field forms, and raises the possibility either of variation in field form during a phase of reclamation concurrent with developments elsewhere at Haeapugua, or an earlier reclamation at Wenani during a period when curvilinear forms were predominant in all environments[21].

There is thus a pattern evident in field form in which probably earlier lobate or curvilinear fields in dryland areas appear to have been subdivided into or transected by progressively smaller and more rectilinear field forms. In almost all wetland areas, and

21. Regretably my interviews in Wenani parish, which was not a focus for intensive work, were restricted largely to current ownership.

most noticeably those which are known to have been reclaimed most recently such as Abagopugua and Lambarepugua, considerably larger, rectilinear field forms are evident. Although topography clearly plays a role in allowing for construction of the large rectilinear forms on the more level wetlands, the restricted presence at Wenani of curvilinear forms in a wetland environment and the tendency for later dryland subdivision to follow a rectilinear pattern further supports the proposition that the distinction between rectilinear and curvilinear forms also marks a historical division. Obviously, field form alone can yield no more than a relative chronology, but I will return shortly to consider the scope for links between crop regimes and field form that might narrow the range of historical possibility.

The form of the wetland field system appears to corroborate at least the sequence of development proposed by the oral historical evidence, and a number of possible avenues for analysis, involving minor modifications to the method of topographic analysis (T.Williamson 1987) to accommodate the specific requirements of wetland field systems, are proposed here. The wetland block-defining *gana* drains are aligned with the major and minor *iba puni* channels, implying that the latter preceded the development of the field system. The largest *iba puni*, such as the Tereba, the Haeawi and, to a lesser extent, the Garai, are distinguished by the lack of matching between drains entering from opposing sides of the channel; I take this to imply either that these larger features have not intersected an existing field system or that the main channels were not laid out together with the surrounding fields in a single series of co-ordinated events.

The Tereba is an interesting case in point as the course of the main channel flow appears to have varied over time: in the middle section of the Tereba, three different courses have been employed over time, with the result that minor drains which entered the Tereba in an earlier channel position now appear to intersect the current channel. A form of horizontal stratigraphy is proposed in Figure C26 which identifies the three courses and their corresponding articulating drains in a relative chronological sequence. The shift from courses B to C is held to have occurred during the 1930s, when Hubi-Gilia sought to expand Wangane's wetland holdings by diverting the boundary-marking Tereba from course B to course C; certainly, course C was the active channel for the Tereba by the time of the 1959 AP coverage. Working from the assumption that minor drains are not initially excavated through larger channels, it is possible to predict that where minor drains <u>do</u> traverse a larger channel, they must either predate excavation of the channel or postdate the abandonment of that channel course by the main flow of the stream. In each case, it is argued, the surrounding minor drains are either broadly contemporary with or immediately postdate the most recent channel course with which they terminate; that is, where there is no obvious matching drain on the opposite side of the channel.

Similar analyses can be performed on other ditch features such as the *hariga* trackways: these operate in the Haeapugua landscape much as Roman roads do in T.Williamson's (1987) analysis of East Anglian field systems, with the proviso that no dates have been determined for the Huli trackways. When set against the background of the entire field system, major trackways such as those in the Haeapugua parishes of Tani (Taibaanda) and Dumbiali emerge as critical lines of division in the landscape against which most of the articulating ditches terminate (Figure C7). As such, they can be presumed to predate much of the surrounding field system. Certainly, their relationship to articulating ditches stands in contrast to that of the pig droveways which have been laid out within the lines of the existing rectilinear network[22].

There is also fragmentary evidence for a wetland field system that predates the bulk of the current network. The exceptional regularity and uniformity of alignment of the wetland field system lying between the Haeawi and Tereba channels is contradicted only in a small area immediately to the south of the lower Haeawi *iba puni*, where a set of drains has been laid out at angles that are neither perpendicular nor parallel to the adjacent *iba puni*. Closer inspection of the 1978 APs revealed faint traces of an abandoned *iba puni* channel running directly from the Haeawi river resurgence across the swamp to a point near the current outfall of the Haeawi *iba puni* (Figure C25)[23]. As this channel seems to replicate the function of the current Haeawi *iba puni*, it must be assumed that its use predates the excavation of the Haeawi channel. It is along the line of this older channel that the anomalous blocks are aligned and, indeed, they actually incorporate sections of it. As the blocks in this central swamp area have not been used in living memory, it is possible that they represent a portion of a network of fields that predates the rest of the system. A number of other "covert" drains that are considerably fainter on the APs and seldom evident on the ground, and that do not appear to be aligned with the current system are also identified in Figure C25; the apparent articulation of these "covert" drains with features of the current system may reflect the differential obscuring of the earlier drains by extensive gardening activity within individual blocks of the current system.

22. Although Figures C7 and C8 do not distinguish between trackways and droveways, as the former tend to transform into the latter as they approach the wetlands, the distinction between the two is fairly clear on the ground.

23. These "covert" drains were only identified on the APs after my final field season but, paradoxically, the ability to interpret the APs at this level of detail was developed only through the preceding process of field walking. It is possible that there are traditions associated with the "covert" Haeawi channel, but the questions that might have elicited such a response were never posed.

The patchy but compelling evidence for an earlier field system in the Haeapugua wetlands provides a further element in the framework of relative chronology that can be teased out from the evidence of the ditch network; but it is impossible, on these grounds alone, to determine whether the "covert" drains represent a phase of drainage and wetland use that is entirely distinct from the current system, or if they are not simply early attempts within the same broad phase of wetland use to channel the major water sources through the swamp. The strong contrast between the visibility of the "covert" drains and that of other abandoned drains more obviously associated with the current system may reflect no more than the continual re-use and re-cutting of the latter set and total abandonment after initial use of the former. Certainly the few discernible blocks associated with the "covert" *iba puni* are broadly similar in shape and size to blocks of the current system.

If the dominant wetland crop during the more recent phase of wetland reclamation can be presumed, on ethnographic and oral historical evidence, to be sweet potato, what scope is there for identifying whether the field networks of these possibly earlier wetland phases reflect the presence of either sweet potato or its putative predecessor, taro? Although there may be differences in the nature of drainage within fields devoted largely to either taro or sweet potato, the larger field drains which constitute the field network serve the more general function of controlling the water table on a gross scale; thus the wetland field systems laid out in the Tambul valley for the almost exclusive production of taro (Figure C27, after Bayliss Smith 1985a) show much the same rectilinear form and common orientation along major drains evident at Haeapugua for sweet potato. Field size is informative, but does not necessarily permit a distinction between either taro or sweet potato as the more likely candidate staple; the only real access to this is the determination of internal garden topography through archaeological excavation of the surfaces of garden blocks. What does emerge from field size is the scope for identifying mono-cropping, or heavy dependance on one or a limited suite of staples, an observation that plays a crucial role in the model of wetland use outlined in Chapter C4.

Ethnographic access to the manner in which elements of the field system are socially distributed at Haeapugua allows questions of the relationship between the field system and specific social units to be entertained; this relationship can be addressed at a series of levels corresponding to the clan, the sub-clan and the family. The oral accounts of clan histories at Haeapugua (C2.4) suggest that clan boundaries have proliferated over time, both through subdivision following conquest and through the process of fission between *tene* and *yamuwini* elements of former parishes (Figures C18, C21 and C22). Generally, clan or parish boundaries have followed the major water features, with internal subdivision proceeding along the lines of lesser water features; the historical process of land division can thus be modelled along a cline that matches increasing (or decreasing) intensification of land use or population size with fluctuation in the size of the water features being employed as clan boundaries.

Wetland holdings at Haeapugua, which are considerably less complex than dryland holdings for reasons which I return to shortly, illustrate the structure of this process, with land holdings broadly matching the hierarchy of channels proposed earlier. Thus the major *iba puni* generally serve to mark parish boundaries, whilst minor *iba puni* correspond to sub-clan "boundaries". This observation can then be used to predict that the extent of "drain matching" on either side of an *iba puni* channel will, to some extent, reflect the political status of that *iba puni*, at the time of its initial construction; those channels which are most significant as political boundaries will display the lowest degree of drain matching.

Thus the Haeawi *iba puni*, which has retained its status as a parish boundary through successive transformations of the social landscape, shows little evidence of drain matching[24]. This is not the case for the adjacent Hagia *iba puni* to the north of the Haeawi; although the Hagia currently serves as a parish boundary between Tani (Walete) and Dobani, it is transected by almost every wetland drain with which it articulates. The only explanation that I can offer for this situation is that the Hagia *iba puni* was no more than an internal parish boundary between subclans or *tene* and *yamuwini* lineages when it was first cut through the swamp. This implies that the channel was initially cut when Bogorali were still resident as *tene* in what is now Tani (Walete) parish, a proposal that contradicts Dobani and Tani assertions about the identity and timing of this drainage event, but that does match Bogorali claims that they had begun wetland reclamation during the 18th century (see C2.5, Footnote 15). The apparent matching of drains along the current course of the Tereba can be accounted for if the proposals made above about change in the Tereba course are valid; in this instance, the political boundary appears to have moved with the river.

As a broad observation, the complexity of distribution of land holdings increases as one moves from wetland to dryland. This dryland complexity is most evident in those areas identified through clan histories as the settlement locations of the earliest ancestors resident in that parish. These ancestral focal points are characterised by extremely complex land division, with at least some representation by almost all of the

24. In fact, this observation could be employed to suggest that the "covert" Haeawi *iba puni* must thus predate the acquisition by Tani of the Waloanda area which lies between the current and "covert" *iba puni* channels for the Haeawi; it may thus date to a period when the Haeawi was a sub-clan boundary between Poro Goya and Poro Gu and Waloanda was Poro territory (see Figure C21).

lineages descended from the ancestor thus identified. Nice examples of this are illustrated in Tani Taibaanda parish at the sites of Waloanda and Taibaanda, where all four of the Tani clans possess land, either individually or collectively, within a small area (Figure C20). Often, but not exclusively, these former ancestral sites are also the centres of the highest density of garden blocks and thus the smallest block sizes; exceptions, as at Waloanda where the apical centre actually consists of a large curvilinear block with two internal dividing *gana* ditches, often indicate the presence of a *gebeanda* ritual site whose grove would not have been subject to subdivision or garden use prior to contact.

The distribution of lineage holdings within parishes reflects the history of land acquisition and division. This can be demonstrated through comparison of the subclan holdings of the Hiwa and Tani (Taibaanda) parishes, introduced and discussed in C2.4 and illustrated in Figures C19 and C20. The dryland holdings in Taibaanda parish are extremely complex, with no ready pattern apparent, other than the location of the senior Hebaria and Hagu lineages in the critical positions along the parish boundaries; the contrast with the regularity of subclan holdings in Hiwa parish, which match closely the line of the parish as a whole, running in three broadly parallel "catena" strips, is striking, particularly as the two parishes lie immediately adjacent to one another.

The explanation for this situation in Hiwa parish almost certainly lies in the relative recency of Hiwa clan's acquisition of their parish land after the Tambaruma war in approximately ?1835; a radical reallotment of land after this event has seen those subclan boundaries delineated after ?1835 endure largely unaltered through to the present. This in turn implies a considerable antiquity for Tani occupation of the Taibaanda drylands. Note, finally, that there is little joy for the archaeologist in this observation, as the complexity of the field system (as distinct from the social distribution of land) differs little between the two parishes, suggesting that Hiwa inherited an existing field system from the former Tambaruma residents, to which they have since contributed further layers of detail and "infilling".

The final level of relationship between the field system and the social distribution of land to be considered is that of the individual house or house cluster: what scope is there for the prediction of house location on the basis of the form of the field system? Modern Huli settlement, as illustrated in Figure C9, consists of houses scattered fairly evenly across the more level drylands, either singly or in small clusters. There is some evidence, both in the form of an earlier map of house distribution between 1970 and 1975 in Hiwa parish (Powell with Harrison 1982:8) and through the oral testimony of older Huli, that settlement was even more dispersed prior to the completion of the

Highway link to Tari in 1981; the increase in road access and transport and the corresponding development of local small business appears to have transformed settlement patterns, inducing the majority to relocate their houses both nearer the highway and in larger clusters.

Prior to this, however, we can expect that settlement will directly have influenced the field system through the process of block subdivision to create smaller house blocks and *gama* kitchen garden areas. Block size is thus an approximate index of the historical density of settlement. Another indicator of settlement in the recent past is the distribution of trackways and droveways which can be presumed to match, at a gross level, the distribution of houses and pigstalls. Thus the presence of smaller blocks in a thin strip along the dryland margins of Haeapugua, with most trackways and droveways extending through or from this same area, provides a reasonable guide to the distribution of the bulk of settlement over the temporal extent of these elements of the field system.

The presence of an even earlier form of settlement has also been mooted, founded on the distribution of ancestral *gebeanda* sites. Distinguished by the presence of Araucaria hoop pine groves, these are commonly situated on defensive ridgelines extending into the Haeapugua and Tari basins. Their relationship to the field system is of interest insofar as the major *hariga* trackways extending between parishes and basins appear to run between these *gebeanda* sites; if the assertion above about the priority of these major trackways in the development of the field system holds, then it may be possible to posit an early landscape in which more nuclear settlement sites connected to each other by tracks have laid out the basic framework of the modern field system, with these early settlement sites and tracks "enshrined" as *gebeanda* ritual sites and discrete *hariga* trackways, respectively.

In conclusion, on the basis of the oral historical and field network evidence, the following model of land use at Haeapugua can be proposed. Use of the dryland margins of Haeapugua for gardens and for settlement is presumed to have been continuous since the first agricultural settlement of the area. Garden fields during earlier periods may not always have been enclosed by excavated ditches, but the earliest ditched blocks for which there are still surface indications may have been large curvilinear lobate or oval forms. Over time, though it is not yet possible to specify what period of time, these larger fields have been either sub-divided or transected by rectilinear features, producing a composite network of curvilinear and rectilinear fields increasingly smaller in size; note that it is, of course, possible for this process to have operated in reverse, with older ditches being slighted and numbers of earlier blocks being incorporated into a single new block.

Early use of the wetlands is likely to have been restricted to the strip of land immediately adjacent to the dryland margins. Evidence for up to three major phases of wetland reclamation can be discerned: an early phase, possibly restricted to the Wenani area of Haeapugua, in which fields similar in form and size to the lobate fields evident on the drylands were extended to the wetlands; an intermediate phase, represented by the covert rectilinear drainage channels partially visible in the centre of Haeapugua; and the most recent phase, beginning from about the 1830s, which is presumed to have produced most of the wetland field network now visible. The bulk of the wetland centre network was probably first laid out between the 1890s and 1930s; finally, after a hiatus in intensive use lasting some two decades, the swamp centre network has been brought back into use, piece by piece, from the 1950s up until the present.

Was the short time frame of forty years between 1890 and 1930 that is asserted by oral tradition sufficient a period of time in which to establish the entire wetland drainage network? Calculations based on the maximum area of wetlands between 1959 and 1992 (shown in Figure C15) show that there are just over 205.609 km of drains in the Haeapugua wetlands[25]. Most estimates of wetland drainage take the more accurate measure of volume of soil excavated per person per hour (see Hartley 1967:33, Bayliss-Smith and Golson 1992a:21, Gorecki 1982:40-41); my data on drain sizes at Haeapugua is insufficient to match these estimates, but observations on the rare excavation of a short stretch of a new wetland drain at Munima parish in Haeapugua, where one man excavated 7 m^3 of soil from a drain 7 m in length in the course of 7.5 hours in a single day, are roughly comparable with the figures of 6 m in length of wetland drain per man per day given by Gorecki (1982:41). Assuming a rate of 7 m per day per man (drain digging being a male activity amongst Huli), it is possible to estimate that excavation of the Haeapugua wetland drainage network would have required almost 3000 man/days; this works out at a little over 8 years of continuous labour for one man, one year for 8 men or a month for 96 men. Obviously, it is not impossible that the network was completed between 1890 and 1930, though inclusion of estimates for the labour required to maintain wetland drains would provide a more accurate and considerably larger estimate of the labour commitment to wetland cultivation at Haeapugua. Like the conclusions drawn about the possible size of the population at Kuk during Phase 4, which range from 78 to 480 (Bayliss-Smith and Golson 1992a:17), these estimates provide a general indication of the range of

25. The area of unreclaimed wetland in 1890 may have been even greater than this composite maximum, but it is sufficiently close to the maximum possible wetland area on the eastern side of the Tagali river to serve the purposes of estimation.

possibility, but can tell us very little about the likely size or even broad formation of the communities which were involved in wetland use.

In light of some of the issues raised within this model of the development of land use at Haeapugua, a number of specific areas were selected for archaeological investigation. The wetland/dryland margins appeared to hold the richest archaeological potential, combining both the scope for a long sequence of use and the advantages of a positive depositional budget within which features might be preserved. Gorecki's (1982) excavations on the drylands surrounding Kuk and my own preliminary ditch surveys had suggested that continuous garden use of dryland areas tended to efface previous features. The assumption made during my fieldwork was that any dryland activity would also be registered on the dryland/wetland margins.

Excavation in most of the wetland centre areas of Haeapugua was not feasible due to their waterlogged conditions. Instead, an obvious focus was the levee areas bordering the Tagali river and the major *iba puni* channels of the Tereba and Garai rivers. Given the central role played by the major *iba puni* in rendering the swamp accessible to drainage, a date for the initiation of the levees would, as argued in C2.5, provide a *terminus post quem* for drainage of much of the rest of the swamp.

Finally, two other features were identified for archaeological investigation: droveways and settlement sites. If the construction of the *nogo dugudugu* droveways marked a critical point both in the extension of drainage into the wetlands from the dryland margins and in the valuation of pig production, a sense of their antiquity would obviously be vital to any understanding of the links between wetland use and "social" demands on production. As the droveways were not strictly constructed so much as excised from existing garden blocks, there was little scope for dating their "construction"; instead, test pits were excavated on the surfaces of the droveways in an attempt to identify the antiquity of their most recent use as gardens. The results of each of these lines of archaeological enquiry are discussed in the following chapter.

CHAPTER C3 - AN ARCHAEOLOGY OF WETLAND USE

C3.1 Introduction

In his review of the first field season at the Manton site in the Wahgi valley (Appendix A1), during which a total area of some 300 square yards (approximately 250 m^2) had been uncovered, Golson (1976c:27) concluded that his excavations had been 'too small' to be informative. The implications of this aside of Golson's for the value of my own archaeological endeavours are sobering and the results reported here should probably be treated as no more than a preliminary reconnaissance of the archaeology of the Haeapugua wetlands. Nevertheless, my intention throughout this thesis has been to emphasize the importance of defining parameters for explanation and to explore the nature of and the relationships between the different "variables" that have been engaged to explain histories of wetland use in the New Guinea Highlands generally. To this extent, the archaeological results contained in this chapter play a significant role in the structure of my argument, providing a chronological framework and a sense of change in the scope of wetland reclamation that both extend and challenge the model proposed in the previous chapter.

The bases for selecting areas for survey and sites for excavation within the Haeapugua basin are described in C2.6. The four principal areas for focus have been identified as the wetland/dryland margins, the levees formed along the Tagali river and along the major *iba puni* channels, the ditched droveways along the swamp margins and the settlement locations. A number of other excavations and site surveys were undertaken on more adventitious grounds but serve to sketch a broader regional and chronological context for the more limited goal of understanding the history of wetland development and use. The difficulties encountered in gaining permission from landowners to excavate in their wetland margin gardens, combined with extended periods of flooding at Haeapugua, produced a situation, exacerbated by personal illness, in which my more ambitious initial plans for excavation had to be scaled down considerably (see A3.2). Nevertheless, the basic plans for survey and excavation were pursued, though the numbers of sites excavated and the extent of individual site areas were all reduced as a result.

The following section (C3.2) reviews both the regional and surface archaeological surveys, describing the general prospects for archaeological enquiry in the Tari region, and the results of the more intensive surface artefact collections undertaken in the Haeapugua basin. In C3.3, the results of ditch surveys, auger transects, test-pits and excavations at Haeapugua are summarized. In light of the reconstruction of the environmental history of the basin in C3.4, based largely on the work of Simon Haberle (1993), an interpretation of the significance of these archaeological results is offered in C3.5.

C3.2 Surface Surveys

The grounds for establishing a regional, strictly archaeological context for the Haeapugua excavations are sparse. The handful of earlier archaeological investigations in the Tari region and its surrounds had yielded only a single ^{14}C result and, other than Mangi's as yet unreported excavations from the Porgera area (see A3.1), nothing more substantial by way of excavations than shallow test-pits in rock-shelters. Appendix C7 outlines the range of archaeological evidence known from the work of previous researchers and my own surveys throughout the region, largely as a means of reviewing the potential for archaeological research beyond my particular focus on wetland drainage. A range of forms of archaeological evidence, including extinct megafauna, cave and rock-shelter sites, rock art and stone artefacts are each reviewed in Appendix C7. Details of the locations of these sites and the artefacts collected are listed in Appendices C8 and C9 respectively[1]. Selected sites, including each of the excavations, are described in further detail in Appendix C10, and ^{14}C results from the region are listed in Appendix C11; those of the archaeological sites located in the Haeapugua basin are mapped in Figures C28 and C31. This section focuses on the results of surface surveys for settlement locations within the Haeapugua basin.

Surface surveys in the Tari region were pursued at three different levels of intensity. Beyond the limits of the map study area in the Haeapugua basin, surveys were entirely adventitious, consisting largely of artefact scatters noted or collected in the course of excursions by foot in other basins or other areas of the Haeapugua basin (Appendix C8: Sites LMU-W, LQV-Z, LSB, LSS-T, LSX). Within the map study area at Haeapugua, where almost every block was entered by foot, inspection of garden surfaces for artefacts was considerably more intensive, though by no means thorough. The most intensive artefact survey involved a series of visits on separate occasions to a cluster of 20 garden blocks in the Waloanda area of Tani (Taibaanda) parish.

Five broad classes of artefact were distinguished in the Haeapugua surveys, consisting of tanged stone blades, stone axe blades, ritual stones (*liru*), cooking stones and flaked stone artefacts; further details relating to each of these classes are provided in Appendix C7. Figure C29 maps the distribution of blocks within the Haeapugua map study area from which artefacts were recovered either through surface collection or

1. Site codes used in the text refer to the three-letter codes of the Papua New Guinea National Site Register, in which the first letters "L" and "Q" denote sites from the Southern Highlands and Enga provinces respectively.

excavation. The concentration of these sites along the dryland margins of the Haeapugua wetlands is immediately apparent and, given the similar distribution of modern settlement (Figure C9), not unexpected; only one stone flake was recovered from a block in the wetland centre (LMO, in the Tani (Walete) parish wetlands) and this was identified by local residents as the site of a former house block. This may, obviously, reflect the greater degree of exposure and ease of access in gardened dryland blocks, but is probably indicative of the broad pattern of settlement distribution over time.

White and Modjeska (1978a, 1978b) have undertaken detailed ethnographic studies of the use-lives of stone axes in the Kopiago area from which they conclude that 'most axe blades do not enter the archaeological context at repair locations or home bases, but in their contexts of use' (1978b:285), presumably largely along forest margins. The map study area, which consists largely of cleared and intensively gardened land, yielded only 9 axes or axe fragments, tentative support for this model of discard behaviour. However, other categories of artefact, specifically the *liru* ritual stones, flaked stone artefacts and cooking stones, can be expected to indicate more directly the distribution of settlement. *Liru* stones, in particular, are associated with the locations of ritual sites which, as described earlier (B2.6, C2.4), are often the sites of ancestral residence. In every case where *liru* stones were located in the course of the surface surveys, the locations were identified by local residents as known and named *gebeanda* ritual sites.

While cooking stones are often difficult to distinguish and suffer further from being continuously reemployed to the point where they degrade, flaked stone artefacts and flake debitage provide a relatively sensitive index to settlement and, I suggest, to the distribution of men's houses (*balamanda*) in particular. For Huli, stone artefact production (but not use) is conventionally the domain of men and it might thus be proposed, as a preliminary hypothesis, that higher densities of production waste (other than at the stream bed sources themselves) can be to taken to indicate the former presence of men's houses. But this pattern is considerably complicated by the short life-span of most domestic Huli buildings and the tendency for a rapid rotation in block use, with house blocks being recirculated as garden blocks before being used again for houses and kitchen gardens. More detailed ethnographic and historic studies would be required to establish whether this rotation extended to the point where blocks containing men's houses were recycled as women's house blocks and vice-versa, but the archaeological implications are that long-term Huli settlement under the pattern described ethnographically would produce a fairly even background distribution of flaked material, possibly interspersed with sites containing a higher density of debitage marking specific men's house locations. The earlier of these sites, ultimately recycled as *gebeanda* ritual sites commemorating the presence of ancestral men's houses, would be expected to contain *liru* ritual stones in addition to flaked material.

The intensive surface artefact survey of the Waloanda area was undertaken to examine the scope either for pinpointing individual settlement locations or for establishing broader patterns of settlement distribution within a dryland area. A sample of 20 contiguous garden blocks was surveyed on three separate occasions (in August 1989, November 1989 and January 1991) in an attempt to gain access to a maximum area of visible surface. All flaked and ground stone artefacts and all *liru* ritual stones were collected and obvious cooking stones were noted and counted[2]. Estimates were made of the total area of each block exposed during the surveys and of the background density of stone material in general.

Table C6 lists the results of the Waloanda survey, providing simple totals for the artefacts collected from each block (AD: artefact density) and an attempt to adjust these totals to account for the variation in surface exposure and visibility (MD: modified density). The results, while crude, suggest the presence of a low-background MD artefact density of 6 to 24 artefacts per block, common to almost all of the blocks where surface exposure was higher than 10% of the block area. Set against this background artefact density are three blocks in which a considerably higher MD artefact density of 116 to 216 artefacts per block was obtained; these I would interpret tentatively as the sites of former men's houses. Interestingly, of the three *liru* finds in the survey, only one occurred in these 3 high MD blocks, suggesting that the other two sites represent either recent men's house sites (uncommemorated as *gebeanda*) or house sites of an antiquity that exceeds historical recall and commemoration as *gebeanda* ritual sites. Figure C30 maps the density of artefacts per m^2 in the area of the Waloanda survey, showing that the distribution of relatively high artefact densities is restricted to the low hills immediately above and adjacent to the wetland margins, with lower densities from blocks on both the steeper slopes and the wetland margin flats to either side.

The range of archaeological evidence discussed here and in Appendix C7 suggests that there is considerable scope for a conventional archaeological approach to the history of the Tari region. Although the limited extent of archaeological research in the region is insufficient to provide a detailed chronological context for my excavations in the Haeapugua wetlands, the possibility of a Pleistocene or at least early Holocene

2. As an indication of the distances over which cooking stones are transported, certain of the cooking stones located during the Waloanda survey were identified as "Darama *tole*", stones from the Darama river in Hiwanda parish on the far side of Haeapugua swamp.

presence in the region is implied by the discovery of large core tools, digitally fluted cave art and megafauna, the last as a potential resource. The Waloanda survey also introduces a possible means of enquiry into a much-neglected facet of regional activity in the past, the distribution of open dryland settlement. What follows is a more focused consideration of the history of wetland use in which the results of archaeological research elsewhere in the Tari region are introduced before turning to a discussion of the results from Haeapugua.

C3.3 Wetland Archaeology

This section reviews the results of regional surveys of buried drainage systems and summarizes the principal findings of the archaeological excavations in the wetlands and wetland margins of Haeapugua; detailed descriptions of the individual sites are contained in Appendix C10. The discoveries of buried drains by earlier workers in the Tari, Kopiago and Porgera regions are briefly described, together with the results of my own surveys in the other basins of the Tari region. The stratigraphic sequence at Haeapugua is then outlined, followed by a discussion of the features of each phase and a review of the chronology generated on the basis of the ^{14}C results.

Drain Surveys

Ancient or abandoned and infilled ditches and drains have previously been identified at Kopiago, Porgera and Mogoropugua. In 1973, White (1974) noticed a series of older ditches in the wall of a new ditch dug into a clay hillock at Lane, on the margins of the central swamp in the Lake Kopiago basin (LAH); these infilled features were a metre wide and a metre deep and spaced apart at intervals of approximately one metre. A sample of charcoal extracted from the basal 20 cm of the fill of one of the ditch features produced a result of 430 ± 110 BP (650 (500) 280 cal BP) (NSW-100). Another ancient ditch has been reported from the Porgera valley (QCI), where a modern road cutting has exposed a charcoal-rich ditch feature in section (Tumu et al. 1988:5) but no date is reported for the site.

The richest finds of ancient ditches in the Tari region have been those made at Tunugua parish in the Mogoropugua wetlands in March 1980 during a brief survey by Jack Golson, Andrew Wood, Tim Bayliss-Smith and Bryant Allen. Notice of this survey has been briefly reported by Golson (1982b:121) who mentions that the site contains phases equivalent to the Kuk phases 5 and 6 (c.400-100 BP), but further details are reproduced here, drawing on a personal communication from Golson (n.d.). Here a rare window of opportunity, strikingly similar to the situation at Kuk, presented itself to Golson's team in the form of a World Bank-funded coffee project for which an attempt was made to reclaim a large area of the Mogoropugua wetlands. Drains were laid out for the coffee project, of about a metre in depth, evenly spaced at intervals of 10 m and extending into the swamp from its western margin for a maximum distance of about 1 km.

Golson describes the top metre of the swamp stratigraphy at Mogoropugua as composed typically of a basal 30 cm red-brown organic layer capped by a thin but heavy woody horizon. Above this woody horizon was a 20 cm layer of slick brown-black clay, overlain by a 25 cm layer of black clay containing occasional lenses of volcanic ash (8 cm above the base of the black clay layer); this ash Golson identified in the field as the "Z" ash known at Kuk (Tibito tephra). Above the black clay was a surficial 7 cm layer of felted peat.

At least two distinct phases of ancient drains, exposed in section along the full extent of the Mogoropugua coffee drain network, were identified within this sequence. The earlier of these appeared to have been excavated within the black clay; critically, the fill of at least five of the drains of this phase, consisting largely of reworked mixed clays, also contained discrete lenses of Tibito tephra. In at least one instance, the fill of a drain feature of this earlier phase had itself been partially re-excavated by a later drain containing a greasy black clay fill. Golson indicates that the earlier phase at Mogoropugua appears to correspond to Phase 5 at Kuk and the later to Kuk Phase 6. As the depth at which the Tibito tephra appears in the different "Phase 5" drains varies considerably, it might be inferred that abandonment or partial abandonment of this phase at Mogoropugua followed immediately upon the Tibito fall, dated to between 305 - 270 cal BP (Appendix A3). The later "Phase 6" drain would thus date to some point after the Tibito fall.

The Mogoropugua coffee project has since been abandoned and a return visit to the site by Golson and myself in February 1991 established that the entire project area had reverted to swamp, with water rising to the lips of the former project drains, rendering impossible the type of survey undertaken both at Mogoropugua in 1980 and at Kuk. Freshly cleaned walls of existing ditch networks were routinely examined during the course of my surveys in the Kandepe, Komo, Tari, Dalipugua, Mogoropugua and Lebani basins; one of the better exposed sections, at Urupupugua swamp in the Tari basin, is described in Appendix C10 (Site LOF) and discussed further in Chapter C4. But the contrast between the exceptional access at Mogoropugua in 1980 and the more limited success of my own regional surveys of exposed ditch and drain features underscores the extent to which the conservatism of the existing ditch networks in the region both obscures their own histories of development and, through a combination of dryland vegetation regrowth and rise in wetland watertables, admits little access to earlier, non-aligned networks. It is significant, in light of my argument about the conservatism of the local field system (C2.3), that the presence in the Tari and adjacent regions of ditch and drainage systems earlier than those currently in use has been exposed largely through their intersection by modern road construction and novel forms of drainage, rather than through exposure in the walls of the current ditch network.

Haeapugua Drain Surveys

At Haeapugua, most of the walls of most of the accessible ditches within the map study area were examined at some point during the mapping surveys. As elsewhere in the region, the results were disappointing, in terms both of the numbers of ditches that contained freshly recut wall faces and of the numbers of features exposed in these faces. In the dryland areas, weathering of the massive ash deposits tends to reduce the basal deposits to a uniform humic brown soil (Wood 1987) and an overall lowering through garden activity of the land surface and successive recutting of the ditches has the effect of continually effacing all traces of previous garden surfaces and the earlier, thinner and shallower ditch features. In the wetland centre at Haeapugua, a high water table generally prevents all access to drain walls; but significantly, attempts made during major dry spells to inspect wetland drains were no more successful in yielding evidence for earlier features.

The best ditch wall exposures at Haeapugua proved to be located in a narrow band along the wetland margins where the water table was sufficiently low to permit inspection and a generally positive soil budget allowed for the vertical separation of features from different phases. This wetland margin strip was subsequently targeted for most of the more detailed section mapping and excavation reported here. After initial and largely unsuccessful test excavations on the northern and southern wetland margins in 1989, the focus of the 1990-91 and 1992 excavations shifted to the narrow wetland margins along the eastern side of the basin, in Dobani parish and the Waloanda area of Tani (Taibaanda) parish. Figure C28 shows the locations of archaeological sites within the map study area, including the 1989 excavations, and Figure C31 provides a more detailed map of the excavations in the Dobani / Waloanda area. Details of the individual excavations are given in Appendix C10. What follows is a generalised description of the stratigraphy at Haeapugua, with particular emphasis on the evidence from the Dobani / Waloanda area.

Basic Stratigraphic Sequence

The basic stratigraphic sequence described here was initially observed in the course of the drain surveys and later confirmed and more closely examined through excavation. While the sequence is common to almost all of the sites of the Dobani /

Waloanda area, its basic structure is also applicable across much of the Haeapugua basin on the eastern side of the Tagali river. In its most simple form, the sequence is described using the four abbreviated unit terms employed in the field: in stratigraphic order from the surface downwards these include the topsoil, dark grey clay, light grey clay and basal white clay units. Each unit potentially contains a number of constituent layers, though these are not always distinguished or distinguishable at individual sites. Note that the basic sequence applies essentially to wetland margin sites; the same sequence at those dryland sites not exposed to flooding consists of a topsoil, a dark soil fill and a basal humic brown soil, the latter reflecting weathering of the basal white clay unit observed in the wetland margins.

The topsoil unit at the wetland margin sites consists of an occasionally silty and therefore slightly sticky peaty loam, typically black (10YR 2/1) with a pH value of 7 to 7.5 and fine roots extending throughout the unit. It was the source of almost all of the excavated stone artefacts and varied in depth from 2 cm, in areas of high use such as trackways, to 22 cm where it overlay buried channel features.

The dark grey clay unit is composed of a labile light medium clay, sticky with moderate pedality and mottled but typically dark greyish brown (2.5Y 4/2) in colour with a pH ranging from 7.5 to 8. The depth of the dark grey clay was usually between 5 cm and 15 cm, but extended up to at least 70 cm where it infilled channel features. In light of its appearance as the fill of channel features, the dark grey clay was interpreted as an admixture of the two lower units, the light grey and basal white clays, with topsoil in the form of soil aggregates, presumably as a product of tillage and other deeply invasive forms of gardening activity.

Beneath this was a lighter grey clay, similar in many respects to the dark grey clay, though tending to greater plasticity and stickiness; the principal colour of this mottled unit was typically light grey (7.5Y 7/2), with a pH value of 7.5 to 8. My initial interpretation of the formation of the light grey clay was, again, of an admixture through gardening processes of the basal white clay with peaty topsoil material; the grounds for the subsequent rejection of this view are discussed below. The close formal similarities between the light and dark grey clays are not surprising, given that they both draw upon the same parent materials, but may in fact mask a considerable disparity in formation process.

The basal white clay unit is the most generalised of the unit categories as it covers a wide range of different component layers, including clayey layers of reworked ash, massive woody organic remains and tephra material. The assumption made in the field was that the uppermost of the layers of reworked ash in the white clay unit represents Tomba tephra and thus predates anthropogenic influence in the region (see C1.2).

The white clay components of the white clay unit vary slightly from layer to layer but typically consist of light to silty calcareous clays, slightly sticky with weak pedality; the colour of the clays is typically pale yellow (5Y 7/3) and pH values range from 6 nearer dry land to 8.5 in wetland sites. Most of the white clay layers contain fragments of freshwater shell, most commonly snail operculae (Hydrobiidae) and bivalves (cf.Sphaeridae) (Ralph Ogden pers.comm., Haberle 1993:138). This observation, together with the fine banding apparent at most sites (see Appendix C10: LOG site), suggests that the clays represent fluvially reworked ashes deposited in lacustrine contexts.

The massive woody organic layers are common to most of the large swamps in the Tari region and are most visible in the northern portions of Mogoropugua swamp where the swamp surface has deflated, exposing a dense cover composed of the former stumps of a drowned swamp forest; these are the layers referred to by Huli as *ira dugu* and associated with the era of pre-ancestral *dama* (C1.2). These layers are composed of massive wood and seed fragments set within friable, compacted peats. Analysis by Haberle (1993:152-153) of pollen from the two woody organic layers at the LOB sites has revealed the presence of a local swamp forest dominated by Dacrydium with Myrtaceae and Pandanus also important. Colours recorded range from black (5Y 2.5/2) to very dark grayish brown (2.5Y 3/2); pH values vary similarly to those for the white clays, from 6.5 in drier locations to a uniform 8.5 in waterlogged conditions.

A number of thin tephra bands, 1 to 5 cm in thickness, apparently deposited more or less *in situ* and possibly of different origin from the massive ash falls which constitute a major source material for the white clays and dryland humic brown soils, are interspersed within the white clay unit. At most, four of these thin tephras have been observed at a single site (LOB), where sampling at various heights along each band in this dipping section suggests that there is more variation with height within each band than there is between different bands (G.Humphreys pers.comm.). The thin tephra bands are typically dark olive grey (5Y 3/2) in colour, brittle and fine sandy in texture, with moderate to high pedality.

While the woody organic and white clay layers obviously mark the former local presence of swamp forest and open surface water respectively at the swamp margins, the white clay layers vary considerably in thickness between sites, appearing thickest near the outfall points for streams descending from Lagale Mandi ridge. Auger transects have established that these white clays do not extend far out into the swamp before tapering out to a point and they are interpreted as fan deposits of volcanic ash reworked to form a calcareous clay (Appendix C10: LOA site). A series of auger transects into the swamp from three different points along the wetland margins, combined with observations on the occurrence of white clay as upcast on freshly dug drain walls, was sufficient to establish that the white clay unit is distributed along all of the wetland margin areas of the map study area with the exception of the vicinity of the Tereba and Garai river channels, where it is either displaced or buried by alluvial deposits of a different origin and composition.

Detailed descriptions of the white clay unit from a number of different locations around the wetland margins suggest that a common sequence of its component layers can be identified. Table C7 describes the individual layers of this sequence and Figure C32 attempts to correlate the sequences described from three sites: LOB and LOC on the eastern side, and LOD on the western side of the basin. The critical elements in this proposed correlation are the four thin tephra bands, the lowest of which is identified by its presence immediately on top of the uppermost of the two woody organic layers; the contact surface between this woody organic layer and the overlying tephra is heavily carbonised, suggestive of a connection between the tephra fall event and the termination of the organic layer. The white clay layers between the two woody organic layers are identified collectively as the source of the megafauna fossil finds at the LOB site but cannot, on present evidence, be matched with the fossiliferous layers from the LOG and Pureni (LAC) sites.

A notable feature of the white clay unit at Haeapugua is that it is often unconformably overlain by the other three units of the basic wetland margin sequence. On both the eastern and western sides of Haeapugua swamp, the white clay unit tilts, usually but not exclusively downwards in the direction of the swamp centre, at angles of up to 15 degrees; the uppermost surfaces of the unit have then been planed level, with the light and dark grey clays and topsoil laid over this new surface. Two possible explanations for this tilting have been proposed. The first seeks a connection between the tilted beds and the presence along the eastern margins of the swamp of a bench or scarp feature, broken only where it is intersected by streams from Lagale Mandi ridge, and ranging in height from 2 m to 4 m. Huli claim both that the bench is fundamentally a "natural" feature and that they have deliberately accentuated its slope by cutting drains along its base to tap aquifers and drain the higher ground above[3]. As Lagale Mandi

3. This practice of digging cut-off drains along the foot of swamp-margin hills has been recommended for the Kandep swamps as a means of controlling seepage from the higher slopes (MacGrigor et al. 1967:5).

ridge is a fault scarp, it is possible to regard the bench as an uplift feature and the tilting of the basal white clay unit as a consequence of the same uplift process.

This explanation fails, however, to account for the presence of similar tilting on the western side of the basin or for the fact that, at some points along the eastern margins, the tilt "reverses" further into the swamp, tilting upwards away from the bench to assume a level position before it tapers off to a point in the swamp. An alternative explanation, which does not exclude the possibility that uplift plays some role in the severity of the angle of tilt along the eastern margin, would view this tilting as a consequence of the differences in pressure loading on lower layers created by overburdens of either peat or clay (Paton, Humphreys and Mitchell in press). The extension of the denser clay in a fan onto underlying swamp or organic deposits may have promoted deformation in the underlying deposits which corrected itself as the fan petered out towards the centre of the swamp. Figure C33 is a schematic illustration of the relationship between the Lagale Mandi ridge, the bench feature and the tilted white clay unit.

Dates for the deposition of the white clay unit layers and for the tilting event or events have not yet been determined. Samples taken from the two organic layers at LOB yielded radiocarbon ages of 33 090 ± 970 BP (ANU-7228) for Layer 6 and 31 800 ± 830 BP (ANU-7229) for Layer 2 (Haberle 1993:142), placing them near the limits of radiocarbon dating and beyond the effective reach of calibration. Haberle (1993:147) argues that the most recent of the major ash falls, that of Tomba tephra at a date earlier than 50 000 BP, caps the tilted white clay unit; as this sequence has not been demonstrated in section, I am inclined to regard the uppermost of the white clay layers in the white clay unit (Layer 16 in Table C7) as Tomba tephra, and thus to infer that the process of tilting of the white clay unit on both sides of the swamp post-dates the fall of Tomba tephra[4].

Given that the white clay unit was presumed, even in the field, to predate human occupation of the Tari region, this may appear a lengthy and unnecessary digression; but the behaviour within the light grey and dark grey clay units of the more durable elements of the white clay unit provoked considerable difficulties in interpretation during excavation, and the process of tilting is critical to an understanding and attempted resolution of these problems. These problematic durable elements of the white clay unit are the thin tephra bands, dubbed "transgressive tephras" in the field

4. As Tomba tephra has not actually been demonstrated from any site in the Tari region, the safest conclusion, based on the basis of Haberle's analysis of pollen from the LOB site (S.Haberle pers.comm.), is perhaps that the tilting post-dates the last inter-glacial (120 000 BP).

because they appeared initially to transgress the basic laws of stratigraphy; their form and significance is best accounted for in the context of the discussion below of the features of each unit.

Features

Three broad sets of features can be identified, corresponding to infilling sediments from the top three stratigraphic units: the topsoil, light and dark grey clays. Features infilled with topsoil or an unconsolidated mix of different materials are essentially associated with the current ditch and garden system. They consist largely of channels and planting holes of dimensions that closely match modern forms. Usually, these features are observed only in road cuttings or in the walls of novel ditches; in rare circumstances, as at the LOG site (Appendix C10), *gana* ditches known to have been abandoned earlier this century have been located within existing gardens.

Features infilled with the material of the dark grey clay unit are cut into both the light grey clay and basal white clay surfaces, depending on the local thickness of the light grey clay unit and the depth of the individual features. As with features infilled with topsoil, those infilled with dark grey clay consist largely of channels and small holes. "Dark grey channels" are typically of three gross size classes. The largest of these are drains, approximately 70 cm in depth and up to 120 cm wide at the top of the channel (as observed in the wall of the modern ditch at the LOC site). The intermediate size class consists of channels 40 to 55 cm in depth and 60 to 80 cm wide at the top of the channel (represented at LOB(i), LOC and LOJ - Feature J). The smallest size class consists of small channels or "runnels", 6 to 20 cm in depth and 15 to 30 cm wide (represented at LOB(ii) and LOJ - Feature A). No clear pattern in the profiles of channels of these different size classes can be discerned, though channel bases appear to become more rounded with increasing size, the smallest channels being almost flat-bottomed. Where dark grey channels appear to articulate with one another, they do so at a right-angle. Instances of apparent articulation at low angles, as at LOJ, are interpreted as evidence for the presence of at least two distinct phases of land use represented by the dark grey clay fill. None of the excavations were of sufficient extent to determine the spacing of channels of comparable size.

Hole or pit features proved very difficult to distinguish within the rather homogeneous dark grey clay unit and were usually detected only in the surface of the light grey clay unit beneath. The dimensions of dark grey clay-filled holes at the LOB(ii), LOC, LOI and LOJ sites, ranging in diameter from 5 to 25 cm at the light grey clay surface and from 5 to 27 cm in depth below that surface, are given in Table C8; no pattern in these dimensions or in the distribution of the hole features in site plans is evident and, given that these measurements represent only the bases of features whose original surfaces have not been determined, little can be said of their likely functions.

Over time, the practice of tillage and the continual planing off of the upper 10 to 20 cm of the soil surface in the process of mound formation for sweet potato cultivation produces a fairly level surface and has the effect of effacing all but the deepest garden features, particularly in such heavily cultivated areas as the wetland margins. The surface of the light grey clay is thus, potentially, the base of all garden activity during the period represented by the accumulation of the dark grey clay unit, though only the more deeply penetrating techniques will have registered in the light grey clay surface. But where the techniques of sweet potato and yam production in the Highlands are notoriously invisible in archaeological garden surfaces (Gorecki 1982: 205,209), some evidence of the much deeper penetrating technique of taro planting (described in B4.4) might have been expected. At present, taro holes, which are typically 21 to 22 cm in diameter at the mouth and 23 to 25 cm in depth (Table B14), are possible candidates for many for the hole features uncovered in the excavations. Other than the channel and hole features, the surfaces of the light grey clay unit immediately underlying the dark grey clay unit at each site (except LOM) are broadly level and undistinguished by any other type of feature.

While slight variations in texture enabled distinctions to be drawn between the lower fills of some dark grey channel features (as at the LOJ site), no internal differentiation of the light grey clay unit was noted at any site, other than a tendency for the fills of deep light grey clay features to grade in colour and texture towards an increasingly darker hue and softer, more plastic clay at the base. Features infilled with light grey clay were thus recognised only as they appeared in the surface of the basal white clay unit or, more rarely, in cemented bands of tephra within the light grey clay unit itself (as at the LOI site).

The complex form of the features in the white clay surface attracted much of my attention during the Dobani / Waloanda area excavations. This complexity is due, in part, to the palimpsest effect created in the white clay surface by the registration of features filled with both dark grey and light grey clay. But examination of the site plans for the white clay surface at sites LOB(i), LOB(ii), LOC, LOI and LOJ reveals some pattern to this complex topography. Four principal types of feature can be discerned: straight channels, curvilinear runnels, pits and tunnels.

Straight channels infilled with light grey clay are present at sites LOB(ii) and LOJ. At LOB(ii), the channel, 25 to 47 cm in depth and 19 to 24 cm wide, is V-shaped, narrowing to a crack at the base which fluctuates in height, with no particular evidence for the direction of flow. This contrasts strongly with the LOJ channel, minimally 18 to 25 cm in depth and 35 cm wide, which has a clearly rounded base.

The features identified as curvilinear runnels are both shorter and shallower than the channels and appear to vary in form with the oegree of slope. Where the white clay surface is level as at LOJ, the site farthest into the swamp, no clear pattern in the orientation of the runnels is evident and they appear to run in short and shallow (5 to 13 cm deep) curving sections between pit features without emptying out in any particular direction. Closer to the dryland margins, at sites such as LOB(ii), LOC and LOJ, the runnels, while still "serving" to connect pit features, display some uniformity in orientation broadly consistent with that of the larger channels and appear generally longer, deeper (8 to 23 cm deep) and straighter than at LOJ.

The pit features infilled with light grey clay appear both at the terminal points and intersections of runnel features. At LOJ, the topography is essentially pockmarked with deeper pits, between which short stretches of shallower runnels extend, with the pits lying 5 to 10 cm lower than the runnels. The degree of pitting decreases with increasing slope, with light grey clay-filled pit features all but absent from the LOC site. Further into the swamp at LOI, the site with the most level base for the light grey clay layer, pits are registered not in the basal white clay but in the surface of the tephra pavement which lies within the light grey clay unit; here, six hole features, each differently shaped in plan, could clearly be identified where they broke the surface of the tephra pavement and yielded grey clay fills noticeably darker in colour than the surrounding light grey clay.

Lastly, tunnel features are present at the LOB(i) and LOB(ii) sites, connecting pits with channel features. These tunnels, 6 to 14 cm in diameter, are clearly filled with light grey clay and distinguishable from their basal white clay surrounds. In each case, the tunnels appear to allow for flow from higher pit features down into lower channel features.

A general observation on the light grey clay features is the tendency towards a slight undercutting of the sides of channel, runnel and pit features which was often difficult to identify or preserve during excavation but obvious in the wall sections. It is also interesting to note that this pit-and-runnel topography was by no means universal across the full extent of the white clay surface in the Dobani / Waloanda area: at the LOG site, for example, the upper surface of the white clay unit appeared level and unbroken by any feature, though it lay at a similar depth beneath the current soil surface. Perhaps significantly, there was no light grey clay unit observed at LOG.

"Transgressive" Tephras

At most of the Dobani / Waloanda area sites, where the white clay unit dips at angles of up to 15 degrees, the stratigraphic "behaviour" of the thin tephra bands of the white clay unit was the source of some consternation. Where these tephra bands occurred above the water table, they hardened to form a concreted "pavement", undergoing a change in colour with oxidation from dark olive grey to yellowish red (5YR 5/8). Although these tephra bands are clearly components of the white clay unit (Figure C32, Table C7), at sites where the dip in this unit is pronounced, the tephra bands extend upwards, beyond the white clay unit, into the overlying light grey clay unit. Where the tephra bands extend into the light grey clay, they usually conform to the angle of dip of the lower white clay unit and retain a degree of coherence in structure. At no site is there a corresponding dip in the light grey clay unit, which rests evenly on the level surface of the white clay.

This tends to produce an unusual stratigraphic relationship between the tephra bands and the light grey clay-filled features, which are etched into the white clay surface both "above" and "below" the point at which the tephra band enters the light grey clay. The tephra pavements do dip slightly, immediately above features infilled with light grey clay, but breaks in the continuity of the pavement are seldom observed even at these locations (see Appendix C10: LOB(ii), LOI, LOJ sites); during the 1990/91 field period, these tephra bands were dubbed "transgressive tephras" to distinguish them from the uppermost tephra, identified as Tibito, which exhibited none of these characteristics. Critically, the tephra bands lose all coherence in structure and in angle of dip upon contact with the base of the dark grey clay unit (see Appendix C10: LOC site). Concreted tephra material is frequently located within features infilled with dark grey clay, but here it occurs as isolated and obviously disturbed individual fragments. Further details of the stratigraphic relationship between the transgressive tephras and the light grey clay unit are given in the descriptions for the LOB, LOC, LOI and LOJ sites in Appendix C10.

Field Interpretation, Radiocarbon Results and Chronology

The model of the chronology of apparent change in land use developed during the 1990-91 excavations essentially distinguished between three major phases corresponding to the different stratigraphic units: Phase 1, consisting of the features infilled with light grey clay; Phase 2, consisting of those infilled with dark grey clay and Phase 3, which combined features infilled with topsoil and the current field system.

The Phase 1 features, which appeared to consist largely of reticulating and ponding features, I interpreted initially as evidence for a form of taro bed unknown ethnographically; the position and behaviour of the tephra pavement in relation to these light grey clay features remained problematic at the end of the 1990-91 field season.

The Phase 2 features, consisting of essentially plain bed surfaces and straight channels, appeared more consistent with the hydrological requirements of sweet potato and were originally interpreted as Ipomoean, with Phase 3 marking a further development of the Phase 2 system over the period of the last century.

In submitting samples for radiocarbon dating from the 1990-91 Dobani / Waloanda area excavations, I was required to provide estimates of the range of expected ages for the different samples; these estimates drew essentially upon the field model of the sequence outlined above. Phase 1, which included the base of the Tagali levee (Appendix C10: site LOH) and the light grey clay-filled features, was estimated at between 1200 BP and 400 BP; Phase 2, which consisted of the dark grey clay-filled features, at between 400 BP and 100 BP (post-dating the arrival of sweet potato) and the topsoil and current system of Phase 3 from 100 BP to the present.

While the ^{14}C results correctly reproduced this relative sequence, there was a considerable extension in the actual antiquity of Phases 1 and 2. Table C9, drawing on Appendix C11 which reviews most of the radiocarbon results from the Tari and Lake Kopiago regions, lists the results of samples from the 1990-91 and 1992 excavations in chronological sequence and designates possible sub-phases within the sequence of three major phases. The most surprising results were those for Phase 1, which returned late Pleistocene / early Holocene dates with median intercepts between 9260 cal BP and 21 040 cal BP for samples from the base of the light grey clay unit and the surface of the white clay unit.

Phase 2, which I had interpreted as Ipomoean in antiquity, instead returned a scatter of median intercepts between 1300 cal BP and 310 cal BP, falling into three broad groups designated here as sub-phases 2A, 2B and 2C. I am inclined to treat the results within each of these three sub-phases as essentially similar in terms of calendrical antiquity. Within sub-phases, each of the calibrated results overlaps with all of the others at two standard deviations; only between sub-phases 2A and 2B is there any overlap at two standard deviations between dates at the extreme end of each sub-phase range. Taken together with the compounding effects of uncertainty about the sources of dated samples from feature fills, the limited radiocarbon resolution for sites of this recency and the scope for optional calculations such as the Southern Hemisphere atmospheric correction factor of 40 years (Stuiver and Reimer 1993a:20), it would be folly to attempt to discern an internal temporal sequence within any of the Phase 2 sub-phases[5]. With so limited a data set, the sub-phase distinctions are themselves obviously fragile but are retained here, if only to serve as a reminder of the scope for finer temporal distinctions within each phase.

Figure C34 relates the calibrated results to a schematic diagram of the stratigraphy of the Dobani / Waloanda area sites. This suggests more clearly the possibility of sub-phase distinctions within the dark grey clay unit, particularly at the LOJ site. It also has the effect of calling further into question the stratigraphic status of the transgressive tephras which are manifest in both the white clay unit (dating presumably to before 50,000 BP) and the light grey unit (tentatively dated to between 21,000 BP and 17,000 BP). A review of Haberle's (1993) reconstruction of environmental history at Haeapugua and in the Tari region provides both a test of the phase distinctions generated by the archaeology and a basis for resolving the problems raised by the transgressive tephras.

C3.4 Environmental History

As at Kuk, reconstructions of the broader environmental history at Haeapugua founded upon pollen and sediment analyses from swamp cores provide a context that considerably extends our understanding of the archaeological results. The earlier work of Jocelyn Powell (Williams et al. 1972) and that of Simon Haberle (1993), whose research coincided with my own, together set out both an impression of region-wide changes in landscape and vegetation and a history of the local environment at Haeapugua. Haberle's thesis (1993), which incorporates the results of Powell's fieldwork, is the prime source of the following summary account.

On the basis of his analysis of cores from the Haeapugua and Lebani basins and the high altitude grasslands of the Tari Gap, Haberle has reconstructed a regional history of environmental changes over the past 120 000 years. This temporal depth enables him to identify with some confidence the initial impact on vegetation of human disturbance through firing, which is marked by a dramatic increase upon previous levels in the influx of carbonised particles into swamp sediments from about 20 500 BP at Haeapugua and about 18 000 BP in the Tari Gap (1993:270)[6]. Haberle points to the

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5. As Anderson (1994:220) notes, in his critical review of the use of radiocarbon results from the Hawaiian Anahulu project with apparent ages between the 17th and 19th centuries, 'calibration curves for the last three hundred years spread probability such that closer interpretation of most of the Anahulu dates is extremely problematical, even at the level of one standard deviation'.

6. Haberle actually cites 21 500 BP here and elsewhere in his later chapters as the date for the initial increase in carbonised particles, though in earlier chapters (1993:195, 214), he cites a date of 20 500 BP; the latter date is employed here as it appears to correspond more closely to the radiocarbon result

cool, moist conditions prevailing during this period under which natural forest fuel ignition might least have been expected, and to the tenfold increase in carbonised particles at 20 500 BP by comparison with the record for similar conditions at earlier dates, to support his contention that this event can accurately be assigned to human interference.

High carbonised particle counts persist until the end of the glacial maximum at about 16 000 BP, accompanying the expansion of dry grassland communities after 18 000 BP. Drier conditions after 16 000 BP see the appearance of drought-tolerant Araucaria until 12 800 BP. While the general forest cover of Nothofagus at higher altitudes and Castanopsis + Lithocarpus at lower is consistent over this period, fluctuations in temperature are attested to by brief excursions of mixed forest taxa into higher altitudes, until conditions finally stabilize from about 8800 BP. From 8800 BP until about 5200 BP, carbonised particle counts from the Haeapugua and Lebani valleys are substantially reduced, and a sharp contraction in grassland and open vegetation is recorded. In accounting for this change, the relative significance of a decline in human impact or simply the wetter conditions during this period cannot yet be determined (Haberle 1993).

From 5200 BP to the present, the composition of the vegetation community is essentially similar to the modern range, but undergoes considerable transformation that, in light of the minimal change in climatic conditions since 5200 BP, can be ascribed largely to human impact. Amongst the more significant elements identified by Haberle (1993) in this process of anthropogenic transformation are: an increase in dominance of Nothofagus on the ridges surrounding the Tari and Haeapugua basins, probably reflecting increasing but low-level disturbance; major phases of Castanopsis + Lithocarpus forest clearance on the basin floors at 5200-3500 BP and again at about 1700 BP; an increase in Pandanus from 3200 BP; a return appearance of Araucaria from 2400 BP; and a rise in Casuarina after 900 BP. Finally, after about 200 BP, there is a further increase in the process of forest clearance, in the rate of sediment influx into swamps and in the presence of Casuarina pollen.

The local vegetation and sediment history at Haeapugua is derived largely from the analysis of Haberle's Core 6, an 8.5 m core located some 300 m into the swamp from the Dobani / Waloanda area excavations (Figure C31). Earlier coring of Haeapugua by Powell and two core transects conducted by Haberle have yielded a total of fifteen cores in the southern half of Haeapugua swamp; these show considerable similarity in their stratigraphic profiles, suggesting that the results from Core 6 hold

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of 20 670 ± 150 BP (ANU-7366) immediately predating this event.

some relevance for the swamp at large.

Figure C35 shows Haberle's summary of the stratigraphy and chronology of Core 6 at Haeapugua, with details of change in the rates of inorganic influx and sediment accumulation that are particularly relevant to the following discussion. A series of ^{14}C results on samples from Haberle's Core 6, in combination with mineral magnetic identification of tephras of known antiquity, permit a fairly fine definition of the chronology of development of the Haeapugua sequence. Pollen analysis of Core 6 at 10 cm intervals has enabled Haberle to identify a series of stratigraphic zones corresponding to major vegetative phases; a chronological framework for these palaeoenvironmental zones, based on an assumption of constant rates of sedimentation between dated layers, is given in Table C10. Haberle's conclusions regarding the contribution of human activity to the Core 6 sequence can now be considered.

Zones Ia and Ib, extending from an inferred age in excess of 40 000 BP at the base of Core 6, to an age of approximately 18 000 BP, show little evidence for human presence or interference until about 20 500 BP. At this point, the carbonised particle count increases tenfold; Haberle's grounds for identifying this as anthropogenic in origin have already been discussed.

Zone II, dated to between 18 000 BP and 8 500 BP, shows evidence for considerable disturbance, with high carbonised particle counts, particularly between 16 000 BP and 13 000 BP, an increase in Castanopsis + Lithocarpus and Nothofagus, and the appearance of Araucaria pollen. Evidence for open dryland vegetation, composed of herbaceous and fern elements, increases dramatically after 18 000 BP, suggestive of forest clearance along the immediate dryland margins of the swamp.

Zone IIIa, from 8500 BP to 3200 BP, is characterised by a return to dominance of woody taxa and a concomitant reduction in the evidence for open grasslands. In the immediate area of Core 6, a steady increase in swamp forest taxa from the base of Zone IIIa is dramatically boosted from 5200 BP, from which point the swamp is held to have been under a swamp forest cover dominated by Dacrydium. While the carbonised particle count is still high relative to pre-20 500 BP levels, and particularly so between 6600 BP and 3500 BP, it is low by comparison with the evidence from Zone II and the end of Zone Ib. Other possible evidence for human activity includes the appearance after 6600 BP of Amaranthus, which is currently associated with garden activity, and a shift in the relative composition of Pandanaceae, from Pandanus brosimos Type pollen at the base, to Pandanus antaresensis Type after about 5000 BP, possibly reflecting the effects of human selection.

Zone IIIb, with an inferred age from 3200 BP to 1700 BP, shows evidence for a decrease in the Castanopsis + Lithocarpus values suggestive of selective clearance on the adjacent drylands, but a generally low carbonised particle count through until the end of the zone where a sharp rise is recorded. Pandanus antaresensis Type pollen is still the dominant Pandanus element in the swamp, but sporadic Pandanus brosimos Type pollen after 2700 BP and the top of Zone IIIb is interpreted as evidence for the presence of the cultivated Pandanus julianettii on the adjacent drylands.

Zone IVa, from 1700 BP to approximately 200 BP, witnesses a dramatic increase in carbonised particles and reduction in forest taxa to values similar to those from Zone II, and a corresponding rise to dominance of Gramineae pollen. Within the reduced woody pollen sum, swamp forest elements are sharply reduced, particularly after 1200 BP, while values for Castanopsis + Lithocarpus and Nothofagus rise; this is not therefore an increase in the area under Castanopsis + Lithocarpus forest so much as a reflection of the nearly total extirpation of the swamp forest, which is replaced by a grass and sedge swamp, possibly dominated by Phragmites karka and/or Coix gigantea. Though most aquatic taxa are poorly represented during Zone IVa, Typha is present at the core site until about 1000 BP, implying the presence of a shallow water swamp. Casuarina, associated ethnographically with tree fallow practices, first reappears from about 900 BP, though probably only on the drylands during the period of this Zone. Haberle (1993:203) speculates that an increase in various regrowth indicators by 700 BP and the disappearance of aquatic taxa by that date might be taken to represent the onset of systematic burning and clearance of the wetland margins and even the initiation of drainage near the site, presumably along the immediate wetland / dryland boundary of the time. Araucaria pollen, which reappears sporadically for the first time since the middle of Zone II at 2400 BP in Zone IIIb, increases slightly in Zone IVa.

Zone IVb, which covers the uppermost 40 cm of Core 6, corresponding approximately to the period 200 BP to the present yields a pollen signature that is essentially modern in character, with Gramineae values dominant; but the scope in this Zone for physical disturbance through modern gardening activity is such that no developments internal to the Zone can be considered reliable. Disturbance indicators and the rate of carbonised particle influx remain high and the total sum of forest taxa continues to decrease. Non-forest woody taxa increase proportionately, with Araucaria and Casuarina pollen reaching their highest and most consistent levels in Zone IV.

C3.5 Interpretation and a Chronology of Wetland Use

It is now possible to attempt a synthesis of the archaeological, palaeo-environmental and oral historical results and to generate a model of the chronology and character of changes in land use at Haeapugua. A bald chronological summary and comparison of Haberle's palaeo-environmental "Zones" and my archaeological "Phases" is offered in Table C10, which suggests a considerable degree of correspondence between the two sequences.

Phase 1

Haberle's proposal, that the massive initial increase in the influx of carbonised particles at Haeapugua from 20 500 BP and in the high altitude Tari Gap from about 18 000 BP marks the onset of anthropogenic firing, closely matches the range of archaeological Phase 1A dates, with median intercepts between 21 040 cal BP and 18 130 cal BP (from the LOC and LOJ sites for the base of the features infilled with light grey clay)[7]. The question of the nature of that human impact, beyond the simple firing of forest fuel, turns upon the status of the light grey clay-filled features from the Dobani / Waloanda area. Inspired by a geomorphic study of the Tari Gap grasslands by Marjorie Sullivan and Philip Hughes (1991), the possibility of a relationship between firing and surface topography under fire-resistant vegetation is sketched here that may account for these features.

Most of the elements contributing to the problematic status of the "pit and runnel" topography infilled with light grey clay have already been described and are only briefly listed here. They include the problem of the "transgressive tephras" which appear at several sites to cover the light grey clay features, yet demonstrably dip into and beneath those same features, as at the LOB(ii) site. There are also problems with the structure of the features themselves which would appear to undermine the possibility of their being artificial in origin. The walls of many of the smaller runnel and larger channel features appear undercut in a manner totally unlike that of the channel features of Phases 2 and 3 at Haeapugua. The runnels also appear to lengthen with increasing slope and to be oriented along the slope, but shorten to form virtual ponds on flatter terrain further into the swamp, as at the LOI site; this would appear to directly contradict the edaphic requirements of crops such as taro, for which one would expect reticulated channel systems on sloping ground that cut across the slope, and straighter draining channels on the more level and poorly drained land. Finally, the known distribution of these light grey features appears locally restricted to the Dobani /

7. Note, however, that the Zone dates lie just beyond the range of the current calibration set and are thus likely, at this antiquity, to predate the calibrated Phase dates; uncalibrated dates for Phase 1 range from 15 210 ± 370 BP (ANU-7809) to 17 660 ± 150 (ANU-7802).

Waloanda area; even within this area, the features are not uniformly distributed, being totally absent from the LOG and LOM sites.

Research by Sullivan and Hughes (1991) in the Porgera and Tari Gap areas has identified a distinct form of patterned microrelief on gently sloping (2 to 6 degrees) but poorly drained peaty soils under grassland. In the Tari Gap, this microrelief consists of circular to elongated depressions, 20 to 300 cm in length, 15 to 65 cm in width and averaging 13 cm in depth, with interfluves 13 to 32 cm in width; the sides of these features range from vertical to undercut, and their bases are uniformly located on a compact 5 cm thick layer of tephra which, on the advice of R.Blong, has been identified as Tibito tephra. Figure C36 reproduces the section from a trench excavated by Sullivan and Hughes, illustrating the relationship between the hollows and the tephra. This tephra, argue Sullivan and Hughes, is crucial to the form of the depressions, operating as a 'lithological baselevel control' by creating an impermeable base for the depressions. Though they acknowledge that the Tari Gap grasslands are probably maintained by anthropogenic firing, Sullivan and Hughes invoke the process of drying and cracking of the peat topsoil during drought conditions, in combination with further expansion of the cracks through frost activity, to account for the formation of the hollows.

The formal similarities between the features described by Sullivan and Hughes and those infilled with light grey clay at the Dobani / Waloanda area excavations are striking and, after reading their 1991 article, I briefly visited the Tari Gap grasslands in 1992 to examine this microrelief for comparison with the Haeapugua finds; though no features were identified that matched exactly those described by Sullivan and Hughes, which they suggest cover only 5% of the Tari Gap grassland area, testpits dug at two elongated hollow features (Appendix C10: LOO, LOP sites) confirm the antiquity of local anthropogenic firing proposed by Haberle.

Four cores taken by Haberle from the small Aluaipugua swamp, 2 km east of the LOO and LOP sites, share a common profile, with a coarse red-brown peat containing a tephra tentatively identified as Tibito (and, in one core, a second tephra which may represent the Olgaboli ash) overlying lake muds, with sandy clays at the base (1993:245). The LOO and LOP profiles also show a 40 - 46 cm peat topsoil containing a patchy horizon of olive green tephra at 10 cm; at the base of this peat, a 10 cm layer of dark brown carbonised organic material caps a series of banded clayey volcanic ash bands, very similar in sequence to the white clay unit at Haeapugua, which probably correspond to the basal clays at Aluaipugua. A date of 8290 ± 90 BP (9400 (9260) 9140 cal BP) (ANU-8758) from the carbonised organic layer at LOO is taken to represent the onset of firing and peat development in the immediate locale of the site. Shown as Phase 1C in Table C10, this event post-dates considerably Haberle's dates from Aluaipugua of between 16 970 ± 130 BP (20 590 (20 060) 19 590 cal BP) (ANU-8272) and 18 540 ± 520 BP (ANU-7241) for the major firing phase at Aluaipugua, probably reflecting a pattern of locally restricted firing and clearance at each of the sites.

Though Sullivan and Hughes (1991:93) conclude that 'it is unlikely that such patterns of microrelief could have formed without lithological baselevel control', it is obvious that Tibito tephra exerts no such influence at the LOO and LOP sites. The description of the baselevel tephra provided by Sullivan and Hughes actually conforms more closely with that of the earlier concreted "transgressive tephras" at Haeapugua, which appear to originate within the white clay unit[8]. Even at Haeapugua, however, the concreted tephra pavements appear to exert little influence over either the under- or over-lying channel and runnel features. Although this is a topic that must obviously now be addressed more fully than it has to date, it might be useful to propose a model alternative or supplementary to that put forward by Sullivan and Hughes that can encompass the origins of both the Tari Gap microrelief and the Haeapugua light grey clay-filled features.

In place of a focus on the stratigraphic position of tephras, this model emphasizes the nature of the grassland cover on poorly drained soils. The only work on the microrelief associated with sedge bog and Phragmites swamp vegetation known to me from New Guinea consists of an agronomist's report on swamp reclamation in the Wahgi valley (Hartley 1967), which describes the formation of Phragmites tussocks and water-filled inter-tussock hollows; tussock bases appear to increase in size and discreteness with increasing soil moisture; fine mats of root hair extending into the inter-tussock hollows trap sediment which settles, forming a dark grey peaty loam base and upper layer of light brown mud.

On the basis of these various observations, and despite the absence of any firm analogues, a geomorphic process is envisaged here that might account for the formation of the light grey clay-filled features of Phase 1 at Haeapugua. This requires differential replacement in solution of the carbonates within the basal white clay unit. Where cover

8. Analysis by Geoff Humphreys of the Rb vs Sr values for samples of the tilted "transgressive tephras" from the LOB site revealed considerable variation corresponding to the depth of the sample and degree of weathering, with some samples plotting within the Tibito envelope and others from the same ash band plotting close to the Olgaboli envelope (Humphreys pers.comm.). This raises the possibility that the hard basal tephra described by Sullivan and Hughes may not be Tibito, but an earlier tephra corresponding to one of the four thin tephra bands from Haeapugua.

conditions vary from exposure to tussock-protected cover, this has resulted in the formation of distinctive inter-tussock hollows. Shallow slope angles have ensured a low speed of solutional flow, with a post-depositional alteration or reduction of the white clay to a light grey clay accompanied by minimal disturbance to the internal structure of the white clay components; obviously, the most durable and least calcareous of the white clay components will suffer the least deformation, though the process of replacement and partial reduction in bulk of underlying components will result in minor dipping between tussock bases[9]. This model, I suggest, accounts for the curious stratigraphic anomaly at Haeapugua of tilted bands of concreted tephra which conform with other white clay component layers until they approach the white clay surface, from which point they continue into the light grey clay, dipping slightly over underlying light grey clay-filled channel and runnel features and losing their coherence only upon contact with the surface of the light grey clay unit. It also accounts for the variation in form of the Phase 1 features, from narrower and straighter runnels on the sloping ground nearer the dryland to wider and less connected hollows towards the swamp centre.

Although, following this model, the vast majority of the light grey clay-filled or Phase 1 features would not appear to be humanly constructed, the light grey clay unit and the surface of the white clay unit are still potential registers of human activity, if Haberle's argument for a human presence after 20 500 BP holds; indeed, the wetland margins in which the Dobani / Waloanda sites are located are likely to have been amongst the richest and most diverse of the local environments in the Tari region throughout the period of human occupation and thus a zone in which human activity might most be expected. Certain Phase 1 features, such as the hole features which penetrate the tephra pavement at the LOI site, might thus be regarded as potentially artifical. The Phase 1 features may also prove indirectly to reflect human impact insofar as the presence of open grasslands along the margins of Haeapugua swamp is associated with human disturbance through firing of the existing forest cover. This, perhaps, accounts for the close correspondence in the basal dates for the Phase 1 features from the LOC and LOJ sites, and Haberle's core records for the onset of anthropogenic firing.

Other perspectives on human activity during Phase 1 are provided by the finds of megafauna, rock art and stone tools documented in C3.2. The study of the scope for interaction between human and megafauna populations in New Guinea is at a very

9. The first step towards testing this model, and one not undertaken for this thesis, would involve a comparison of the bulk densities of white clay and adjacent light grey clays, and of light grey clay layers corresponding to white clay layers of differing calcareous composition.

preliminary stage, but given the established co-existence of megafauna and humans in the vicinity of the Nombe rock-shelter site in Simbu Province until as late as 14 000 BP (Flannery, Mountain and Aplin 1983) and the obvious presence of a range of megafaunal species in the Tari region (Menzies and Ballard 1994), it is possible to suggest that the local appearance of humans at Haeapugua may have overlapped to some degree with the last of the megafauna. Other cultural material that is potentially Pleistocene in antiquity, such as the large core tools from the LAI, LLI and LSH sites and the digitally fluted cave art at the LOT and LOQ sites, contributes further to the slim but tantalizing body of potential archaeological evidence for a Pleistocene presence for humans in the Tari region.

Other than the archaeological evidence for firing from the Tari Gap at 9000 BP and the ambivalent evidence for disturbance-related fans at the LOA site at Haeapugua (Appendix C10), there is no dated archaeological material that relates to the period between 18 000 BP and, at the earliest, 3000 BP. The palaeoenvironmental record for this period, corresponding to Haberle's Zones II and IIIa, shows a gradual decline in the influx of carbonised particles after the peak values recorded between 16 000 BP and about 13 000 BP to a particularly low, but still arguably anthropogenically induced count during Zone IIIa. This corresponds to the return to dominance of woody taxa in Zone IIIa and the development of a swamp forest cover at Haeapugua. While there is indirect evidence, therefore, for the presence of humans in the Tari region during this period, their impact on the landscape and vegetation appears markedly reduced by comparison with the evidence from Phases 1 and 2.

Phase 2

Tentative evidence for three distinct periods within Phase 2 has been proposed on the basis of the distribution of radiocarbon results from archaeological sites. Phase 2A, represented by the earliest features infilled with dark grey clay such as the earlier of the channels (Feature A) at the LOJ site and the thin dark grey clay layer at the LOI site, dates approximately to between 2500 cal BP and 2000 cal BP (with a possible range from 3000 cal BP to 1500 cal BP). This neatly matches the antiquity of Haberle's Zone IIIb, from about 3200 BP to 1700 BP, in many respects a transitional zone towards the end of which the carbonised particle count and grass and sedge values increase dramatically. A notable reappearance is that of Araucaria pollen from about 2400 BP, which may well mark the emergence of those early settlements recorded in Huli myth and oral history and identified now as major *gebeanda* ancestral sites. Phase 2A thus represents the earliest evidence for agriculture in the region and possibly for settlement by people for whom some cultural continuity with the current Huli-speaking population might be proposed.

Phase 2B, between about 1300 cal BP and 1000 cal BP (with a possible range of 1400 cal BP to 600 cal BP), is represented by firing events that mark the initiation of peat development in the Haeapugua basin (LOE) and at the Urupupugua swamp (LOF), by the younger of the two dark grey clay-filled channels at the LOJ site and by the earliest date available for occupation of the high-altitude Lebani valley (LOQ). This period corresponds to the first half of Zone IVa from 1700 BP, in which the rise in clearance initiated towards the end of Zone IIIb reaches a constant level, as indicated by carbonised particle counts and grass and sedge values; the swamp forest component at Haeapugua undergoes a sharp reduction after 1200 BP.

The latter half of Zone IVa, corresponding to the archaeological Phase 2C from 600 cal BP (ranging at 2 S.D. to as early as 780 cal BP) to c.200 BP, contains a number of significant developments, including a rise in Casuarina pollen after its first Holocene appearance at about 900 BP and an increase in other regrowth indicators from about 700 BP. Archaeological evidence for this Phase includes the formation of the alluvial fan deposit at the mouth of the Tereba river (prior to its channeled extension into the swamp centre), the earliest radiocarbon result (though not the earliest deposit) from the Embo Egeanda shelter site above Haeapugua, the articulating dark grey clay-filled channels at the LOC site and the further deposition of dark grey clay at the LOJ site. The most recent date from the only pig droveway site to produce radiocarbon results, a date of 690 (500) 50 cal BP (ANU-8754), unfortunately straddles too great a range to be of much use but suggests that the site was not in use as a pig droveway before Phase 2C.

On the basis of Golson's identification of Tibito tephra in drains at Mogoropugua (C3.3), Phase 2C also marks the earliest evidence for swamp centre drainage in the Tari region, at or before 305 - 270 cal BP. Tephrochronology plays a potentially important role within the temporal spans of Phases 2B and 2C, as the Olgaboli and Tibito tephra falls are generally accepted to have occurred at about 1190 - 970 cal BP and 305 - 270 cal BP, respectively (Appendix A3); although neither tephra was observed at any of the excavated sites (but see Appendix C10: site LOE), Haberle's reconstructions of the upper sections of his cores rely heavily on ages inferred from the stratigraphic positions of these two tephras and their magnetic signals (Haberle 1993:183f).

Phase 3

Phase 3 can be considered essentially continuous with the preceding Phase 2C and is distinguished largely on the grounds of a change in the use of the swamp centre at Haeapugua; where Tibito ash is present, it can be expected to lie stratigraphically beneath Phase 3 features and sediments, which thus date after 305 - 270 cal BP. At this point, the oral historical material described in Chapter C2 effectively displaces the palaeoenvironmental and archaeological results, which are insufficiently accurate at this temporal scale, as a source of understanding developments within Phase 3. This is not to suggest that the oral historical material operates, and is treated, independently of assessment from the other sources. The oral history of land use at Haeapugua, which suggests that initial reclamation of the wetland centre and the extension of the major *iba puni* drainage channels into the swamp began in earnest only recently, after about 1830 AD, finds tentative support in the archaeological evidence from the Tereba levee (LOU), where it is argued that channeling of the Tereba within the swamp followed at some point after the date on the alluvial fan of 560 (490) 280 cal BP (ANU-8757); in light of the limited resolution of radiocarbon dating, this is obviously no more than a general chronological agreement.

The palaeoenvironmental evidence is equally supportive of a short history for swamp centre reclamation at Haeapugua; high values for aquatic pollen until about 1200 BP suggest that the swamp was probably too wet prior to this date for wetland reclamation without extremely intensive labour inputs. Haberle (1993:206) suggests that drainage and cultivation at the Haeapugua Core 6 site, some 300 m from the dryland margin, which is marked by disturbed sediments and an increase in disturbance indicators such as grass pollen, fern spores and carbonised particles, postdate the fall of Tibito tephra at 305 - 270 cal BP. Dryland activity also reaches its apogee during Phase 3, with the highest recorded carbonised particle values and herbaceous pollen totals, and an order of magnitude increase in Casuarina pollen after the fall of Tibito tephra (Haberle 1993).

Although the scale of research at Haeapugua is dwarfed by that of the Kuk project, a tentative chronological sequence for the development of land use at Haeapugua can thus be sketched and an avenue opened for formal comparison between the Kuk and Haeapugua sequences. One aspect of the Haeapugua results that may shed some new light on the problems of interpretation common to both Kuk and Haeapugua is the ethnographic and oral historical access to the details of wetland use and abandonment during the past two centuries avaliable for the latter area. Why it is that specific historical agents first reclaimed and then abandoned areas of wetland at Haeapugua is the topic of the following chapter.

CHAPTER C4 - EXPLAINING WETLAND USE AND ABANDONMENT

C4.1 Modelling Wetland Use and Abandonment

With a sense of the chronology of wetland use at Haeapugua established, it is now possible to return to the models initially generated at Kuk to account for the events of wetland reclamation and abandonment, and subsequently applied to the Tari area by Andrew Wood. Where Wood (1984) saw the impact of sweet potato in the region as alleviating the need to engage in labour-intensive wetland production, with the population expanding from basin floor wetlands up onto the surrounding slopes and, in particular, from the Tari basin to the higher but soil-poor Paijaka plateau, he was confronted at Haeapugua by the local assertion that it was only since the arrival of sweet potato that the wetland centre had been reclaimed. Perversely, where previous phases of wetland reclamation (presumably at other swamps in the region) had been accounted for in terms of dryland degradation and population pressure, the Haeapugua reclamation was regarded by Wood as a move led by "social" demands, specifically the desire to increase both crop and pig production: 'the Huli have not been forced into cultivating an area like Haibuga [Haeapugua] through population pressure alone' (1984, Vol.I:234).

What I seek to suggest in this chapter is that this view of wetland use as an index of population pressure and technological innovation, which I argue is a faithful application of the logic underwriting explanation of the Kuk sequence, needs to be more attentive both to the environmental parameters for human activity and to the complexity of Brookfield's "social" calls on production (A2.2, Appendix A1). Such archaeological, palaeo-environmental and oral historical data as there are from Haeapugua are apparently in accord on the recency of the reclamation of the wetland centre. Why should reclamation have occurred only as recently as the mid-19th century and not at some earlier date, and why have large areas of wetland garden apparently been abandoned since?

This emphasis on the question of the timing of reclamation at Haeapugua, which invokes both environmental parameters and human agency, is provoked in part by the contrast presented by the situation at the Mogoropugua wetlands. At Mogoropugua, Golson's survey of wetland drains revealed the presence of a drainage network deep in the wetland centre that predates the Tibito ashfall at 305 - 270 cal BP and is thus older than any evidence for wetland centre reclamation at Haeapugua. This directly contradicts the sequence of use that might be expected for these two swamps on the basis of a population-pressure argument.

First, the gross size of the population of the Mogoropugua basin is currently less than half that of the Haeapugua basin: the most recent reliable census, the provincial census of 1983 estimated the resident population of Mogoropugua at 2744 and that of Haeapugua at 6875[1]. At some distance from the major regional centres of population at Lake Kopiago and in the Tari basin, it is likely that population pressure on local resources at Mogoropugua has been less than that experienced at Haeapugua for at least the period of wetland reclamation under discussion. Certainly, the cumulative flow of historical migration has been from the Tari and Haeapugua basins outwards towards Dalipugua, Mogoropugua, Komo and Paijaka (see D1.2).

Second, at an altitude of 1870 m, Mogoropugua lies close to or above the usual range of a suite of pre-contact crops that are more productive 220 m lower at Haeapugua, including banana, yam, amaranthus, aibika, lowland pitpit and marita pandanus (Figure B15). The outstanding subsistence advantage conferred by residence at Mogoropugua is greater access to the seasonal harvests of karuka pandanus, particularly through temporary migration to the adjacent Lebani valley; but seasonal migrations are presumably less conducive to wetland reclamation attributed to the pressures of local population increase and increasing resource depletion.

On the conventional grounds of population pressure and dryland degradation, the Haeapugua wetlands, lying adjacent to the major Tari basin and favourably suited to the production of a wide range of subsistence crops, might be expected to have shown evidence for reclamation earlier than the higher and, in terms of population concentration, more remote Mogoropugua swamp. To account for this apparent paradox it is necessary to model in further detail the processes and possible causes of wetland reclamation and abandonment at Haeapugua. I discuss abandonment first, because an understanding of the grounds for failing to maintain wetland gardens serves to illuminate the disincentives to initial reclamation.

C4.2 Wetland Abandonment

Wetland abandonment is evidently a different phenomenon when observed either ethnographically or archaeologically. It is a moot point whether the current disuse of the ditch network over much of the Haeapugua wetlands would be recognised archaeologically as abandonment. The descriptions of wetland use in C2.3 and C2.5 clearly identify the piecemeal process of wetland reclamation and abandonment in

1. These estimates are based on the figures contained in Crittenden and Puruno (1984) for those Census Units (CUs) that lie within the basin areas. The Mogoropugua figures correspond to CUs 01, 03, 05, 06, 401 and 402 of Census District (CD) 02 ("Mogorofugwa") for the Southern Highlands. The Haeapugua figures are drawn from CUs 01, 03, 04, 05, 06, 07, 402 and 403 of CD 14 ("Haibuga-Munima") and CUs 10, 13, 16 and 409 of CD 03 ("Koroba").

which the actions of often small groups of gardeners or even individuals contribute over time to an extensive drainage system which is superficially orderly in appearance and, as the palimpsest of blocks in use between 1959 and 1992 suggests (Figure C16), archaeologically instantaneous. Wetland garden blocks, reclaimed for periods of about a decade, are then allowed to revert to swamp either individually or in clusters of contiguous blocks; yet recutting of the same drains decades later would presumably represent continuity archaeologically unless there were radical changes in block form[2]. A note of caution needs to be inserted, therefore, in employing observations on the small-scale and temporary abandonments of sections of the wetland drainage network to interpret the causes of wholescale abandonment on an archaeologically visible scale, as has been claimed for Kuk[3].

Huli explanations for the abandonment of wetland gardens constitute a refrain built around the triad of pigs, water and labour:

> Swamp gardens are abandoned because of water, pigs and laziness. Truly, water is the cause, because when water fills the ditches, pigs swim across and destroy the gardens.
>
> Tumbu, 2.1.91, Interview Notes

Invasion by pigs is commonly cited as the point at which swamp gardens are finally abandoned:

> When we dig drains, we plant everything in the swamp gardens - sweet potato, Highland pitpit, rungia, sugarcane, taro, banana. We eat these and think nothing of the pigs. Other people's pigs forage in the swamps for worms. But they are really hungry for sweet potato and they come up to the edges of the drains. When they find one that has collapsed a bit, one of the pigs will see this and force its way across the drain. A second will see the tracks of the first and follow it into the garden. Then a third, and they'll eat up everything. Pigs know that all of the good food is in the gardens. Then the water follows the pigs in and people say, "Now it's too hard," and they go back to the dry land.
>
> Kamiali, 26.8.91, 91/18B:409-502

These and other similar commentaries on the abandonment of wetland gardens require some degree of interpretation. Peter Dwyer (1990) has recently examined the role that the event of *sugua mai*, the destruction by pigs of fenced garden areas, plays in the seasonal subsistence strategies of Etoro communities of the neighbouring Papuan plateau. The twist in this "ecological cycle" is that *sugua mai* is initiated by the deliberate but covert removal of sections of fence to assist the ingress of pigs; Dwyer

2. Note that recutting can be detected archaeologically, as at the LOG site (Appendix C10).
3. Gorecki (1985:342-3) has raised the possibility that the major phases of apparent abandonment described by Golson for Kuk may be locally restricted and that wetland reclamation may instead have been regionally continuous within the Wahgi valley; this would suppose a pattern of use not unlike that at Haeapugua over the last century, but played out on a considerably larger scale.

argues cogently that this apparently self-inflicted loss forms a deliberate component of Etoro subsistence strategy, steeling the community's resolve to open fresh garden areas and commit more time to sago production.

Huli, like the Etoro, would deny that any such strategy operated at Haeapugua and I have none of the evidence which Dwyer adduces in support of his claim. But pig invasion at Haeapugua can be taken as a metaphor for the relationship between the two other elements of the abandonment triad: the tension between "water", representing the environmental constraints and hurdles posed by wetlands, and the labour required to reclaim and maintain wetland gardens[4].

Water balance is obviously the key environmental factor in wetland reclamation and abandonment. Excessive drainage is held by Huli to result in poorer yields; along those areas of the wetland margins not threatened by flooding, local landowners observe that continuous cultivation and enduring drainage systems have had the effect of depleting the fertile *iba* grease content of the soil[5]. Predominantly peaty soils of the Haeapugua wetlands may in fact require regular flooding as a means of moderating soil pH; Behrens (1989:90) notes studies which suggest that regular submergence has the effect of increasing the pH of acid soils such as the Haeapugua peats. Indeed, Wood (1984, Vol.I:122) has noted that wetland gardens at Haeapugua that are exposed to flooding from the Tagali tributaries have a higher pH and yield a greater variety of crops; the major *iba puni* channels for rivers such as the Tereba and Garai might thus be regarded as a form of control over the provision of floodwater to wetland blocks.

However, excessive flooding, particularly evident nearer the Tagali river, poses a more dramatic and immediate threat to wetland gardens than excessive drainage. Within the central area of the Haeapugua wetlands, only those garden blocks along the Tereba levee appear to escape these major flood events; elsewhere in the wetland centre, a flood of this magnitude destroys garden surfaces and crops and, perhaps more seriously for the long term viability of wetland blocks, infills *gana* ditches with sediment. Major floods in 1989, 1991, 1992 and 1994 covered much of the wetland centre of Haeapugua for up to 48 hours[6]; Plate C15 shows flooding on both sides of the

4. As Robin Hide (pers.comm.) has suggested, the references made to pigs by both Huli and Etoro in accounting for the abandonment of gardens may serve to attribute responsibility to (non-human) agents; in both societies, pigs frequently compensate for their role in these transgressions with their lives.
5. The act of redirecting the Tereba channel out towards the Tagali river is held to have disrupted the former flow of fertile substance; where the Tereba is said before to have 'carried' the intestines of Baya Baya (a sacrificial substance, produced through performance of the *dindi bayabaya* rite, that replenished the land's fertility (see Section B5.5)) down towards the Bombowi area on the eastern margins of Haeapugua swamp, now it exits over Hewai falls, and the benefits of this substance are lost to Haeapugua (Pudaya, 21.10.92, 92/1A:293-316).
6. Known dates for recent major flood events at Haeapugua include 15/16 August 1991, 25 February

Tagali river in September 1994. Flooding at Haeapugua is sufficiently common an event in local history for the flood lake to be referred to, by name, as Yagoro. But the scale of flooding since 1989 is held by older residents to exceed anything seen in their lifetimes; perhaps, therefore, since at least the late 1920s or early 1930s. Interestingly, this suggests that the widespread abandonment of swamp gardens during the 1930s documented in Appendix C6 is not obviously related to flood events. The current reluctance to invest much labour in wetland reclamation projects is, however, at least partly attributable to the scale of these recent floods and it is worth considering in further detail the process of flooding at Haeapugua.

From observations on the 1989, 1991 and 1992 flood events and the testimony of local residents, the bulk of the floodwater at Haeapugua appears to derive from the Tagali tributaries within the basin. High water levels in the Tagali river prevent inflow from rivers such as the Tereba and Garai which then backflood onto the swamp. A number of possible causes for this can be proposed. The first is a loss of efficiency in the Tagali outfall from the basin, at Hewai falls, where the river has undercut the former channel over the falls and is presumably restricted during flood events; no date for this undercutting has been determined. Secondly, the Tagali tributaries have presumably increased in efficiency with the extension both of the ditch network over an increasing area of the dryland catchment, and of the river channels from their former points of diffusion into the swamp towards their current junctions with the Tagali river (see A.Hill 1976); it has been estimated that the latter process has occurred at Haeapugua only since the mid-19th century (Appendix C6). Thirdly, in a largely limestone environment such as Haeapugua, regional failure in the karstic absorption of excess water must be considered as possibly contributing to any increase in flooding events (Pope and Dahlin 1989:91).

Finally, drainage of peat swamps is classically associated with shrinkage of the surface peats and a consequent decline in the height of the swamp surface. Recorded shrinkage rates at the experimental tea plantations at Kuk and Olgaboli in the Wahgi valley showed dramatic declines in swamp surfaces of 60-70 cm within 3-12 months, stabilizing at an average total loss in height of about 90 cm after 7 years (McGrigor 1973:34f.); near to the drains themselves, losses of up to 120 cm were recorded (Hartley 1967:33). When combined with the possibility of an increase in the elevation of the Tagali river channel as its levees have developed, the scope for flooding of the swamp since the inception of the reclamation process is considerable. To some extent, peat swamp drainage conducted in ignorance of these processes is thus doomed to cyclical failure, particularly in perfluent basins, such as Haeapugua, where channels

1993 and September 1994.

drawing on catchments larger than the immediate swamp catchment pass through the swamp.

There is no evidence from discussion with swamp gardeners at Haeapugua that they have acted in awareness of these inadvertent consequences of their actions. Flood events and the process of peat dessication are instead considered further tokens of the longer term processes of cosmological instability and entropic decline respectively (Chapter B5). While "water" is thus cited as a cause of wetland abandonment, pigs and labour can perhaps be associated more directly with the immediate causes of abandonment. As Wood's (1984) study of soil quality has suggested, the Haeapugua wetland soils are capable of sustaining virtually continuous cycles of crops and grassy fallows (B4.5). Other than the scope for flooding outlined above, the only real limit on the longevity of wetland gardens is the ability of the gardens' owners and users to maintain their drains. There is no doubt that this becomes increasingly difficult over the lifetime of a wetland garden, largely because unconsolidated sediments are not necessarily easier to excavate than compact peat turves. The conclusion drawn in Appendix C6 that wetland gardens tend to last for approximately ten years may thus date the point at which drain-wall slumping and sediment accumulation in the surrounding drains defeat casual attempts at maintenance; a possible corollary of this is that the lapse period between phases of use of the same block may reflect the rate of peat formation in former drains and thus the speed with which the fill of those drains is rendered excavatable[7].

I have focused on flooding and drain maintenance, which might be viewed as systemic causes of wetland abandonment, but there must also be scope for cataclysmic causes; extreme flood events and karst-deforming earthquakes are possible candidates, but another is epidemic disease associated with wetland residence. Gorecki (1979) has already raised the possibility that the abandonment of Phase 6 at Kuk swamp may have been associated with the spread of malaria from lower altitudes to the floor of the Wahgi valley; he cites a fear of 'bad spirits living in the [Wahgi] swamps' (Gorecki 1979:103) as one of the reasons for their abandonment and interprets this as the occurrence of an epidemic associated not just with wetlands, but with low-lying areas in general.

7. This qualifies the assumption made by Bayliss-Smith and Golson (1992a:11) for Kuk that 'cleaning out old silted-up ditches is less effort than digging new ones' and that closely parallel ditches thus imply long lapse periods between phases of use, sufficient for all trace of the earlier ditch to be lost; as the difference between unexcavated peat and peaty fill is fairly readily distinguished at Haeapugua, even for ditches that have been abandoned for more than 50 years. I would suggest that this is instead a deliberate strategy to maintain the line of a ditch (which is never just a ditch, but also always a marker of land ownership) while exploiting the advantages of firm walls conferred by a freshly cut ditch.

At Mogoropugua, Uriabu Haritimbu recounted a tradition that, during periods of excess water in the swamp, people shifted to higher dryland locations not just because of the failure of their wetland crops but also because *dama* spirits associated with these wet periods killed people living near the swamp (Mogoropugua Notebook, 14.3.91); he claimed that these flights from the swamp lasted for as long as a generation before people returned to the wetlands. The only *dama* spirit associated with wetlands at Haeapugua was the *dama* Hiribi Warule (*hiribi*: Ficus adenosperma; *waru*: mud), for whom gardeners planning to drain wetland blocks would sacrifice pigs; but this was more a means of contracting for success in the production of sweet potato and pigs from the swamp gardens than an attempt to avert illness or disaster. For a *dama*, Hiribi Warule appears to have been unusually lacking in malevolence. If an epidemic such as that posited by Gorecki for the Wahgi valley struck at Haeapugua, it has since been overshadowed in memory by the impact of the dysentery epidemic of 1945 (Appendix B1). Only one older man at Haeapugua, Piwa-Ngai (EB: ?1910) can recall an epidemic of comparable severity, which he says occurred when he was about 5 or 6. There were none of the external symptoms that characterised later epidemics, such as sores or bloody excreta; people simply fell and died. But it is not possible to identify this as malaria rather than any other form of disease, nor do there appear to have been any mass movements from the swamp associated with the event.

The entry of pigs into swamp gardens thus marks the point at which a range of factors, including failing commitment to drain maintenance and the increasing susceptibility to flooding of the immediately surrounding swamp area apparently conspire to force abandonment. But increase in the depredations of pigs may also be a consequence of the success of one of the principal goals of wetland reclamation: pig production. To understand why the commitment of gardeners to their wetland projects ultimately fails, it is necessary to consider the initial basis for that commitment; the following section thus attempts to uncover the reasons why Huli commit themselves to the task of wetland reclamation.

C4.3 Wetland Reclamation

If local residents at Haeapugua have an explanation for what they too regard as the relative recency of reclamation of the swamp centre it is, as Wood (1984) also found, that the swamp had formerly been too wet to consider the possibility of reclamation. The process of entropy is sufficient to account for the gradual dessication over time of the land in general and thus the increasing opportunity to garden on this wet and fertile core of the Huli landscape. There is a temptation, yielded to thus far in this thesis, to follow the Huli conception of *pugua* wetlands as a relatively uniform category. Pope and Dahlin (1989) have argued convincingly that variation in local hydrological regimes in the Maya lowlands is such that cultivation was effectively precluded in many wetland habitats and Maya wetland water control can have had only a limited distribution. A simple analysis of swamp/catchment ratios from the Tari region reveals a considerable degree of variety in the condition of swamps in the different basins.

Swamp/catchment ratios express the area of a swamp as a proportion of the area of its catchment and serve to provide a general impression, in the absence of detailed local information on rainfall, evapotranspiration and runoff, of the balance in scale between a swamp and its catchment (Goldsmith et al. 1983). Figure C37 shows the areas of the major swamps of the Tari region and their respective catchments, and the outfall points of each catchment; the areal measurements are listed in Table C11, together with the calculated swamp/catchment (S/C) ratios and, because they make the point more clearly still, the same figures expressed as catchment/swamp (C/S) ratios. The directions of outflow from each catchment are critical; while flows from the Dagia, Wabupugua, Lebani and E Mama catchments exit individually from the area shown in Figure C37, the Mogoropugua, Dalipugua/Nagia river and Tagali catchments form a series of nested catchments, one flowing into the next. Gross differences in the hydrological regimes of specific swamps may have implications for the scope for wetland reclamation, irrespective of considerations of dryland degradation or population pressure on resources.

Ranking the C/S ratios in order of size exposes the basis for a possible explanation for the early use of the Mogoropugua wetlands. The C/S ratio for Mogoropugua of 8.4 (where the two halves represent the presence of two major channels which enter and meet in the swamp), low relative to almost all of the other swamps, suggests that Mogoropugua may have been the driest and most easily drained and the least exposed to flooding of the Tari region swamps, bar Urupupugua.

The perched swamp at Urupupugua, with a C/S ratio of only 1.5, is exceptional in that there appears to be outflow from the very limited swamp catchment only during severe wet periods. Sections of the Urupupugua swamp exposed in the walls of a major new drain were examined and revealed some antiquity for the deposit, with a date of 1280 (1170) 1060 cal BP (ANU-7624) at a depth of 46 cm within at least a 2 m depth of exposed section (Appendix C10: LOF site). Yet no evidence was noted for drainage at any point along a distance of over 400 m of this drain, nor have aerial photographs of the swamp revealed any of the extensive drain networks visible in other swamps of the region; the only explanation I have for this anomalous situation is that ritual proscriptions on use of the swamp, as a centre of regional fertility in the Tari basin, were strictly observed over a long period of time. More detailed enquiry into this matter in and around the Urupupugua locality are obviously a priority for future work.

After Mogoropugua, the next largest in the size-ordered sequence of C/S ratios is that of the swampy floor of the Lebani basin, at 2250 m, where the C/S ratio of 18.5 is more than double that of Mogoropugua. There is no evidence on the ground or in the testimony of local residents that these wetlands have ever been subjected to drainage or garden activity; given the danger of frost on basin floors at altitudes above 2000 m, the Lebani wetlands are not thus of immediate relevance to this comparison.

Dalipugua, with a C/S ratio of 33.2, receives the cumulative flow of the Nagia river catchment and the Mogoropugua catchment. Low-level AP coverage of the Dalipugua swamp, similar to that available for Haeapugua, suggests that reclamation has been much less extensive and certainly less obviously co-ordinated around major *iba puni* channels than at Haeapugua. Local residents recount traditions similar to those at Haeapugua of an early period before the Nagia river entered the swamp when ancestral *dama* lived and gardened in and around the swamp; after the entry of the river, the swamp became too wet for gardens and was abandoned entirely. A common observation is that the levees formed around the Nagia river within the swamp are insufficiently developed to prevent regular flooding. In combination with the problem of congestion at the outfall point in the Nagia gorge, this results in regular flooding; during the period of my fieldwork, Dalipugua flooded more often than any other basin in the region, and appears particularly susceptible in this regard.

The extensive and early reclamation of the wetlands at Mogoropugua stands in strong contrast to the situation at Dalipugua; but this in turn raises the question of how the Haeapugua wetlands, which receive the collective outflow of the Tagali river, Dalipugua and Mogoropugua catchments producing a C/S ratio almost double that for Dalipugua, could ever have been reclaimed. One largely speculative explanation turns upon the role that levees have played in stabilizing channel courses for the Tagali river and its local tributaries within Haeapugua swamp. The only date for the formation of the Tagali levee is the rather unsatisfactory result of 320 (280, 170, 150, 10, 0) m cal BP (ANU-7804) from a depth of 60-66 cm at the LOH site (Appendix C10); this suggests simply that there is a high probablity that the upper 60 cm of the levee was deposited during the last 360 years and offers no insight into the rate of development of the underlying metre of silty sandy clay deposit above the current water table. The levee on the Tereba tributary channel is more securely dated by a result from the LOU site of 560 (490) 280 cal BP (ANU-8757) for the alluvial fan immediately beneath the levee deposit, implying that the levee was initiated no earlier than 300-400 BP.

Slim chronological evidence indeed, but sufficient as a basis on which to raise the possibility that the augmented rate of levee formation on these rivers was related to expanded forest clearance in the headwaters of their respective catchments; further, that this increase in activity on steeper slopes and poorer soils was possible only after the regional adoption of sweet potato as a staple (see the discussion of the properties of sweet potato in B4.4). The bulk of the material deposited along the Tagali levee is most likely to derive from the catchment of the Tagali river itself, rather than the Mogoropugua and Dalipugua catchments, the material from which would presumably be deposited largely on the level swampy floor of the Dalipugua basin. The most plausible location within the Tagali catchment of increased post-Ipomoean occupation and clearance, and thus a likely source of the Tagali levee material, has already been identified by Wood (1984) as the Paijaka plateau. The Paijaka plateau, lying between 1750 m and 2000 m in altitude, lies immediately to the northwest of the Tari basin (Figure B20); Wood characterises the volcanic ash soils of the plateau as relatively acidic, low in nutrients and prone to erosion due to steeper slopes and relatively high rainfall. Clearance of the majority of the forest cover on the plateau has led to the most serious levels of land degradation and the most extensive soil loss in the Tari area (Wood 1984, Vol.I:151,172). The marginality of the Paijaka plateau as an agricultural environment suggests that degradation was rapid and, in turn, that occupation at current or recent levels of population density could not have been sustained over a long period of time. The only staple viable at this altitude and on such poor soils is sweet potato and the implication is that the extensive clearance, land degradation and resultant soil loss on the Paijaka plateau post-date the local adoption of sweet potato as a staple.

Not unlike the situation described by Spriggs (1981) for Aneityum, where heavy erosion following hillside clearance had the effect of creating a fertile band of alluvial soil plains along the coastline, the rich wetlands of Haeapugua may have been rendered sufficiently stable hydrologically only through clearance by people with a new staple crop moving into the upper catchment of the main river entering the basin[8]. Pope and Dahlin (1989:101) have recently advocated a hydrological approach to Maya wetland agriculture:

> it may be that the initiation and termination of wetland agriculture and the use of canals had more to do with changes in hydrological conditions than with human population dynamics and the demand for wetland produce.

8. A parallel situation also appears at the Manton site in the Wahgi valley, where wetland drainage was first detected archaeologically in the Highlands (Section A2.2): Powell (1970:162) has suggested that the formation of the swamp deposits at the Manton site may have been initiated by disruption of the natural drainage system through increased sedimentation as a result of anthropogenic clearance.

But if the development of the Tagali levee sets out the gross ecological parameters of possibility, it still fails to account for the multitude of decisions taken by historical agents at Haeapugua which ultimately produced the wetland drainage network. Why, once the possibility of gardening on swampland was present at Haeapugua, did people decide to commit labour and other resources to wetland reclamation?

Like explanations for abandonment, Huli responses to my questions about the incentives for wetland reclamation revealed three common themes: population growth and pressure on dryland resources, decline in the range and quality of crops from dryland gardens and the need to raise pigs. As with the explanations for abandonment, statements about incentives for reclamation are not self-evident in implication and require some interpretation.

Perceived limits on dryland resources, exacerbated by pressure from an expanding population, are commonly cited as causes of wetland reclamation. Kamiali, leader of the 1989 Mabu Gobe gardening project in Dumbiali parish (Appendix C6), claims that the impetus for reclamation came from a dispute over dryland blocks; weary at the protracted debate over ownership of a small dryland garden, he recalled his father's wetland gardens and his own first use of the Mabu Gobe block in 1954/55, and set about the task of reclamation. Though all of the swamp land is conceptually owned at either a corporate or individual level, the scope for dispute is considerably reduced by comparison with dryland holdings, particularly as the act of recutting *iba puni* drains creates rights of access and use in adjacent swampland, irrespective of ownership. Interestingly, the most common observation on causes of the earliest use of the wetland centre is that these ancestral gardeners were also experiencing population pressure on dry land, suggesting that population pressure is as much a matter of perception as it is of any fixed relationship between population size and resources; of course, observations on the intentions of others, and more so still of ancestral others, run the risk of assuming the narrator's concerns.

A decline in the quality and yield of crops from the dryland gardens is the second incentive nominated by people who have reclaimed wetland blocks. Decline in dryland yields of "green" vegetables, such as cucumber, the rorippa, acanthus and amaranthus spinaches, Oenanthe javanica and aibika, and also in banana yield, are cited as critical spurs in the decision to invest labour in wetland reclamation; sweet potato and taro from the parched and exhausted soils of dryland gardens are said to taste dry and old by comparison with the sweeter and "fresher" tubers from wetland gardens. Importantly, sweet potato cultivated on the wetlands is held to be superior, not just for human consumption but also for the production of pig fodder, to that grown in dryland gardens: people at Haeapugua say that there are "more" tubers left for pigs from wetland gardens, largely because the tubers rot less quickly there and a higher percentage remain to be eaten by pigs after the final harvest.

The allusions to the range of crops that grow better on wetland soils are interesting. There is no doubt that an exceptional range of crops is produced, from the alluvial channel levees in particular (see above) and also during the first few phases of most swamp centre gardens (B4.4). Thereafter, however, crop composition in wetland gardens shifts rapidly to virtual monocropping of sweet potato, with sugarcane present in low quantities and an occasional but largely token representation from taro. If wetland gardens are commonly maintained and cropped over periods of approximately 10 years, most of their duration is thus devoted overwhelmingly to the production of a single staple crop. There are limits to the amount of surplus sweet potato that can be consumed by a relatively stable human population without comparable production of other foodstuffs. The considerable fluctuation in the area of wetland gardens, which are predominantly under sweet potato, over the period 1959 to 1992 at Haeapugua cannot be accounted for in terms of changes in the size of the resident human population or, given the narrow dryland margins at Haeapugua, in terms of corresponding expansion and contraction in the area of dryland under garden.

Instead the sweet potato surplus is directed explicitly at the production of pigs. The production of this surplus is not incidental, but a deliberate strategy[9]. Interviews with some of the men who led the major reclamation project visible in the 1978 coverage of the Lebe area of the Tani (Taibaanda) wetlands (see Figures C12 and C20) made it clear that individuals often entered the wetland projects with the intention of raising pig herds for specific goals, such as compensation or brideprice payments. Ngoari-Dagiabu explained that, with 29 pigs already foraging in the swamp, he planned to further increase his herd dramatically in anticipation of some forthcoming compensation payments and recut the Ngolo *puni* channel, initiating wetland gardens on either side of the drain in order, as he put it, to avoid the effort of carrying bags of fodder into the swamp for his pigs. Pigs raised in the swamp and fed on a mixed diet of foraged worms and ample portions of sweet potato were said to grow to exceptional sizes. It was this emphasis on pig production that led individuals such as Ngoari-Mandiga to construct their houses deep within the swamp, where they could more easily observe and tend their herds (C2.5, Appendix C6).

9. This harks back to an observation by Brookfield, in reference to Kuk and Aneityum, that 'the innovation and adoption of labour- and skill-intensive water-control practices facilitated the production of a surplus of substantial size, and it is hence inferred that the creation of such a surplus was their principal objective' (1984:23).

The relationship between wetland reclamation and pig production appears well-founded. A detailed ethnographic analysis of the production and movements of individual pigs, along the lines of Hide's (1981) classic study of Sinasina pig husbandry, would be required to substantiate the impressions gained from these anecdotes; but this was both beyond my means at the time, and beyond the willingness of most Haeapugua residents to divulge such information. Pigs are social capital and people would no more reveal to me the numbers of their herds than they would the balance of their accounts in the bank at Tari (see Wood 1991:10 for the same point). The chapter that follows (Chapter D1) thus pursues the role of pigs within the category of "social capital" as a preliminary step in the generation of a history of changing "social" demands on production that may help to account for the impetus behind wetland reclamation at Haeapugua.

PART D

WRITING REVOLUTIONS

It is therefore practice, in its most specific aspect, which is annihilated when the scheme is identified with the model: retrospective necessity becomes prospective necessity, the product a project; and things which have happened, and can no longer not happen, become the irresistible future of the acts which made them happen.

Bourdieu 1977, pp.9-10

CHAPTER D1 - THE IMPACT OF SWEET POTATO IN THE TARI REGION

> It is an old joke that when archaeologists cannot explain the function of some object or feature, they refer it to the realm of ritual.
>
> Bowdler 1990, p.61

D1.1 Introduction

Thus far, explanations for the timing of wetland reclamation at Haeapugua might appear to be encompassed by the "ecological" arguments advanced for Kuk by Golson and others (A2.2, Appendix A1). From this perspective, the opportunity to garden on the wetlands stemmed from the "technological" breakthrough of the stabilisation of the Tagali river channel (though at Haeapugua this opportunity appears to have been the inadvertent consequence of clearance by other communities in the Tagali headwaters), in combination with pressure on dryland resources. At one level, such an explanation is certainly valid but, as an account of social as well as environmental transformations, it fails to address the bases for the actions of the human agents of these transformations, assuming instead that technological or hydrological opportunity and pressure on dryland resources are themselves sufficient to account for the decision to reclaim the wetlands. What we miss in this account is the intermediate link between "pressure" and "response", the black box of agency within which "pressure" is variably perceived and "responses" varyingly implemented. The "ecological" account is not wrong; rather it is insufficient, and particularly so if we accept the assertion that social change is the central problematic of an archaeological history. Accordingly, this chapter moves to explore the historical constitution of "social" demands on production at Haeapugua.

Much as the hydrological explanation given in Chapter C4 for the timing of wetland reclamation at Haeapugua draws on an understanding of processes such as headwater clearance operating on a regional scale, so too developments in local society must be considered within a broader regional context. A series of events such as the introduction and adoption of sweet potato can only be identified and their effects comprehended at more inclusive scales of analysis than the conventional archaeological units of analysis such as individual sites or their immediate subsistence catchments[1]. Accordingly, the impact of the adoption of sweet potato on Huli society is thus traced through analysis of a concatenation of effects, working from survey evidence for region-wide changes in the patterns of settlement and land-use (D1.2), through the oral history of change in the nature and scale of "social" calls on production, towards an

1. This emphasis on the regional scale matches recent moves by archaeologists working in Australia and Papua New Guinea to shift the focus of analysis from the domestic level of production to the extra-domestic, from the organisation of primary units of production to the structure of inter-group networks of exchange (White 1985, Lourandos 1988, Gosden 1989).

account of transformations in the structure of Huli society (D1.3). The model of historical events at Haeapugua set out in Part C underpins this region-wide analysis which then returns, in conclusion, to a more comprehensive account of the social history of wetland use at Haeapugua (D1.4).

D1.2 A Regional Review

Palaeoecologists have made the point that the effects of major subsistence developments such as the postulated Ipomoean revolution are likely to be more clearly registered in marginal subsistence environments than in the favourable environments of the central valleys of the New Guinea Highlands (Worsley and Oldfield 1988); intensification is more difficult to gauge or distinguish in established environments such as the dryland floors of the major basins. Thus, at Haeapugua we can expect a near-continuous use of the rich wetland margin environments, which offer the productive advantages of the wetlands without the constraints of the higher labour commitments required to establish a wider drainage network. Beyond the detection of a process of "infilling" of the ditch network, itself a difficult archaeological endeavour, it would be hard to identify changes in land use from the archaeology of this particular zone alone.

Four marginal environmental categories are identified for the Tari region, each of which might be regarded as a more sensitive indicator of changes in land use and settlement following upon the adoption of sweet potato within the established enclaves of settlement. These four categories comprise: wetland centres (e.g. Haeapugua, Dalipugua), forested interbasin ridges (e.g. Lagale Mandi ridge between the Haeapugua and Tari basins), and basins broadly higher (Lebani, Margarima) and lower (Komo, Benalia, Lower Tagali valley) in altitude than the central Tari, Haeapugua, Dalipugua and Mogoropugua basins.

Evidence for extensification through the expansion of gardens onto the wetland centres of the Haeapugua and Mogoropugua swamps has been set out in Chapter C3. At Mogoropugua, where there is evidence for a network of drainage channels in operation immediately prior to the Tibito ash fall (307 - 270 cal BP), no drains earlier than these were noted by Golson within the wetland centre. At Haeapugua, despite archaeological and palaeoecological records for clearance and garden activity along the wetland margins that appear to extend virtually unbroken from at least 2000 BP, such evidence as there is suggests that the wetland centre can have been in use only since the mid-19th century AD. In the central basins of the Tari region, use of wetland centres, as distinct from wetland margins, is thus in evidence only as far back as the period immediately preceding the Tibito fall; even if an orthodox or late date for the introduction of sweet potato is accepted (A2.3), Tibito-era events are still potentially post-Ipomoean.

Ideally, the wetland centre record at Haeapugua would be complemented by a comparable record of clearance on the steep slopes of the adjacent Lagale Mandi ridge. This would provide complete coverage of the full spectrum of local environments within the basin and provide the basis for parallel histories of extensification from the wetland margins out into the wetland centre and up onto the forested slopes. Such a project was considered in the course of the field study but not pursued, largely because of the time required to map the steep slopes on a scale and at a quality comparable to the AP-derived maps available for the wetlands[2].

The marginal status of the other two environmental categories, the higher and lower altitude basins, reflects the central position, both geographically and in Huli history and thought, of the Tari basin. The cardinal centrality accorded to the southern part of the basin around the *gebeanda* ritual centre of Bebenite, described by Huli as *hulihuli* or "very Huli" (see Chapter B2), is indicative of the assumption implicit in Huli history that this area has historically been the heartland of the Huli-speaking population. If the argument advanced in C2.4, that block subdivision and fragmentation of ownership among different lineages increase at sites with the longest occupation history and highest population densities, is played out on the grander scale of parishes themselves, then the suggestion that the south Tari basin has long been a centre of high population density finds support in the dramatic decline in parish size in this area (B4.5, Figure B13). Currently, the highest population densities in the Tari region are found on the floors of the Tari and Haeapugua basins (Table B22) and a focus on marginal environments thus directs attention towards the history of occupation of the higher and lower altitudinal extremes and of those areas currently settled by Huli-speakers that are most distant from the Tari and Haeapugua basins.

Given that the productivity of sweet potato declines less rapidly with altitude above 2000 m than that of taro or other tuberous staples, it has been argued that permanent occupation by significant populations of valleys above 2000 m is probably related historically to the availability and adoption of sweet potato (B4.2). The dates for permanent settlement of two major basins currently occupied by Huli-speakers, the Lebani (2250 m - 2400 m) and Margarima (2100 m - 2600 m) basins, may thus be of

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2. Anecdotal evidence for forest clearance was documented in the Dalipugua and Haeapugua basins, but not in any systematic way. However, I can see no reason why a history of the clearance of the forested ridges, similar to that documented for the wetlands, would not be feasible. In a study of sediment rampart features on gardened slopes in Simbu Province, Humphreys (1994) has already demonstrated the scope for archaeological access to such a history, and Allen (1982:114) and Wohlt (1978) have both documented long-term histories of forest clearance in Enga Province on the basis of local oral testimony.

some significance in identifying the regional impact of sweet potato adoption.

Anthropogenic disturbance of high-altitude grassland areas can be identified as early as 18 000 BP in the Tari Gap area (2750 m) but the record of forest clearance and firing intensifies from the end of the hiatus in the Tari Gap record at 1300 BP, with the rate of sediment accumulation in Tugupugua swamp peaking after 200 BP (Haberle 1993). The Tari Gap area, together with the E Mama valley (2500 m - 2700 m), still lies above the current limits of permanent settlement, but the records from these altitudes make clear the point that visits to high-altitude locations from lower-lying settlements for the purposes of hunting, trade and pandanus harvesting are likely to have produced an extensive history of human interference prior to the establishment of permanent settlements.

Though evidence for the effects of firing dates back to at least 17 300 BP in the Lebani valley, burning and swamp forest clearance that can be related more certainly to human agency occurs only after about 6200 BP (Haberle 1993). By 5000 BP the basin floor forests were substantially cleared and expansion of grasslands onto the surrounding slopes ensued between 4200 BP and c.550 BP. But the onset of clearance and agricultural activity on a modern scale, marked by the development of a clayey coarse peat at the palaeoecological site of Aluaipugua in the Lebani basin, post-dates the fall of Tibito ash (305 - 270 cal BP)[3]. This last post-Tibito period also witnessed a significant reduction in the forest cover and a concomitant rise in grasslands in the basin together with the first evidence for the introduction of Casuarina, presumably marking the introduction to the basin of intensive agricultural techniques.

The oral history of settlement of the Lebani basin tallies well with this impression of a relatively recent increase in intensive land use. There are at least 24 clans now resident as *tene* or *tene hamene* in the Lebani basin; genealogies and oral narratives documenting the initial arrival of ancestors for nine of these clans were recorded in 1991. A broad distinction can be made between clan traditions that identify the earliest human ancestor (usually seven to nine generations above the narrator), and those that nominate a more recent ancestor, only two to five generations above the narrator, as the first occupant of their Lebani parish. Those clans that claim early occupation (Mugua,

3. In his interpretation of the Aluaipugua results, Haberle nominates a date of 550 BP for the onset of development of the clayey coarse peat; this inferred age derives from his Core 1 (1993: Figure 6.2), where a radiocarbon sample from within the underlying coarse red-brown peat yielded a result of 880 ± 70 BP (920 (770) 680 cal BP) (ANU-8271). As Core 2 from the same site shows Tibito ash (absent in Core 1) clearly underlying the base of the clayey coarse peat and overlying the red-brown peat, it seems probable that the Core 1 sequence has been truncated above the radiocarbon sample and that the estimated age of 550 BP, inferred from an interpolated age/depth curve, is too early for the base of the clayey coarse peat.

Gobera, Genamo and Dileya) are all recognised as the original *tene* in the Lebani basin, though they each derive ultimately from parent populations in the adjacent Mogoropugua basin. These *tene* clans occupy strategic positions with respect to the mineral oil sources and pandanus groves which constitute the basin's principal resources of value. Those clans claiming to have arrived more recently trace their origins either west to the Strickland plains (Tinali) or east to the Mogoropugua basin (Mora, Huguni, Dolo, Dabero). Narrative claims for ancestral occupation in the recent past are an unusual element in a genre that places great emphasis on precedence and are thus probably an accurate reflection of migration up to the Lebani basin between about ?1790 AD and ?1910 AD. The earlier claims undoubtedly reflect an ancient presence and the early establishment of rights in the Lebani area, but may or may not reflect actual permanence of settlement. Even now, the Lebani population fluctuates massively as people generally resident in Mogoropugua migrate to higher altitudes during pandanus harvest events.

Similar evidence for migration is available for the Margarima area to the east of the Tari basin, where at least 12 clans speaking Huli as a first language all identify the southern and eastern parts of the Tari basin as their ultimate points of origin. Again, two categories of oral tradition emerge, with some clans (Hiri, Aluba, Wabima) claiming a presence in the Margarima area for 11 to 12 generations, effectively since the emergence of human ancestors, and others (Yambali, Alia) referring to recent migrations from the Tari basin within the last 4 to 7 generations; the most recent migration, that of Yambali clan, appears to have occurred as late as the ?1830s.

The effects of migration from the Tari basin north and west onto the higher Paijaka plateau have already been discussed (B4.5, C4.3), but there has been no palaeoecological or oral historical work done in this area, beyond the collection of some short genealogies by Andrew Wood (1984, Vol.II).

Three further areas to the south of the central basins also reveal oral historical evidence for relatively recent migration from the Tari and Haeapugua basins in particular: the lower-altitude Tagali and Benalia valleys and the Komo basin (Figure B1). The Benalia population includes at least 14 *tene* clans, most of whom represent offshoots from parent clans of the same name in the south Tari basin. Similarly, the lower Tagali valley contains a large number of very small lineage-based groups all of whom trace their origins to the Haeapugua, Tari or Yaluba basins. In most cases these clan remnants are refugees from fighting in the central basins; thus one finds small sections of the Bogorali, Dagima, Dobani, Mbuda, Tambaruma and Luguni clans from Haeapugua scattered throughout the lower Tagali valley, from the Nogoli area just below Hewai falls on the Tagali river as far to the south and east as the junction of the Tagali and Benalia rivers[4].

This form of refugee frontier movement might be expected along the margins of major population centres like the Tari basin over long periods of time; no clear association with the adoption of sweet potato need necessarily be assumed. But the oral history of Huli settlement of the Komo basin, to the south of the Tagali river, is more directly supportive of a link between the adoption of sweet potato and consequent out-migration from the central basins. The Komo basin floor (1540 m - 1800 m) lies within an altitudinal range very similar to that of the Tari basin (1550 m - 1850 m), with the additional advantages of the scope for trade with the Duguba communities of the Papuan plateau and greater access to game and other forest resources than the central basins.

Currently there are some 49 named clans in and around the Komo basin. These clans are identified as either Huli or Duguba in origin; members of the Duguba clans are heavily intermarried with the Huli and are mostly bilingual in Huli and either Etoro or Onabasulu. The primacy of the 15 Duguba clans in the region is widely acknowledged, with clans such as Duguba Kuara controlling the major *gebeanda* ritual sites in the area. Almost all of the remaining 34 clans claim origins in the Haeapugua and southern Tari basins. Responding to Blong's queries about time of darkness (*mbingi*) narratives at Komo in 1977, Gabriel Lomas, then working at Komo as a Catholic priest, noted that:

> the Huli people claim to have moved into the Komo area only seven or eight generations ago. All of those questioned are emphatic in stating that the [*mbingi*] story originates in the Wabia area and is peculiar to that area of the Huli country. No one in Komo that I've questioned has any recollection of such an occurrence having taken place since the Huli migrated down this way.
>
> Lomas in Blong (ed.) 1979, p.40

If the *mbingi* narrative is taken to refer to the Tibito ash fall, an assumption that I argue is valid (Chapter B5), this implies that migration to Komo out of the central basins occurred after both the Tibito fall and the earlier introduction of sweet potato.

Brief surveys of oral traditions and genealogies in the Komo basin in 1989 and 1991 generally confirmed Lomas' observations and identified more precisely the period of initial Huli migration to the area. Wabiago is widely regarded as the first Huli clan

4. Allen and Frankel (1991:120-121), in discussing Jack Hides' estimate of the size of the population in the lower Tagali valley in 1935, observe that continuing warfare in this marginal area may have led to rapid local depopulation in the late 1930s.

to have migrated in significant numbers from Tari to Komo. Wabiago clan leaders at Komo clearly identified the individuals who had led the migrating lineages; assuming mature ages of 35 to 40 for these individuals, this initial migration is estimated to have occurred between ?1800 AD and ?1840 AD. Further confirmation for this date comes from detailed work on Dobani genealogies throughout the Tari region, which included interviews with Dobani clan members resident at Komo; there, the first Dobani said to have emigrated from the Dobani parish at Yangome in the south Tari basin are estimated to have arrived in Komo between ?1840 AD and ?1865 AD, shortly after the pioneering Wabiago lineages.

Tari, which is the conceptual centre of Huli identity, appears historically to have been a centre for the Huli population and a source of clans migrating outwards to both higher and lower altitudes. Indeed, by the time administrative control was established at Tari in the early 1950s, the southern Tari basin had been largely emptied of its population as a result of intense warfare and epidemics (Anthony 1952:9, A.Sinclair pers.comm.). The return to the high population densities recorded by Wood in the 1970s occurred only after the government-enforced cessation of warfare and the provision of health services in the area.

Where it is possible to identify a history of movements from the central basins, two very broad phases of migration can be discerned: a diffuse early phase, during which claims were established by Huli-speaking communities to land in the Margarima, Benalia and Lebani areas and initial settlement was undertaken; and a more recent and more sharply defined phase, following after the fall of Tibito ash (305 - 270 cal BP) but continuing up until contact as refugees from intense warfare in the central basins joined the initial colonist clans. It is perhaps worth noting that the estimated dates for the initial migration of substantial numbers of Huli to Komo, between ?1800 AD and ?1840 AD, closely match the period during which major wars erupted in Haeapugua and the process of drainage leading to wetland centre reclamation was initiated (Chapter C4). From this correspondence in timing of these disparate events, it might be possible to infer that pressure on dryland resources during the much same period in both the Tari and Haeapugua basins was contributing to local wetland reclamation at Haeapugua and to large-scale warfare within and migration from both basins.

More direct enquiries about the reasons for these migrations met with a response that was perhaps too enticing. When I cautiously enquired at Komo if oral traditions nominated why it was that the Huli-speaking clans should have migrated en masse from the Tari basin to Komo, Pebe Wagima of Wabiago clan replied that the adoption of sweet potato by Huli living in the Tari basin had resulted in a swift and explosive increase in the population, forcing clans from the over-crowded Wabia area in particular to seek land elsewhere through the invocation of distant ancestral ties to the Komo area. Similar responses, citing the role of sweet potato adoption in population growth, came from enquiries in the Lebani and Margarima basins.

On the basis of a broad review of the clan genealogies available to me from across much of Huli territory (see Appendix B6), it is possible to discern a region-wide pattern in genealogical elaboration. This elaboration takes the form of a proliferation in the occurrence of male ancestors with multiple wives and larger numbers of children between six and nine generations above today's adults (which translates very roughly as between about 245 and 350 years before the present). Whether this represents the maximum temporal extent of "biologically" accurate genealogical recall in Huli oral traditions or an actual increase in population numbers, the implications of a transformation either in real population size or in the requirements of social reckoning through genealogy amount to much the same thing.

There is a temptation, to which responses such as that of Pebe Wagima pander, in describing the historical period after the mid-17th century as "post-Ipomoean" to assume that major developments in land use or in social formation during the post-Ipomoean period are necessarily consequences of the adoption of sweet potato. The evidence for apparently post-Ipomoean migration and its implications for population growth in the central Huli basins might neatly be interpreted in this fashion but the link between these processes and the adoption of sweet potato needs to be clearly demonstrated, rather than simply assumed; we can presume, after all, that human populations in the New Guinea Highlands have historically been capable of increase in the absence of sweet potato. The discussion which follows of historical transformations in exchange practices and in the structure of Huli society foregrounds the role in this process of pig production in such a way as to propose a series of links between ritual, pig production and sweet potato and thus provide a model of the impact of sweet potato on Huli society.

D1.3 Transformations in Huli Ritual and Society

I suggested earlier (B4.5) that an understanding of structural transformations in Huli society requires that the distinction between "subsistence" and "social" forms of production be opened to question. The analytic category of "social" production, employed as shorthand for all production above a minimum level of subsistence requirement, finds no match in Huli discourse or in the coordination of labour and consumption; all Huli production is effectively encompassed within the category "social", whose power to describe change in terms of the intentions of historic Huli agents is consequently diminished. The challenge this raises for an analysis that seeks to work through a model of intentional agency is to identify new perspectives on the meaning of production; to understand the significance for those agents of the relationship between changes at the level of production, such as the processes of intensification or extensification, and accompanying transformations in society. I briefly outline in this section the possibility that ritual, as the set of practices which most clearly addresses and articulates the cosmological framework of shared meanings that constitute Huli culture, offers a powerful lens through which to discern the changing structure of the relationship between Huli and their environment.

Perhaps the most obvious and immediate links between ritual and production are pig herds. Although there is some suggestion that other media of exchange such as possums and tree wallabies were formerly an appropriate sacrifice in the most ancient rituals, all of the rituals still being performed in the middle of this century required pigs, or more accuratley pork, in varying quantities[5]. Pig fat and pig blood, in particular, were employed as the substances establishing or renewing the ties of exchange between supplicant humans and ancestral or other *dama* spirits; but it is the history of changes in the movement of the remaining pork produced through this sacrificial process that is of particular interest to this analysis.

It should be no surprise, given the regionally atypical forms of ritual leadership and the degree of elaboration evident in Huli cosmology, to find that the history of Huli ritual is extremely complex. Rather than sketch the full extent of that history, insofar as it is known, I seek to contrast two major sets of ritual forms, the ancient *gebe* ("ancestor") and *dindi gamu* ("earth spell") and the more recent *tege pulu*[6], as a means of tracing the broad historical trajectory of change in the relationship between ritual and production; in addressing this specific aspect of Huli ritual, description of the rituals here is limited largely to the issues of leadership and the deployment of pigs and pork[7].

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5. Possums were still employed in more recent rituals, such as the opening sequences of *tege pulu* (described below); but, like the reenactment of the gardening technology of the earliest ancestress and the consumption of lowland sago in the inner sanctum at the Gelote ritual site (Section B4.2), the use of possums is a conscious invocation of a deeper past.
6. Despite numerous enquiries, no gloss was offered for the term *tege pulu*, other than that *pulu* is the call made during the opening stages of the ceremony; a remote possibility is that the term *tege* is cognate with the term for the ceremonial exchanges of the central and eastern Enga, *tee* (Feil 1984).
7. In conjunction with my general research into Huli oral history, the history of Huli ritual was documented in considerable detail; the accounts of *dindi gamu* and *tege pulu* provided here are considerably abridged, but draw on this extensive body of documentation.

Gebe and dindi gamu

The related *gebe* and *dindi gamu* rituals are undoubtedly ancient, at least within the temporal reckoning of Huli historicity[8]. The constitution of these rituals is entwined with that of the landscape and the emergence of the earliest ancestral *dama* in the region, and their most immediate purposes were the restoration of the fortunes and fertility of the land and of people in the face of the tendency in both towards entropy (B2.5 and Chapter B5). Both *gebe* and *dindi gamu* rituals were still current in the Tari region during the early 1970s but, under pressure from the various missions and due to wholesale conversion to Christianity of the bulk of the Huli population since the 1950s, neither ritual has since been performed.

Gebe performances can be regarded as the minimal components of the much larger *dindi gamu* rituals. *Gebe* was performed at fixed sites, the *gebeanda* residences of former ancestors, both human and *dama*. The nature of *gebe* rituals varied considerably from clan to clan, with each performing lineage transmitting its own traditions of practice from generation to generation. Generally, however, *gebe* rituals involved the sacrifice of a small number of pigs, the blood and fat from which would be poured over stones or other features associated with particular male and female ancestors in order to attract their favour. *Gebeali*, specific individuals from the families or lineages within which traditions of ritual performance were maintained, would undertake the performance either in their own individual interest, or at the behest of others, who would then supply the necessary pigs and a payment in the form of cowrie shells. Attendance of these rituals at *gebeanda* ritual sites was restricted largely to senior men related to the lineage owning the *gebeanda*, to the extent that ritual sponsors from other lineages were often not permitted to observe performances.

Dindi gamu was a complex of rituals which effectively played out the logic of the smaller, local *gebe* rituals on a far larger stage, with many other elements incorporated within each performance. Performances of *dindi gamu* at the major *gebeanda* ritual centres, or *dindi pongone gebeanda* (Table B4, Figure B10), addressed fertility on a regional or universal scale. As with *gebe*, the details of *dindi gamu* performances varied from *gebeanda* to *gebeanda*, but certain common themes appear to have been established through a process of regional linkage; indeed, there appears to have been a historical extension of the regional influence of *dindi gamu* to non-Huli neighbours along, and probably in support of, lines of regional trade centred upon the Tari region (Ballard 1994).

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8. Here I am forced to contradict Glasse's (1965:46) assertion that *dindi gamu* was adopted from the Duguba early this century; in this he appears to conflate elements of a single ritual performance of the *dindi bayabaya* rite at Bebenite with the larger *dindi gamu* ritual.

Leadership in *gebe* and *dindi gamu* rituals was thus descent-based, with performances held at specific *gebeanda* locations and orchestrated by individuals from a limited set of prescribed lineages. The spells (*gamu*) and knowledge (*mana*) required for performance were transacted between generations, often with payment involved, but not beyond a closely bounded circle of kin. Effectively, the *gebe* and *dindi gamu* rituals were controlled by a small elite; there is considerable genealogical evidence to suggest that *gebeali* families from the major *dindi pongone gebeanda* such as Gelote, Bebenite, Tundaga and Bebealia Puni intermarried extensively[9].

The numbers of pigs involved and the frequency with which different *gebe* and *dindi gamu* rituals were performed are difficult to establish with any certainty, but some impression of the scale of pig production required for these rituals can nevertheless be gained. *Gebe* rituals typically involved between one and no more than three pigs, referred to collectively as *gebe nogo*. In sponsored performances, these would be supplied to the *gebeali* or *gebe gamuyi* ("*gebe* spell-holder") by the *gebe anduane* sponsor. One pig was always consecrated to the relevant *gebe dama* spirit being supplicated, with the other two sacrificed for the *dama* Hana Wali and for the *liru* ritual stones.

The circulation of pigs at *dindi gamu* performances was more complex. The performing *gebeali* lineage or lineages would acquire and provide a single "sacred" pig, known at Gelote as *iba tiri nogo* and at Bebenite as *nogo yabe*; in both cases, there were specific requirements about the size, type and colour of the pig and its source. These "sacred" pigs were then killed and cooked within the *gebeanda*, with half being thrown to the *iba tiri* spirits in the Girabo and Dagia rivers and the other half cut into small portions for the *dindi bayabaya* rite; these portions were then distributed to the different swamps in the region and buried to replenish the fertile *iba* substance of the land (Chapter B5).

The *gebe nogo* contributions of sponsoring clans at *dindi gamu* rituals (known at Bebenite as *burugu abi nogo*) typically consisted of between 15 and 25 pigs for each performance. These would also be killed in the *gebeanda*, and their flesh mixed and cooked with that of the *iba tiri nogo* or *nogo yabe* which would impart some of its

9. With so small a ritual elite, the risk of knowledge loss was ever-present; though a single *gebeali* generally presided over ritual performances at each *gebeanda*, other agnates within his lineage and even certain of his *aba* kin collectively retained a full knowledge of the requisite *mana* and *gamu*. Despite this strategy, the dysentery epidemic of the 1940s devastated many of the *gebeali* families - a blow which may have contributed to the speed of the collapse of *dindi gamu* following administrative and missionary contact in the 1950s.

qualities to the flesh of the "secular" pigs. Small cuts of this pork would be offered to ancestral *dama* spirits related to the *gebeali* clans, but the bulk of the meat was then consumed by the *gebeali* and their families, both inside and outside the *gebeanda*.

Gebe and *dindi gamu* rituals were not performed regularly but were initiated as the perceived need arose in response to food shortages, unaccountable illnesses or deaths, or general ill fortune in such matters as war. On the basis of estimates of the years in which *dindi gamu* was performed at Gelote and Bebenite, it is possible to suggest that the major *dindi gamu* rituals were undertaken as often as every 5 to 10 years, on average. Smaller *gebe* rituals would have been performed much more regularly at the minor *gebeanda* sites, but the overall impression gained from the numbers of pigs involved at these performances suggests that the scale of production required to support *gebe* and *dindi gamu* rituals was not great. This conclusion is supported by the contrasting impression of the deployment of pigs in the more recent *tege pulu* ritual[10].

Tege pulu

Tege pulu (generally referred to in abbreviated form as *tege*) was the most enduring of a large number of experiments in ritual launched by Huli, during the period from the late 19th century up until contact, in response to the perceived failure of *dindi gamu* and other rituals such as *yabo* and *gomia* to maintain the fertility of the land and of people[11]. The evidence of land degradation in the form of declining crop yields on the poorer soils, the advent of large-scale warfare and an apparent increase in both epidemics and famines are collectively described in terms of the emergence of a host of new, unrelated and unremittingly malevolent *dama* spirits (Chapter B5, Frankel 1986). In effect, *tege* replaced *gebe* in prominence on a local scale when the origins and effects of this "epidemic" of misfortune could no longer be ascribed to *gebe* ancestors and were sought instead amongst new, unrelated *dama* spirits. The emergence of *tege* did not result in the abandonment of *gebe* and *dindi gamu* performances, but rather augmented them and, in so doing, effected something of a revolution in Huli society.

Tege was a remarkable amalgam of materials, rites and dances from different sources, reassembled to form a novel ritual. *Tege* performances incorporated rites that were both ancient, such as *homa haguene*, the sacrifice for and repainting of ancestral

10. There is no thorough ethnographic analysis of *tege* available in published form (brief references to *tege* are made by Glasse (1968), Frankel (1986) and Goldman (1983)), but eyewitness descriptions published in two popular books on travel in the Highlands give some sense of proceedings in the ritual (Gaisseau 1957, Bjerre 1964).
11. I have briefly described elsewhere a number of the other ritual experiments and considered the adoption of Christianity by Huli as the most recent in this sequence of experiments (Ballard 1992b).

skulls, and others that were entirely new, such as *guruma igiri*, a series of rites of passage for boys and young men. The origins of *tege* are fairly clearly ascribed to Dagabua clan at the Gelote *dindi pongone gebeanda*, where the *gebeali* Yaliduma-Wabira is said to have inadvertently released the epidemic of malevolent *dama* spirits. Hoyamo clan, afflicted by these *dama*, were the first to pay for or sponsor a performance of *tege*, which was performed for them by Dagabua in Dagabua parish; Maiya-Tawa of Hubi clan then sponsored a second performance, as *tege tene* ("the source of the *tege*") or *tege anduane* ("the owner [literally: "breast-giver"] of the *tege*"), in Hubi parish for the death of a kinsman. There is exceptional concordance amongst the estimates for the ages of these and other individuals said to have been alive as adults when the *dama* emerged and *tege* was initiated, and it is possible to assign these events fairly firmly to the period between ?1870 AD and ?1885 AD.

From the Haeapugua basin, *tege* spread rapidly to most of the other Huli basins, reaching Mogoropugua in about ?1910 AD; the services of *tege* ritual specialists from Mogoropugua were then acquired by Duna-speakers of the Upper Tumbudu valley, where *tege* appears to have been adopted as the Duna *kiria* ritual (Modjeska 1991:245f.). Along the outer margins of Huli territory, debate over whether or not to adopt *tege* had varying results: Huli-speakers of the Komo basin enthusiastically took up *tege* (where it was recorded by a number of patrol officers in the 1950s); there was a single performance of *tege* in the Lebani basin when, in the late 1940s, Lebani residents "bought" *tege* from Mogoropugua and performed it in an apparently successful attempt to stem the loss of life ascribed to the depredations of *dama*; but in the Benalia valley and amongst the scattered Huli communities along the southern slopes of Mt Gereba, *tege* was decisively rejected[12]. Although Benalia residents frequently attended performances of *tege* held elsewhere, they decided, as Habo Pebe (Hobi *tene*) revealingly phrased it in 1990, that they preferred to continue fighting rather than adopt *tege* and the truces it entailed. The last *tege* performances appear to have taken place in the mid-1960s, after which pressure from the various missions resulted in its total abandonment.

Unlike *gebe* and *dindi gamu*, the performance of *tege* appears to have been remarkably homogeneous across its full geographical extent. The same reasons given for the performance of *tege* (war, famine, unaccountable death, illness and suicide) are widely cited. The primary goal of *tege* was to identify correctly through dream, and then seek to appease through performance, the responsible *dama*. This *dama*, which

12. One of the earliest written accounts of *tege*, by Patrol Officer C.E.T.Terrell in 1953, also referred to the Benalia area as a 'noteworthy exception' to the universal practice of *tege* amongst Huli (Terrell 1953).

could be either unrelated or ancestral, was the focus of *tege* sacrifices, together with other principal members of the Huli pantheon, including Ni (the sun), Iba Tiri and Dama Dindi Tene or Dindi Ainya. A standard sequence of rites, performed at irregular intervals over a period of years, was universally observed: the initial *himugu* and *deba* rites were followed by the *ega* rite and culminated in the full performance of *tege pulu*[13].

Tege pulu performances typically took place in gardens within the parish where the *dama* was held to have been resident; significantly, *tege* was not performed within the major *gebeanda* centres. Over a period of four days and under terms of truce between any warring groups, numerous rites were conducted within a fenced enclosure to which no women were admitted. Women, however, were permitted to camp just beyond the perimeter for the duration of the ritual, and most men were freely admitted to the enclosure, practices which stand in strong contrast to the secrecy and limits on access associated with the *gebe* and *dindi gamu* rituals. Unmarried women and married men also met at *daweanda* courtship ceremonies, though the buildings for these were constructed beyond the *tege* perimeter fence.

As an experiment with ritual, *tege* was also an experiment in social order. Leadership in the *tege* ritual sequence constituted a significant departure from the forms of leadership described for *gebe* and *dindi gamu*. In place of the narrowly prescribed and essentially hereditary offices of the older rituals, *tege* leadership consisted of a shallow hierarchy with a multiplicity of offices and roles. A limited number of men known as *liruali* ("*liru* ritual stone-men") were said to have held a complete grasp of the requisite *mana* and *gamu* for *tege*[14]. These *liruali* operated as instructors for the actual officiants in *tege*, the *uriali*, of whom between one and four were typically present for a *tege* performance. *Gamu* spells and *mana* knowledge were exchanged in payment between *liruali* and *uriali*; with sufficient experience and knowledge, *uriali* would ultimately perform as *liruali* in their own right[15]. Significantly, there appears to have been no kinship requirement between *liruali* and *uriali*, though performing *uriali* at a specific *tege* were conventionally drawn in even numbers from *tene* and *yamuwini* kin

13. The *ega* and *himugu* rites which preceded *tege* appear to have functioned largely as a process of divination. They were not widely attended and the pigs provided by the sponsor were typically three or less in number.

14. The majority of these *liruali* appear to have been based in the central Tari and Haeapugua basins: Glasse (1965) has suggested that as many as 12 *liruali* directed proceedings at a single *tege* in the Tari basin, and I have documented and confirmed through different accounts the names of 26 different *liruali* who co-ordinated *tege* performances in the Haeapugua basin; but Terrell (1953) recorded that only two *liruali* were known in the entire lower Tagali valley and Komo basin area, and *liruali* were never resident in the Lebani basin.

15. A standard payment made to a *liruali* by an *uriali* in exchange for *tege* knowledge consisted of 60 ("four fifteens") strings of cowrie shell (*dange hende*).

within the performing parish; this freedom of transaction of *tege* knowledge presumably accounts for the exceptional uniformity of *tege* performance across Huli territory. Under instruction from the *liruali* and *uriali*, a large number of men and boys acted in a wide range of specified roles both prior to and throughout the four days of the *tege* performance; indeed, most of the large number of men attending each *tege* would have been acting in at least one of these roles. Women were also accorded named roles, as the mothers of the *guruma igiri* initiates and as *nogo ainya* ("pig mothers"), the providers of many of the pigs killed during the ritual.

If *tege* served to expand dramatically the pool of potential officiants, who were no longer drawn solely from genealogically specified lineages, it also widened the net for potential sponsors for ritual performance. As a ritual performed largely in the (male) public eye, the prestige of sponsorship accrued to a much greater degree to the *tege anduane* sponsor than was the case for *gebe anduane* sponsors; within the local area around a *tege* ritual, the performance was generally described as "X's *tege*" and through successive sponsorship, X gained renown as an *agali homogo*, a rich man capable of marshalling the efforts of others in the production of wealth. A brief review of the movements of pigs and pork associated with *tege* reinforces the impression of a transformation in the role of the sponsor, including the notable emergence in *tege* of women as ritual sponsors, albeit under the auspices and name of a male relative.

All exchanges of pigs in *tege* took the form of pork; it was apparently axiomatic for all Huli ritual that pork, rather than live pigs, be the medium of transaction. But competitive exchange need not require live pigs and a highly significant element of *tege* was precisely its role as a vehicle for competitive exchange between groups led by *tege* sponsors[16].

Detailed reconstruction of payments made at eight *tege* sponsored or received by Tani Lebe subclan at Haeapugua between 1951 and 1954 suggests that an average of 72 pigs were killed at each *tege* (ranging between a minimum of 20 and a maximum of 120). Not all of these belonged to the *tege anduane*; instead, he solicited contributions from his kin, affines and parish coresidents, forming as it were a *tege* project group (B4.5). The *tege anduane* himself typically contributed between 10 and 20 pigs, usually representing the largest single contribution and thus assuring that the *tege* was sponsored under his name. Of the total number of pigs assembled for each *tege*, approximately one quarter was given in payment to the officiating *liruali* and *uriali*, a

16. An absence of competitive or cyclical exchange ceremonies amongst Huli had previously been asserted by ethnographers of the Huli (Goldman 1981b:61; Frankel 1986:44) and has passed into the regional literature (e.g. Feil 1987:240), but the scope proposed here for competitive (albeit equivalent) and cyclical exchange in *tege* has since been confirmed by L.Goldman (pers.comm. 1993).

second quarter was given to the host lineage by the *tege anduane* and his sponsoring lineage, and the remainder were provided by each lineage for their own consumption or redistribution. The overall volume of pigs required for *tege* cycles is, again, difficult to calculate with much confidence. Involvement by Tani Lebe in eight *tege* over four years (of which they sponsored five) required an estimated 303 pigs from Lebe, or 76 pigs each year. Lebe are only one of nine lineages of comparable size in the Hewago clan or subclan of the Tani superclan (Appendix B6: Gen.3); as many as 600 or 700 pigs may thus have been committed annually to *tege* by Tani Hewago and in addition to this must be reckoned the usual flow of pigs in payment for brideprice and other forms of compensation.

The element of competition in *tege* derived from the assumption that sponsorship by lineage A of a *tege* performed by lineage B would be reciprocated with an equal or larger number of pigs in a second *tege* in which the roles of sponsor and officiant were reveresed; from such evidence as I have, it appears that increased returns were in fact very rare and that equivalent reciprocity was the effective rule. The competitive "edge" in this system of apparently direct reciprocity stemmed instead from the strategic timing of sponsorship; as former sponsors explained to me, the key to "winning" at *tege*, or gaining the prestige of the indebtedness of one's hosts, was to muster one's resources in secret and spring a sponsorship upon the host lineage when they were least equipped to respond quickly with a return *tege*.

Obviously, there was a complex web of individual debt creation and settlement at play under the general rubric of *tege* exchanges, and I do not intend here to trace the full significance for Huli social structure of the directions in which these payments flowed[17]. Instead the point that needs to be made for my argument is that *tege* represented an occasion for pig exchange on a scale unprecedented in Huli history. Further, it was an explicitly ritual occasion, insofar as the pigs were exchanged as pork, in contrast to the practice of compensation payments such as brideprice or compensation after war where the bulk of the transaction was, and still is, conducted with live pigs (Table B21).

Conclusions

The contrast set up here between *gebe/dindi gamu* and *tege* allows us to perceive a rough trajectory in the transformation of both leadership and the organization and form of consumption of pig production over the broad period of the last two centuries. Although all three of the "secular" leadership types listed in B4.5 (*homogo*, *wai biaga*,

17. Perhaps the most significant observation to be made in this respect is that *tege* competition was conducted largely between lineages standing in relationship as *aba* to one another (Chapter B3).

bi laga) are deemed to be ancient, it is possible to propose that there was a general shift during this period in the balance of prestige associated with different forms of leadership.

Thus types of leadership such as the clan headman (*agali haguene*) and ancestral ritual leader (*gebeali*) which were founded upon descent-based forms of knowledge, such as clan origins (*dindi malu*), genealogies (*malu*) and the spells and knowledge associated with *gebe* and *dindi gamu* rituals, declined in significance, insofar as that can be gauged by their ability to marshal the labour of others in the form of pigs. In their place, but not to the point of their exclusion or extinction, types of leadership which drew their status from generally transactable knowledge (*liruali* and *uriali* in the *tege* ritual) and a degree of renown achieved through the ability to marshal labour (such as *homogo* in pig transactions or *wai biaga* in warfare and its attendant compensations) assumed a new prominence. Implicit in this transformation and in the increase in the commitment of pigs to *tege* rituals, is a significant increase in the demand for and production of pigs. Equipped with this insight, it is possible to return to the problem of explaining wetland reclamation at Haeapugua with a fresh alternative with which to account for both the impetus behind wetland reclamation and the historic significance of sweet potato for the Huli.

D1.4 Towards a History of Sweet Potato and Wetland Use at Haeapugua

The relationship between the adoption of sweet potato and the nature of wetland use at Haeapugua can be approached from a variety of angles. The review that follows is based, in large measure, on existing models of developments in land use associated with the adoption of sweet potato, as set out by such authors as Watson, Modjeska and Golson (Chapter A2). But the perception of social and environmental change described by Huli cosmology in terms of the relationship between humans and *dama* spirits (Part B) allows for a richer and more complex analysis of the local impact of sweet potato, in which a regional pattern of intensification of production can be regarded as both the cause and the consequence of land degradation.

Two basic assumptions are made in this account of Haeapugua history: first, that sweet potato became available in the New Guinea Highlands, and in the Tari region in particular, only within the last 400 years and probably only shortly before the Tibito ash fall (A2.3, Appendix A3); and second, that populations of the major basins of the New Guinea Highlands, such as the Tari and Haeapugua basins, which were already committed to intensive forms of agricultural production (Chapter C4) and, in particular, to forms of exchange in which pigs featured as the principal valuable, were particularly susceptible to the productive possibilities of sweet potato. In these central basins, the potential for increased yields by weight of sweet potato over the yields of other existing staple tubers and the advantages of sweet potato as pig fodder would quickly have been apparent. Why these potential advantages should have been exploited to the extent that they were is an issue to which I return in Chapter D2. It can be suggested however, on the basis of the oral historical evidence for migration and for increased warfare, that the human populations of the central Huli basins increased fairly dramatically subsequent to the adoption of sweet potato, resulting in a relative increase in the pressure of demands on the resources of the more favourable environments in which the bulk of the population was presumably resident; a plausible consequence of the population increase and one which is also articulated in the oral narratives.

Four principal forms of initial response to this pressure can be proposed: dryland intensification (shortening of the fallow period in favourable environments), dryland extensification (migration or extension of gardens to lower and higher altitudes and onto poorer soils and steeper slopes), wetland extensification (the reclamation of wetlands for gardens) and increased warfare in direct competition for the favourable environments. The relationships between these different options are complicated but my particular interest here is to show how each of the other options also served, in turn, to increase the pressure of demand for wetland reclamation.

The key to this argument is the role that pig consumption played formerly in Huli fertility rituals and other forms of exchange. From the descriptions of early Huli rituals such as *gebe* and *dindi gamu*, it appears that pigs were a long-established element of ritual performance in Huli society; indeed, we can presume, on the basis of the apparent antiquity of *dindi gamu*, that this role extended to periods well prior to the introduction of sweet potato. Modjeska (1982) has already illustrated, in his model of the exchange-value of pigs, the scope for a cycle in which increasing population size and structural complexity leads to increased opportunity for conflict and need for conflict mediation, and thence to an increase in pig production and in ceremonial exchange. In the Huli case, this cycle needs to be extended to incorporate the deployment of pigs in ritual contexts.

Figure D1 illustrates a series of relationships proposed between the different responses to an increase in the pressure of demand on favourable environments. The four different options identified above all apply on both a local and regional scale: thus dryland extensification was an option within Haeapugua, through further clearance or reuse of the surrounding ridgeline slopes, or on a regional scale through migration to the lower Tagali valley or the Komo basin. But each of the different options is also shown to have further contributed to the perception of social or environmental degradation that historically fuelled the Huli experiments in ritual of the 19th and 20th centuries. Thus reports of local or regional warfare, wetland desiccation, degradation of poor soil and steep slope environments, increased risk of frosts at higher altitudes and of malaria at lower altitudes have all been interpreted by Huli ritual leaders for the community at large as symptoms of a decline in the relationships between humans, the land and *dama* spirits (Chapter B5). Insofar as ritual constituted a form of exchange between humans and *dama* that mirrored exchanges amongst humans, the intensification of exchange between humans posited by Modjeska can be said, in the Tari region, to have been matched by a concomitant increase in exchange with *dama* that took much the same form: greater numbers of pigs. The truly revolutionary effect of sweet potato upon Huli society and the environment of the Tari region was thus to provide the scope both for increased pig production and for an increase in the demand for that production.

While this increase in demand for pigs can be expected to have had an effect on all environments, I have argued that wetlands represented the principal environmental zone in which massive overproduction of sweet potato for pig fodder could successfully be undertaken without significant detriment to the human subsistence base (B4.5, C4.3). Thus, while wetland reclamation at Haeapugua might reasonably be viewed archaeologically as a sound "response" to dryland pressure, that was neither the perception nor the primary intention of the Huli gardeners. Insofar as wetland reclamation was a "response" to external forces, it was a response to the perception of entropic decline in society and in dryland productivity. Those Huli with access to the wetlands at Haeapugua thus sought to increase the relative production of sweet potato with a view towards producing pigs for novel forms of ritual exchange with which to address their afflictions.

CHAPTER D2 - RETHINKING THE IPOMOEAN REVOLUTION

> The most difficult task in theoretical reasoning, as in practical actions, is to make an inventory and analysis of the "possibilities" which coexist at a given moment in time.
>
> Godelier 1977, p.7

Rethinking "Revolution"

In his review of Thomas' Rethinking the Neolithic, Carman (1992:199) delivers the telling criticism that by taking the Neolithic 'as read', Thomas 'does not rethink the Neolithic but merely rethinks within it'. The same danger is certainly present in any consideration of the Ipomoean revolution in Highland New Guinea and this chapter thus seeks to put up for question the value of the concept of an Ipomoean revolution. I have argued in the previous chapter that changes which might be descibed as revolutionary, in the use of the Haeapugua wetlands and more generally in the organisation of Huli society, followed upon and can be linked to the introduction of sweet potato to the Tari region. But can the impact of sweet potato on regional Highlands society and environment be similarly defined and identified, and how might the specific evidence from Tari and a general approach drawing on archaeological ethnographic methods contribute to such a project?

I suggested in Chapter A1, adopting a narrative approach to history, that revolutions are identified contextually, that is, in terms of the significance accorded to a particular event or phenomenon through its emplotment or positioning within a narrative sequence. Two broad qualifications appear to be required in common usage for a revolution: that it denote a fundamental change between states, and that it be swift, relative to a notionally conventional pace of change between those states. In Highlands history, introductions of new crops or domesticates and changes in the relationships between humans and these introductions appear most easily to have met these criteria; hence the proposed Susian, Colocasian, Canine and Ipomoean revolutions (see Chapter A2). Within the specific terms of reference set by the authors of these neologisms, they can indeed be considered revolutions; for example, given Kelly's (1988:166) focus on the supply of game, the introduction to New Guinea and use in hunting of dogs might aptly be identified as a 'Canine' revolution. Given the range of social and environmental fields within which revolutionary change might similarly be discerned, it is not possible to legislate for use of the term "revolution"; but the corollary of this conclusion is that the scope for reference and the limits of the field within which a revolution is designated "revolutionary", must be clearly defined.

The dangers of not specifying the limits and terms of a historical revolution are evident in studies which seek to identify or contrast "real" revolutions. Thus Grigg (1984:15) concludes that all agricultural change in Europe prior to the 1930s was 'evolutionary rather than revolutionary', but fails to stress that this conclusion derives from the comparative perspective of wheat yields in 1980 - a perspective which presumably denies revolutionary change across the world until the 20th century. Closer to home, Bayliss-Smith's study of high-altitude settlement in the Highlands becomes enmeshed in conflicting definitions of revolution when he declares that '[t]he revolution was Colocasian not Ipomoean' (1988:159) - here in reference to initial colonisation - having earlier concluded that the Ipomoean revolution produced a transformation in high-altitude settlement 'as great, if not greater, than that accomplished by the much earlier Colocasian Revolution' (1985a:314)[1].

Revolutions, from a narrativist perspective, need to do useful work both within and beyond the terms of a specific narrative; both to explain a particular sequence of development and to provoke comparison and thought in other areas. This, as I have argued in Appendix A1, is what was truly "revolutionary" about Watson's formulation of an Ipomoean revolution, in that he both explained (within the limits of contemporary knowledge) a specific historical development and introduced to the history of Highlands society the concept of revolution as primarily a social phenomenon, opening the field of enquiry for subsequent authors to consider history in terms of change in the construction of value (Modjeska 1977, Godelier 1986).

The concept of an Ipomoean revolution has been in the literature now for 30 years and some reformulation of its constitution is now timely. A reading of Salaman's (1985) epic study, The History and Social Influence of the Potato, provides a model for this analytical process. Salaman makes clear the central role of human agency in the introduction of the potato to Europe: war, famine and the failure of other staples played an important part in the acceptance of potato as a foodstuff but, everywhere, the nature and extent of that acceptance took different forms depending on such matters as status or religious affiliation. Following a method illustrated (if not directly articulated) by Salaman, the emphasis on human agency urged throughout this thesis requires that a distinction be drawn between different stages in the process of sweet potato's adoption. In a conceptually chronological sequence, these stages are introduction, adoption, and deployment; their distinguishing characteristics can be described through consideration of the light shed by the evidence from Tari on the Ipomoean revolution at a regional Highlands scale.

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1. See also the argument for a Colocasian revolution during Phase 4 at Kuk (Bayliss-Smith and Golson 1992a:18) which manages to declare both for and against the case within the same paragraph.

The Introduction of Sweet Potato

Like the terms Neolithic and Mesolithic, the chronological contrast implied between pre- and post-Ipomoean requires constant qualification. Sweet potato is likely to have been introduced or made available to different parts of New Guinea and of the Highlands region at different times and the term "post-Ipomoean" thus refers to different dates for different areas and communities. An emphasis on agency and the role of human choice leads to the recognition that introduction does not necessarily entail adoption, but only the potential for adoption. Nevertheless, the historical fact of introduction is of interest in establishing the lapse of time between the introduction and availabilty of sweet potato and its subsequent adoption.

As outlined in A2.3, the current state of our knowledge about the date of the introduction (or introductions) of sweet potato to New Guinea is limited to inferences from knowledge of diffusion of the tuber elsewhere in the world. While the recent archaeological discovery of sweet potato fragments in Polynesia keeps alive the hope that the future recovery of similar material in New Guinea will provide us with a clearer understanding of the date of introduction, there are limits to the degree of accuracy we can hope for in determining that date. Despite the wealth of available documentation, Salaman (1985:142ff.) also finds difficulty in determining a precise date for the introduction of the potato to 16th-century Europe. Lacking direct archaeological evidence for sweet potato in New Guinea, several other underexplored avenues of enquiry may serve to narrow down the range of possibility. The models reviewed by Yen (1974) for the introduction of sweet potato to New Guinea through the Moluccas along either the Camote or Batata routes (see A2.3) have not yet been adequately tested through consideration of the 16th- and 17th-century Portuguese and Dutch archives, which may yet permit a more precise understanding of its diffusion in the Moluccas[2]. Scaglion and Soto (1991) have also begun the task of demonstrating a putative diffusion from Polynesia on the basis of the distribution of terms for sweet potato through New Guinea.

I have relied in this thesis on Huli oral history as another source of information about the introduction of sweet potato. In Huli oral tradition, sweet potato is stated unequivocally to have been present in the Tari region prior to the *mbingi* time of darkness, interpreted here as the fall of the Tibito ash between about 1645 AD and 1680 AD. Less certain is the length of time between the initial introduction of sweet potato

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2. New historical material relating to the 16th-century history of the Moluccas and of western New Guinea is still emerging: Gelpke (1994) relates and translates de Brito's voyage in 1581-1582 to the MacCluer Gulf in Irian Jaya, reporting the extensive contact at the time between New Guinea and the Moluccas.

and *mbingi*, though, where individuals within the same genealogy who were alive during *mbingi* and during the introduction of sweet potato are identified, the gap between the two is typically of only two to three generations. What Huli oral history shares with the oral traditions of the neighbouring Duna and Enga is the notion of an introduction of sweet potato from the north and west of the Southern Highlands and Enga areas (Wood 1984, Vol.I:232, Wiessner and Tumu in prep., Haley 1993:58), which sits poorly with the model proposed by Scaglion and Soto for an introduction to the Southern Highlands from the Papuan Gulf[3]. Although Huli oral traditions are amongst the deepest in historical terms in New Guinea, they are at best suggestive of a date of introduction for sweet potato; the fact of a distinction between men of taro and men of sweet potato in Huli genealogies (B4.2) and the recency of migrations, credited by Huli to population increase after the adoption of sweet potato might appear to offer some grounds for proposing a late introduction; but in fact they only serve further to stress the need to distinguish between introduction and adoption.

Adoption

Watson's (1965b) early observation that certain Highlands communities made little or no use of sweet potato despite its significant presence amongst their neighbours made clearly the point that the sheer availability of sweet potato was no guarantee of its adoption[4]. As with the innovations associated with the Neolithic in Europe, which were in many cases available to Mesolithic communities long before their adoption (J.Thomas 1987), communities in the Highlands made conscious decisions to adopt or not to adopt sweet potato that were founded upon a myriad of factors over and above the intrinsic qualities of the tuber[5].

Narrative B6, in which the most widely cited oral tradition about the Huli adoption of sweet potato is recounted, clearly describes a local propensity for experimentation, still evident in a willingness amongst contemporary Huli to test the capacities of novel crops and cultivars (B4.2), a propensity which is presumably not

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3. The identification of an origin for sweet potato via the Sepik hills to the north and west of Lake Kopiago tallies closely with Hays' (1990) proposed route of diffusion for tobacco in the 16th century into the central Highlands from the north coast through the Sepik Hills and Mountain Ok areas; however, tobacco and sweet potato are not clearly linked in Huli narratives of origin. See also Narrative B6 for an alternative (and more common) Huli tradition, in which sweet potato emerges from the grave of a woman in the Tari region.

4. Further support for Watson's observation that adoption of the sweet potato was not a necessary consequence of its introduction comes from the lowland and coastal areas of New Guinea, through some part or parts of which the tuber must have passed to reach the Highlands; yet nowhere in these regions was sweet potato of any great significance until after 1945.

5. Salaman's study of the diffusion of potato is replete with examples of culturally specific negative reactions to the potato, ranging from the objection in Ulster that 'it was not mentioned in the Bible, and hence was not a food designed for man by God' (1985:116) to the equation in 18th century England of the potato with the Catholic rich, giving rise to the slogan, "No Potatoes, No Popery!" (1985:120).

restricted in the Highlands to Huli-speakers. If we can assume that some of the qualities now associated with sweet potato, such as its productivity at high altitudes or its attractions as fodder for pigs, were fairly easily and swiftly identified, we shall need to look further than these intrinsic attributes to understand the tuber's variable adoption.

The diffusion of new crops is also a matter of the spread and adoption of the ideas and practices associated with those crops. Although there is some limited scope for diffusion of sweet potato by natural means (R.Bulmer (1965, 1966) has proposed propagation by birds, for example), the diffusion of crops, as of other materials, is essentially a process of exchange between communities and between individuals. Indeed, it could be argued that is this exchange context which accounts for the strength of the association between sweet potato and pigs, a link whose significance in Huli oral traditions and in the history of the local region is set out in this thesis. The role of the pig as the principal medium of exchange within and between the larger communities of the central Highlands valleys directs attention to the importance of pig production and the role of sweet potato as pig fodder in the diffusion of the latter[6].

The scope for increased pig production would have been most attractive to those communities in which the exchange of pigs was already an established practice. Adoption of sweet potato by specific communities thus involved decisions founded in part on anticipation of the crop's value within existing local systems of production and worlds of meaning. Having thus distinguished between the processes of introduction and adoption, it is necessary to make the further distinction between the act of adoption and the precise nature of deployment of sweet potato; just as introduction of sweet potato does not necessarily lead to its adoption, so too the fact of adoption does not determine the nature of its deployment.

Deployment

Deployment of sweet potato, the particular ways in which the crop was exploited, is not easily separated from adoption but is distinguished here in order to stress the cultural specificity of the relationship between regimes of agricultural production and consumption. In terms of the nature of social change, deployment is perhaps the most difficult stage to discern and account for, either ethnographically or archaeologically, in the general process of sweet potato's "introduction". The results of my research in Tari most obviously address the question of the ways in which sweet potato was deployed

6. Yet such a causal sequence may be too hastily drawn. Salaman (1985:369) documents the reverse situation: 'The final disappearance of the [Scottish] Highland prejudice against pig-rearing may be attributed in no small degree to the cultivation of the [Surinam potato], for experience showed that swine throve on it remarkably well. At Killin in Perth the swine population definitely rose with the increasing cultivation of the potato.'

upon its adoption.

I have suggested that ritual, which provided the framework for Huli understanding of and interactions with their environment, was also the means whereby perceived changes in the local environment or in Huli society were addressed by Huli. The establishment of a series of relationships between sweet potato introduction, environmental and social change and ritual innovation is a significant finding in terms of local Huli history but the specific details of these relationships are unlikely to be matched elsewhere in the Highlands region. It is not sufficient, then, simply to export a model drawn from observations on the Tari situation to account for the role of sweet potato in other Highlands societies. Nevertheless the structural role of ritual in the history of social change at Tari may offer some insight into the history of other Highlands societies.

Huli ritual holds a particular significance for questions about the local impact of sweet potato in that pigs appear to have been a feature of pre-Ipomoean ritual such as *dindi gamu*, as the media of exchange with *dama* spirits. The elaboration of Huli exchange consequent upon the adoption of sweet potato took place largely within the context of new forms of ritual such as *tege*. In the Huli case, the "intensification" of ritual exchange was further heightened by the local logic of entropy through which the effects of an increasing population and increasing demands on resources were interpreted as the grounds for still more ritual experiment requiring still greater numbers of pigs.

It might thus be inferred that, for other Highlands societies, the pre-Ipomoean role of pigs in ritual (as a form of exchange) was also significantly related to the subsequent development of post-Ipomoean forms of exchange. To speculate further, as competitive exchange between Huli lineages emerged within the framework of *tege* rituals, so the classic ceremonial exchanges of other Highlands communities, such as the *moka* of the Melpa (A.Strathern 1971) and the *tee* of the Enga (Feil 1984), may have derived from origins in conceptual ritual exchanges with spirits[7]. The Huli situation contrasts with that of the neighbouring Etoro, amongst whom:

> pigs figure in bridewealth payments, witchcraft and death compensation, affinal exchange, mortuary ceremony, and divinations pertaining to witchcraft accusations... [but] are notably absent from some of the most important ritual contexts... , are not sacrificed to ancestral or other spirits,

7. A case that finds some support in Strauss' (1990) earlier writing on the Melpa and the recent work of Wiessner and Tumu (in prep.) on the oral history of *tee*. See also Modjeska's (1977:iv) early proposition that 'initially it seems that social transformation is realized primarily within ritual rather than in actual political economy' and A.Strathern's (1993) recent revision of the role of ritual power in forms of Highlands leadership.

and are largely irrelevant to Etoro religious beliefs concerning the spirits and spirit world.

Kelly 1988:123

Though the use of small numbers of pigs in certain forms of payment might appear to have offered the grounds for more widespread adoption of sweet potato in Etoro gardens, this did not appear to have occurred there before the 1960s (1988:174). I suggest that the limited role for pigs in the conceptually critical arena of ritual exchange is closely related (but does not, of itself, explain) the limited deployment of sweet potato in Etoro society. Ritual, as a forum for mediation between people and landscapes and as a framework for exchange more generally, would thus appear to offer a useful new lens for regional comparison and for the reconstruction of historic variation in the impact of sweet potato[8].

By focusing on the role in history of human agency, it has been possible to account for variation in the impact of sweet potato through reference not only to variation in local environmental or technological conditions but also to the part played by human decisions in a sequential process of introduction, adoption and deployment of the new crop. A traditional emphasis in archaeology on origins has led Highlands archaeologists to focus on the problem of the date of introduction of sweet potato, often at the expense of closer consideration of the more complex social processes at play in adoption and deployment. The distinction drawn here between introduction, adoption, and deployment casts the debate between proponents for an early or late introduction (A2.3) in a new light. While the problem of a date for the introduction of sweet potato to New Guinea loses none of its significance as an important chronological event, it is of only marginal relevance to the task of identifying the form of social change associated with the adoption and deployment of sweet potato. At Tari, in terms of changes in the size and distribution of the Huli population, in the structure of Huli society and in the nature of local land use, the developments of the last two centuries, which can apparently be assigned to the period of the deployment of sweet potato, can indeed be described as revolutionary.

Whose Revolution?

In addition to the recognition that the Ipomoean revolution described for Huli society was variably implemented in different Highlands communities, the scope for variation in the experience of that revolution within Huli and other societies must also be addressed. In trying to argue the case for a focus on agency in explaining the history

8. Here it might be observed that ritual did not feature in the major comparative review of the evolution of Highlands societies by Feil (1987), perhaps because his materialist perspective made no allowance for the significance of the link between ritual and production.

of land and society at Haeapugua, I have done little to deconstruct the "logic" or "world view" of entropy, or to describe the sociology or political economy of knowledge within Huli society (see Davis 1992). A focus on the deployment of sweet potato, as Brookfield (1984:39) writing on agricultural revolutions has suggested, makes it 'necessary to understand who benefits from change, and why and when'. My focus on ritual, on ritual leaders and on history as articulated and experienced by Huli men rather than Huli women is obviously only one amongst many possible perspectives.

There is scope, in other words, for contest over the significance of change (however revolutionary it might be). Space does not permit the elaboration of these alternative perspectives but the grounds for a critique of the implicit valorisation of the Ipomoean revolution should at least be aired. There is a temptation, doubtless evident in this thesis as in much archaeological and ethnographic writing on Highlands history (see Appendix A1), to regard successive revolutions - the Colocasian, the Ipomoean, even the Cash Crop or Coffee revolution of the 1970s (Stewart 1992) - in progressivist terms as a series of social and technological transitions towards a more prosperous and stable present. Salaman (1985:600), characteristically prescient, has concluded of the potato's role in European history that it

> can, and generally does, play a twofold part: that of a nutritious food, and that of a weapon ready forged for the exploitation of a weaker group in a mixed society.

An association between technological innovation and opportunity for increased social inequality has been argued by Guyer (1984) specifically in reference to changes in crop repertoires, and by Modejska (1982) and Spriggs (1981) in reference to the increased demands in agricultural intensification on the labour of women. In an aside which deserves the attention of Highlands archaeologists, Nelson (1971:213-4) speculated that the decreased requirements of garden preparation by men for sweet potato, relative to the requirements of such staples as taro and sugarcane, must have transformed the gender division of labour[9]; further, that a new staple which could be produced largely with female labour either introduced or enlarged the 'economic' possibility of polygyny. Obviously there are more facets to the Ipomoean revolution amongst Highlands societies than can be encompassed within a single argument; the challenge for archaeologists writing history is at least to allow space for, if not themselves conceive of, these other perspectives.

9. In this reference to change in the division of labour, Nelson almost certainly drew upon the earlier speculations of Watson (1965b).

Archaeological Implications

In addressing a problem set in the recent past, it might be argued that the methods of an archaeological ethnography which I have employed here hold little relevance for the "deeper" past and still less value for archaeology as a discipline, an argument that has currency in contemporary Australian archaeology (see Murray 1994, White 1994). A swift, initial response, following an earlier observation by Murray (1988:12), is that archaeology may not be well-served by the notion of 'a discipline unified by method'; that the methods used here have been the most appropriate for the historical problem defined for this thesis. Methods commonly employed in Pleistocene archaeology could not have provided the level of historical detail presented here. The use of archaeological ethnography, I would argue, has yielded both a novel means of access to historical change in regimes of pig production (through the identification of pig droveways at Haeapugua) and a more sophisticated model of the relationship between the production and consumption of pigs than might have been gained by a conventional archaeological approach. Not the least of my interests has been the documentation of the specific history of a particular community, a project of value in its own right.

A more considered response to the charge that archaeological ethnography has little to offer the broader discipline of archaeology turns upon the role of such an approach in rethinking the nature of archaeological explanation. The central problem raised in Chapter A1 of the difficulty of describing social and environmental change on vastly differing time scales is by no means resolved here; instead the principal contribution of this study has been the attempt to demonstrate that archaeological accounts of the history of human societies, by definition, require the form of a social explanation.

I have sought to qualify this humanist position by showing how environmental change operates both within and beyond the understanding of historic agents, on both longer and shorter scales of time. Thus the development of the Tagali river levee at Haeapugua, a longer-term consequence of forest clearance in the headwaters of the Tagali catchment of which Haeapugua residents were presumably unaware, created the possibility (but not necessity) for wetland drainage and gardens in the centre of the Haeapugua swamp (C4.3). Shorter-term environmental conditions such as the 1935 drought (B5.2), of which Huli alive then and since are acutely aware, have played a major and locally acknowledged role in the substitution of staples and cultivars (B4.2). But if the possibility of wetland drainage or of sweet potato adoption reflect "environmental" conditions, it is only in retrospect that the specific choices made by historical agents appear inevitable.

That social factors require a place in historical explanation for change in the recent past is hopefully demonstrated through this study. That those same factors have operated in the deeper past is indubitable; the difference of opinion rests on the extent to which one can write of agency over longer time periods. By working from the present, across the period of administrative contact in the Papua New Guinea Highlands, which is conventionally taken as the boundary between local anthropology and archaeology (Gillieson and Mountain 1983:53), and thence deeper into the past, I have attempted to test the notion of a boundary which operates between "archaeological" and "ethnographic" forms of explanation.

This is not to propose that the past can or should be read directly from the present. A fundamental tenet of archaeological ethnography is that attention be paid to the historical constitution of specific social forms and conditions. I have sought, therefore, to expose the historical contingency of all aspects of Huli society and of its interactions with the environment of the Tari region; but access to this sense of historical contingency has been possible only through the production of an ethnography charged through with an awareness of history. Ethnography is too valuable a resource for archaeologists working in the New Guinea Highlands to ignore, but the challenge for us is to do that ethnography ourselves, with a sense of temporal and spatial scale derived from archaeology and an attentiveness to social process and to the agency of humans that can only be gained in the present.

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THE DEATH OF A GREAT LAND

Ritual, History and Subsistence Revolution in the Southern Highlands of Papua New Guinea

VOLUME II

Figures, Tables, Appendices, Narratives and Plates

Chris Ballard

A thesis submitted for the degree of Doctor of Philosophy
of The Australian National University,
Canberra, January 1995.

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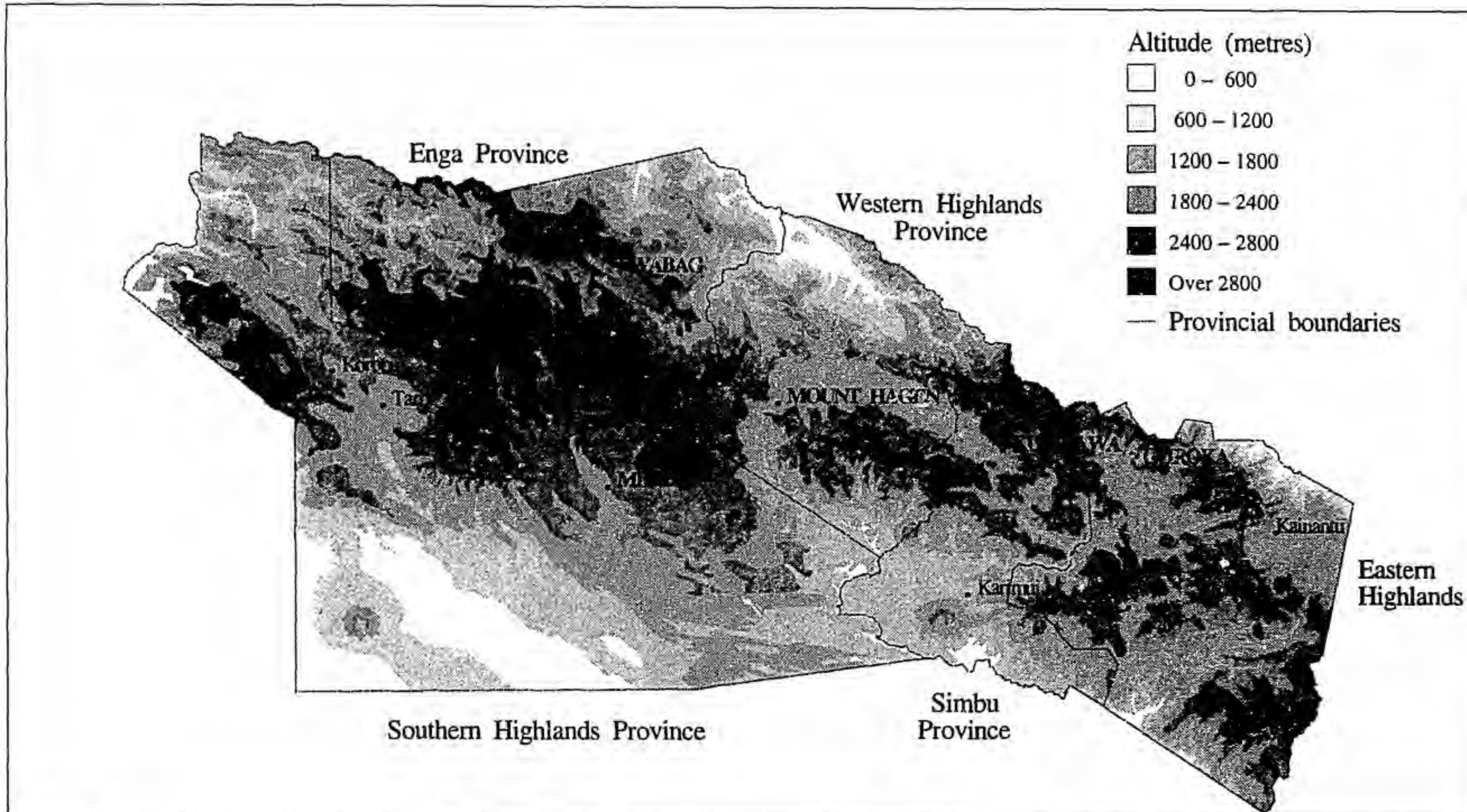

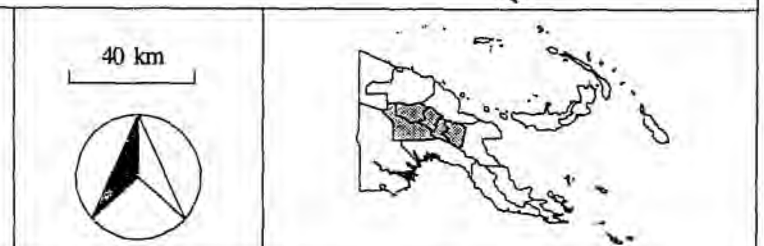

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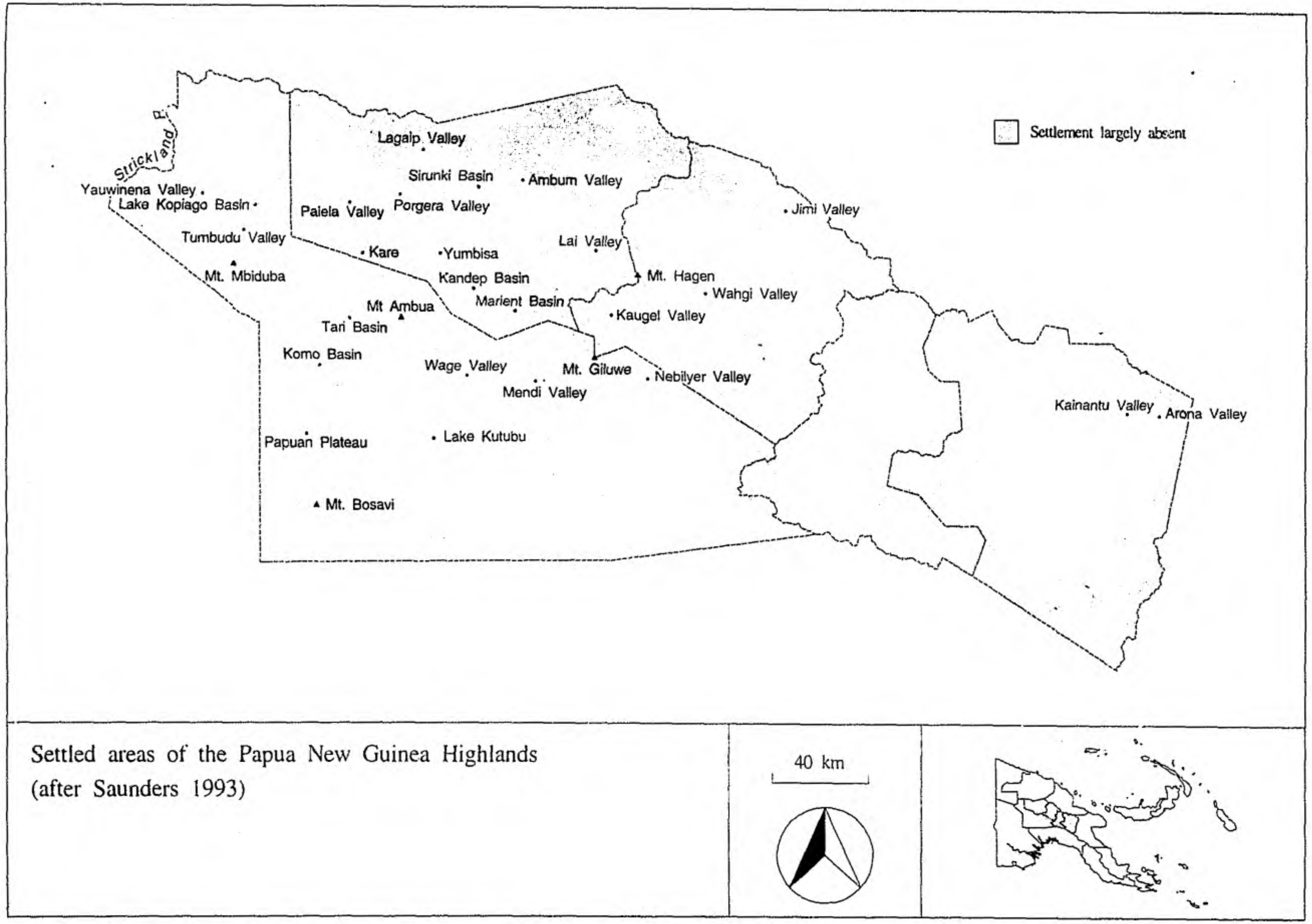
Topography and towns of the Central Highlands of Papua New Guinea (after Bellamy 1986)

Figure A2 Settled areas of the Papua New Guinea Highlands



Settled areas of the Papua New Guinea Highlands
(after Saunders 1993)

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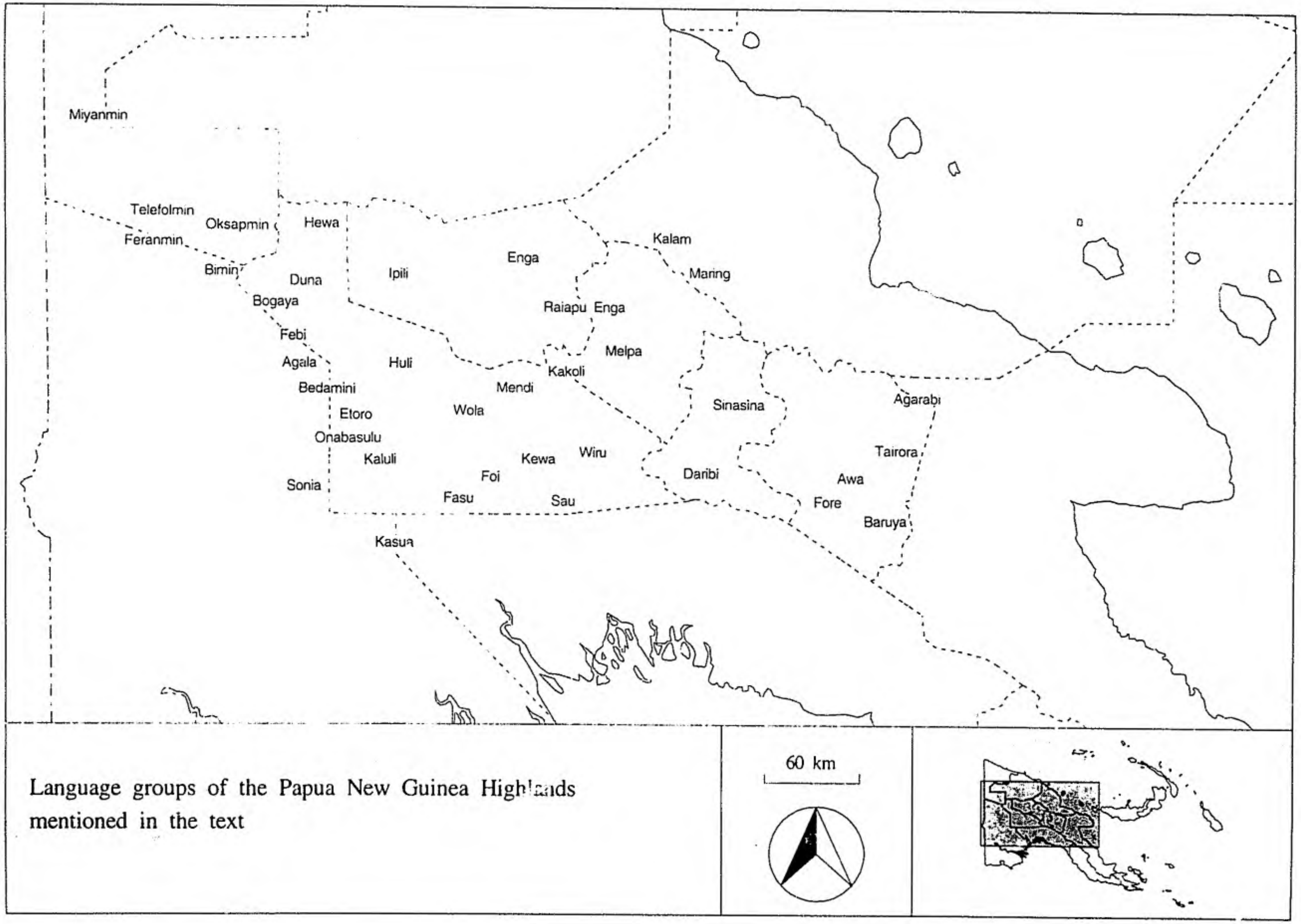

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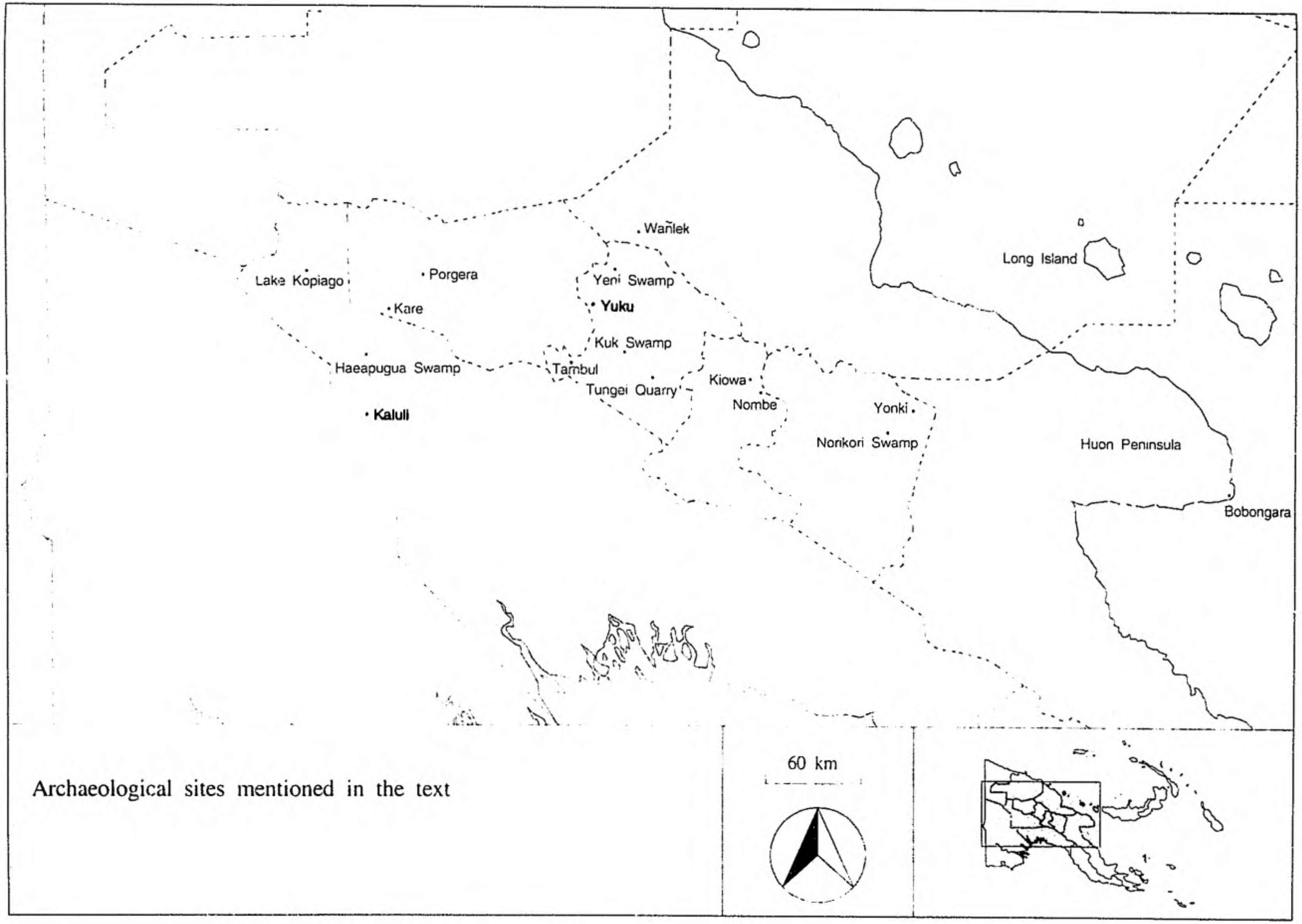


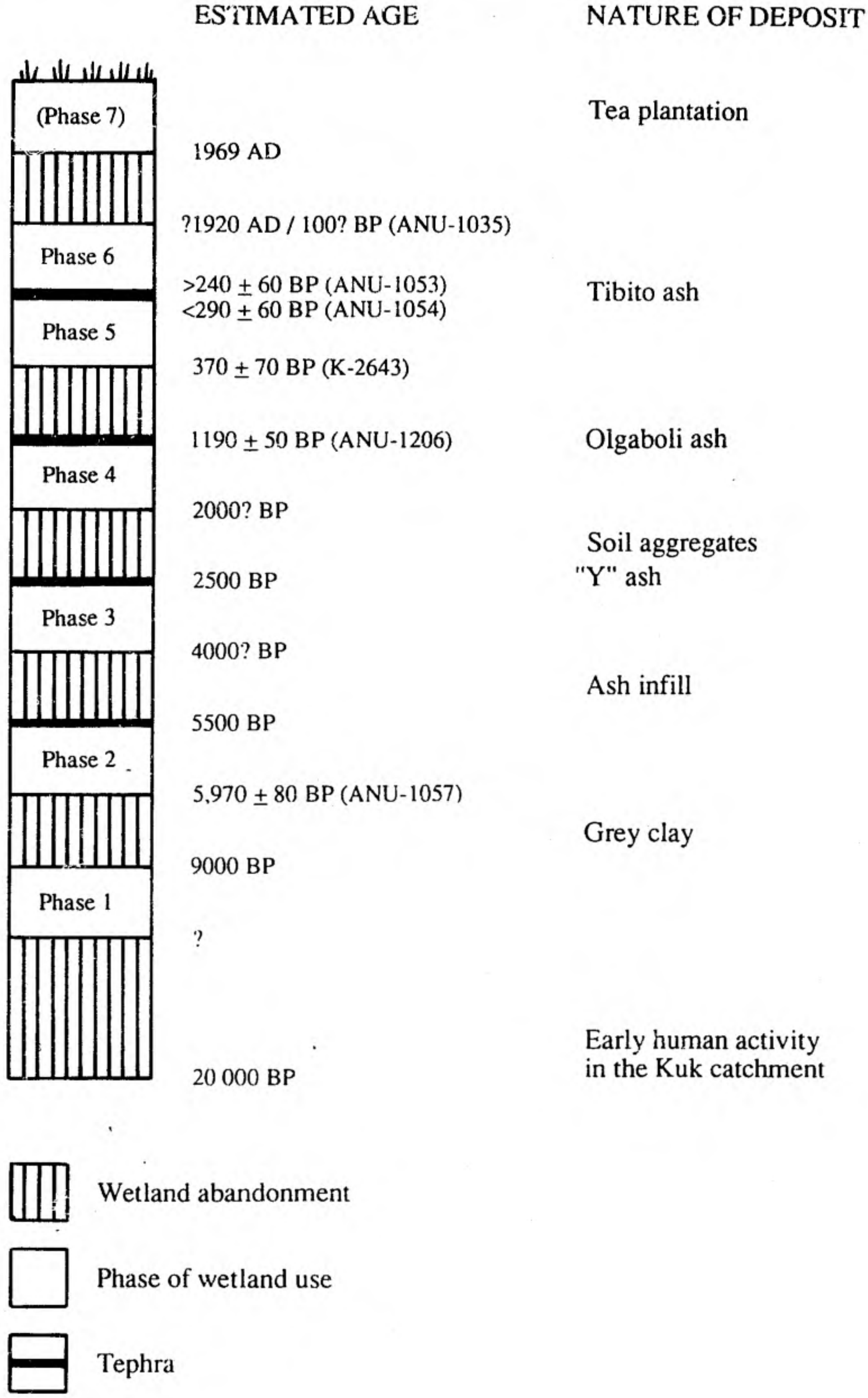
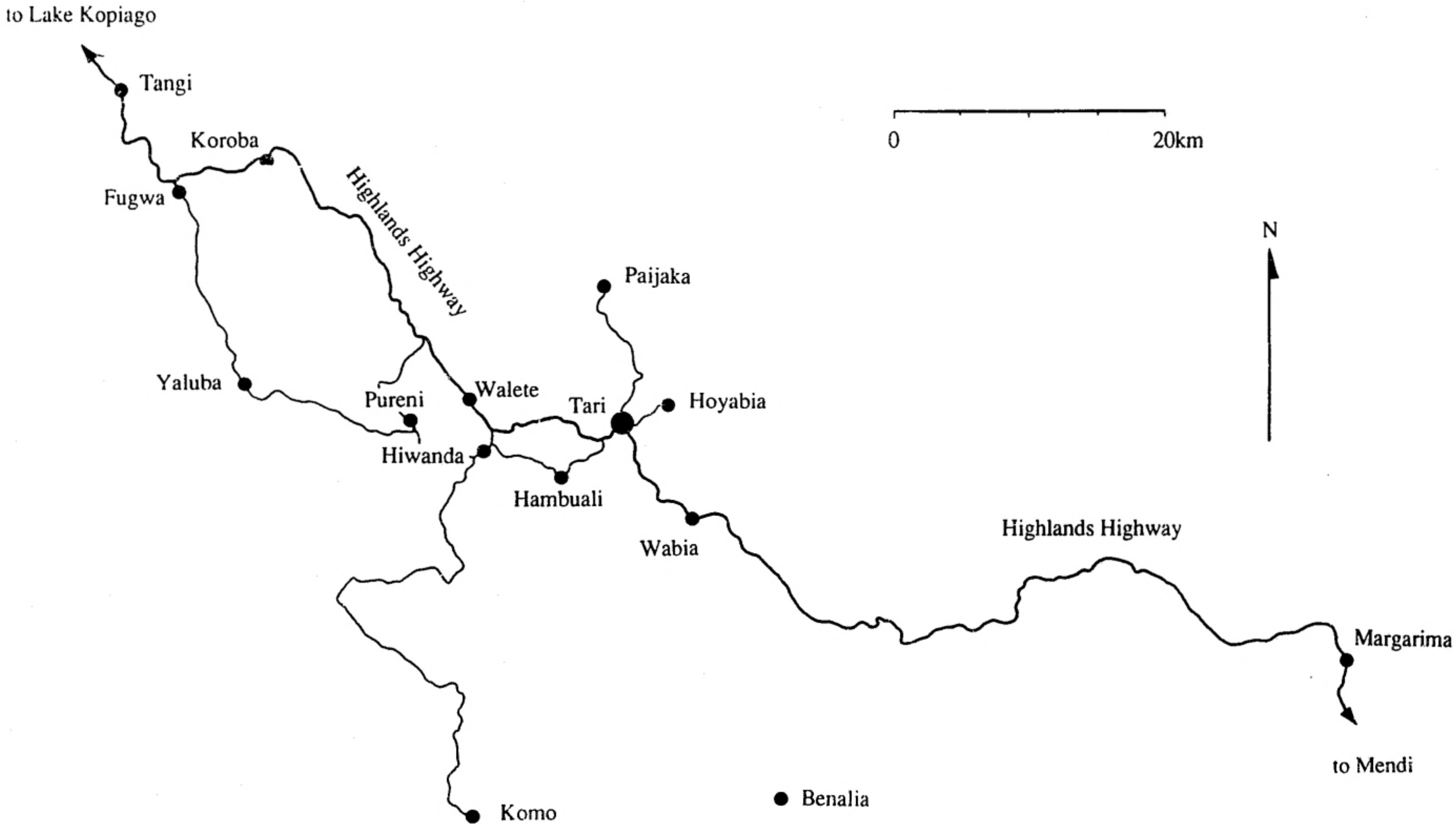


Figure A5 A schematic stratigraphy for the Kuk swamp site

Figure B1 The Tari region



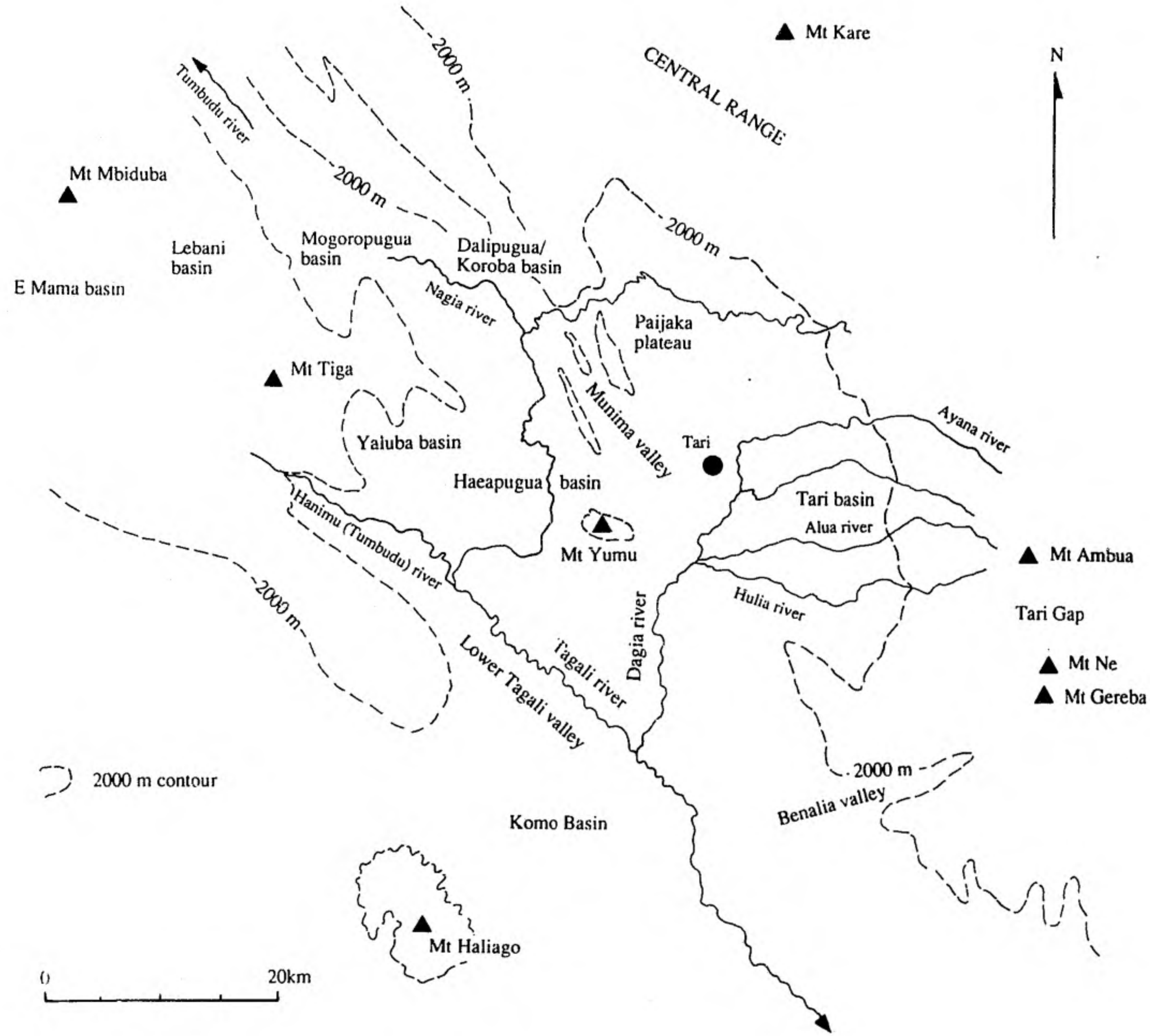


Figure B2 Topography and drainage of the Tari region

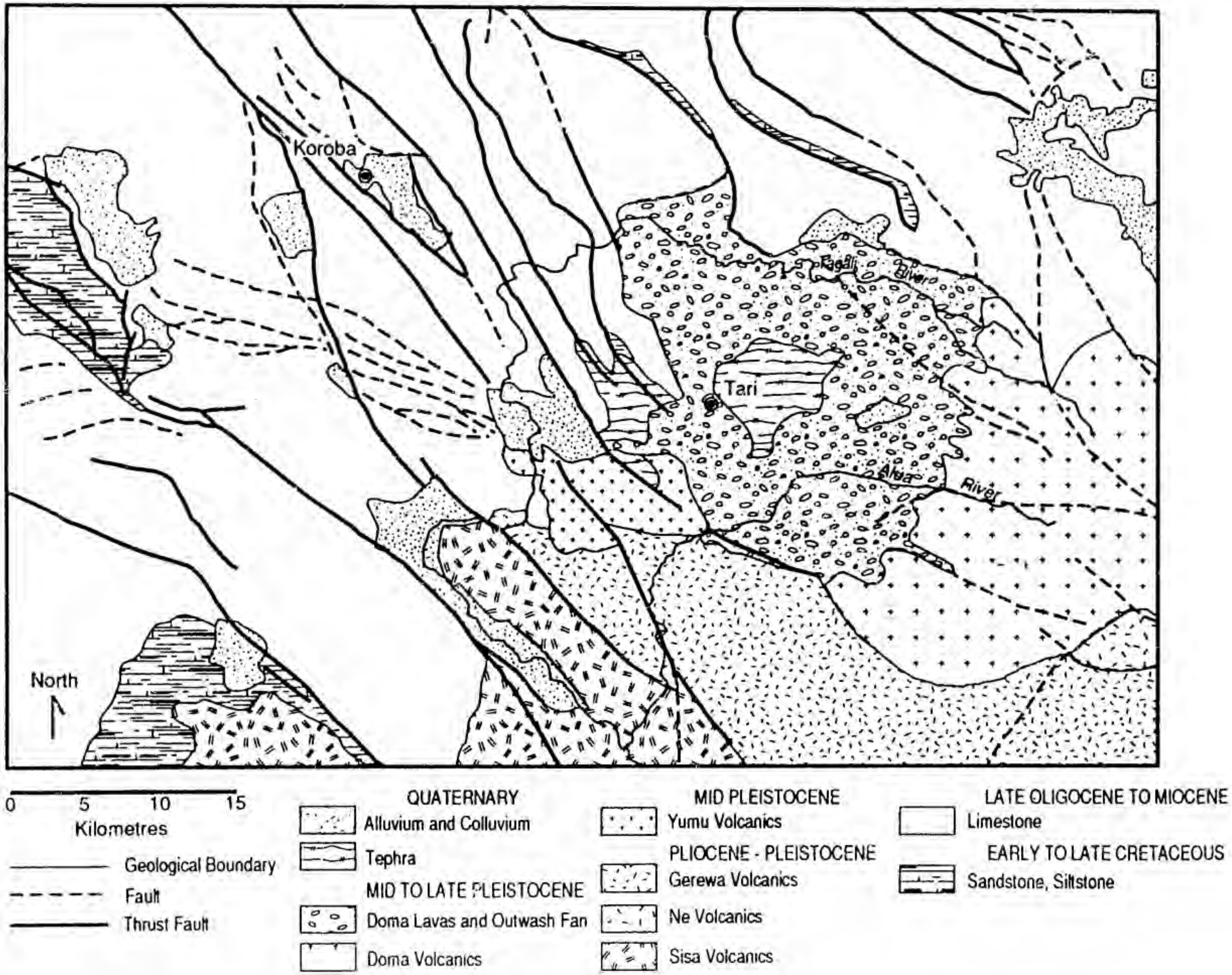
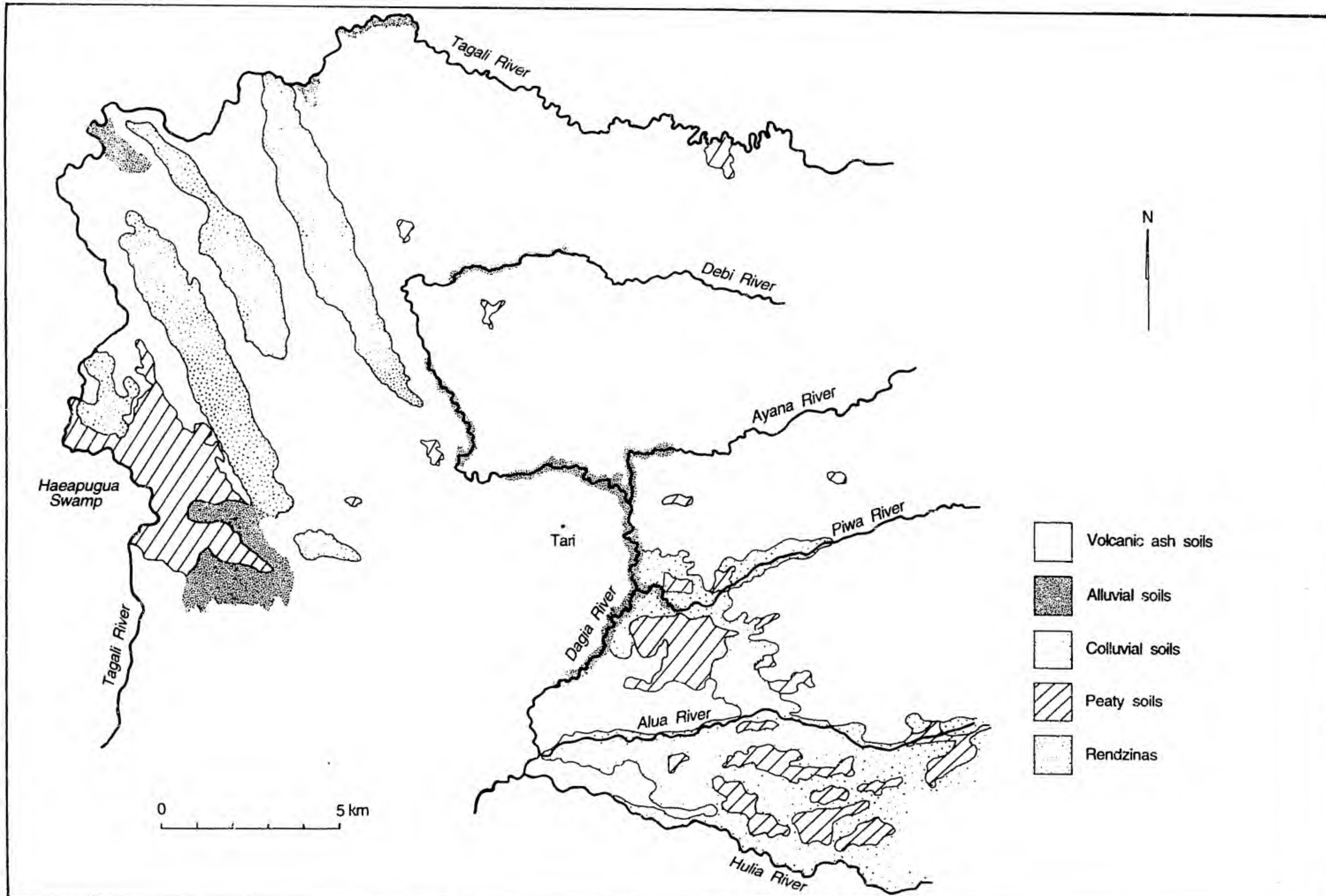


Figure B3 Geology of the Tari region [after Davies 1983 and Haberle 1983]



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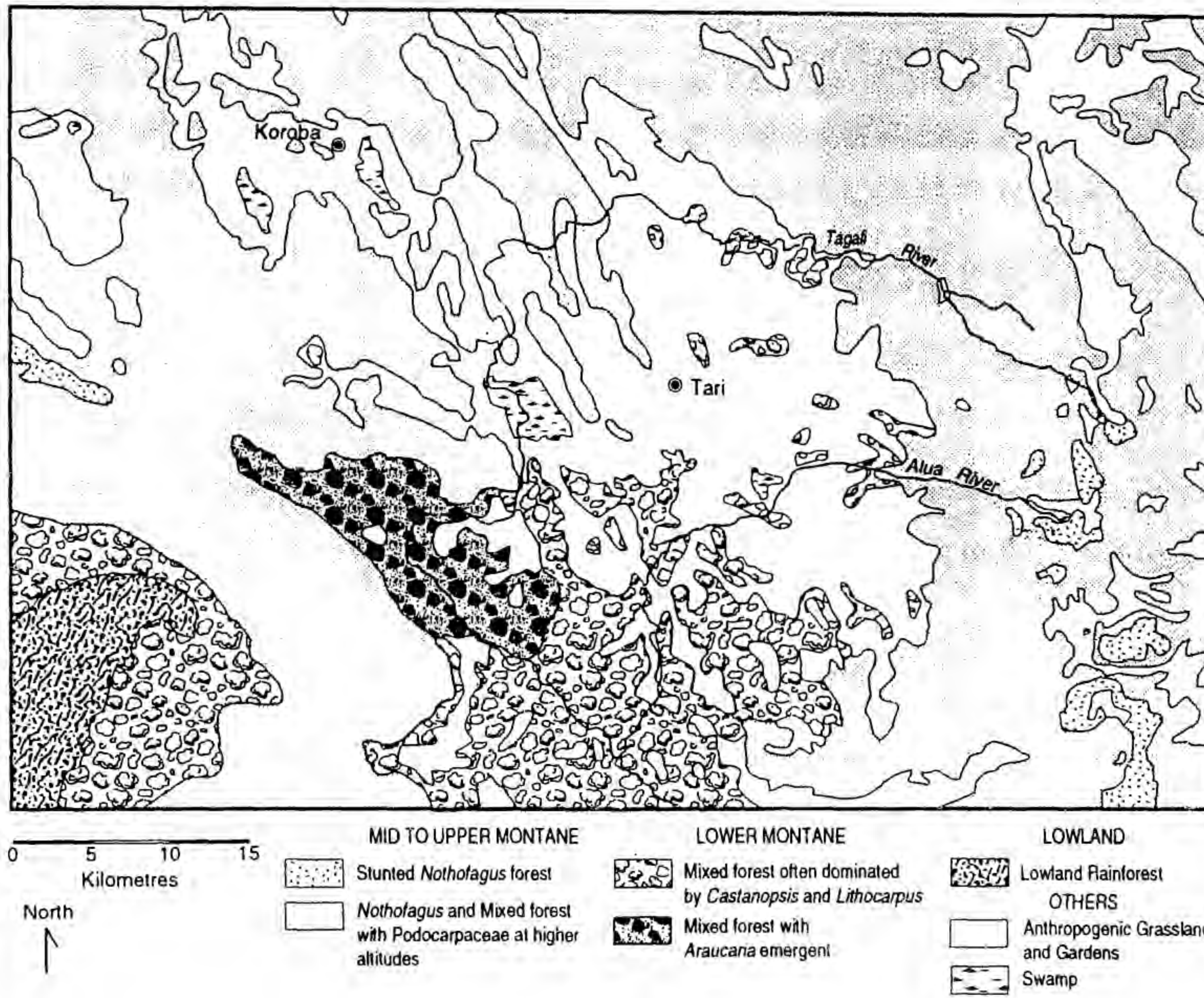

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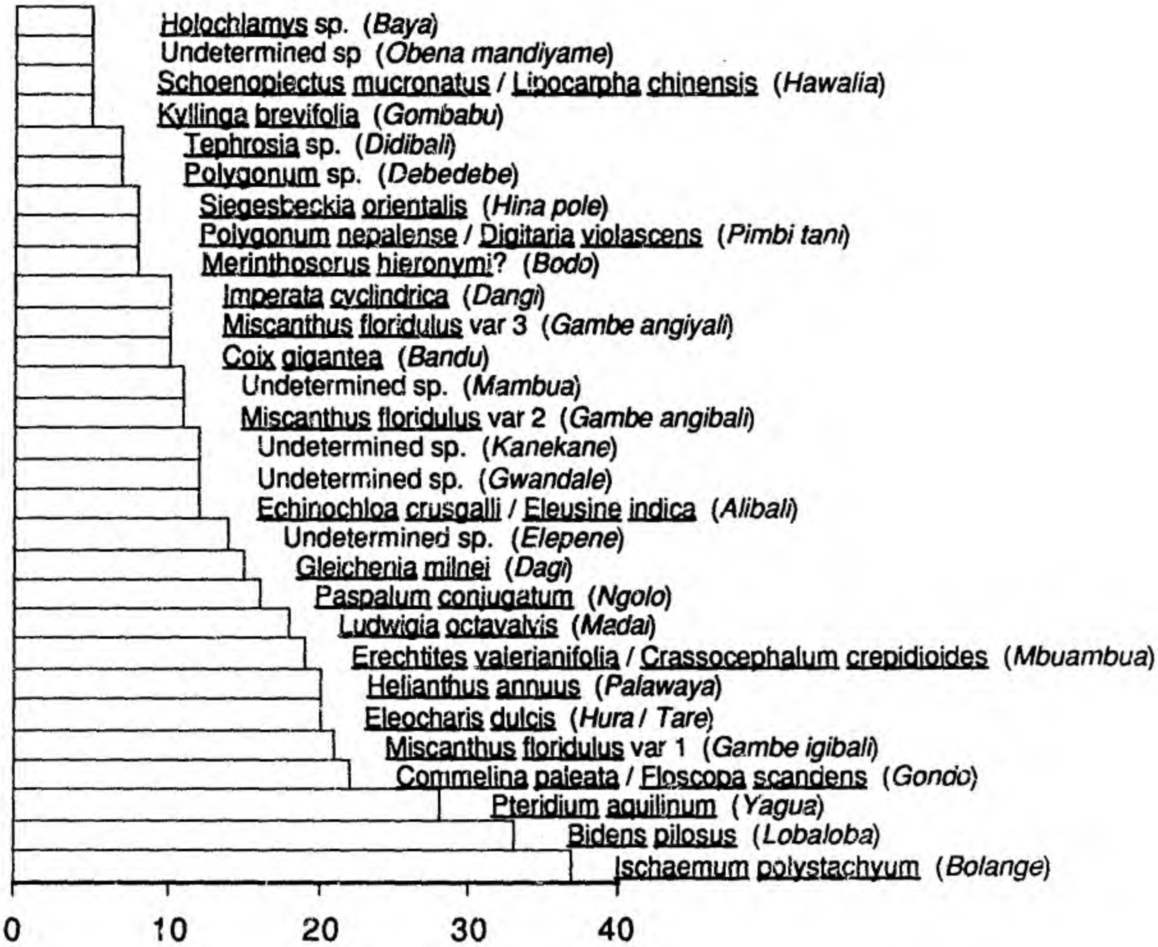
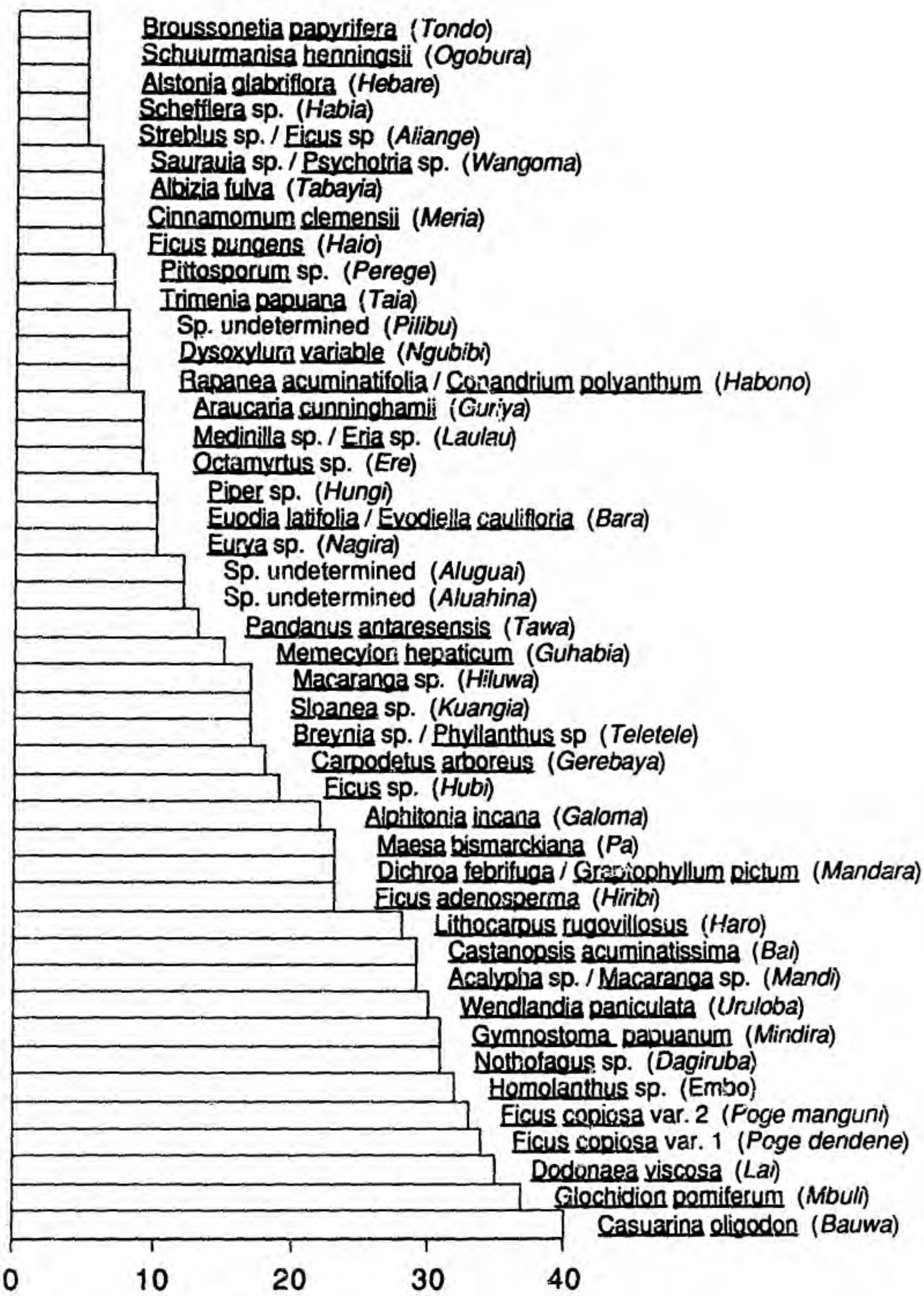


Figure B6 Frequency of occurrence of the more common grass species in 52 Dobani gardens



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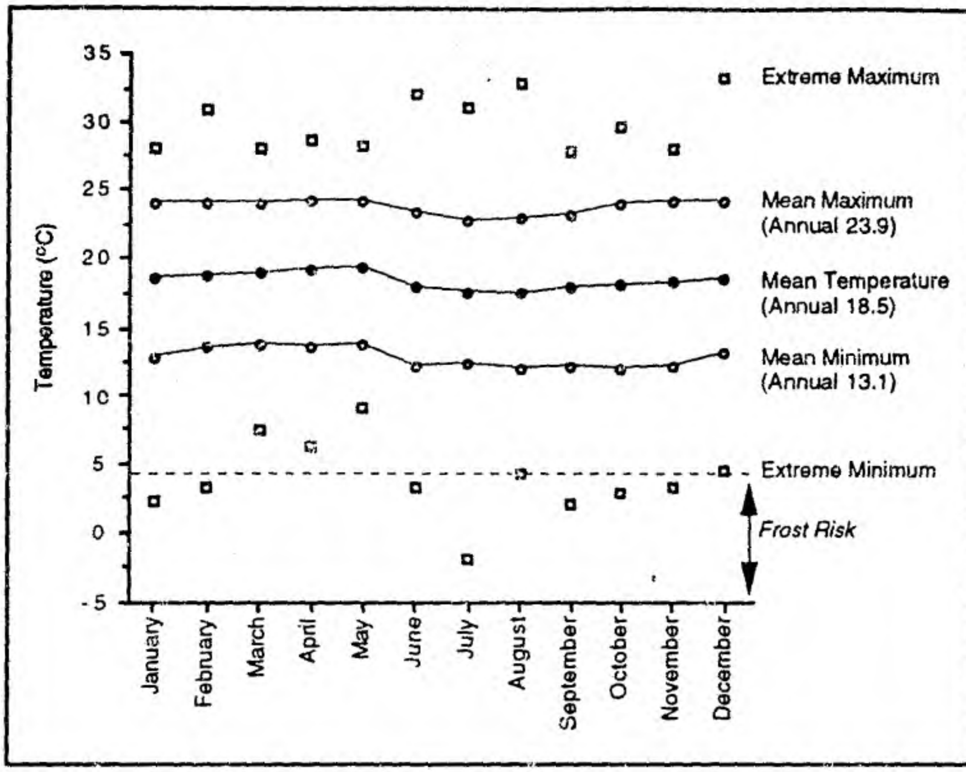

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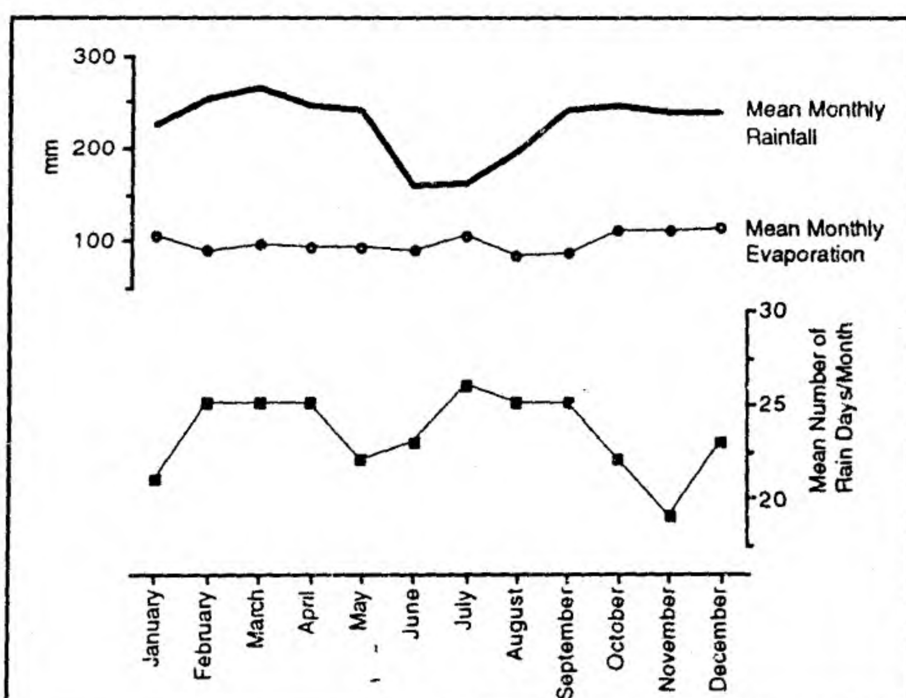

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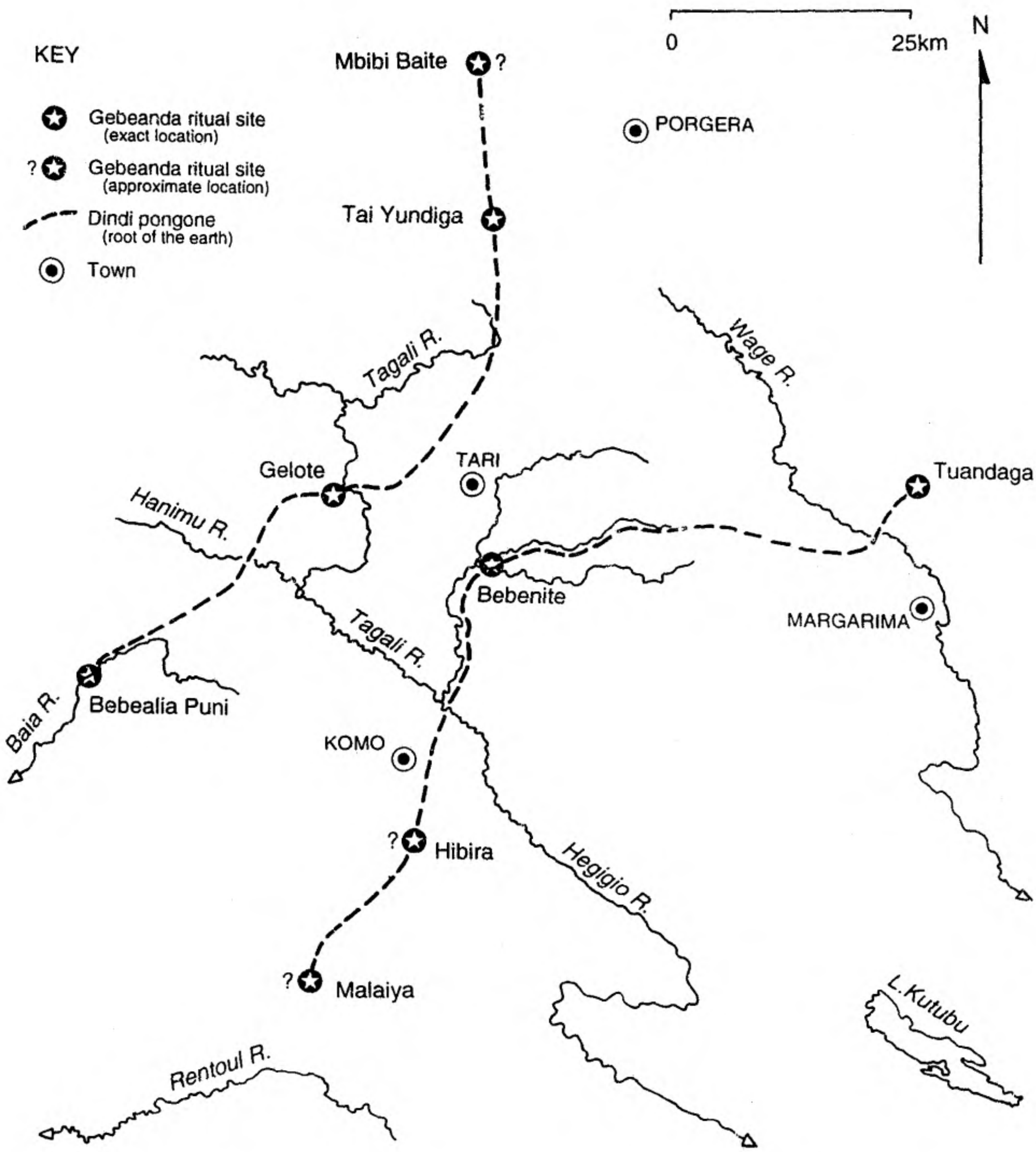

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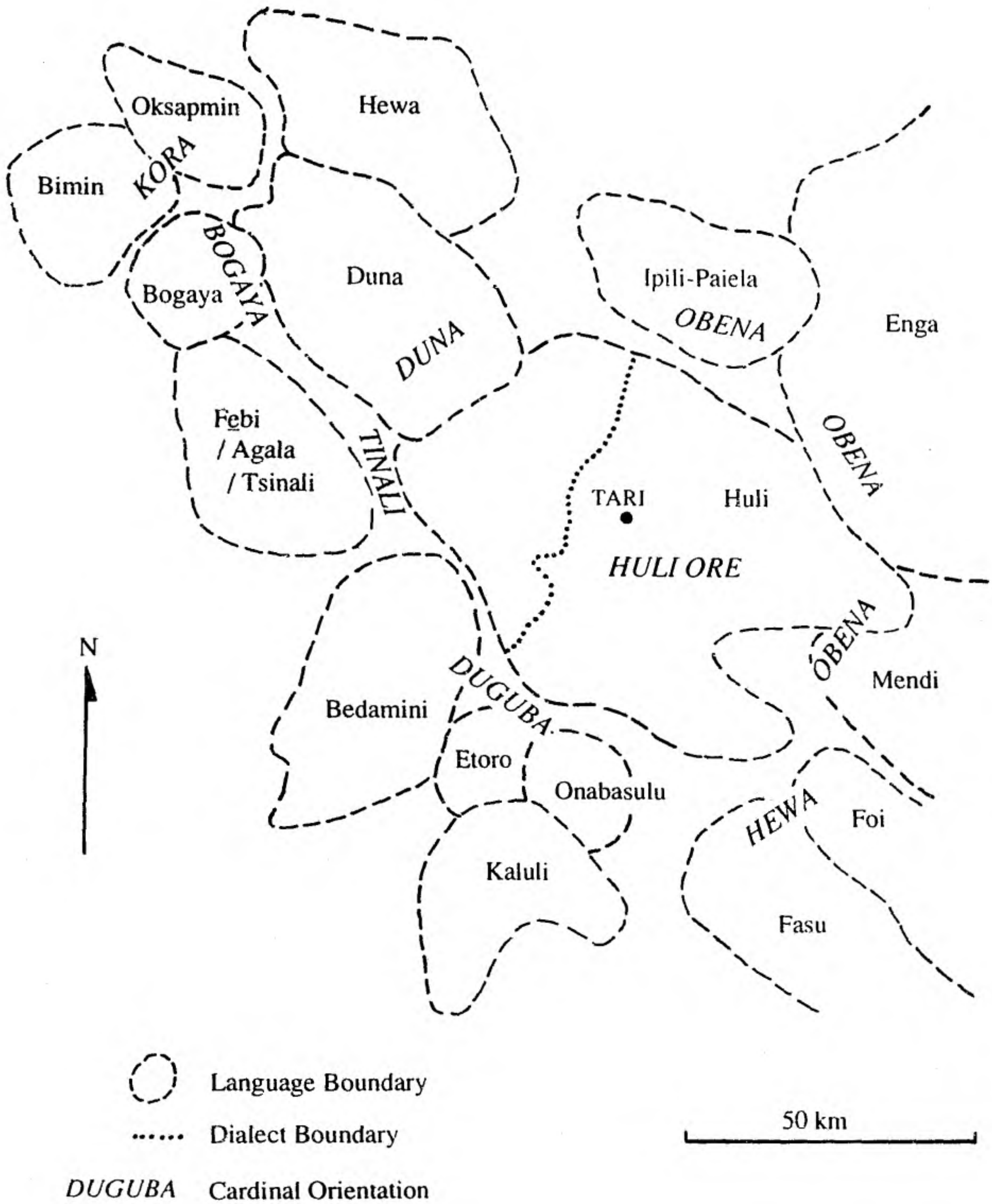

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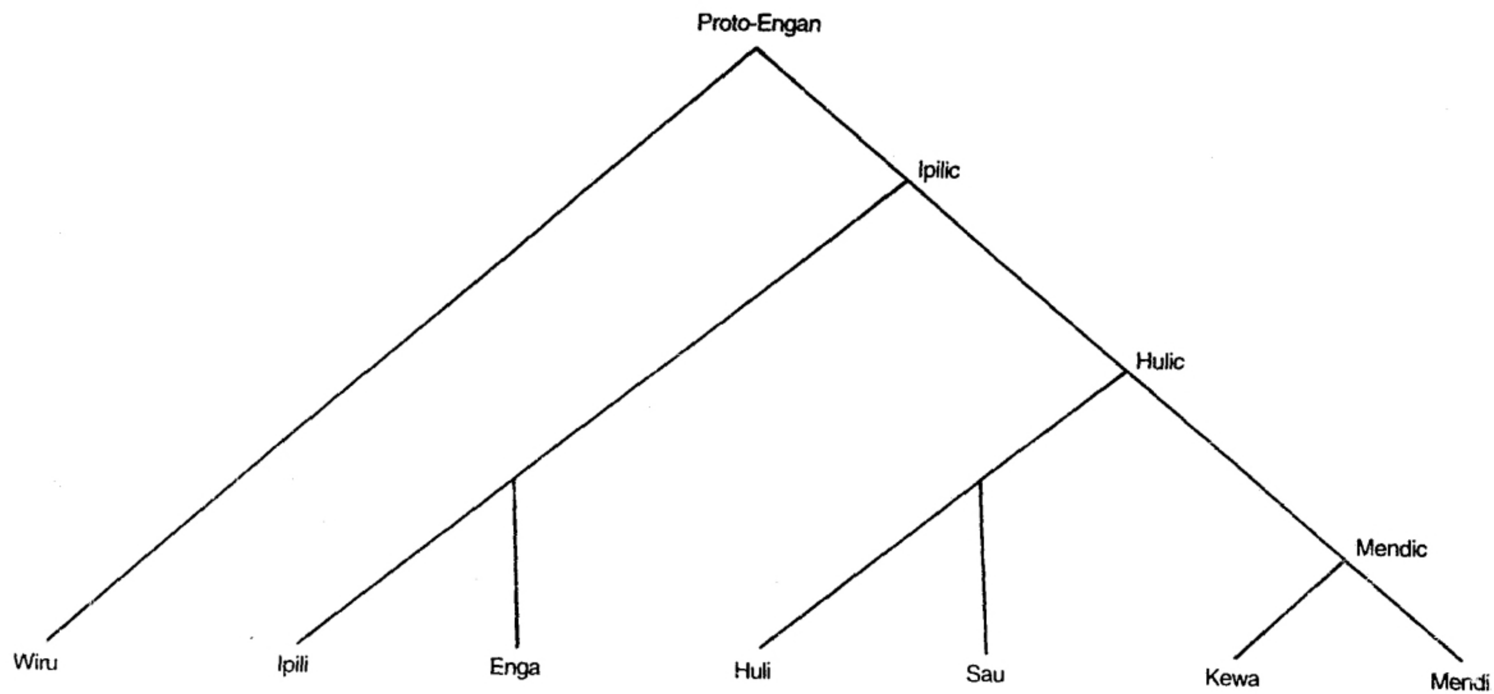

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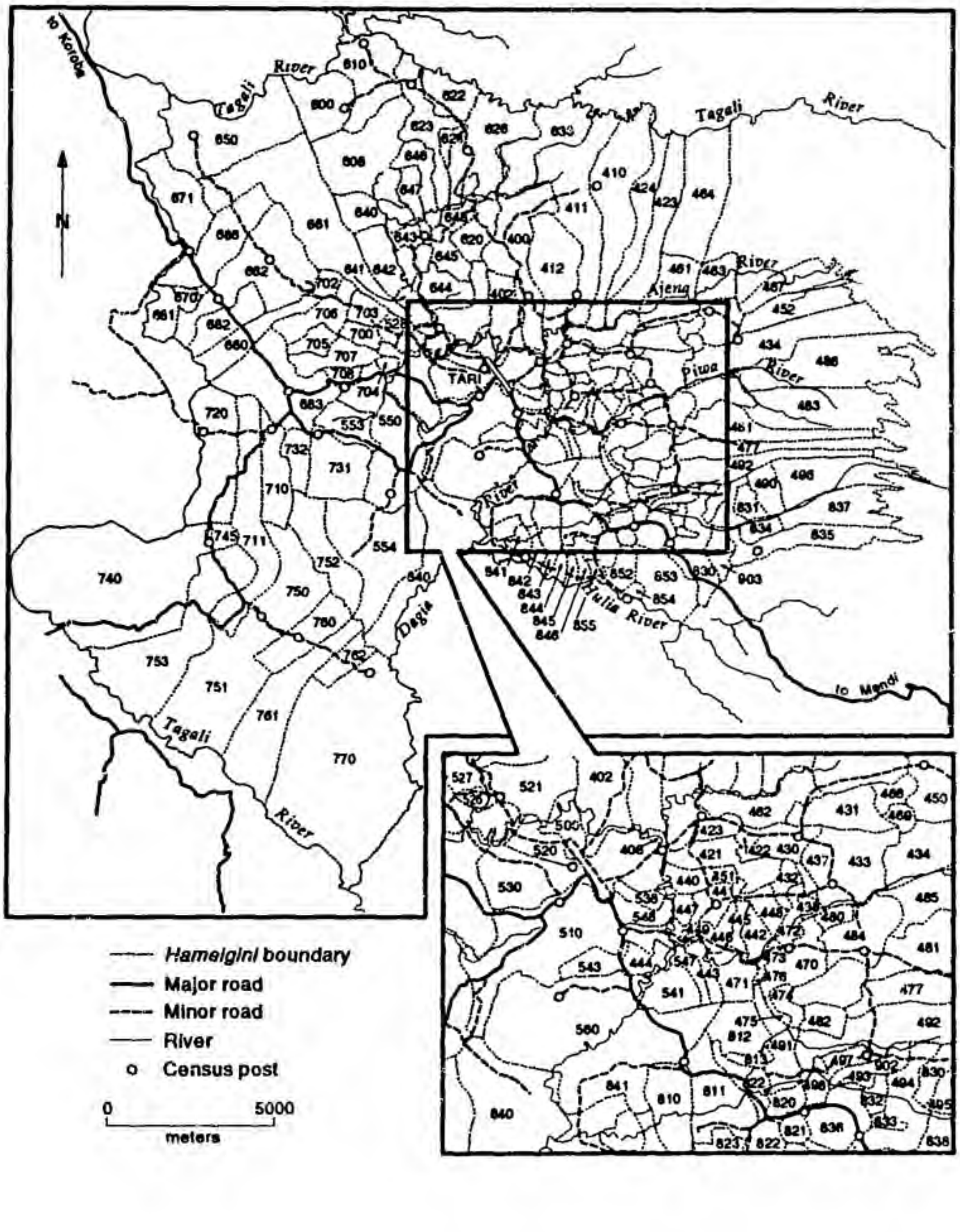


Figure B13 *Hameigini* parish boundaries of the Tari area [after Allen in press]

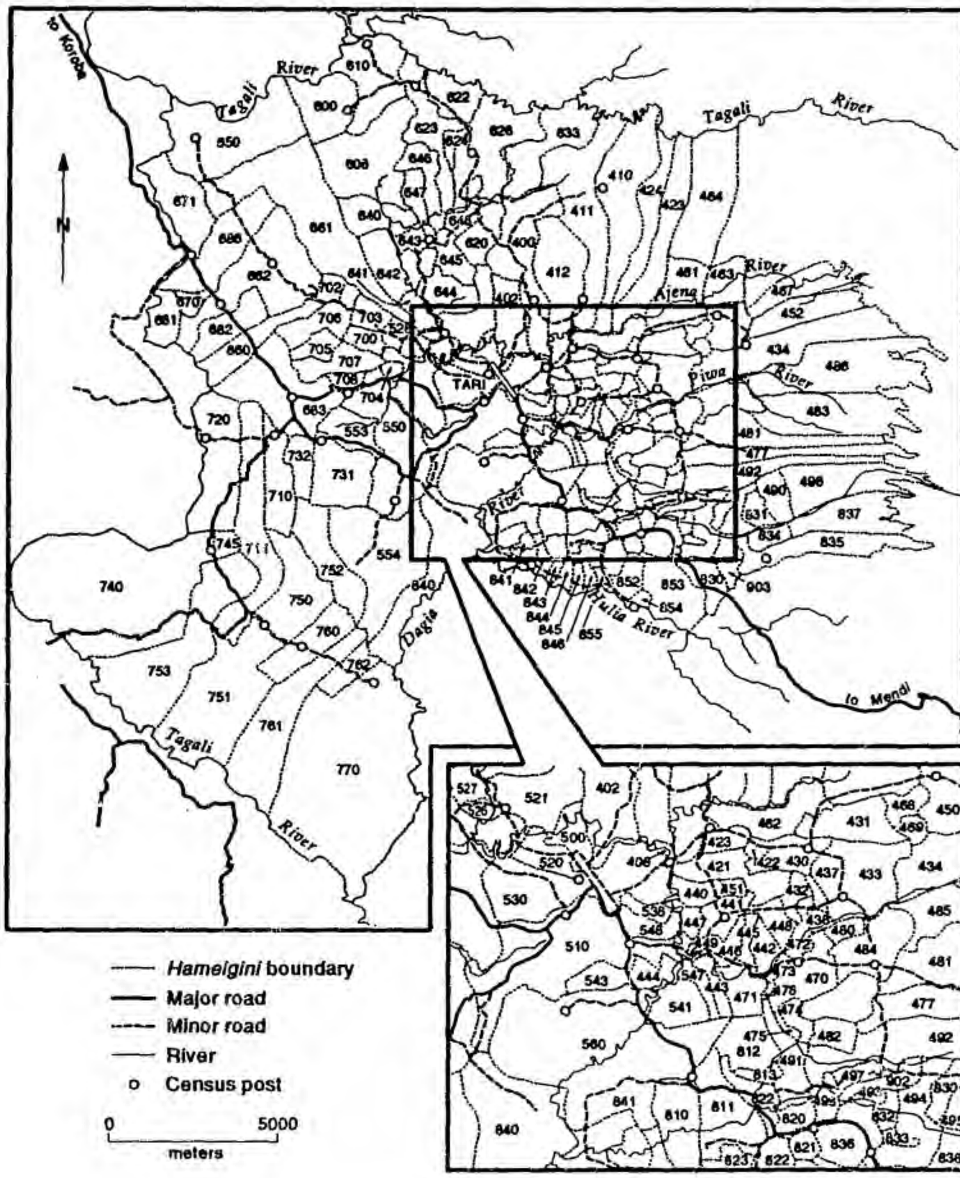


Figure B13 *Hameigini* parish boundaries of the Tari area [after Allen in press]

Hameigini names, Tari area (Figure B13):

400 Madaba
402 Pi
408 Lomo A
410 Amburu
411 Tugure
412 Toanda
421 Tobe
422 Bangubi A
423 Gole A
424 Bangubi B
430 Dombe Kauwe
431 Marini
432 Ura
433 Tabaya
434 Haro
437 Digibi
438 Daloanda
440 Bagada A
441 Erebe
442 Beandali
443 Doria
444 Lewa B
444 Bagada B
445 Huria
446 Tege
447 Tugure
448 Lewa A
449 Libi
450 Erebe
452 Wawe
461 Libura
462 Magabo
463 Hogani
464 Wabira
467 Tege
469 Doria Swamp
470 Bolabu
471 Haro
472 Bagada
473 Giniba
474 Haria
475 Bilini
476 Doma
477 Lomo Bilini
480 Undi A
481 Nomanda
482 Undi B
483 Undi C
484 Gendo B
485 Gomia A
486 Gomia B
490 Kenya Hongoya
491 Dabuda
492 Gangua
493 Porali
494 Walabini
495 Uriani
496 Pariaga
497 Digibi
498 Daloanda
500 Lewa
510 Piribu
512 Baibuali Alugo
518 Bai
520 Hadani
521 Halengo
526 Diba
527 Wida
528 Digima
530 Gigida
538 Diba
541 Yarini
543 Ereya
547 Tamburu
548 Hondobe Homane
550 Hambuali
553 Tigua
554 Linabini
560 Bai
589 Yama
590 Dalibu
600 Halengo
608 Dombe
610 Puyaro
620 Lomo B
622 Haya
623 Heli
624 Doma
626 Kauwi Madaba
633 Pi
640 Amburu
641 Hubi
642 Ayago
643 Dombe Diba
644 Hawa
645 Danga
646 Agana
647 Tuliani
648 Haya
650 Karida Hubi
655 Yobiya
660 Dobani
661 Peda
662 Munima
670 Hubi
671 Arua
681 Wenani
682 Tani
683 Tani Doromo
684 Dobani
686 Yobiya
700 Gudama
701 Diba
702 Wida
703 Tani
704 Bibi
705 Poro
706 Bogorali
707 Haro
708 Digima
710 Hiwa
711 Dumbiali
720 Telabo
731 Dagima
732 Yumu
740 Luguni Tamea
750 Pi
751 Aroma
752 Tunguabe
753 Mbuda Kulupa
760 Yula
761 Tiani
762 Dabu
770 Undubi
810 Amburu
811 Dobani
812 Daraga
813 Hedarubi
820 Bibi
821 Wabiago
822 Balabo
822 Balabo
823 Wenani
830 Hadani
831 TubaliB
832 Timani
833 Lomo A
834 Mabiani
835 Daraga
836 Biango
838 Tubali A
839 Lomo B
840 Yangali
841 Page
842 Yaluma
843 Balabo
844 Derebaya
845 Dobo
846 Gandebo
852 Haro
853 Dabuma
854 Hagoni
855 Dombehala

Sources: Allen, Wood and Vail (1990), Allen in press
Fieldwork: A.W.Wood and B.J.Allen
Other Sources: Tari Research Unit, Papua New Guinea Institute of Medical Research; J.Vail and C.Ballard.

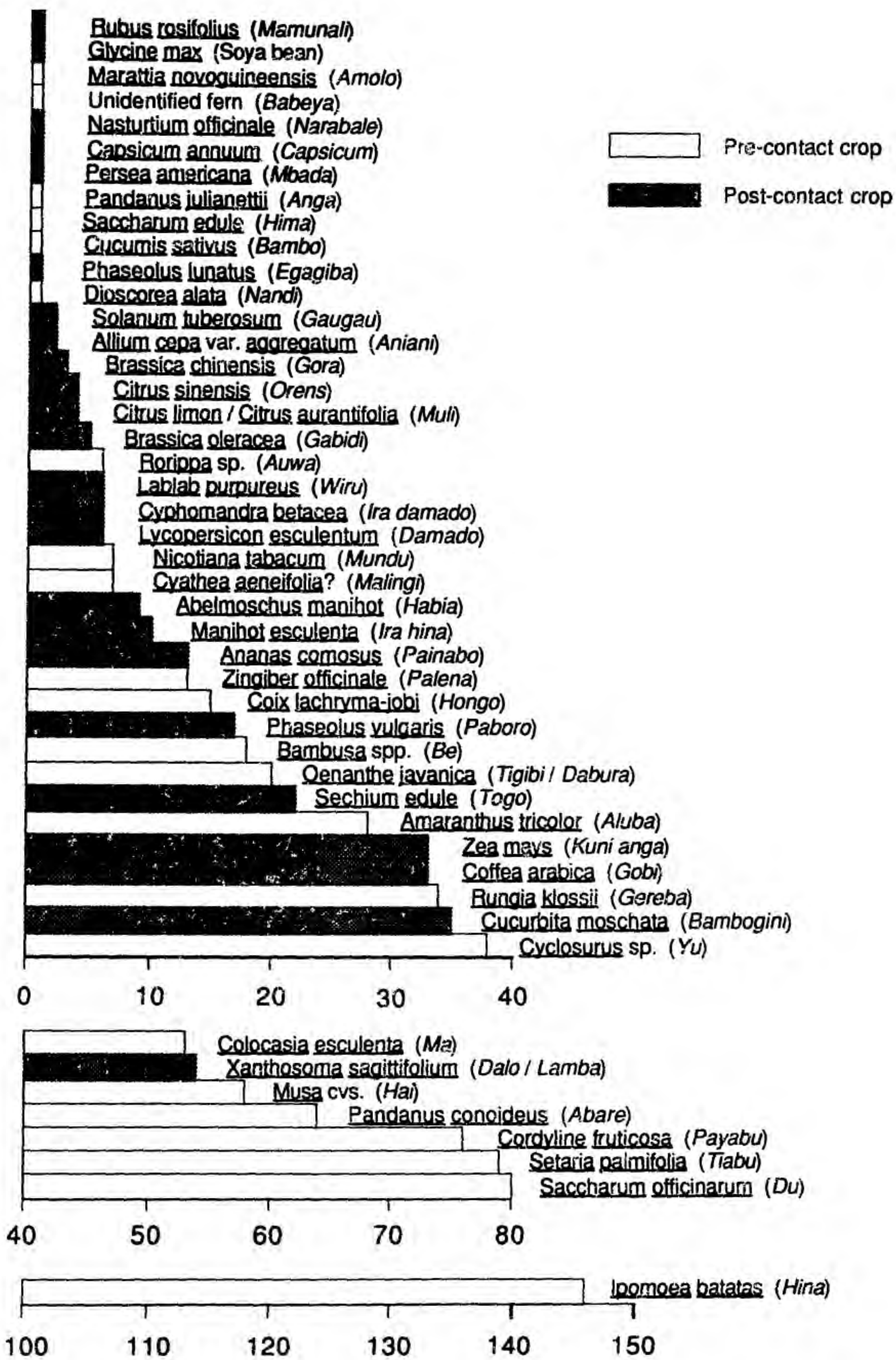


Figure B14 Frequency of occurrence of food crops in 231 Dobani garden plots

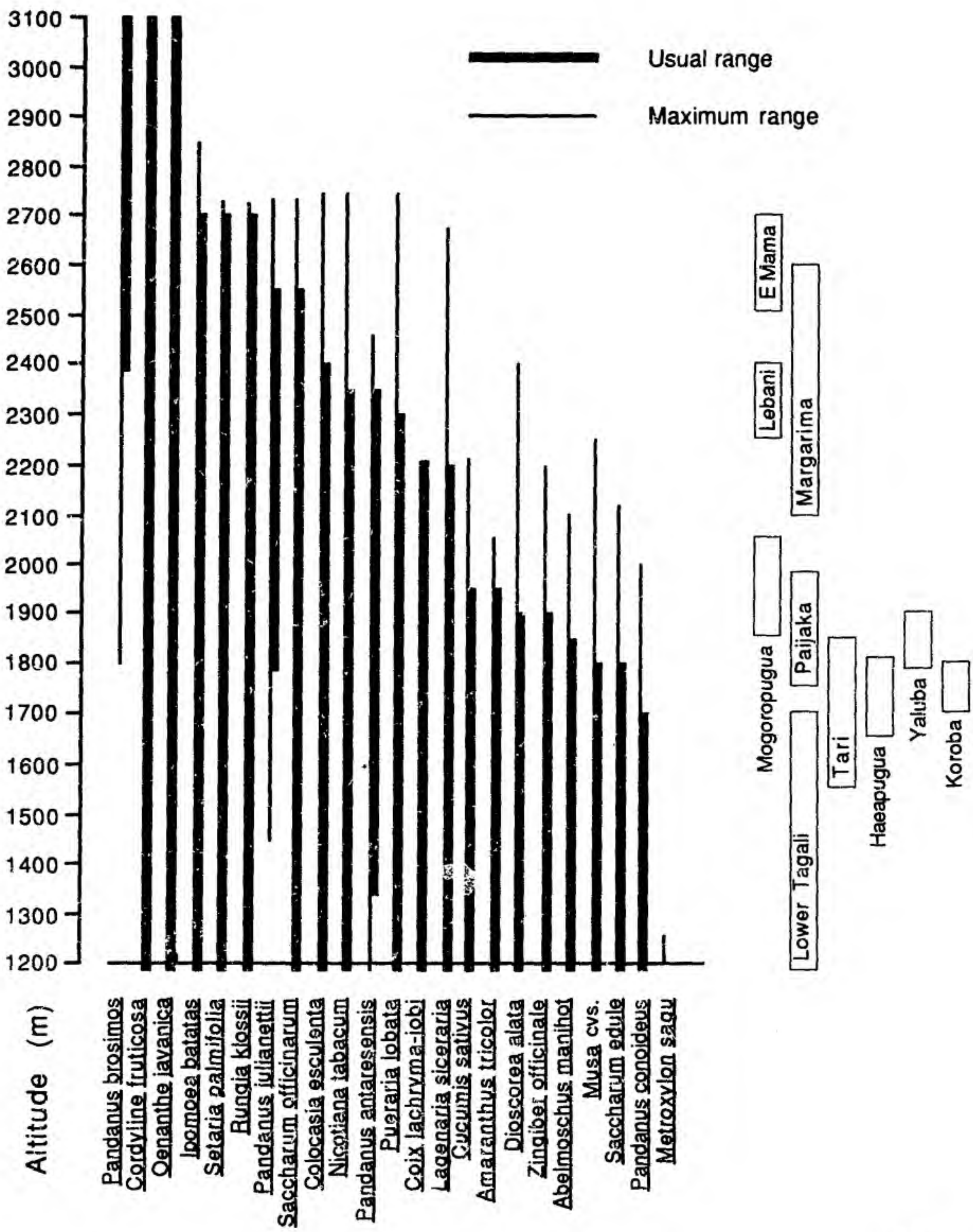


Figure B15 Altitudinal limits for precontact crops in the Tari region

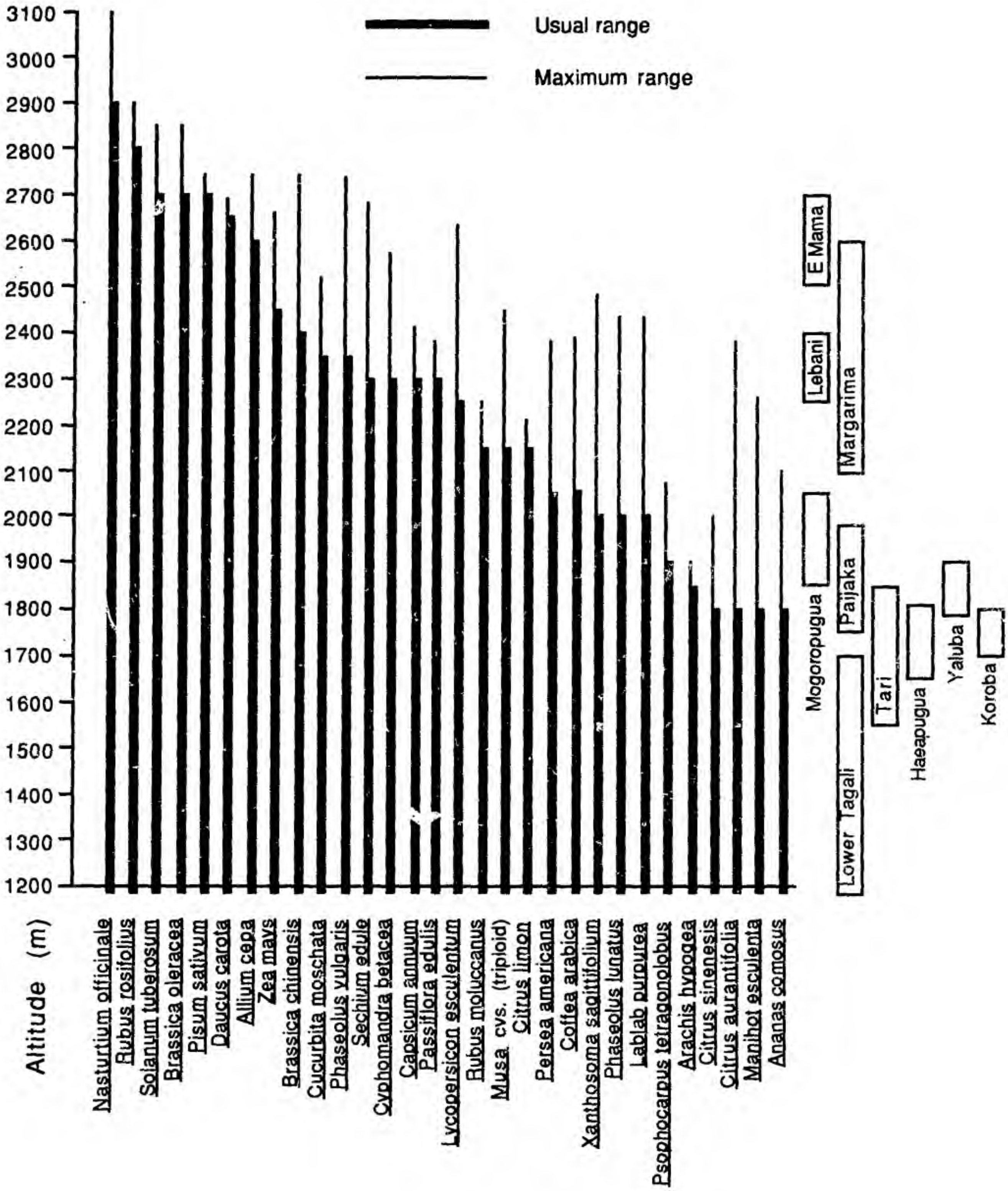


Figure B16 Altitudinal limits for postcontact crops in the Tari region

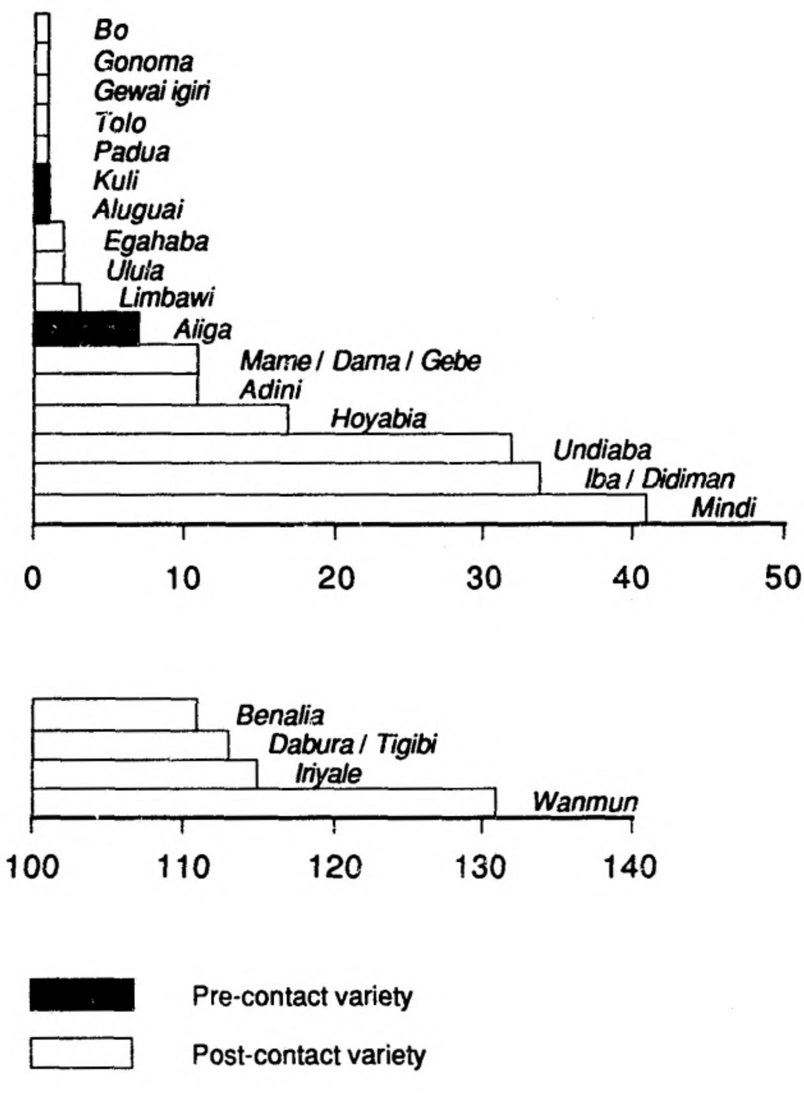


Figure B17 Frequency of occurrence of different sweet potato varieties in 231 Dobani garden plots

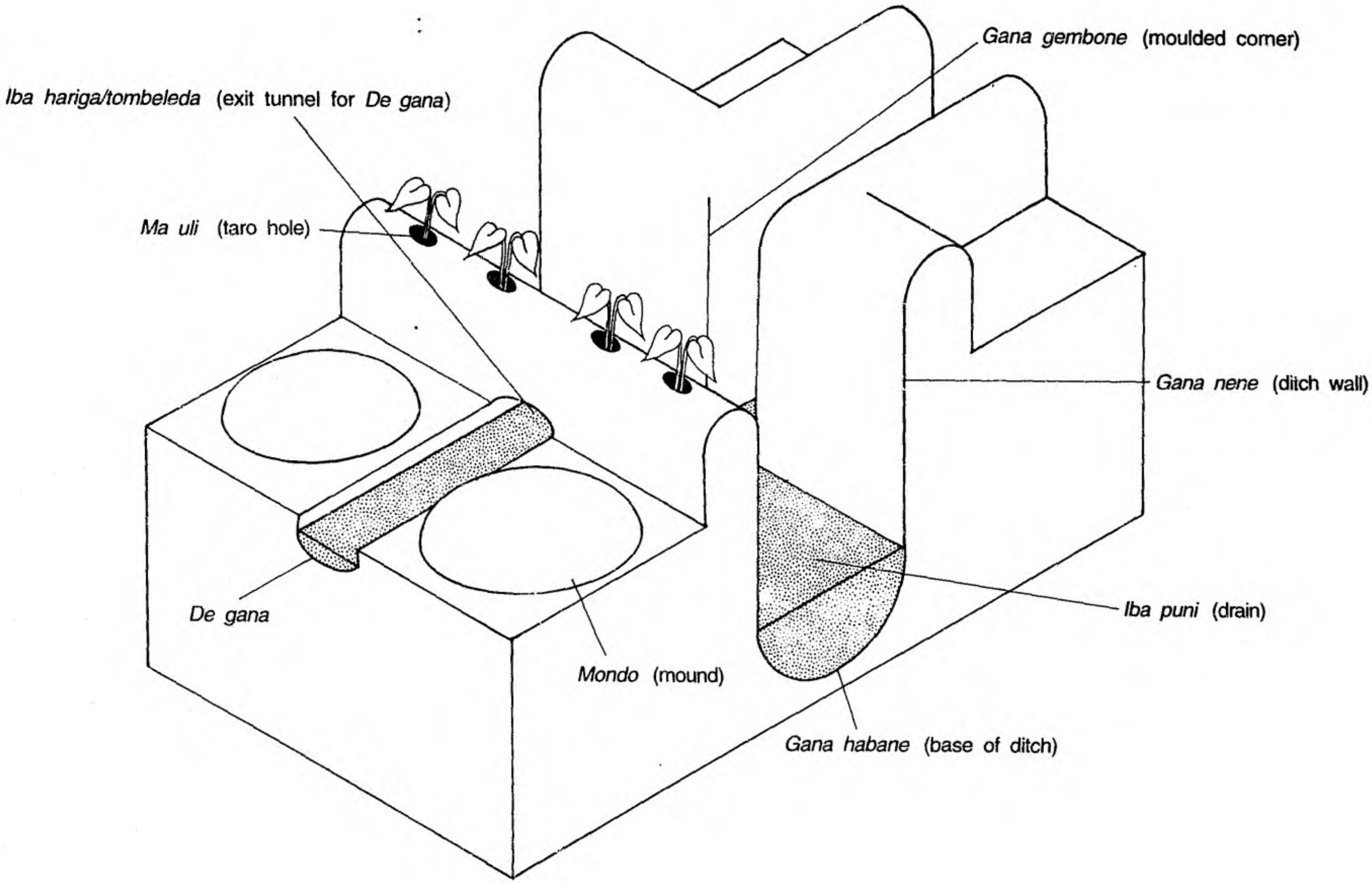


Figure B18 *Gana* (ditch) features

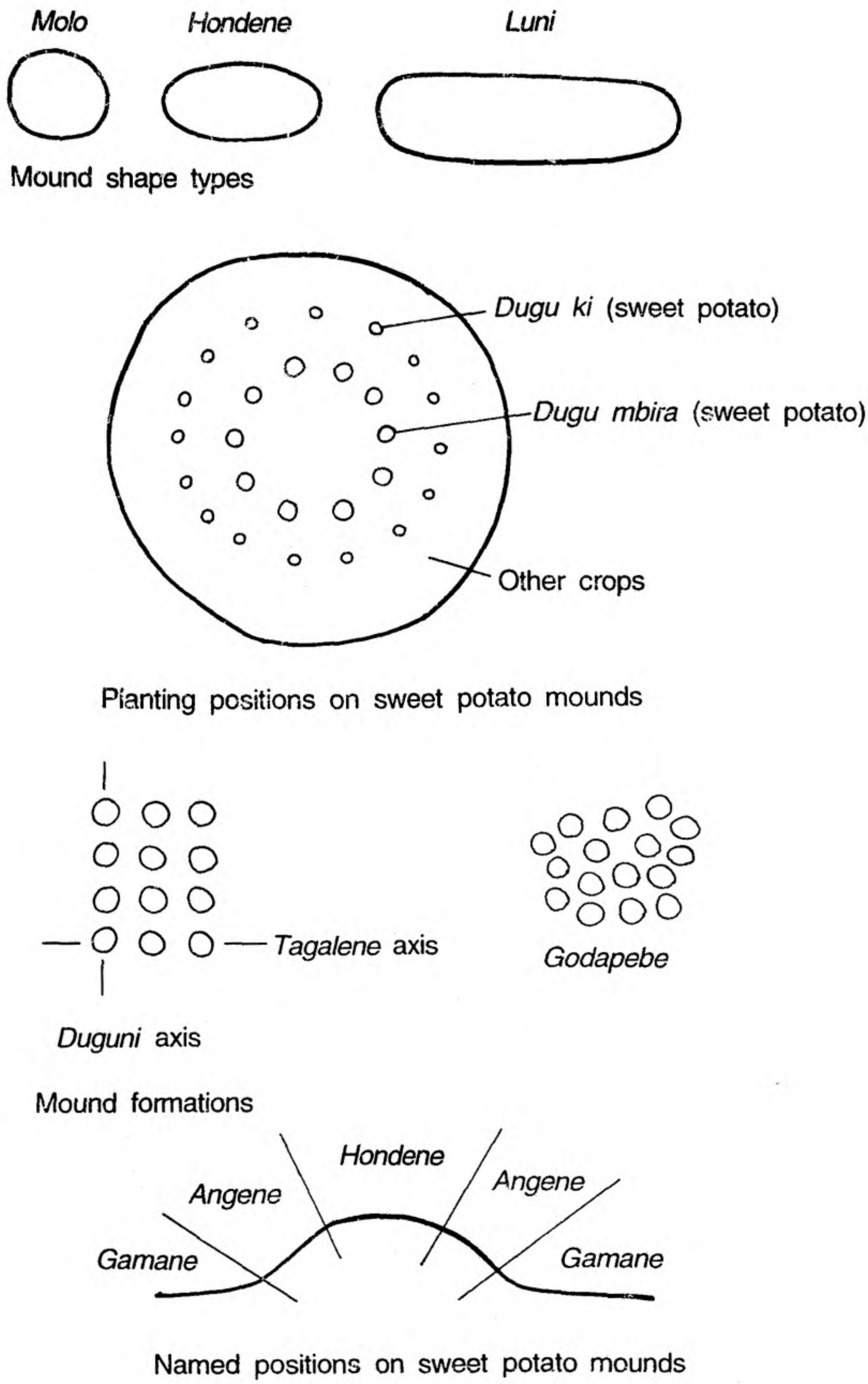


Figure B19 *Mondo* (composted mound) characteristics

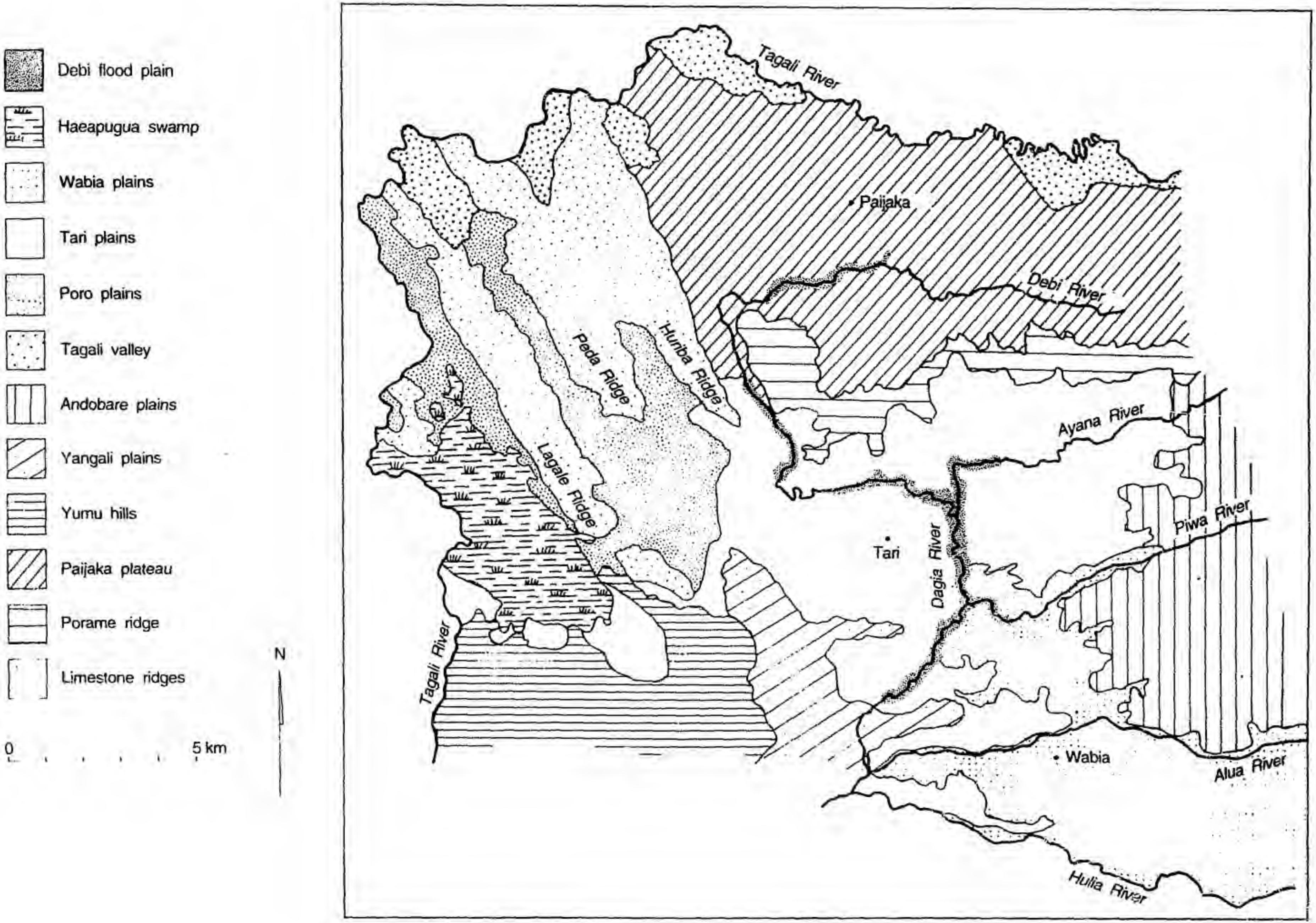


Figure B20 Environmental zones in the Tari area [after Wood 1984]

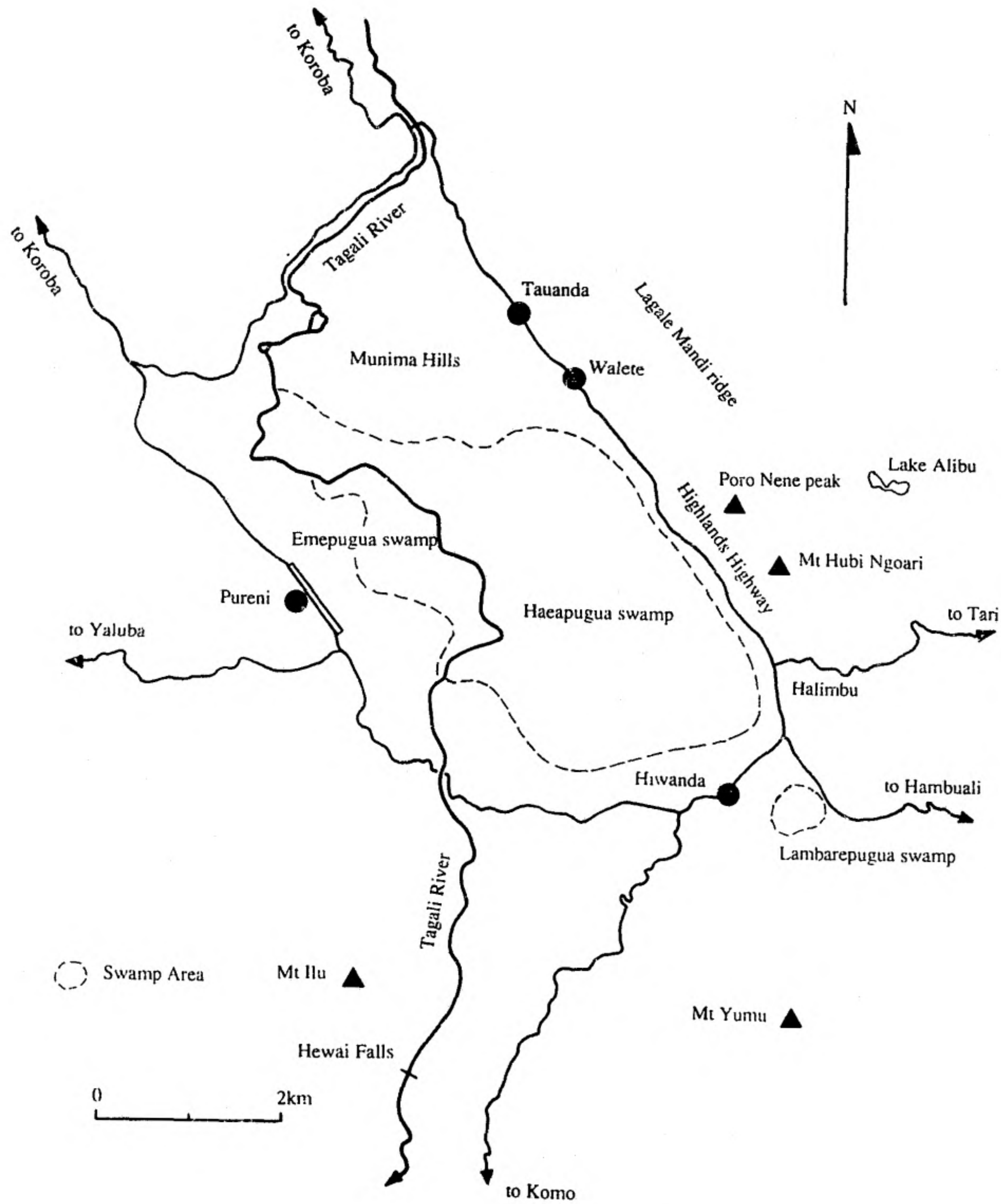


Figure C1 The Haeapugua basin

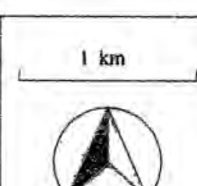


FIGURE C2
Haeapugua map study area:
the field system

FIGURE C3
Haeapugua map study area: place names and roads

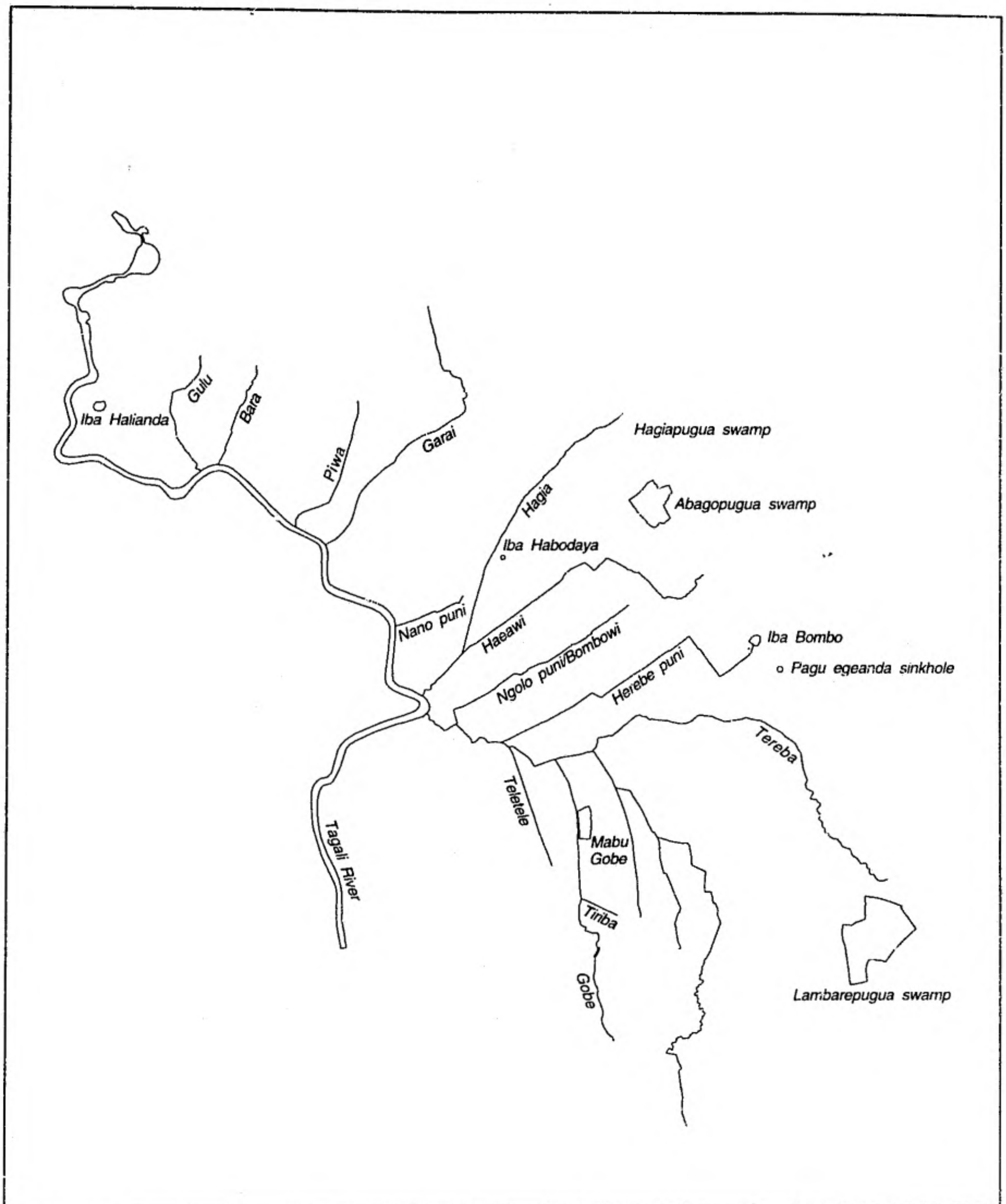


FIGURE C4
Haeapugua map study area:
water features and drainage case study areas

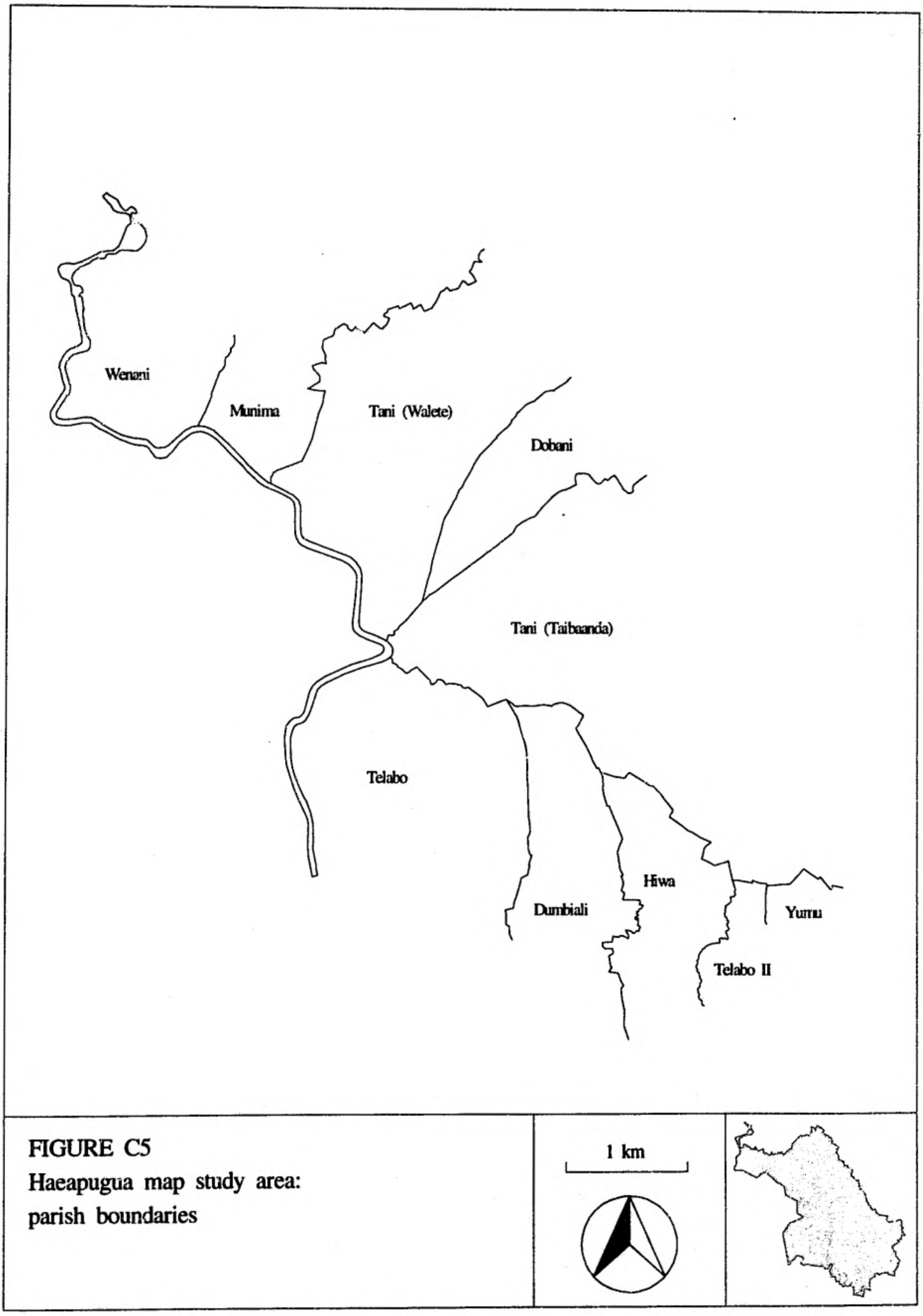


FIGURE C5
Haeapugua map study area:
parish boundaries

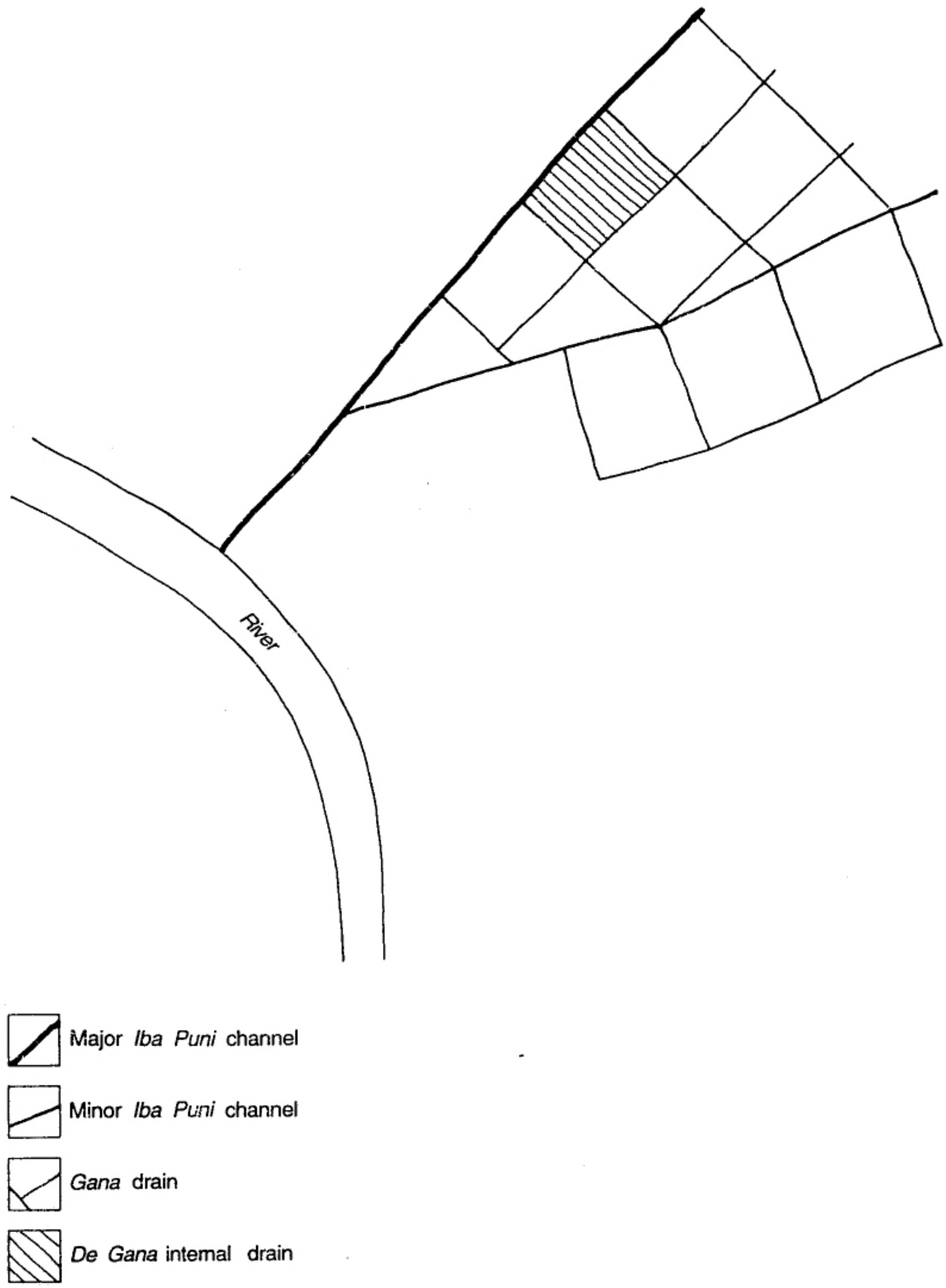


Figure C6 Drain hierarchy at Haeapugua

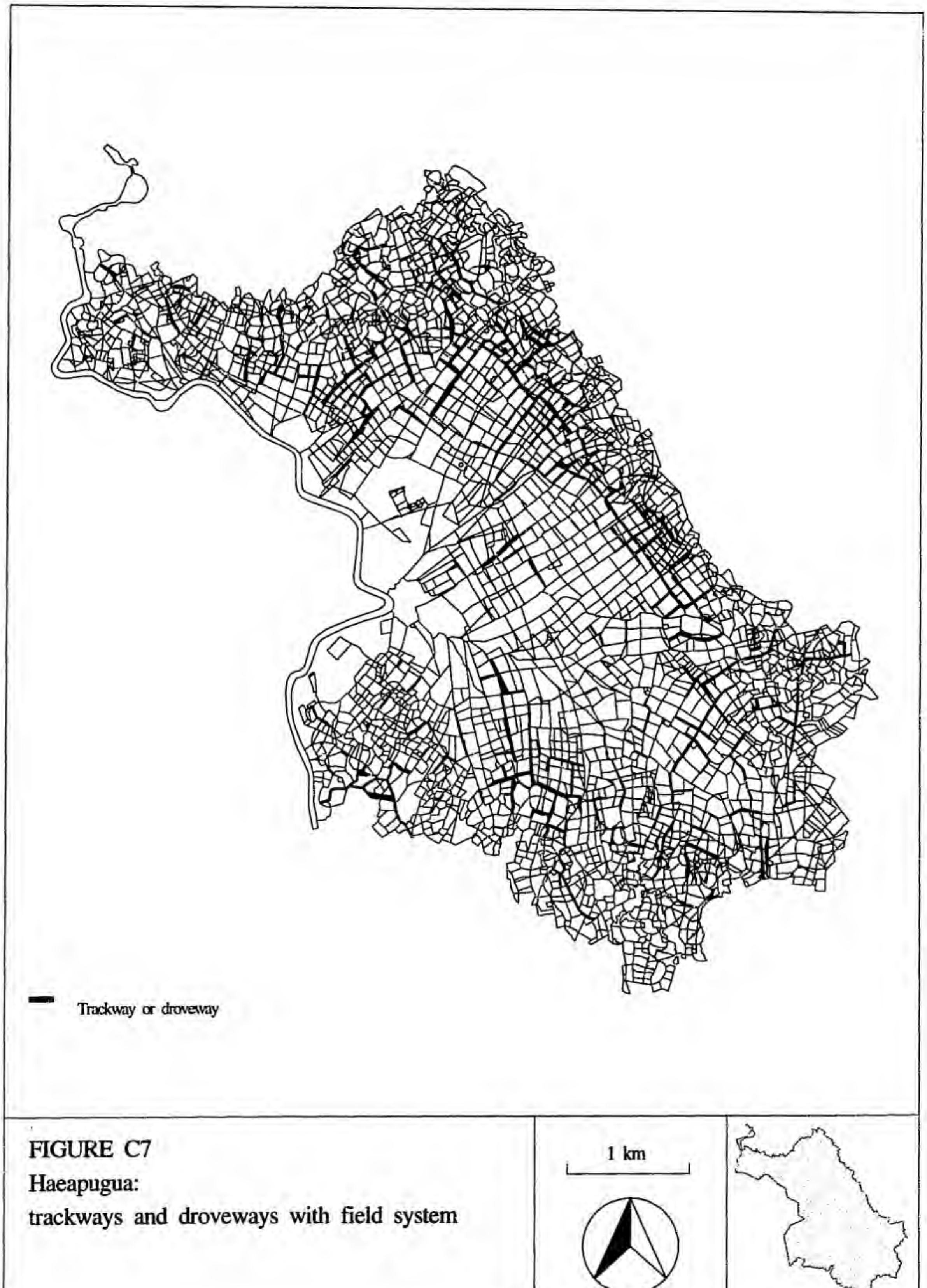
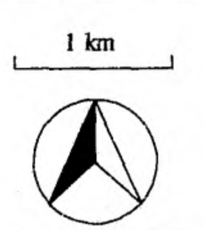


FIGURE C7
Haeapugua:
trackways and droveways with field system



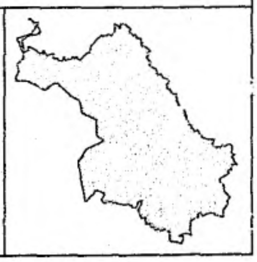


FIGURE C8
Haeapugua:
trackways and droveways

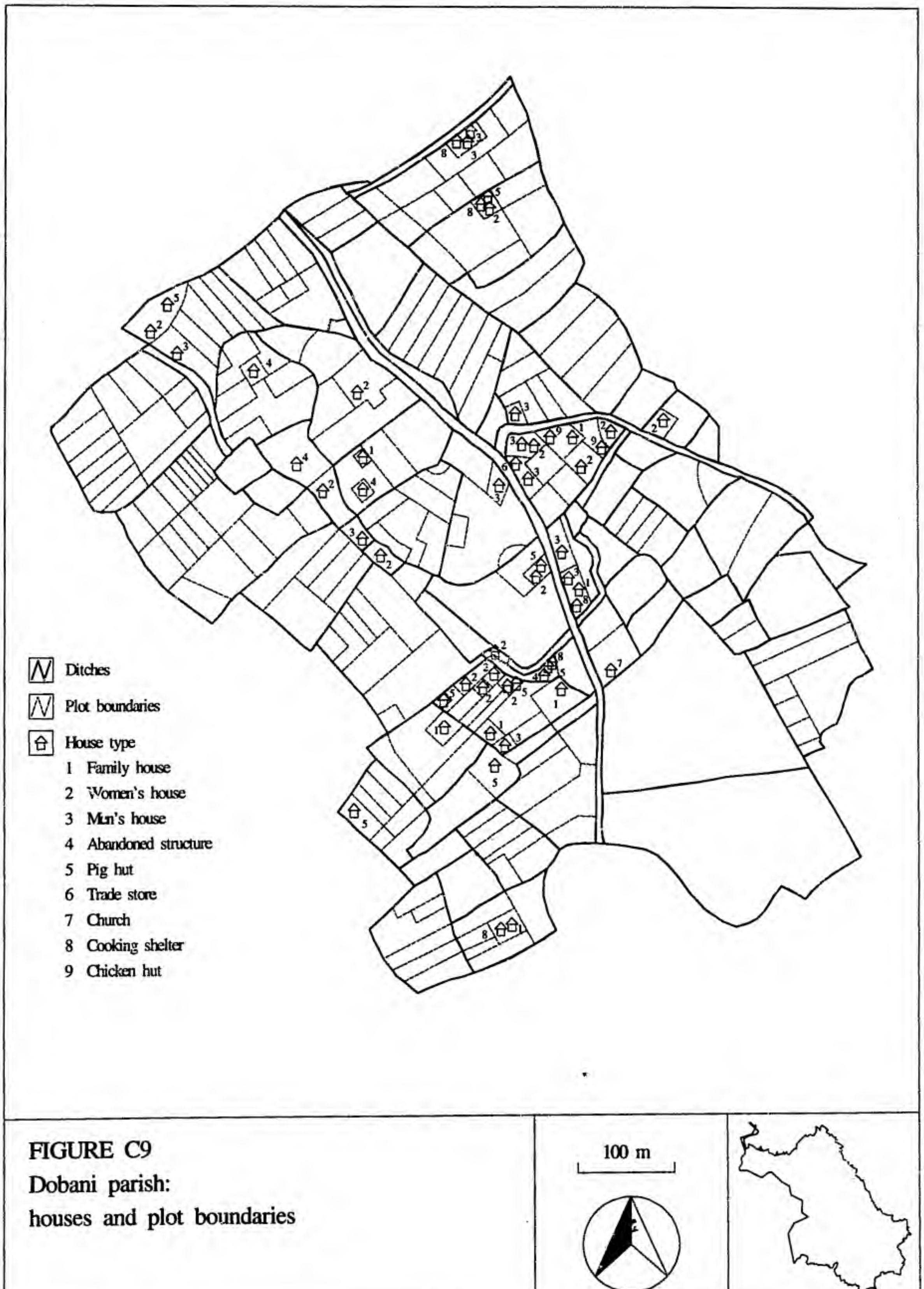
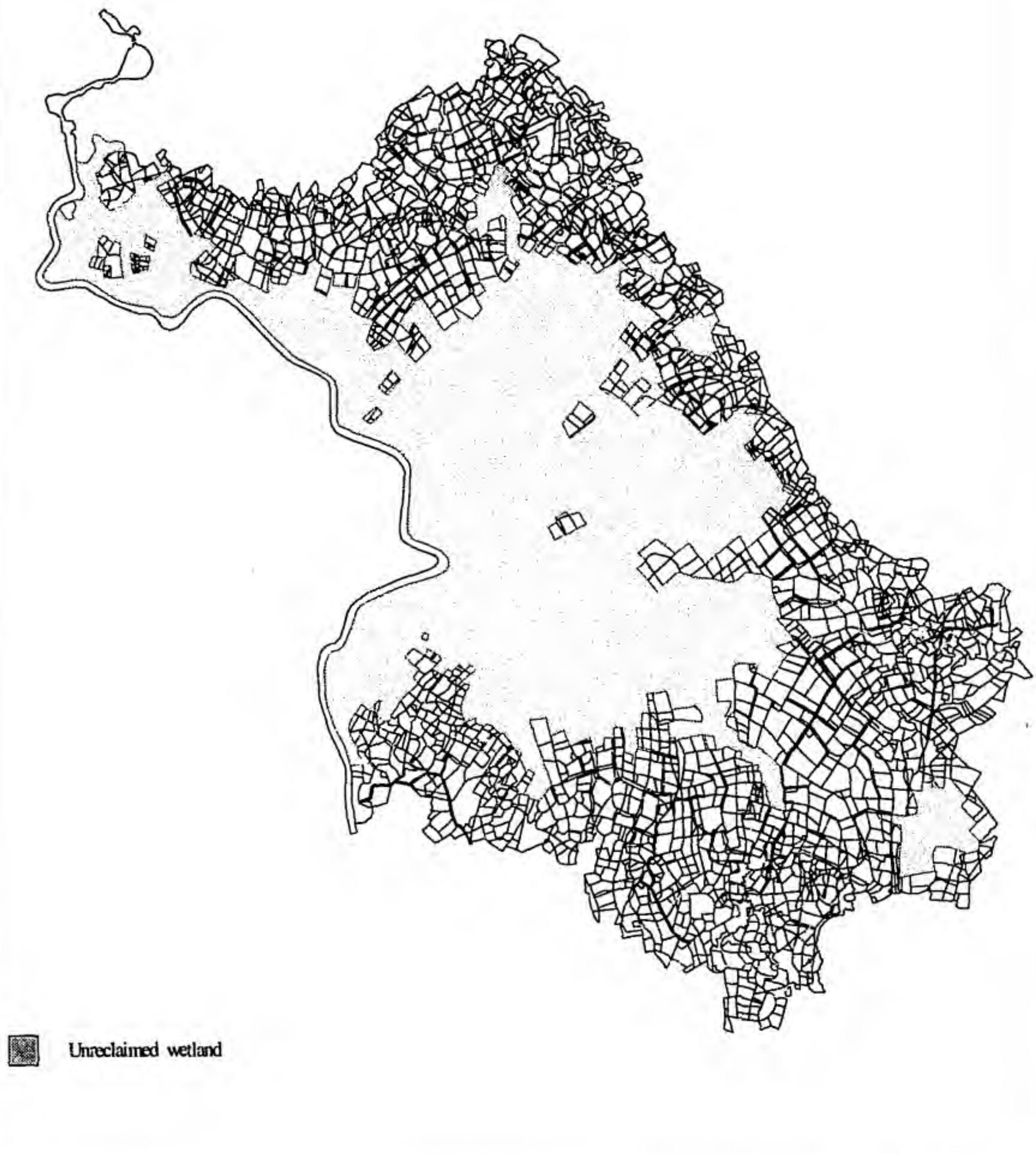


FIGURE C9
Dobani parish:
houses and plot boundaries



1 km

FIGURE C10
Haeapugua:
extent of wetland reclamation
1959

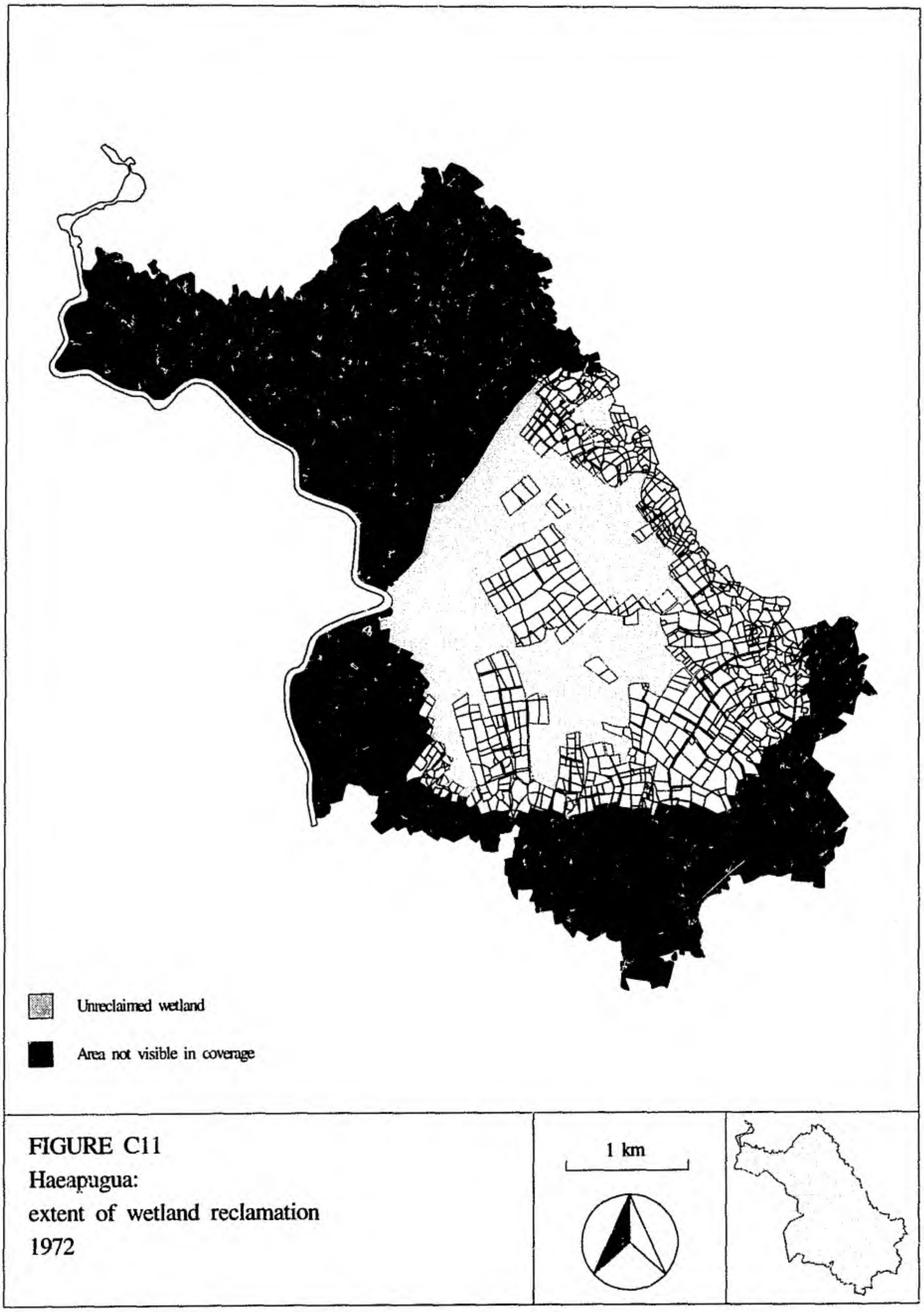
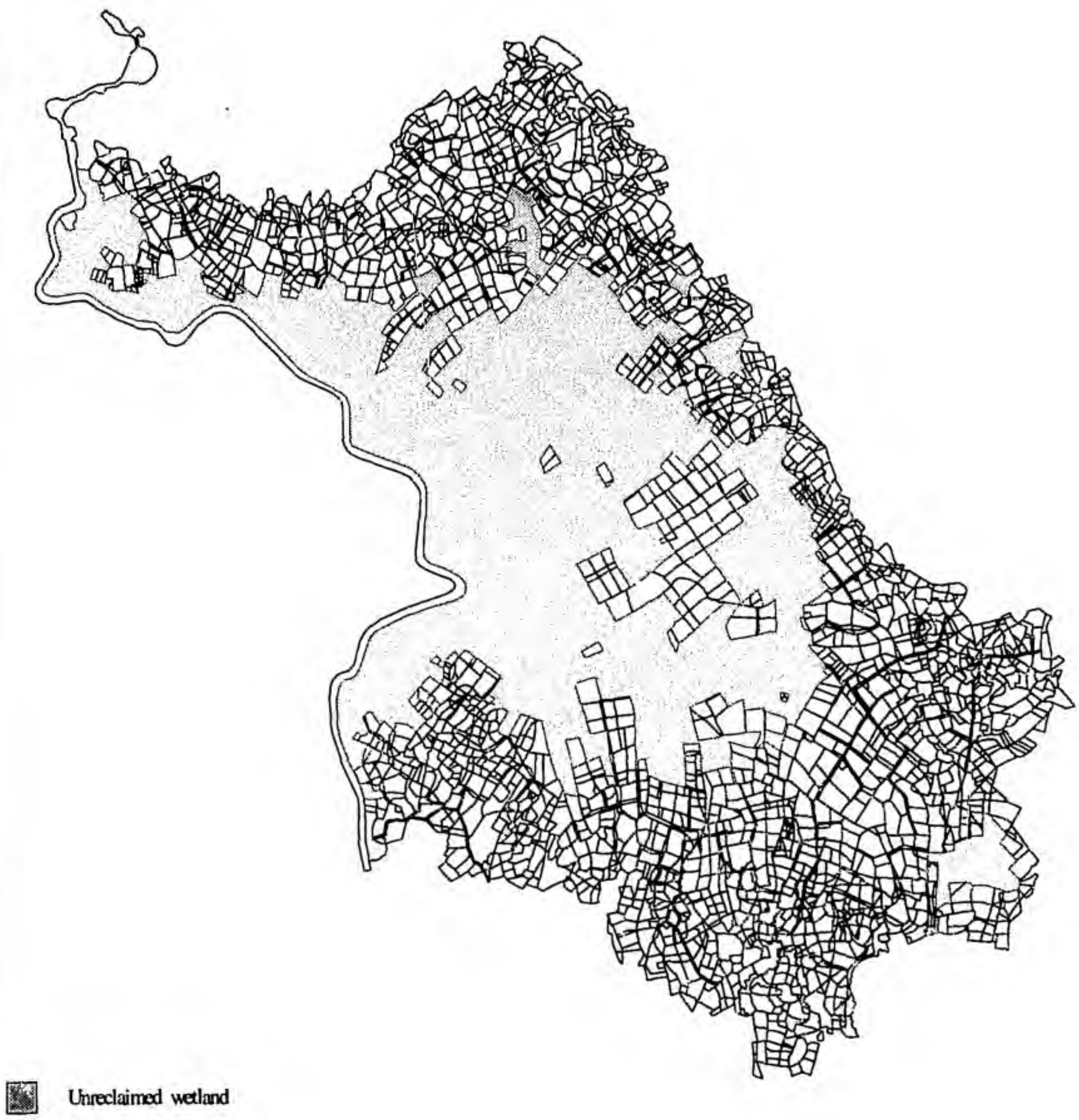


FIGURE C11
Haeapugua:
extent of wetland reclamation
1972



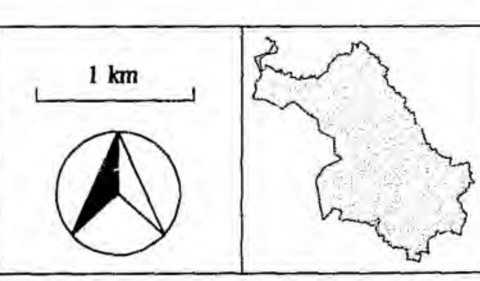
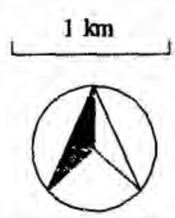


FIGURE C12
Haeapugua:
extent of wetland reclamation
1978

FIGURE C13
Haeapugua:
extent of wetland reclamation
1989



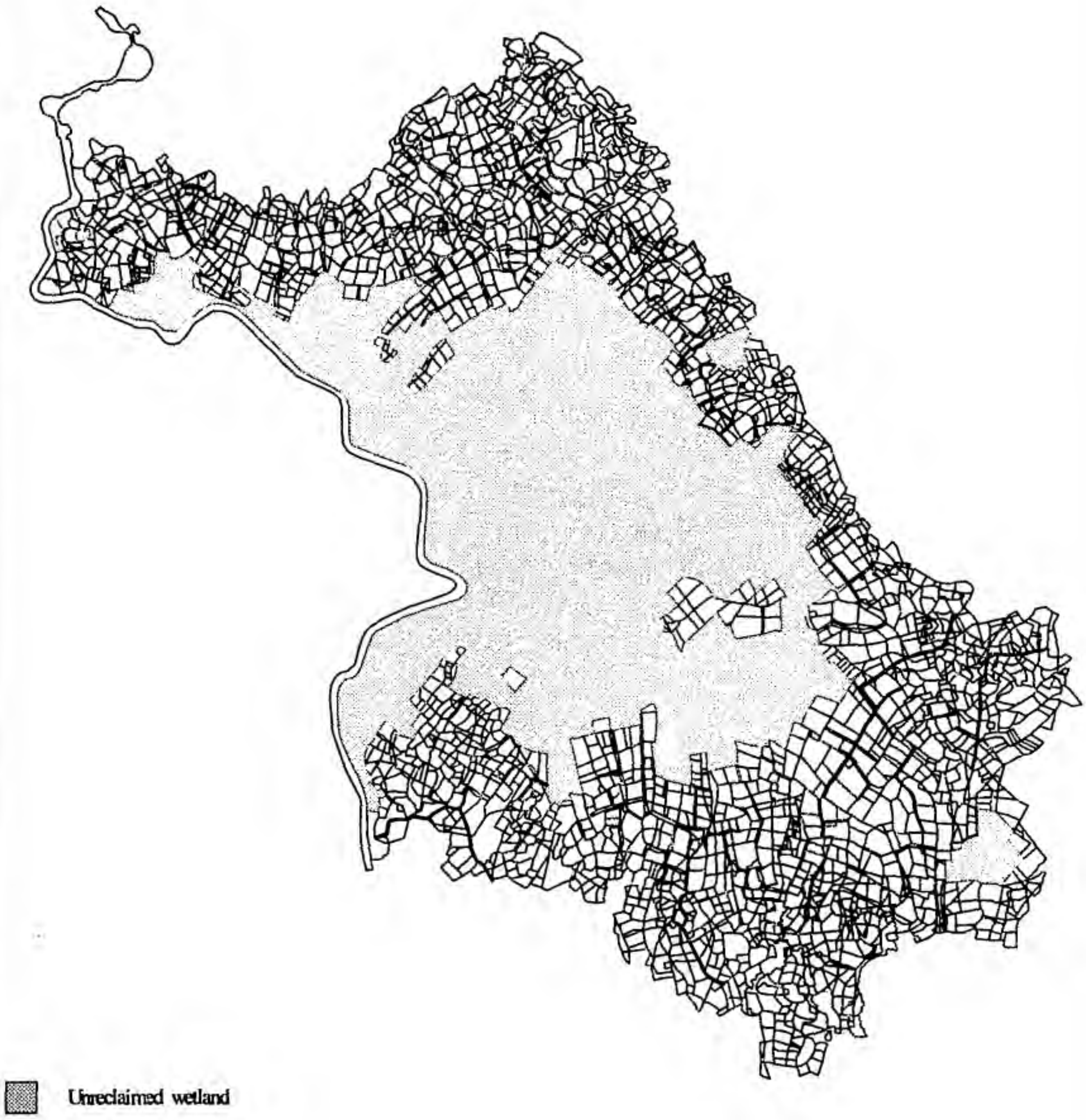
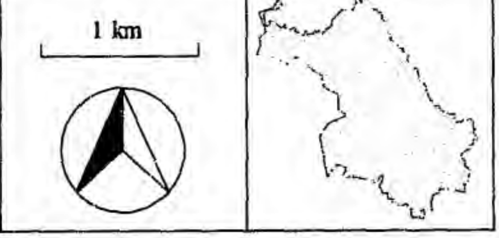
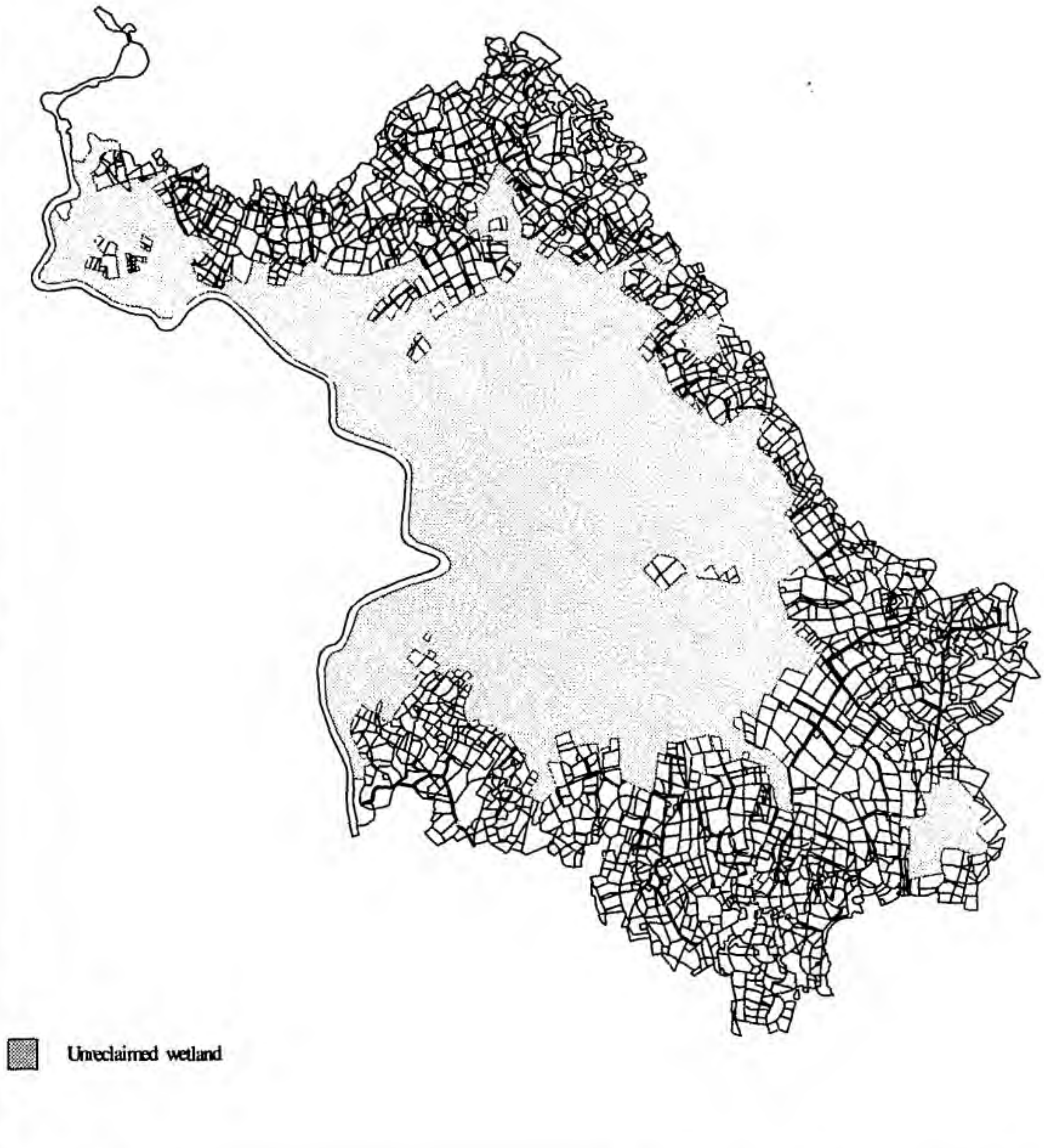


FIGURE C14
Haeapugua:
extent of wetland reclamation
1992





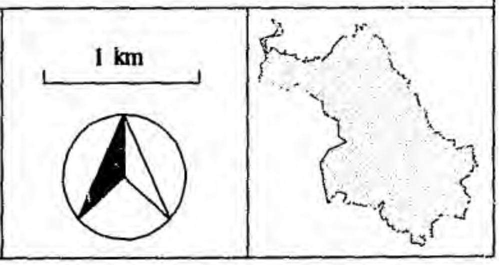


FIGURE C15
Haeapugua:
minimum extent of wetland reclamation
1959 – 1992

FIGURE C16
Haeapugua:
maximum extent of wetland reclamation
1959 – 1992

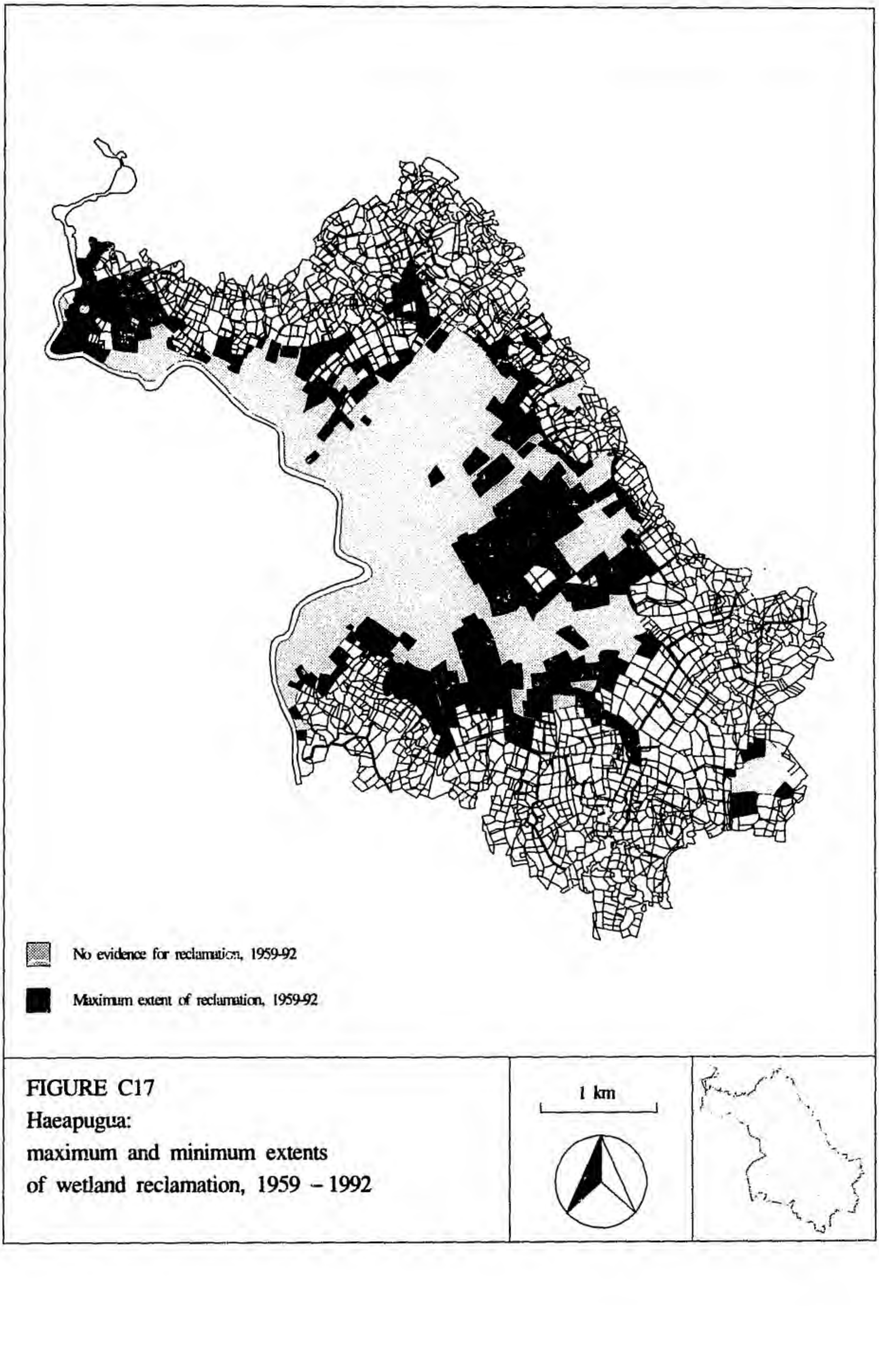


FIGURE C17
Haeapugua:
maximum and minimum extents
of wetland reclamation, 1959 – 1992

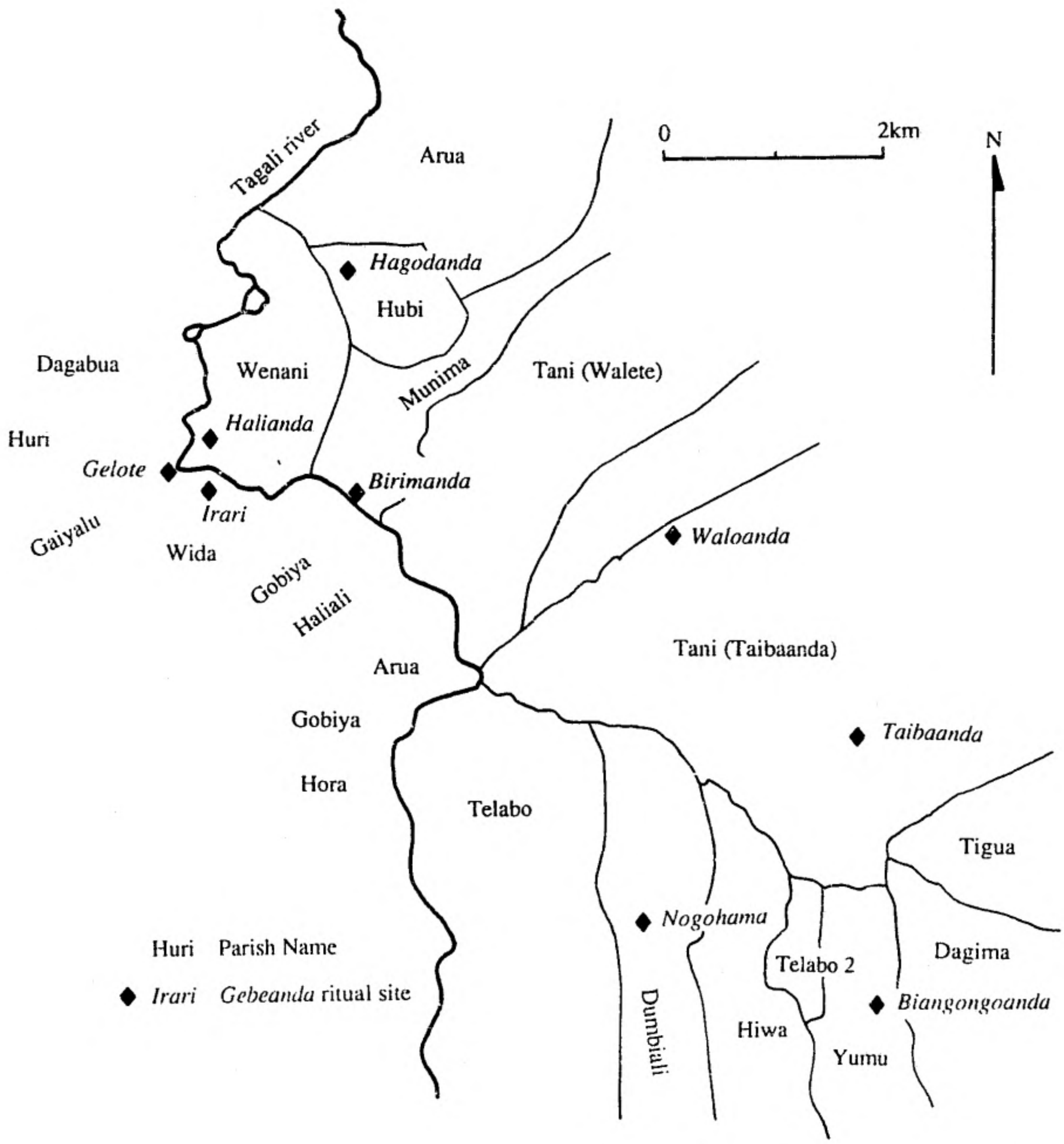


Figure C18 Clan boundaries and gebeanda, Haeapugua basin

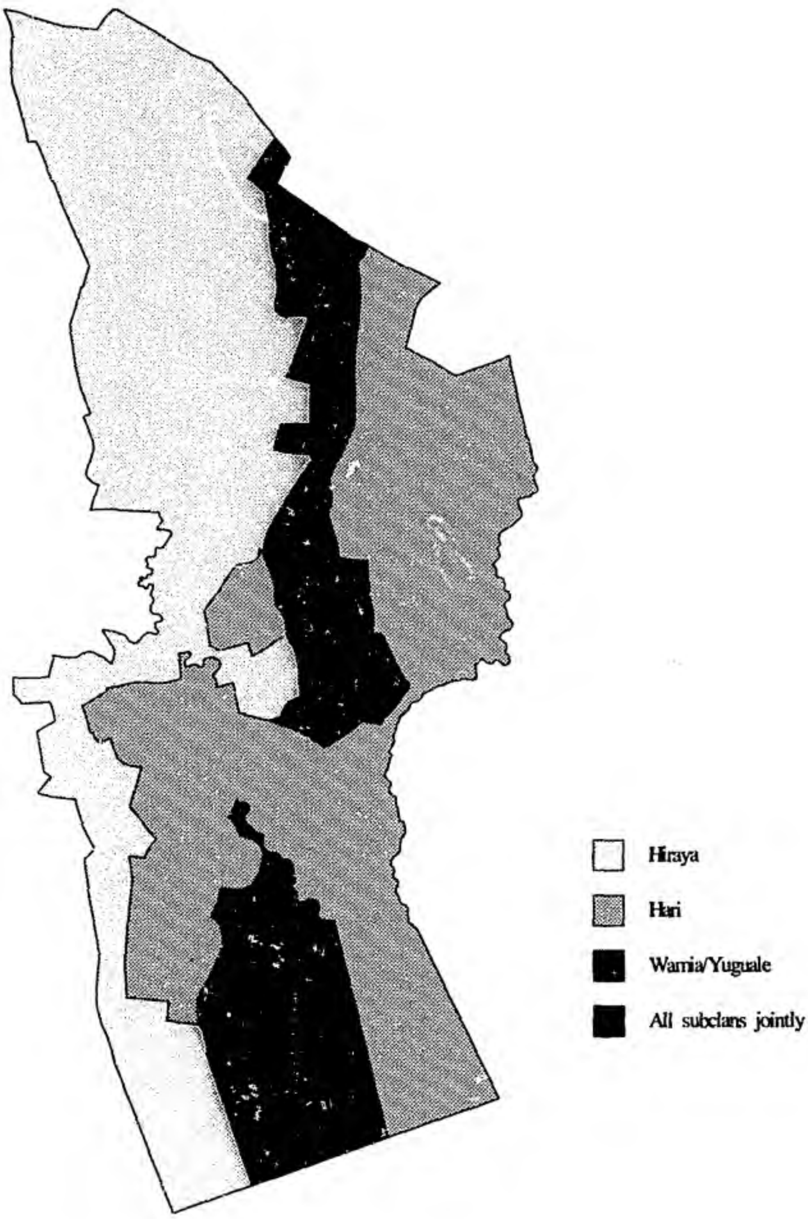
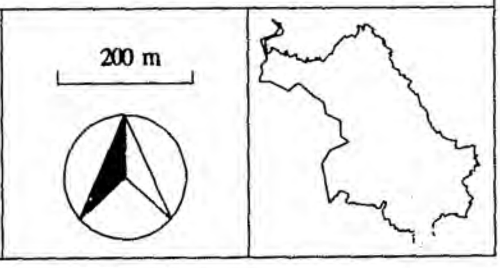
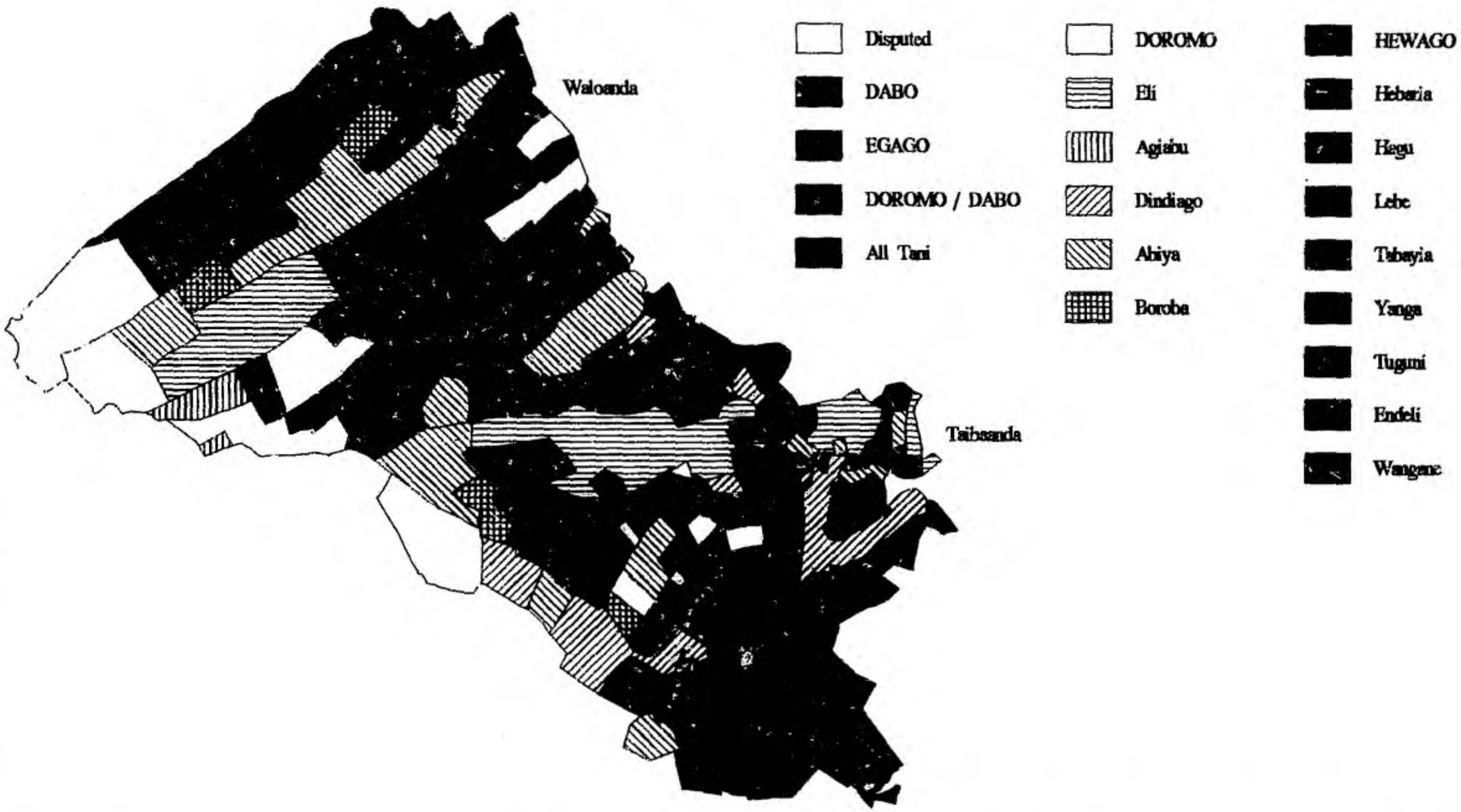


FIGURE C19
Hiwa parish subclan holdings





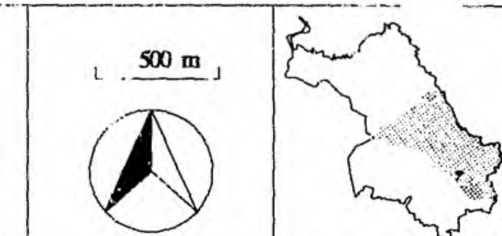


FIGURE C20
Tani subclan holdings at Taibaanda parish, Haeapugua

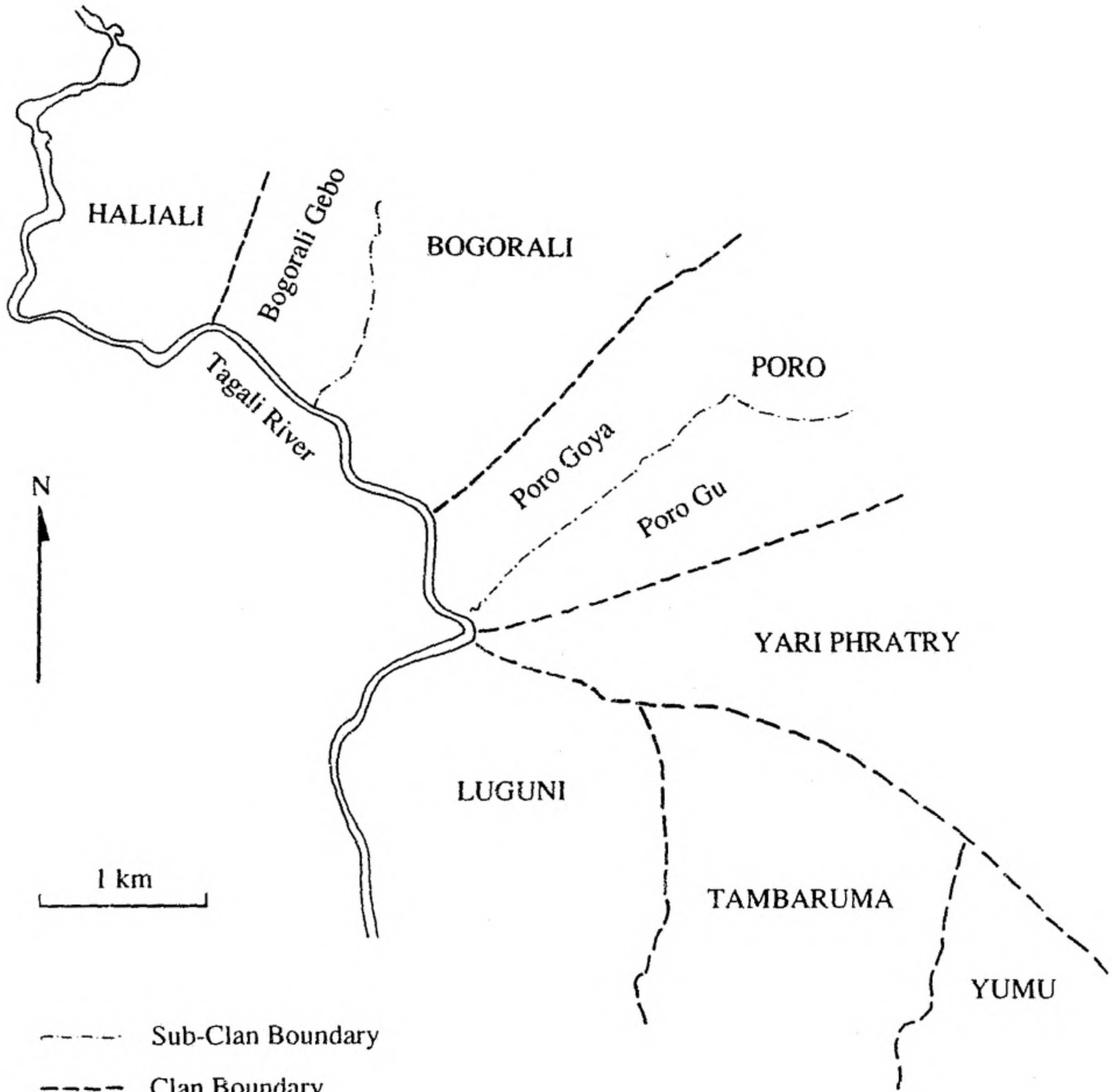


Figure C21 Clan boundaries before the Tambaruma war (to c.1830 AD)

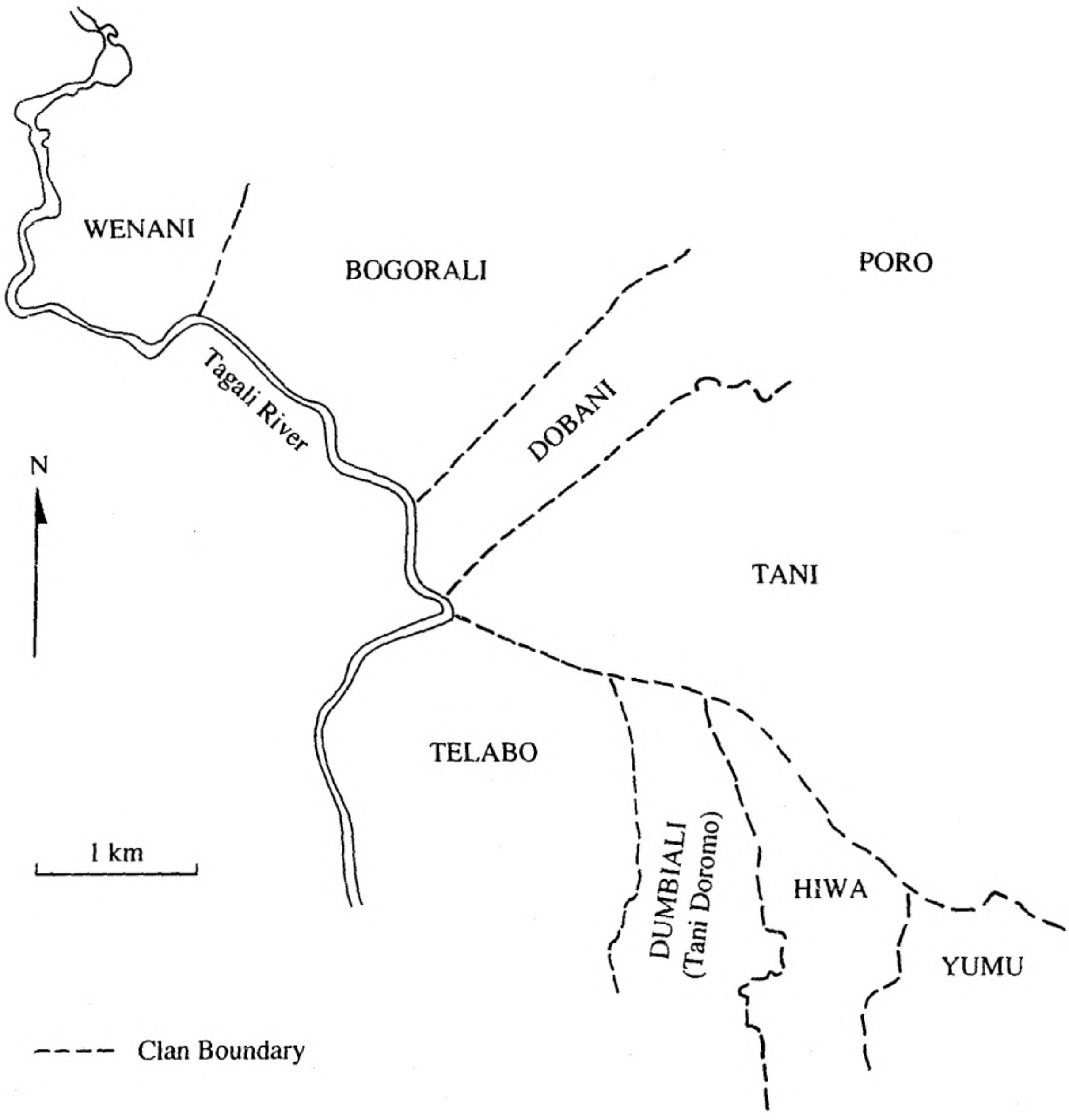


Figure C22 Clan boundaries after the Tambaruma war (post c.1830 AD)

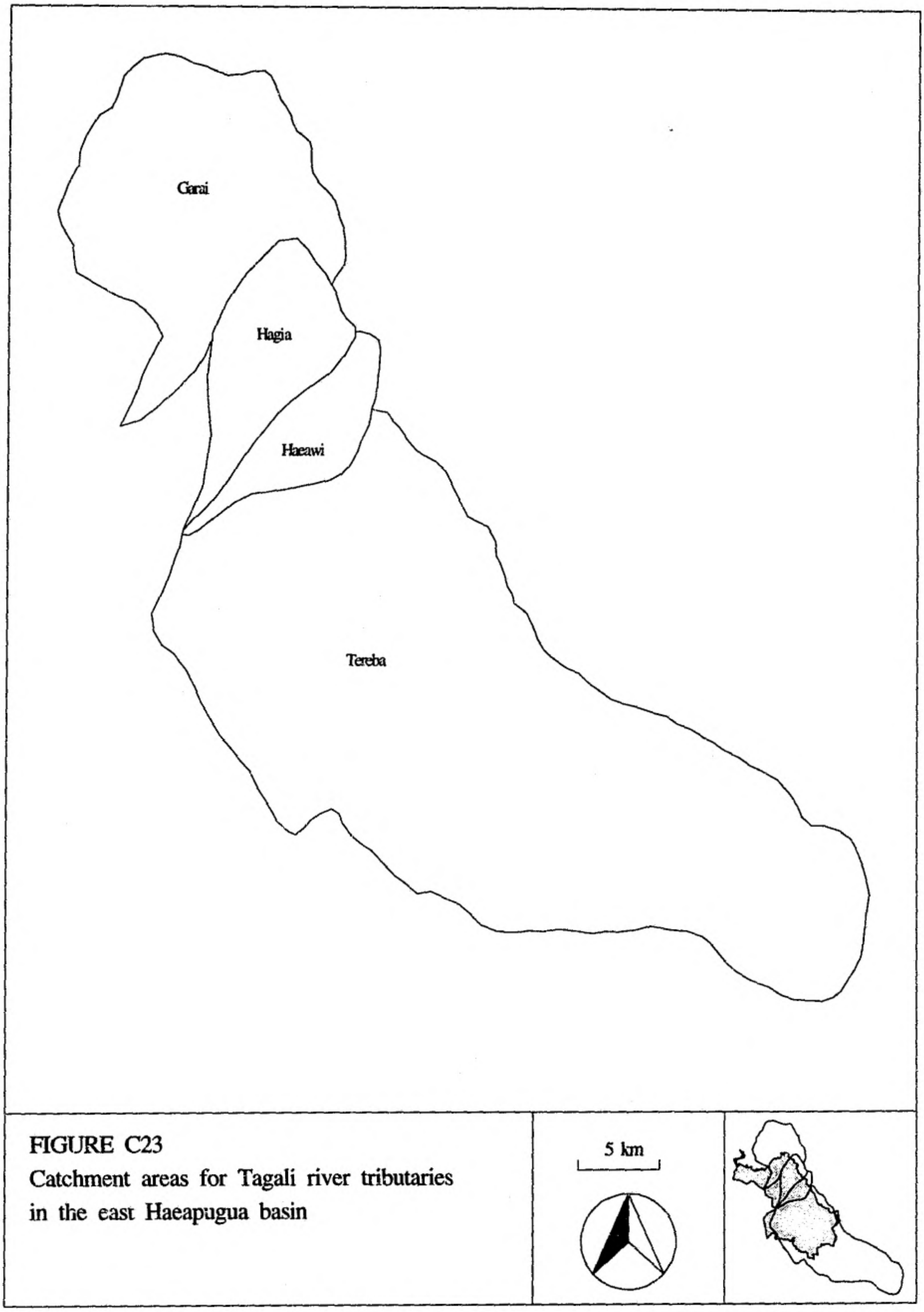


FIGURE C23
Catchment areas for Tagali river tributaries
in the east Haeapugua basin

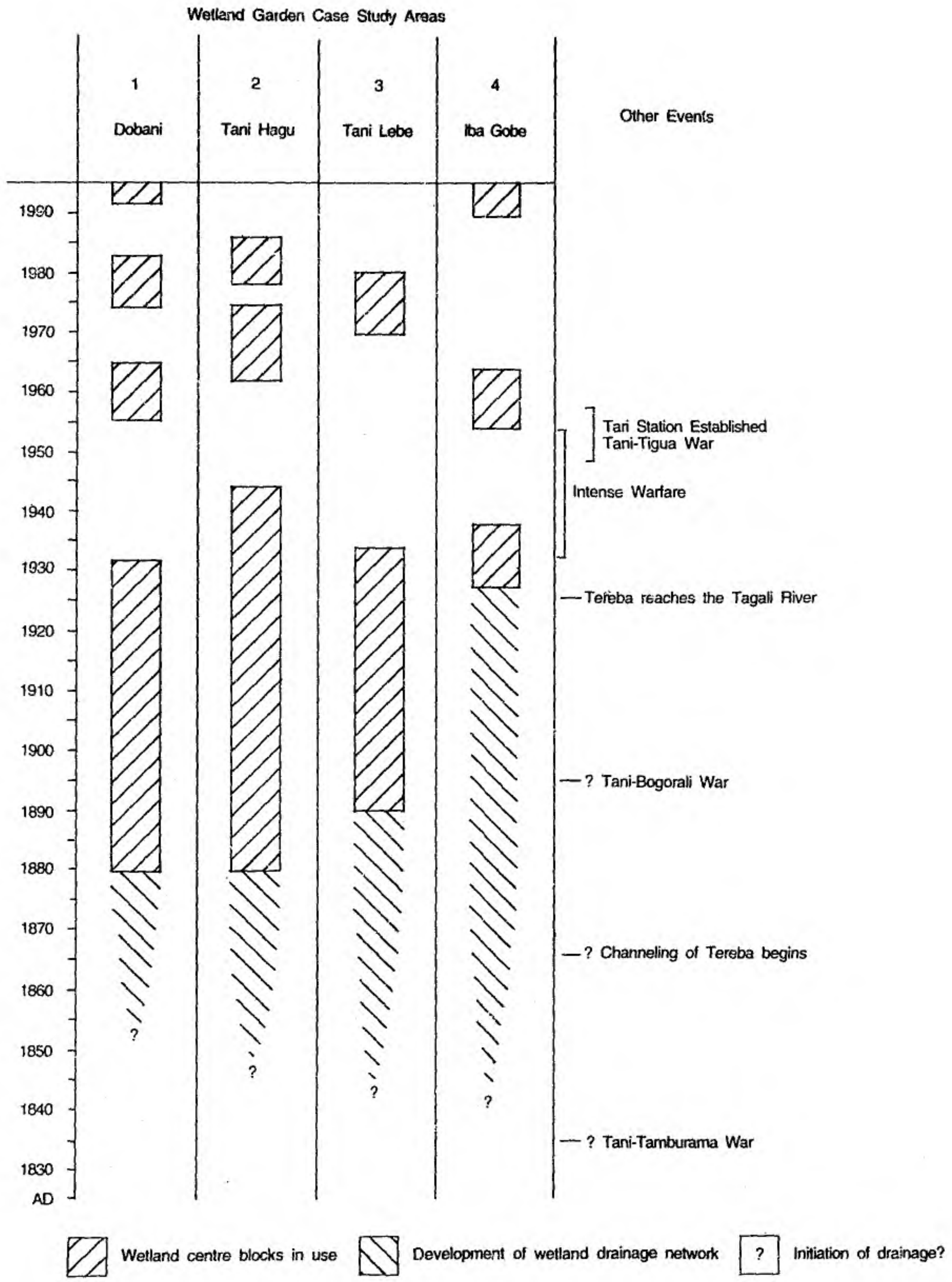


Figure C24 Drainage case study summary diagram

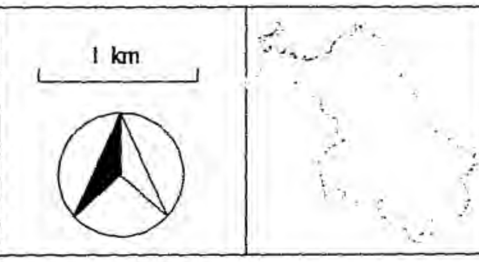


FIGURE C25
Haeapugua:
covert drains and lobate field forms

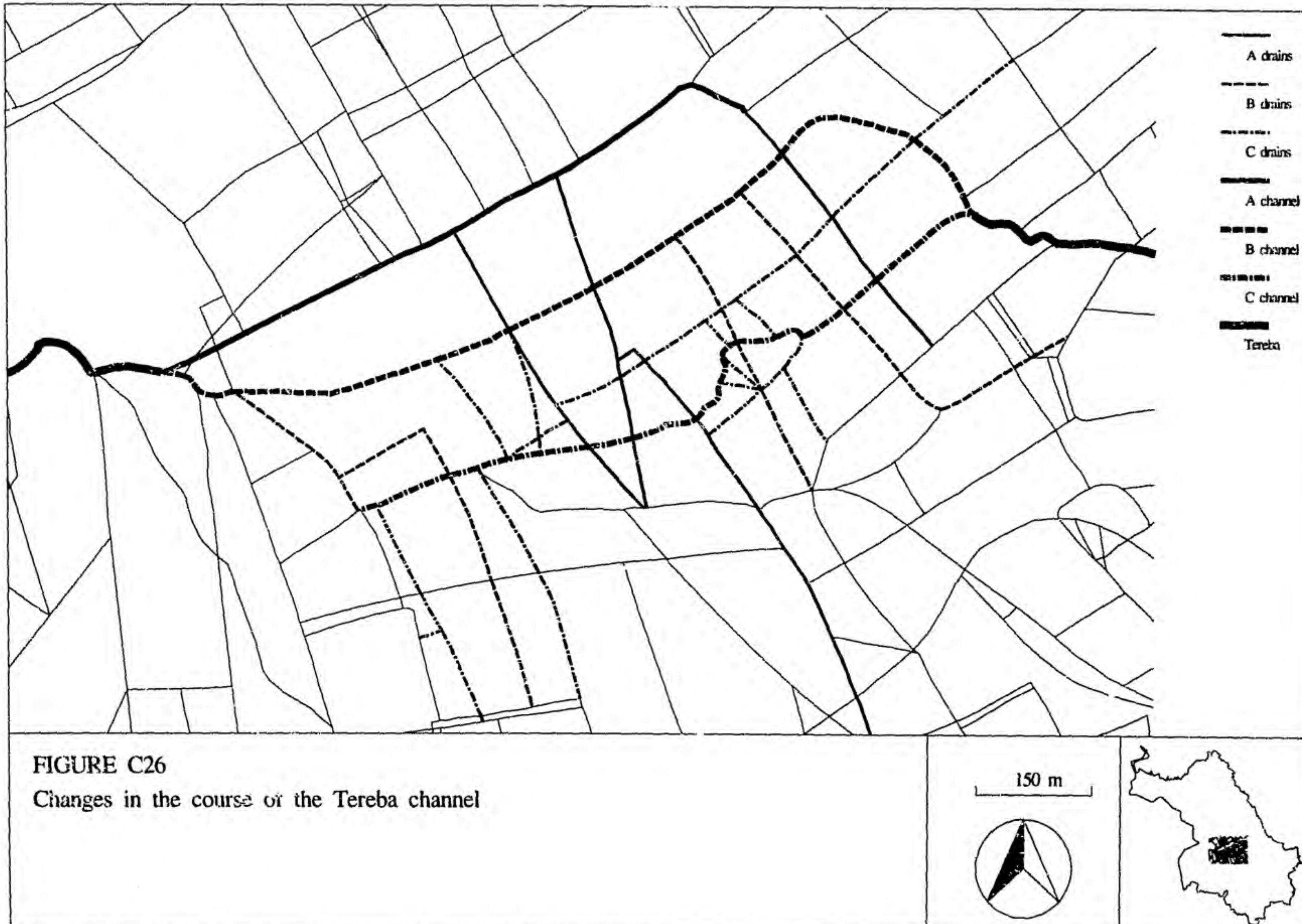
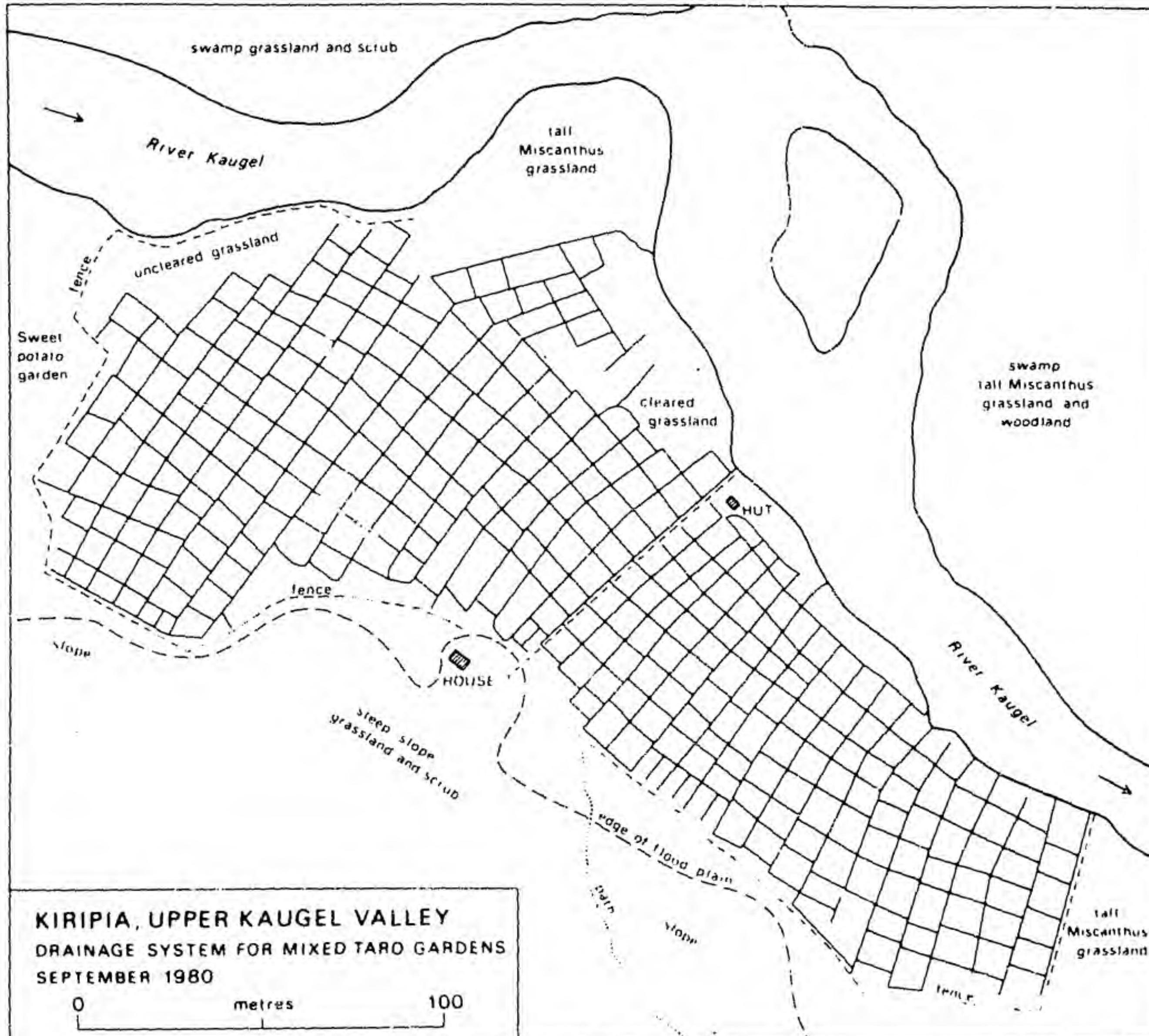
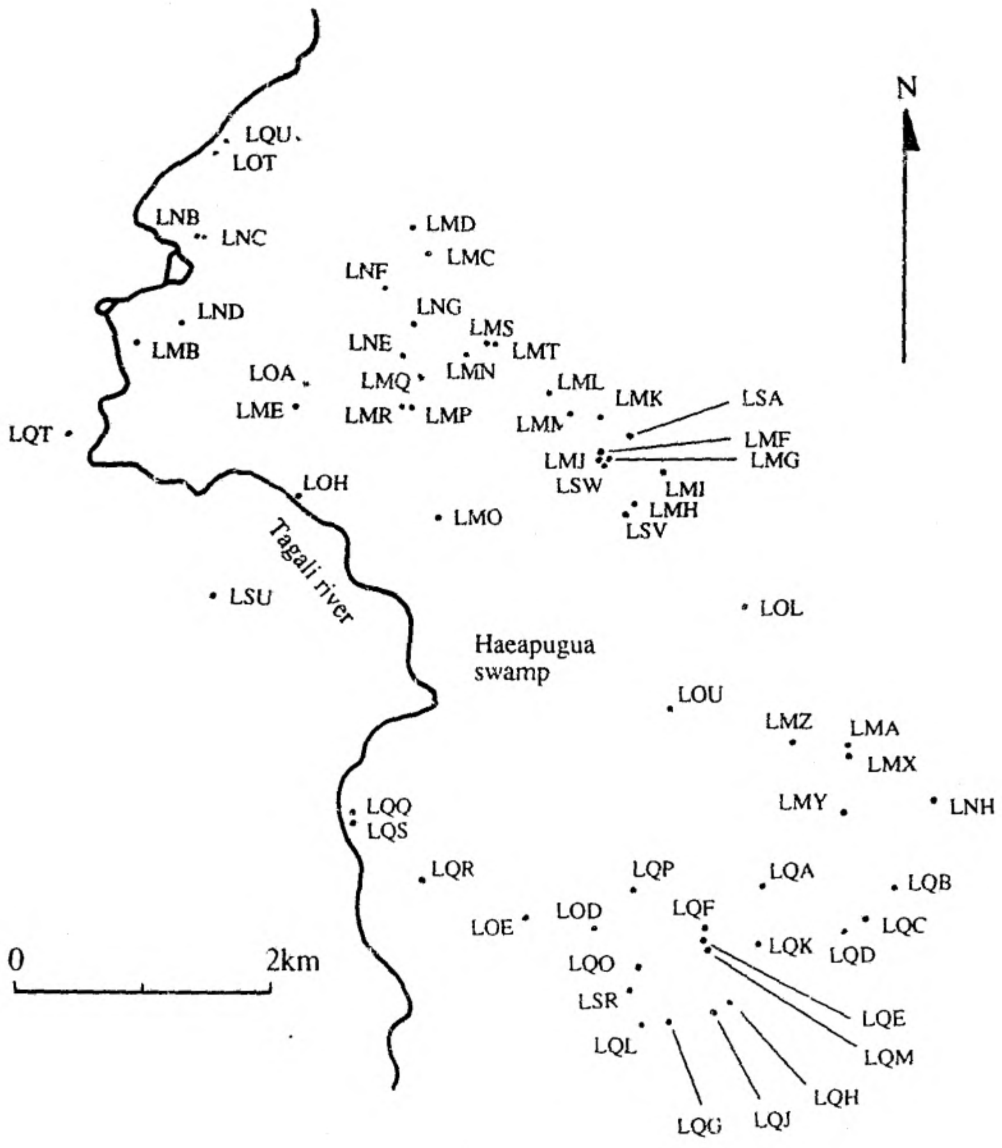


FIGURE C26
Changes in the course of the Tereba channel

Figure C27 Taro wetland field systems, Tambul [after Bayliss-Smith 1985a]





Excavations in the Dobani-Waloanda area are mapped in Figure C30. The locations of the sites of intensive surface collection in the Waloanda garden survey are mapped in Figure C31.

Figure C28 Archaeological sites of the Haeapugua basin

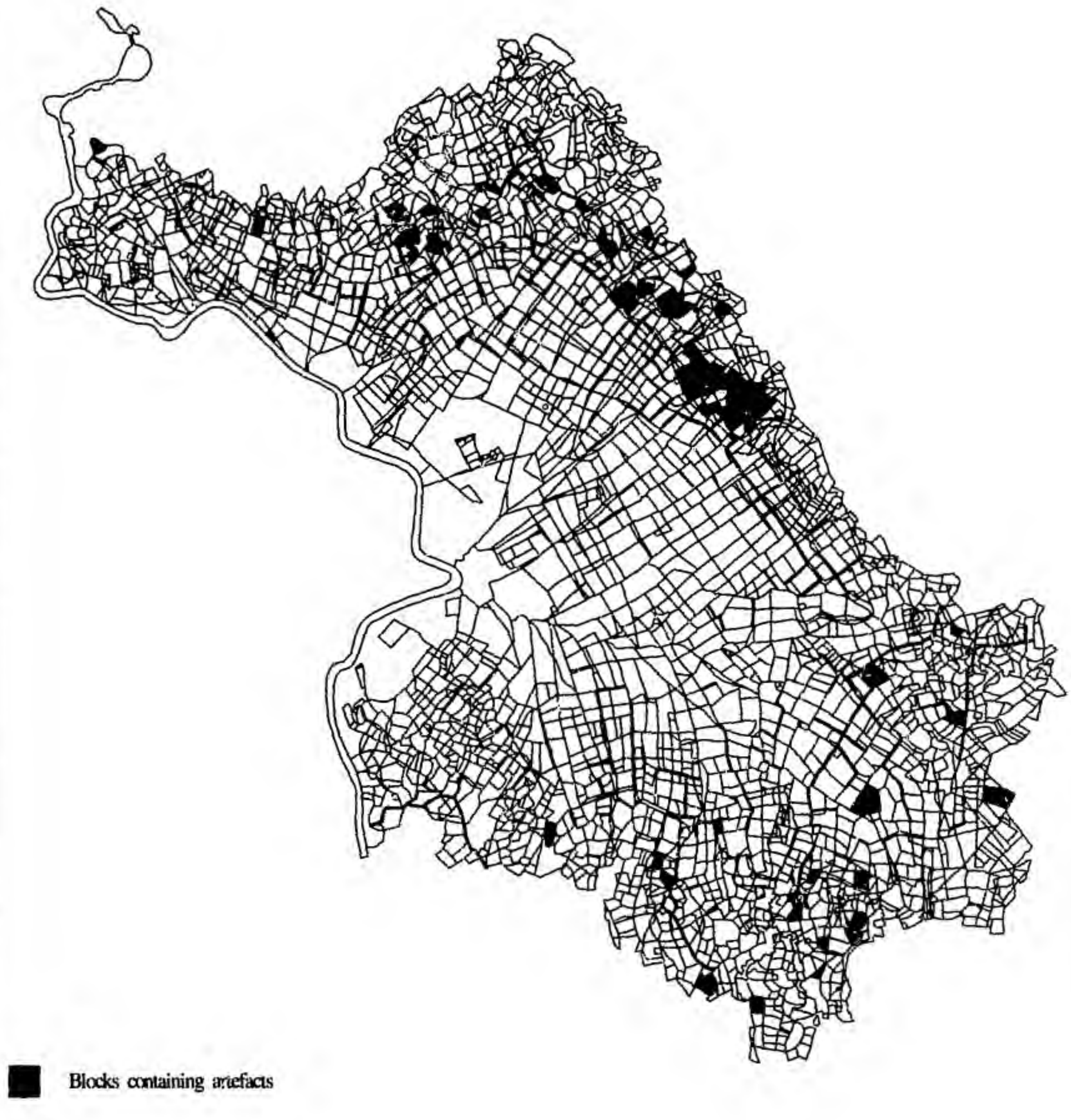
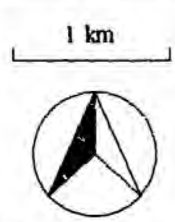
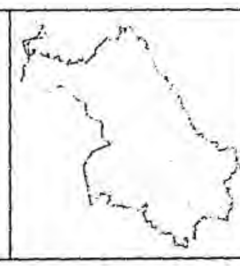


FIGURE C29
Haeapugua:
blocks containing surface artefact scatters





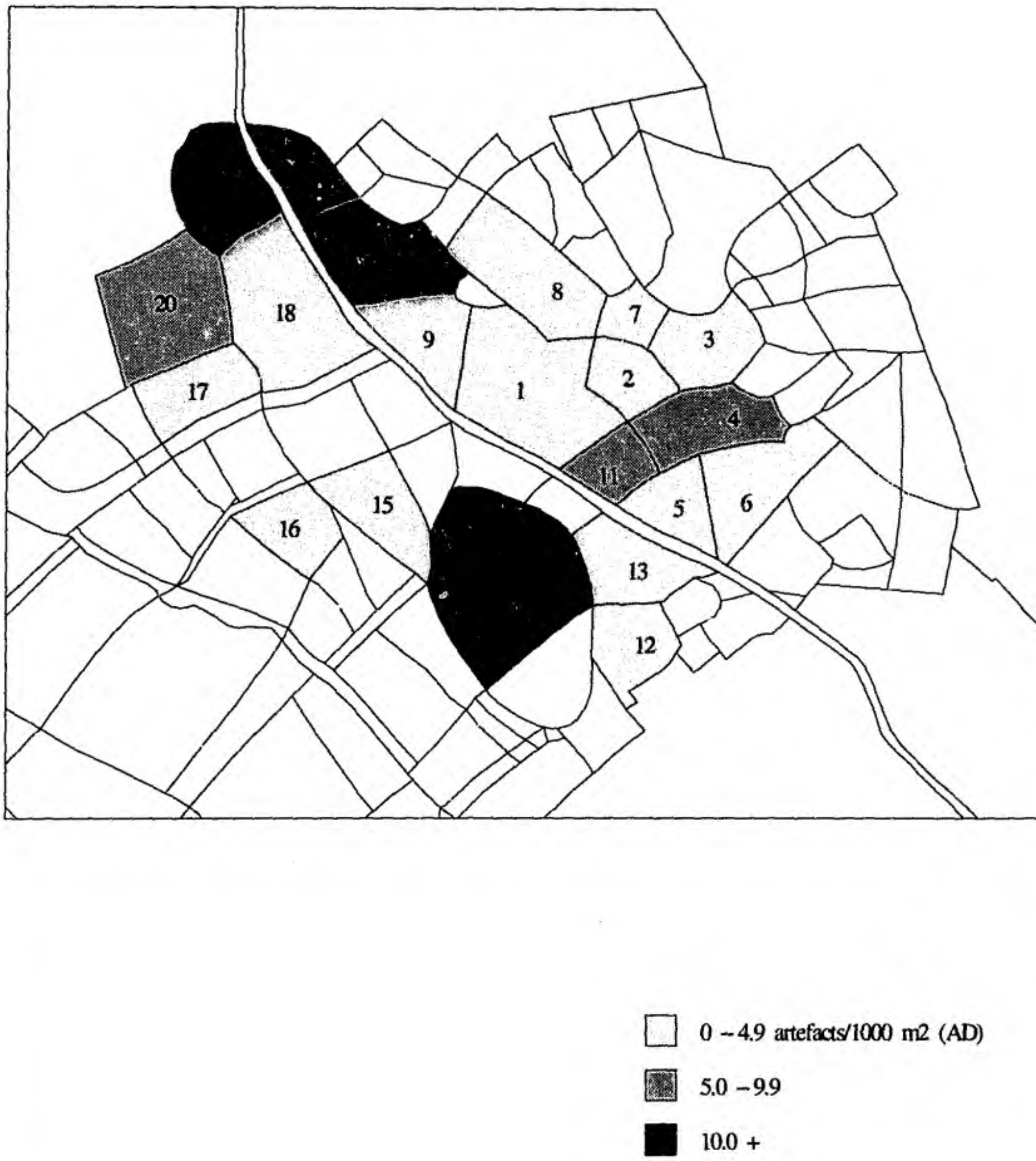
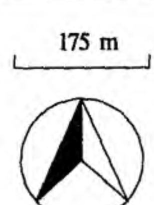


FIGURE C~~31~~ 30
Waloanda garden survey – artefact densities



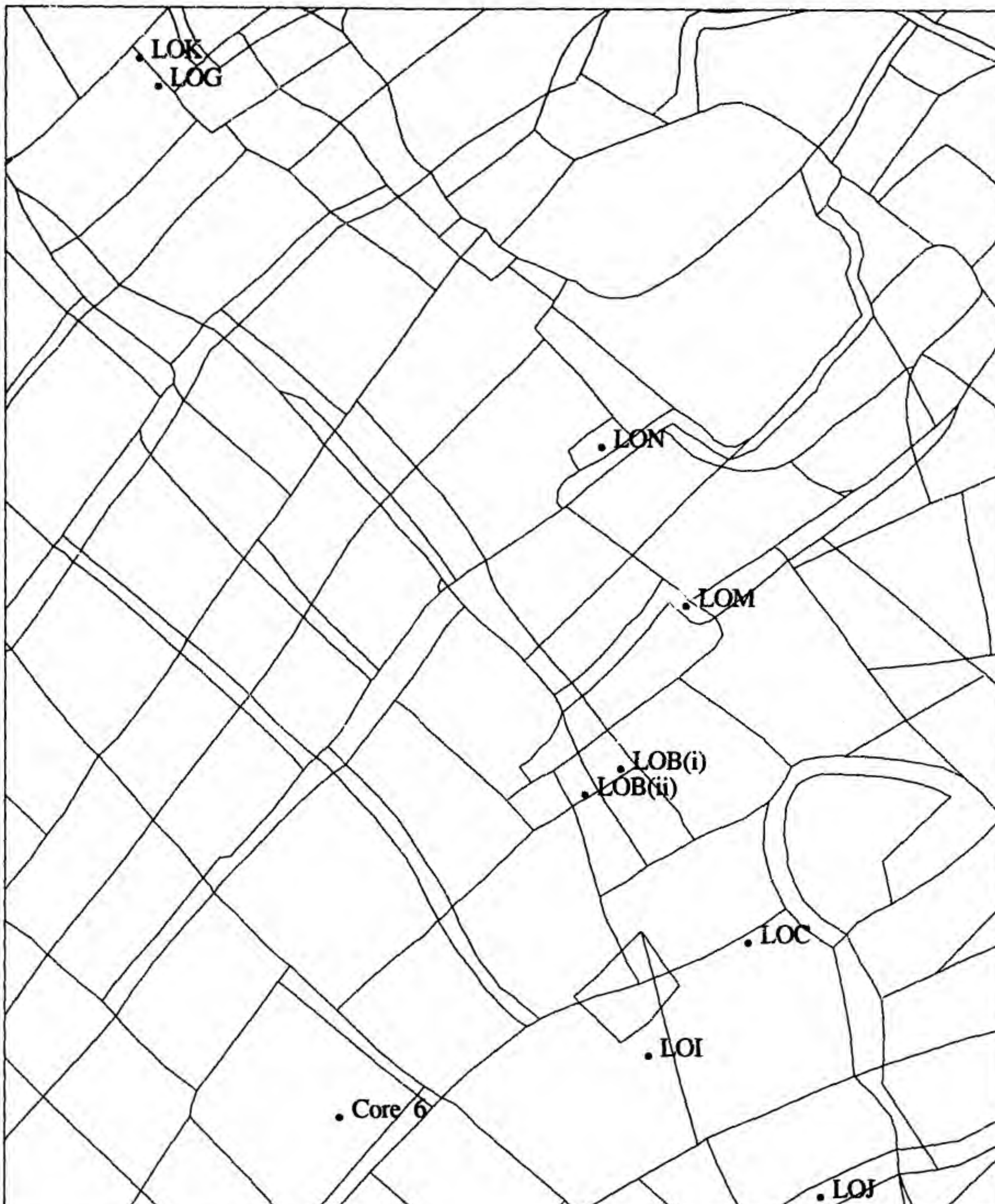
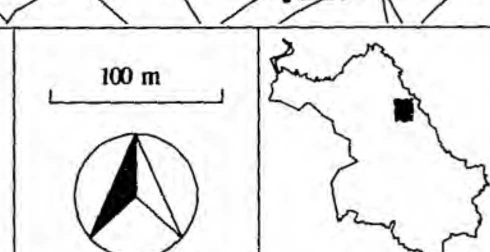


FIGURE C30 31
Waloanda / Dobani area:
archaeological site locations
(Core 6 location approximate)



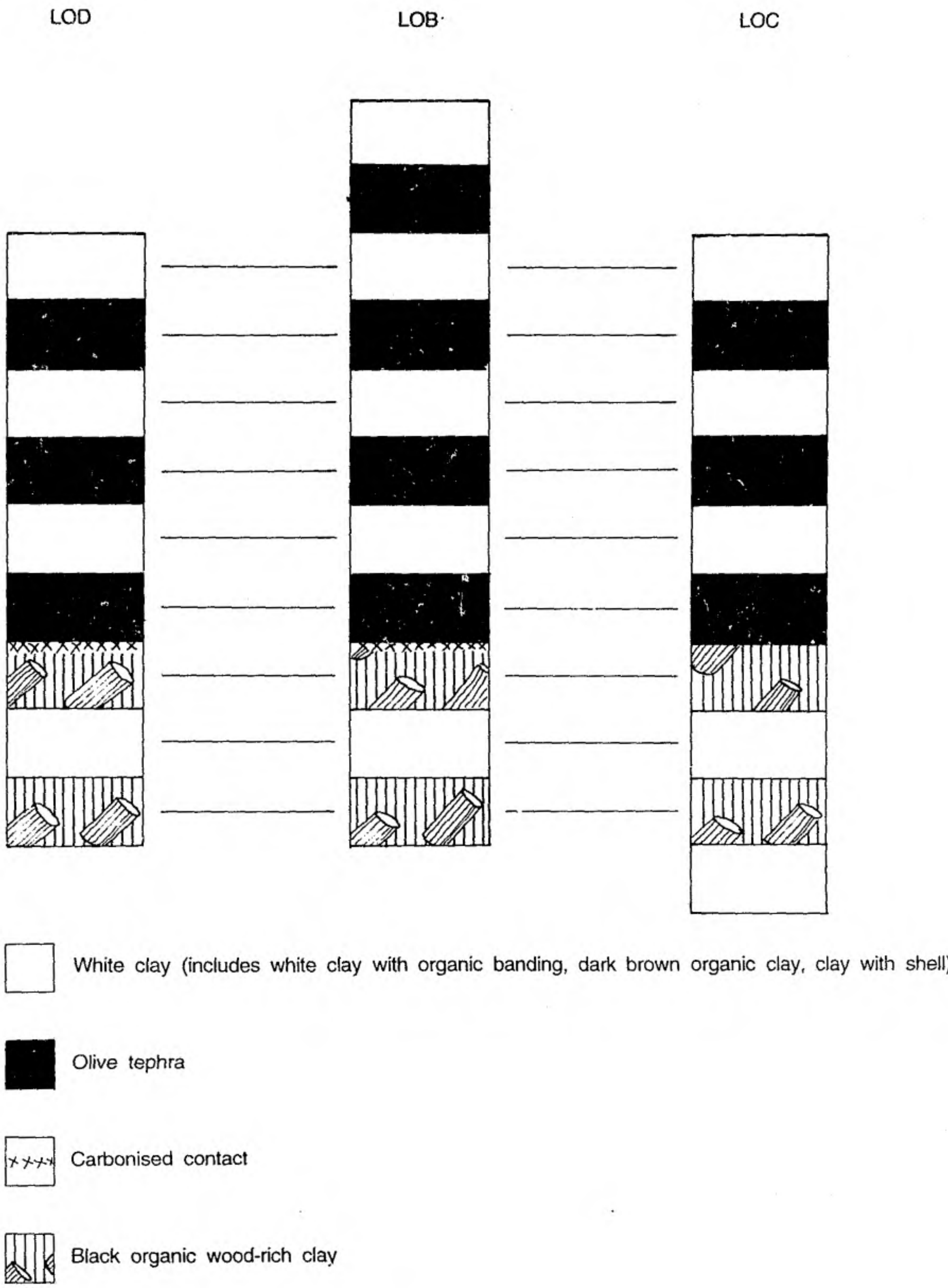


Figure C32 White clay unit sequences at the LOB, LOC and LOD sites

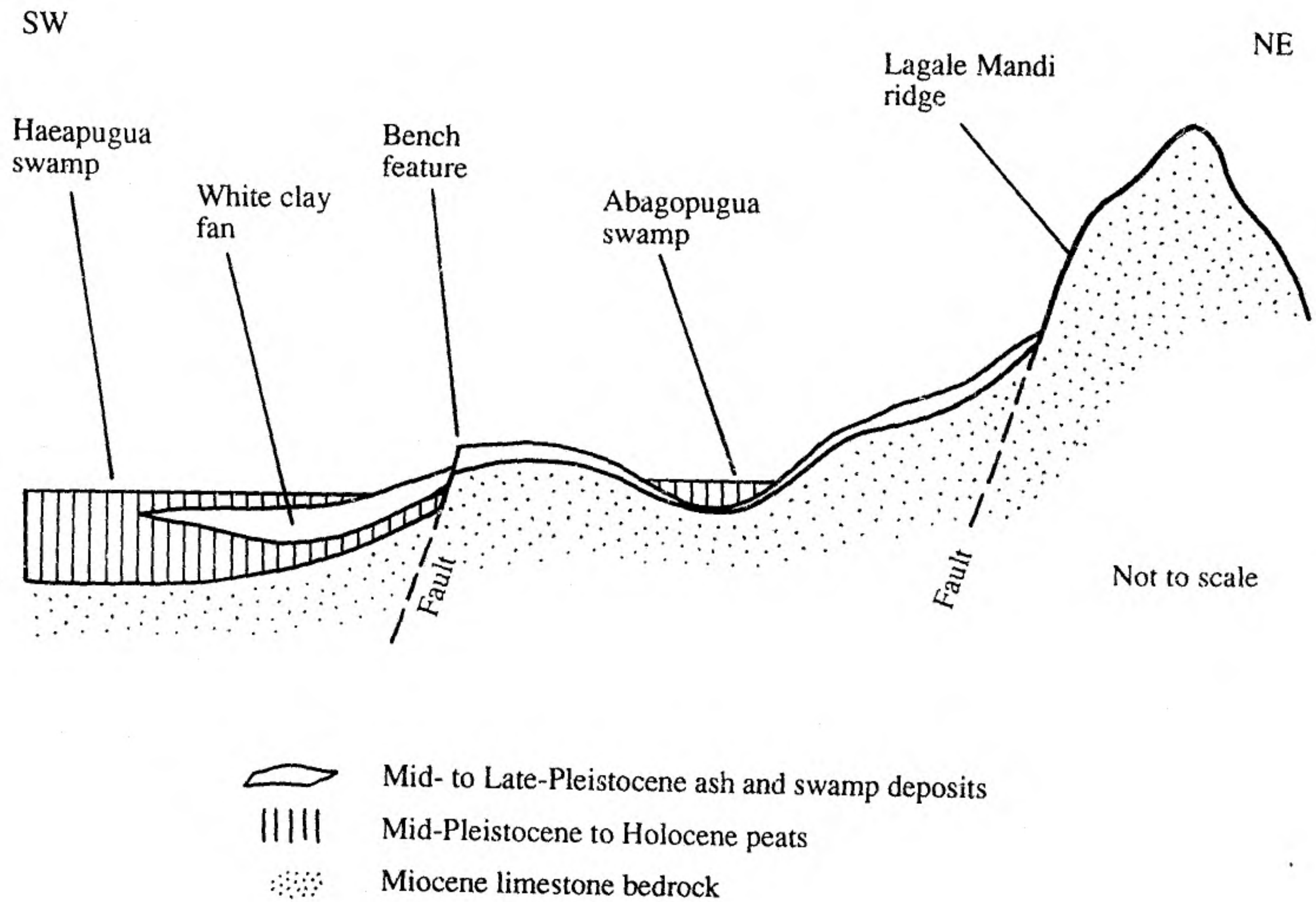


Figure C33 Haeapugua: profile of eastern margins

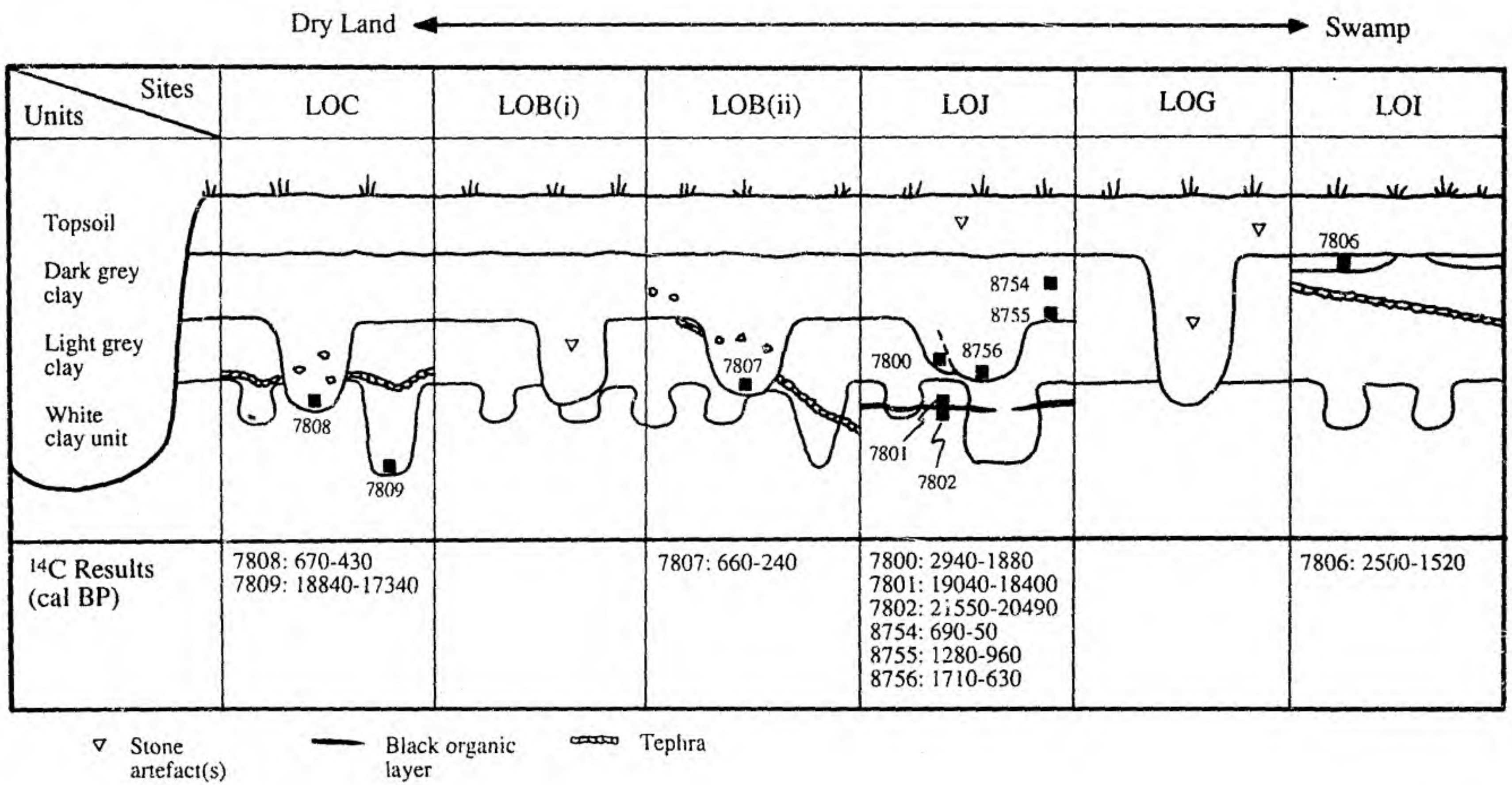


Figure C34 A schematic stratigraphy for the Dobani / Waloanda area excavations

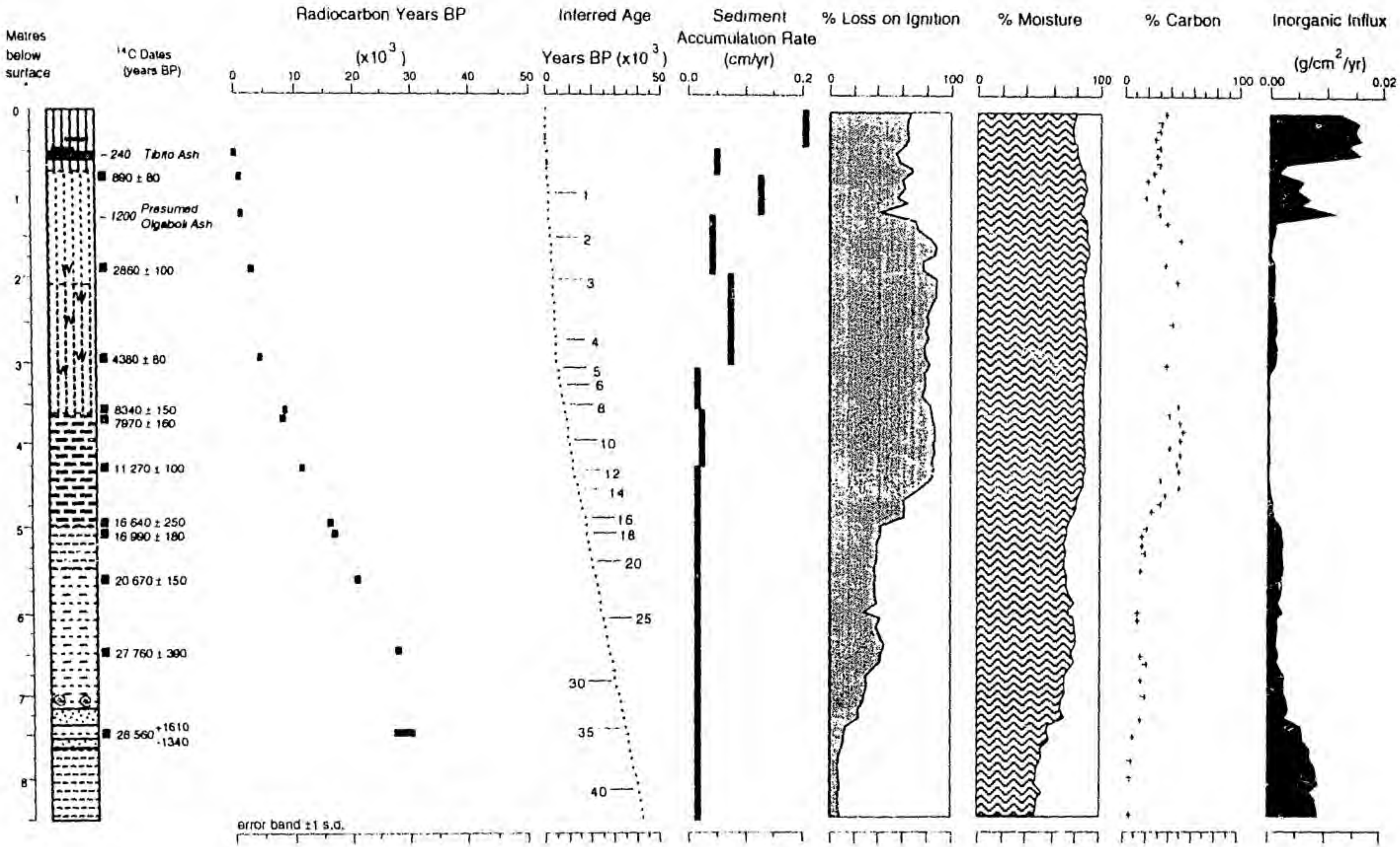
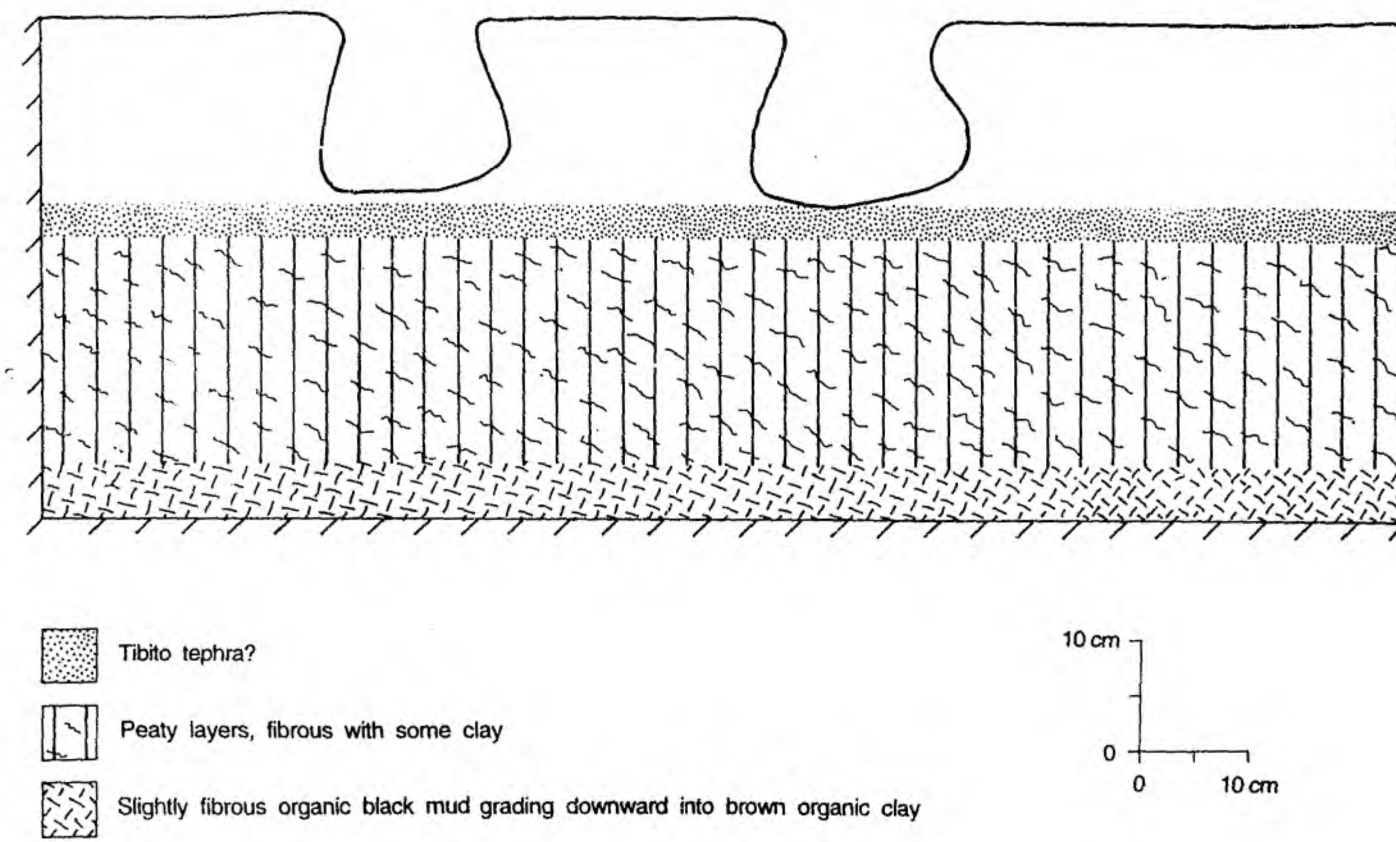


Figure C35 Haeapugua Core 6 stratigraphy and chronology [after Haberle 1993]

Figure C36 Excavated trench section, Tari Gap [after Sullivan and Hughes 1991]



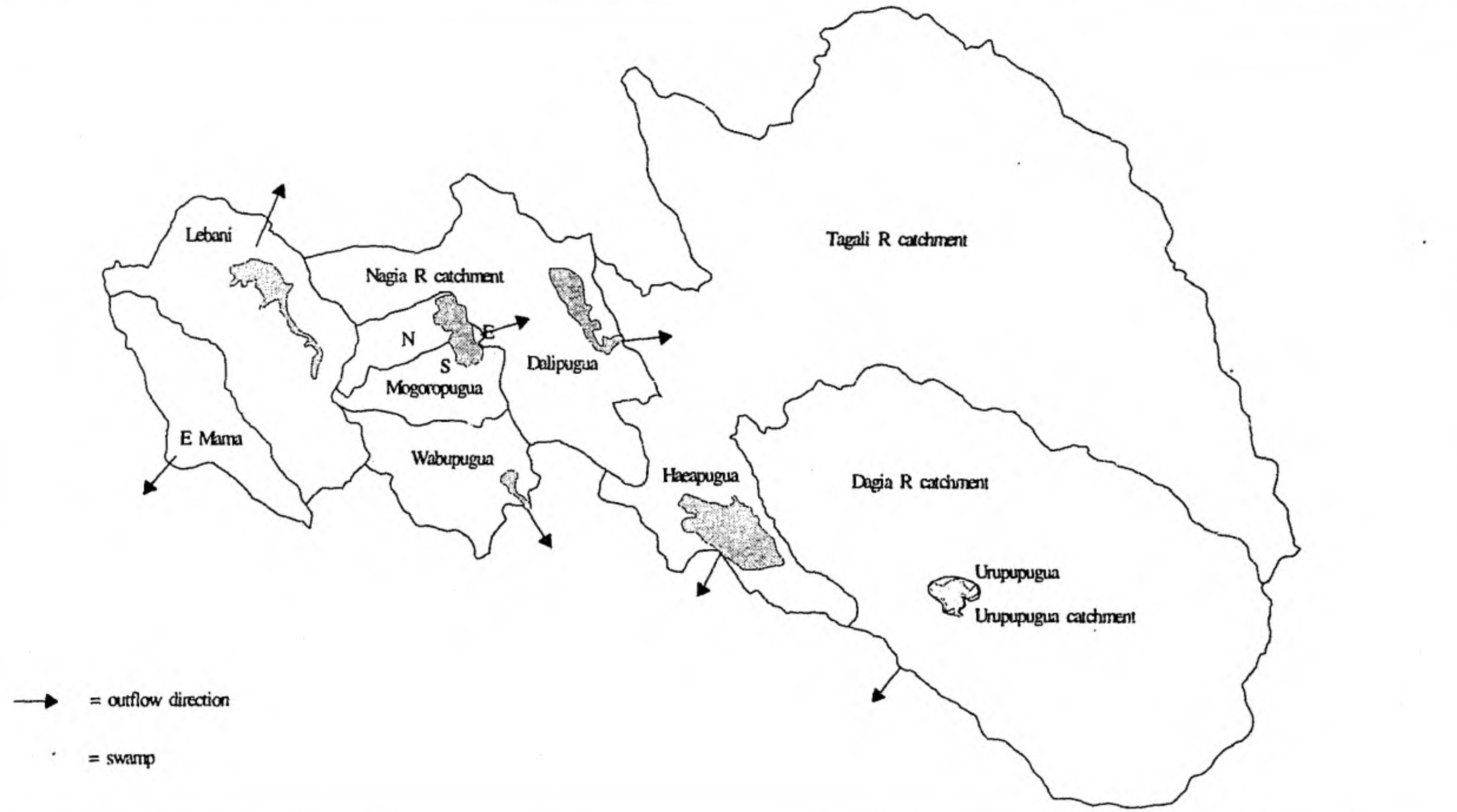


FIGURE C37

Swamps and catchment areas of the Tari region.

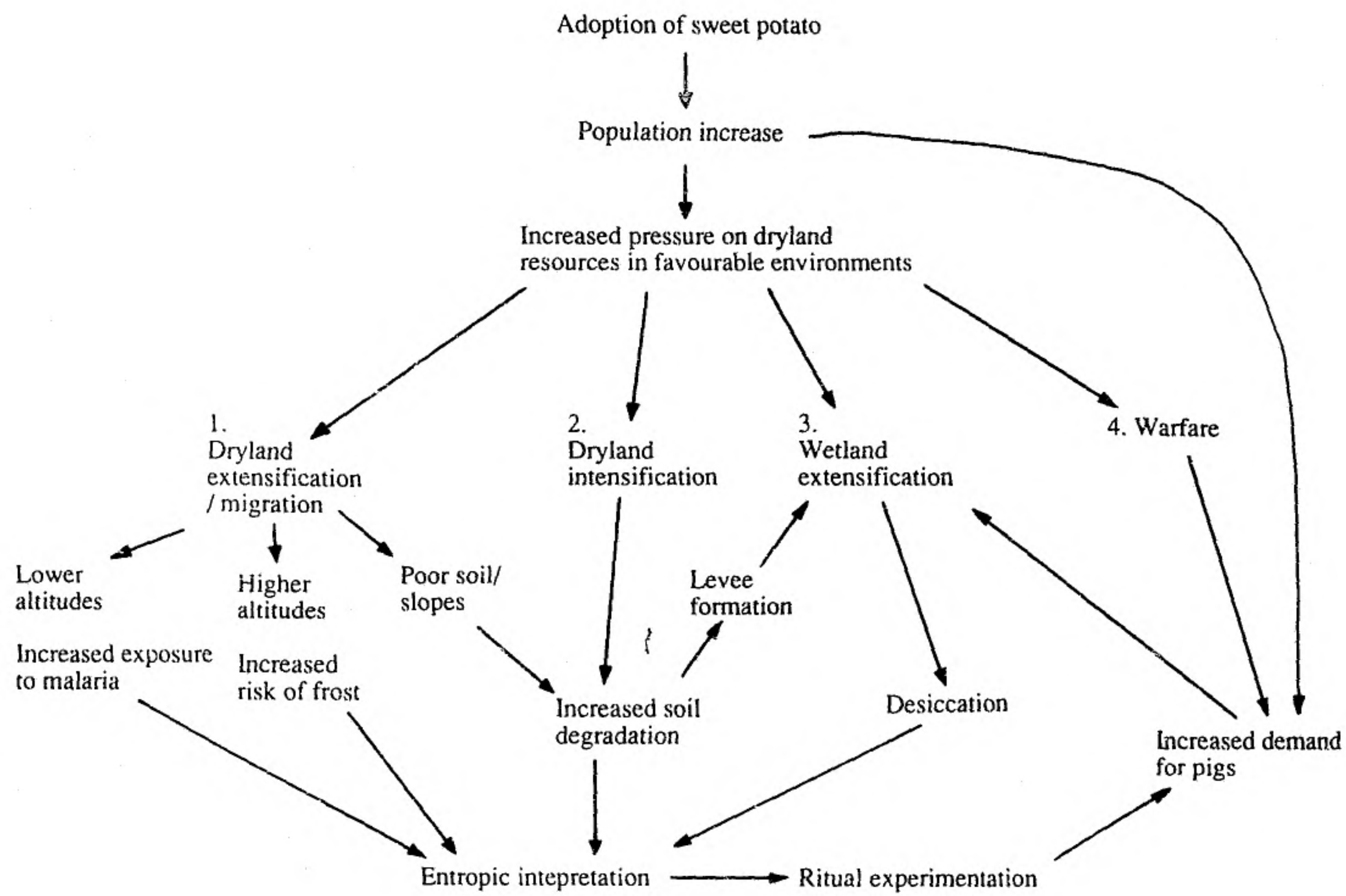


Figure D1 A model of the impact of sweet potato adoption in the Tari region

LIST OF TABLES

TABLE B1

BASINS AND SWAMPS OF THE TARI REGION

	Basin altitude range (m)	Swamp name	Swamp altitude (m)	Swamp area (km²)
A. Higher				
E Mama	2500-2700	-	-	-
Lebani	2250-2400	-	2250	7.7
Margarima	2100-2600	-	-	-
B. Intermediate				
Mogoropugua	1860-2050	Mogoropugua	1860	7.6
Yaluba	1790-1900	Wabupugua	1790	1.3
Paijaka plateau	1750-1980	-	-	-
Koroba/Dalipugua	1705-1800	Dalipugua	1705	6.9
Haeapugua	1650-1810	Haeapugua	1650	17.1
Tari	1550-1850	Urupupugua	1610	3.3
Komo	1540-1800	-	-	-
Benalia	1440-2000	-	-	-
C. Lower				
Lower Tagali valley	1180-1700	-	-	-

TABLE B2

PRAISE TERMS (*KAI MINI*) FOR MAJOR RIVERS OF THE TARI REGION

Gu Tagali	Tagali river, Tari and Haeapugua basins
Gu Hanimu	Hanimu river, lower Tagali tributary
Gu Nagia	Nagia river, Koroba basin, Tagali tributary
Gu Dagia	Dagia river, Tari basin, lower Tagali tributary
Gu A Gabia	Strickland river (Huli term)
Gora Awe	Strickland river (Duna term used by Huli)
Hona Lai	Lai river, Lai valley
Hona Wage	Wage river, Margarima valley

TABLE B3

HULI SOIL TERMS

A. Generic terms:

mu	sand, silt
dindi	soil, clay
ibi dindi	clay
tole	stone, rock

B. Soil types:

mu	
iba mu	sandy alluvial soil
gi mu	coarse sand, gravel, small pebbles
mbi mu	usually identifies Tibito tephra ("darkness sand")
hi mu	dust
dindi	
mbi dindi	Tibito tephra; thin olive-grey gritty tephra, identified as "green" in colour, synonymous with *mbi mu*
dindi mindi	"black soil", commonly a rich dark brown or black humic topsoil, but refers broadly to any friable topsoil; said to incorporate elements of *ibi dindi* and *iba mu*.
dindi dongoma	white clay, good for taro, poor for sweet potato; includes:
pele	very white, waterlogged, gleyed clay
durubu lene	off-white, blue streaks, scratches skin (i.e. contains sand)
ndodabi	very sticky mixed grey clay (*dongoma* mixed with *dindi mindi*)
dindi goloba	red clay
dindi tobe	dull blue clay
dindi pelalahe	grey clay
dindi kui	identified by Wood (1984) as dry yellow soil, but probably refers to all firm drained soil
dindi kabi	yellow-brown alluvial clay; particularly suitable for sweet potato
dindi ambuabi	yellow clay
dindi gade	yellow clay, *dindi abai* with added water; soft (Wood 1984 describes it as massive and hard), not good for crops; heated in fires to produce yellow ochre which is used in mourning; also referred to as *ibi dindi gade*
hagua dindi	gleyed, red-streaked clay
ibi dindi	
ibi dindi abai	red-brown, yellow-brown or yellow-red clay (weathered tephra); soft, good for all crops; with added water, turns into *dindi gade*
ibi dindi gulalume	dry, hard clay, no good at all for crops

C. Ritual and mourning clays:

tagali taya	blue clay
tubitubi	ritual clay
ambua gaga	yellow ritual clay
hare	red ochre
kalo	mourning clay
aga	mourning clay
humburali	mourning clay

D. Miscellaneous soil terms:

dindi kui	firm dry land
iba tabu	peat
waru	mud
lumbura	deep mud
ira dugu	massive buried and fossilized woody/organic layers found in the swamps (also referred to as *bambali kuni*)

Notes:

Huli soil terms are also given, with minor variations in orthography and meaning, by Wood (1984, Vol.I: 59-60) and Powell with Harrison (1982: 31).

TABLE B4

MAJOR *GEBEANDA* RITUAL SITES

A. *Dindi Pongone Gebeanda* in Huli territory

Site:	Location:	Clan owners:
Hibiraanda	Komo	Kuare
Irari	Pureni	Dabu, Wida
Gelote	Pureni	Dagabua
Bebenite	Tari Basin	Yangali
Garaleanda	Tari Basin	Gigira
Dabereanda	Tari Basin	Hondobe
Iba Gunu	Koroba	Baru, Wandu and Gaiyalu

B. *Dindi Pongone Gebeanda* in non-Huli territory

Site:	Ethnic group:	Clan owners:
Dongoya	Bedamini?/Huli	Duguba Wara
Bebealia Puni	Bedamini/Huli	Duguba Bebe
Tai Yundiga	Ipili/Huli	Pulumaini
Mbibi Baite	Paiela	Bibi
Geloro	Duna	Hareke?
Hewari Gambe	Duna	Wanga
Tuandaga	Enga/Huli	Yamabu and Kuari
Malaiya	Onabasulu	Not known

TABLE B5

SOME HULI PHRATRIES

Phratry	**Clan**	**Patronym**
Ayaaya	Ayane	Aya
	Hegani	Aya
	Madaba	Aya
	Tobe	Aya
Biribiri	Poro	Haea
"Yami igini"	Yumu	Bari
Dalidali	Aguma	Dali
"Ni igini"	Baru	Dali
	Beraboli	Dali
	Dega	Dali
	Gaiyalu	Dali
	Gobiya	Dali
	Kambili	Dali
	Naliba	Dali
	Wandu	Dali
Hubihubi	Bari	Hubi
"Ni igini"	Bina	Hubi
	Goma	Hubi
	Humiya	Hulu
	Mora	Hubi
Iraira	Dagima	Ngoari
"Yari igini"	Hiwa	Ngoari
	Mbuda	Ngoari
	Dabo	Ngoari
	Tani	Ngoari
	Telabo	Ngoari

TABLE B6

PERCENTAGE VARIATION IN THE COMPOSITION OF PARISHES

Parish	**Period**	**Residential Categories**		
		tene	***yamuwini***	***tara***
Average[1]	1955-60	27	58	15
Toanda[2]	1955-60	20	58	22
Toanda[3]	1979	49	42	6
Koma[4]	1977-78	50	40	10
Tobani[5]	1977-78	26	37	37
Hambuali[6]	1977-79	25	56	19

Locations and Sources:

[1] Tari Basin (Glasse 1992:246); an average of five parishes
[2] Tari Basin (Glasse 1968:29-30)
[3] Tari Basin (Grant 1979); status of 2% of residents undetermined
[4] Yaluba Basin (Goldman 1981a:466)
[5] Yaluba Basin (Goldman 1981a:466)
[6] Tari Basin (Frankel 1986:43)

TABLE B7

VARIATION WITH ALTITUDE IN MATURATION RATES FOR TARO AND SWEET POTATO

Location	Altitude (m)	Taro (months)	Sweet Potato (months)
North Simbu[3]	2570	-	12
Upper Wage[1]	2550	19-28	7-12
North Simbu[3]	2470	-	11
Porgera[2]	2450	15	12
North Simbu[3]	2400	26	-
Porgera[2]	2300	12-15	10-12
Lebani[8]	2300	14+	7+
North Simbu[3]	2160	-	9
Tambul[5]	2125	12+	-
Telefomin[7]	2000-2150	24	-
North Simbu[3]	2000	-	8
North Simbu[3]	1900	-	7
Jimi Valley[4]	1850	9	-
North Simbu[3]	1800	-	6-7
Porgera[2]	1800-2000	<12	8
Mt Hagen[6]	1650	12-13	8
Mt Hagen[4]	1650	8	-
North Simbu[3]	1540	-	5
North Simbu[3]	1500	11-12	-
Jimi Valley[4]	1200	6	-

Sources:
1. Wohlt (1978)
2. Hughes and Sullivan (1990)
3. Goodbody (in press)
4. Clarke (1977)
5. Bayliss-Smith (1985a)
6. Bayliss-Smith and Golson (1992a)
7. Jorgensen (1981)
8. Ballard, Fieldnotes

TABLE B8

HULI GENERIC CROP TERMS RELATING TO MORE THAN ONE SPECIES

aluba	amaranthus - covers Amaranthus tricolor, A. cruentus and other Amaranthus species.
anga	[high altitude] pandanus - the generic label for both karuka pandanus (Pandanus julianettii: *anga*) and the "wild" pandanus (Pandanus brosimos: *anga mundiya*), but not for the lower-lying marita pandanus (Pandanus conoideus: *abare*).
auwa	*auwa auwa* ("true *auwa*") refers to Rorippa sp., *auwa ibilira* to Cardamine hirsuta.
bambo	cucumber - a pre-contact term for Cucumis sativus, extended to *bambo gini* ("*bambo*-offspring") for the introduced pumpkin (Cucurbita moschata), the latter possibly exploiting the apparent homophony between the Huli (*bambo gini*) and English (pumpkin) terms.
hai	banana - covers plants of both the Australimusa and Eumusa (diploid and triploid) sections, and also all of the wild, inedible banana species known to the Huli.
homa	kudzu - refers to both cultivated (*homa*: Pueraria lobata) and wild forms (*homa bawi*: ?Dioscorea nummularia / ?Pueraria sp.)
ma	taro - used in reference both to cultivars of Colocasia esculenta (e.g. *ma abarapu* for the *abarapu* cultivar) and to possible wild Alocasia taro species (e.g. *ma dale*, *ma andaguru*).
yu	fern - identifies species from a number of different fern genera, including Cyclosurus, Saurauia and Cyathea.

TABLE B9

PRAISE TERMS (*KAI MINI*) FOR CROP SPECIES

Common term:	**Praise term:**	**Scientific term:**
hina	*alu muguba*	Ipomoea batatas
kuli hina	*gayawi kuli*	Ipomoea batatas cv.
ma	*hubi gaea*	Colocasia esculenta
hai	*habo waya*	Musa sp.
hai giabi	*wayali giabi*	Musa cv.
baya	*walu baya*	Holochlamys sp.
yu	*wongoli waeabe*	Unidentified fern sp.
du	*hiwa tege*	Saccharum officinarum
tiabu	*goloba anguma*	Setaria palmifolia
nandi	*nandi gae*	Dioscorea alata
gereba	*uru gereba*	Rungia klossii
tigibi	*ugu tigibi*	Oenanthe javanica
aluba	*hundu aluba*	Amaranthus sp.
mbagua	*mbagua ugumi*	Lagenaria siceraria
abare	*mau walo*	Pandanus conoideus
anga	*doro wale*	Pandanus julianettii
homai	*yuwi*	Pandanus brosimos
palena	*pongo wabe*	Zingiber officinale
yu	*mali wango*	Cyclosurus sp.
mundu	*uru lumuni*	Nicotiana tabacum

TABLE B10

RELATIVE ANTIQUITY OF DIFFERENT SWEET POTATO CULTIVARS

These phases for the introduction of different sweet potato cultivars are based on the views of nine older men from the following areas: Komo (1), Mogoropugua (2), Lebani (2) and Haeapugua (4).

1. First cultivar (agreed upon by all those (7 of 9) who nominated a first cultivar):

muguba / digi hina

2. Pre-contact (numbers in brackets refer to the number of identifications by different individuals; cultivars identified by only one person are not listed):

mogia / magaya (8)
mandiyame (6)
daria (6)
giambu (4)
kuli (4)
tianobi (4)
ma hina (4)
parima / mole / gora awa (4)
dambali (3)
auwaeri (3)
aluguai (3)
irali (3)
aliga (3)
hangapo (3)
gabitugu (2)
kandugua (2)
pe (2)
kauwa (2)
tebolopaia (2)
iri hina (2)

There was some dispute over the following cultivars, for which the first figure is the number of people who identified the cultivar as pre-contact, the second referring to those who thought it was post-contact:

biyu (3/1)
heme (2/3)
hai (1/2)
tugulu (1/2)

3. Early contact (1934 - 1945): (all identified by four or more individuals)

bo hina
dambera
gebe / dama / mame

4. Post-1950: (all identified by two or more individuals)

benalia, dabura, dambera, ganduma, habia, iriyale, kayani, piyu, wanmun, iba, didiman

TABLE B11

A HISTORICAL REGISTER OF HULI CROPS

1. *Ira Goba Naga* ("the time of rotten wood")

   ira goba ("rotten wood")
   nano (mushroom sp.)
   homa bawi (?Dioscorea nummularia / ?Pueraria sp.)
   yagua (fern sp.)
   yu (fern sp.)
   tumbu (?Alocasia sp.)
   ma dale (?Alocasia sp.)

2. *Ma Naga* ("the time of taro")

   ma (Colocasia esculenta)
   hai (Musa cvs.)
   du (Saccharum officinarum)
   tiabu (Setaria palmifolia)
   gereba (Rungia klossii)
   tigibi (Oenanthe javanica)
   aluba (Amaranthus ?tricolor)
   bambo (Cucumis sativus)
   mbagua (Lagenaria siceraria)
   nandi (Dioscorea alata)
   paboro (Psophocarpus tetragonolobus? Lablab purpureus?)
   palena (Zingiber officinale)

3. *Hina Naga* ("the time of sweet potato")

   hina (Ipomoea batatas)
   mundu (Nicotiana tabacum)

4. 1930s - 1950 (Early Colonial Contact)

   Aibika?, Corn, Potato, Peanut, Pumpkin, Shallot, Cabbage, Runner bean (from Kutubu)

5. 1950 - present (Late Colonial Contact / Independence)

   Tomato, Xanthosoma taro, Common bean, Winged bean?, Amaranthus cruentus, Amaranthus caudatus, Pineapple, Watercress, Carrot, Lemon, Lime, Orange, Passionfruit, Pea, Avocado, Capsicum, Choko, Chinese cabbage, Soya bean, Tree tomato, Breadfruit, Chili, Eggplant, Coffee

TABLE B12

HULI WOODEN TOOL TYPES

A. Generic wooden tool terms:

keba / *geba*: spade (properly male)
nama / *lama*: digging stick (properly female)

B. Wood species terms:

These terms are used in combination with tool terms and denote "ideal" woods for each tool, though a wide range of wood species were actually used in the construction of most tool types.

ayaga: Areca sp.
habono: Rapanea acuminatifolia
hewe: Quintinia nutantiflora
mandara: Graptophyllum pictum / Dichroa febrifuga
mbada: Euodia latifolia

C. Tool type terms:

ayaga gembo - short, double-paddled ceremonial spade carried by women in mourning [*gembo*: "rage"]
ayaga keba - long-handled, single-paddled men's spade; 110-133 cm in length, with an oval-sectioned blade 30-50 cm long and 8-14 cm wide
**ayaga nama* - long, single-paddled men's spade?
gula - women's digging stick carried by male transvestite performers (*endeali*) in *tege* rituals
habono - men's digging and grass-cutting stick; similar in size and form to *homabu*, but with a flattened tip; 120-150 cm in length
halimbu - women's walking stick
**hewe* - double-paddled spade?
hina nama - women's short digging stick for extracting sweet potato from hearths (the functional equivalent of *pero* for men)
homabu - men's heavy pointed digging stick; 150-180 cm in length, 6-10 cm in diameter
iba wango / *walango* - long hook made of *aliange* wood; used by men to clear drains and garden surfaces of cut vegetation
ma habono - heavy, round-ended taro dibbling stick used by men; 80-128 cm in length, diameter ranging from 9.5 cm near the base to 5 cm at the handle
mandara nama - women's digging and planting stick; 60-120 cm in length, 2.5-4 cm in diameter; often with thin paddle-blade at one end, 4.5-6 cm in width and 14-33 cm in length
mbada keba - men's paddle-spade, virtually identical to *ayaga keba*; one example measured 118 cm in length, 3.5-4.5 cm in diameter, with a blade 8.5 cm wide and 27 cm long
mondo lawini? - digging-stick used to harvest sweet potato from mounds (*mondo*: mound; *lawini*: girlfriend/boyfriend)
pero - bamboo fire-tongs, exclusively for male use

* These two tool types were described (as "*hewa*" and "*ayaganama*") at Haeapugua in the 1970s (Powell with Harrison 1982). I was unable to find anyone who could recall either term or remember seeing a large double-paddled spade. Double-paddled spades are known from the Wahgi swamp (Gorecki 1978), but none have been found in the swamps of the Tari region. "*Ayaganama*" is presumably a synonym for *ayaga keba*, as it describes the same tool, but the use of the term *nama*, which is usually reserved for women's digging sticks, is puzzling.

TABLE B13

HULI DITCH AND FENCE TYPES

A. Ditches:

gana - generic term for all ditches or redirected watercourses

de gana / hagua gana - an internal drain or plot marker within a garden; typical dimensions: 80 cm wide, 20 cm deep (*iba hagua*: muddy water)

iba ganarua - a small drainage ditch running beneath the eaves of a house; typical dimensions: 50 cm wide, 10 cm deep

iba puni ("water-drain") - a ditch that drains water, used largely in reference to wetland ditches; dimensions range up to 3 m deep and 5 m wide

mabu gana ("garden-ditch") - a standard dryland *gana* around the boundaries of a garden; dimensions range up to 5m deep and 3.5m wide

wai pabe gana / pabeanda gana ("war-fence-ditch") - a ditch dug or deepened around a communal men's house during war; dimensions generally at the larger end of the range of *mabu gana*

hariga - major *gana* used as a thoroughfare by people and pigs

B. Fences:

pabe - generic term for fences; also refers specifically to fences consisting of sharp-tipped stakes (*pi*) planted upright in close formation

amalaya - fence consisting of planks laid side on, piled on top of each other between spaced upright supports

pabe wede - large pig-fence

panga - arched gate within a *pabe* fence or in the base of a major *gana* to control passage

TABLE B14

***MA ULI*: DIMENSIONS AND SPACING OF TARO HOLES**

Location (n)	Mean maximum diameter [range] (cm)	Mean minimum diameter [range] (cm)	Mean depth [range] (cm)
mondo (17) (mounds)	16.5 [12-18]	13.9 [11-17]	23.6 [16-31]
gana habane (21) (base of ditch)	30.4 [22-41]	30.0 [21-34]	25.2 [18-31]
gana nene (11) (ditch wall)	16.9 [15-19]	15.9 [14-18]	24.5 [21-30]
Composite (49)	22.5 [41]	21.2 [11]	24.5 [16-31]

Ma uli spacing on top of *gana habane* (n = 42): mean average of 16.7 cm between holes, with a range between 9 cm and 24 cm.

TABLE B15

CONSTRUCTION SEQUENCE FOR COMPOSTED MOUNDS (*MONDO*)

1. *anda ha* ("clear") - the old garden surface is cleared of grass and leaves

2. *nogo hgla* ("push/lead pigs") - pigs are brought in to root for worms and small tubers left from the previous garden

3. *gini bia* ("play?") - uprooted weeds and old vines are gathered in rows of evenly spaced clusters

4. *go da* ("make mounds") - mounds are constructed using these piles of detritus and the soil of old mounds

5. *hina wai hanga* ("plant sweet potato vines") - vines are planted into the mounds

6. *tani bia* ("weed") - weeding (several events)

7. *hina wa* ("harvest sweet potato") - the sweet potato is either harvested from the mounds in one event, if it is for pig fodder or a feast, or it is taken out progressively as needed over a period of several days for human consumption (Rose (1979) has demonstrated higher yields from progressive harvests of Tari region mounds).

TABLE B16

MONDO **(COMPOSTED MOUND) DIMENSIONS**

LOC	N	ALT	MAH	MAD	MID	HPL	LPL	NSN	NVI	NVA	MIS	MAS
L	25	2260	52	211	189	48	36	15	3	4	35	56
M	25	1870	54	198	188	47	41	7	3	3	30	94
H	20	1650	54	270	248	49	36	13	3	2	-	-
K	10	1540	50	330	226	50	30	28	3	5	37[1]	63[1]
Y	20	1240	45	154	145	45	33	7	-[2]	-	29	47
C	100	----	51	220	196	48	36	12	3	3	32	67

1 - three measurements only
2 - between 3 and 5 vines per planting, depending on size of vine

Abbreviations:

LOC - Location of mounds

L - Lebani, slope garden
M - Mogoropugua, wetland garden
H - Haeapugua, wetland garden
K - Komo, wetland garden
Y - Yokona (Duna), slope garden
C - Composite

N Number of mounds measured
ALT Altitude of location (metres above sea level)
MAH Maximum height of mound (mean average, in cm)
MAD Maximum diameter of mound (mean average, in cm)
MID Minimum diameter of mound (mean average, in cm)
HPL Highest planting position on mound (mean average, in cm)
LPL Lowest planting position on mound (mean average, in cm)
NSN Number of planting stations per mound
NVI Number of sweet potato vines per planting station
NVA Number of sweet potato varieties per mound
MIS Minimum spacing between mounds (mean average, in cm)
MAS Maximum spacing between mounds (mean average, in cm)

TABLE B17

DRYLAND GARDEN SEQUENCE

[Ideal sequence proceeds from 1 to 9]

1. *IRABU* ("primary forest") - forest cover

2. *E MA / E IMA* ("taro swidden garden")

   - *amalaya* (fence) constructed around garden
   - *e hiraga* ("burn the swidden garden") - detritus burnt, larger trees ringbarked or burnt at base
   - *e dindini* ("dibble-plant the swidden garden") - individual sweet potato vines dibbled, harvested after 5 months

3. *O DA BIA* ("do the burning")

   - *e gela* ("clear the swidden garden") / *dugua* ("pull up") - grass cleared with *habono* digging stick, heaped in piles
   - *e hiraga* ("burn the swidden garden") - grass and other detritus burnt and then re-gathered
   - minor tillage; wide range of crops planted; second dibbled planting of sweet potato, which is harvested after 5 months; may include:
   - *e panamondo* ("small swidden mounds") - constructed using burnt detritus and a small quantity of soil cover; harvesting of sweet potato from *e panamondo* signals the onset of complete tillage

4. *E GODA / GODA PEGENA* ("make mounds in the swidden garden")

   - complete tillage
   - mixed garden, with sweet potato planted in large composted mounds (*mondo*)

5. *MABU* ("fixed garden")/ *MONDO MABU* ("mounded garden")/ *E HONDENE* ("mounded swidden garden")/ *E HINA* (sweet potato swidden garden")

   - established mounded sweet potato garden; crop range reduced from previous stages and reduces further during course of two to three sweet potato harvests
   - *labu* ("abandoned garden") - total abandonment of garden

6. *EMBERA* ("in disuse") - short grass fallow (Ischaemum polystachyum, or Imperata cyclindrica if soil is poor)

7. *GAMBETE* ("long grass grove") - long grass fallow (Miscanthus floridulus)

8. *IRABU GAMBETE* ("forest and long grass grove")/ *E TABAYIA* ("swidden Albizia forest") - woody fallow

9. *IRATE* ("woody grove") - secondary forest; reverts to *irabu* (primary forest)

TABLE B18

WETLAND GARDEN SEQUENCE

[Ideal sequence proceeds from 1 to 7]

1. *BOLANGE* ("Leersia grass") - Swamp grass (Leersia hexandra) cover

2. *IBA DADAPU* ("drain the water")

- drainage ditches (*iba puni*) excavated or cleared with *iba wango* rakes
- enclosing ditches (*gana*) dug around garden area
- garden left to dry out for up to two years

3. *LARA* ("wetland swidden")

- *yu / bolange gandu* ("cut tall grass") - tall grass cleared from garden surface
- *de* ("?") - grass cleared along line of *de gana*
- *bugu* ("?") - borders of internal boundary ditches (*de gana*) marked with paddle spades
- internal boundary ditches (*de gana*) dug; spoil spread over garden surface and trampled down over grass
- *lara hina* ("sweet potato wetland swidden") - *habono* digging sticks used to dibble sweet potato vines into garden surface
- *lara tani* ("weed wetland swidden") - garden surface weeded by men and women once every month
- *hina wa* ("take out sweet potato") - sweet potato harvested after 5 months
- *e hina pu* ("harvested swidden garden") - short grass fallow for 1 to 2 months
- *lara* sequence repeated a second time

4. *TABU*

- *lara anda ha* ("sweep wetland swidden garden") - clear grass after fallow
- *e gela* ("clear swidden") - weed and grass detritus cleared
- *e hira* ("burn swidden") - heaped grass and weeds burnt
- *e anda ha* ("sweep swidden") - remaining detritus gathered in heaps
- *dindi wa* ("dig up the ground")/ *e alia* ("dig over the swidden") - soil excavated for mound material
- *mabu hi la* - women break up soil for mounds
- *lara tabu / tabu bo go da* - first mounds constructed
- *hina wai hanga* ("plant sweet potato vines") - sweet potato vines planted in mounds
- *tani bia* ("weed") - garden weeded two to three times
- *hina wa* ("harvest sweet potato") - sweet potato harvested
- *e hina pu* ("harvested swidden garden") - short grass fallow

5. *MABU* ("fixed garden")

- sequence as above for *tabu*, but of indefinite length: sugarcane, Rorippa added, each cropping cycle concluding with:
- *mabu hina pu* ("harvested garden") - short grass fallow

6. *EMBERA* ("in disuse")

- long fallow, followed either by re-excavation of all ditches and re-activation of the garden cycle, or:

7. *PUGUA TAGIRA* ("swamp comes out")/ *BOLANGE* ("Leersia grass")

- full reversion to swamp

TABLE B19

TYPES OF MALE HULI LEADER

Ascribed Ritual Leadership

gebeali ("ancestor man") - men from specific lineages in each clan who hold the responsibility for ritual performances addressed to ancestral *dama* spirits at *gebeanda* ritual sites; also known as *gebe gamuyi* ("*gebe* spell holder").

dindi pongoneyi ("holder of the root of the earth") - *gebeali* leaders at the largest *gebeanda* ritual sites along the the root of the earth (*dindi pongone*), such as Gelote and Bebenite.

Achieved Ritual Leadership

gamuyi ("spell holder") - men with a reputation for possessing a wide stock of *gamu* spells which they provide to others in return for payment.

liruali ("*liru* (ritual stone) man") - men with specialist knowledge and spells who perform rituals addressed to *liru* stones; also, in the context of *tege pulu* rituals, those who instruct the *uriali* officiants in appropriate procedure.

uriali (*uri* (?) man") - officiants at the *tege pulu* ritual; with experience and a series of payments to *liruali*, *uriali* eventually attain *liruali* status.

Ascribed Secular Leadership

agali haguene ("head man") - the senior man in the senior lineage of a clan; ideally, the ultimate repository of knowledge about clan origins (*dindi malu*) and clan genealogies (*malu*) and the sole individual with the right to deliver such knowledge in the formal *damba bi* speech genre in public forums such as disputes; otherwise referred to as *damba bi laga* ("*damba bi* sayer").

Achieved Secular Leadership

agali homogo ("rich man") - men deemed wealthy in terms of their ability to produce or marshal resources such as pigs; synonyms, all of which stress the role of pigs in the status of *homogo*, include: *nogo hini* ("pig owner"), *nogo baga* ("pig killer"), *nogo homogo* ("rich in pigs"). Referred to in contemporary contexts as "big men".

agali wai biaga ("fight maker man") - war leaders; often men with a reputation for initiating, and thus being able to co-ordinate compensation for, wars; sometimes distinguished by the praise term *pari wayali* to mark their ability to stay free from wounds; synonyms include: *bogaga* ("killer"), *wai taya biaga* ("fight maker"), *agali bolenego* ("man killer or killer man").

agali bi laga ("speech sayer") - often synoymmous with the status of *agali haguene*, but generally used in reference to other individuals knowledgeable in terms of lineage genealogies and capable of serving the function of *agali haguene* at disputes; typically said to be capable of negotiating peace between opposing lineages; otherwise referred to as *bi lolene* ("speech sayer").

agali dombeni ("middle man") - men who mediate between clans to both of which they are related. Such men are usually resident along the common boundaries of the two clans, where these are adjacent; synonyms include: *dombeniali*, *agali hanuni* ("middle man") and *dombe kua* ("middle (?)").

TABLE B20

HULI FOOD PROSCRIPTIONS

1. Forbidden to all men:

the *emberali* variety of Highland pitpit
all eel species (see myth in Narrative B2)
insects (with some minor exceptions)
pig intestines, ears and trotters

2. Forbidden to younger married men:

most or all possum species

3. Forbidden to young or unmarried men:

the *hogolo* variety of banana
all yams
the *puruni* snake
ginger (*palena garo*)

4. Forbidden to all women:

all parts of pigs which died of disease
tobacco
all yams
the *hogolo* variety of banana
shoots of the areca palm

5. Forbidden to young or unmarried women:

all insects

6. Reserved for men:

neck and backbone parts of pig

7. Reserved for women:

tail, head and intestine parts of pig

TABLE B21

TYPES OF EXCHANGE AND CONSUMPTION OF PIGS

This list confirms and expands upon an earlier list of exchange types given by Goldman (1981b). Brief descriptions are provided of each type of exchange, the state of the pigs transacted (live or dead) and the number of pigs commonly transacted in each exchange. On the basis of interviews with older men and women, the numbers of pigs transacted in specific exchanges from the 1940s to the present were documented and are given here as common ranges for two particular periods, the 1940s and 1950s (Size 1) and the 1980s and 1990s (Size 2).

Form / ***Type***	**State**	**Size 1**	**Size 2**	**Description**
Compensation				
Nogo abi/damba	L	30	60-750	Major compensation paid by a *wai tene* war leader to his allies for the death or wounding of their members; usually preceded by a *nogo dabua* payment.
Nogo dabua	L	5-6	45	Initial compensation paid by a *wai tene* to his allies for the death or wounding of their members, in order to forestall immediate attempts at revenge on his own kin.
Nogo gima	?	?	?	Payment by a *wai tene* to an ally who has killed an enemy; restricted amongst Huli to the Yaluba, Mogoropugua and Lebani areas, and said to be a Duna custom.
Nogo mabura	D>L	3>30	x	Payment made by an individual who has killed someone in war to the victim's kin or allies; paid only if the killer is identified.
Nogo magu	L	45-60	10	Pigs given as a loan to allies to enable them to meet compensation demands.
Nogo nigi	L	1-2	1	Payment made by a *wai tene* to allies for their injuries; also known as *nogo kaga*.

Form / *Type*	State	Size 1	Size 2	Description
Nogo palipalo	L/D	2	x	Payment of one pig each made between enemies to mark the cessation of warfare, particularly in instances where no deaths or injuries have been sustained on either side.
Nogo tauwa	L	2	2-10	Payment made by a man to the parents or kin of a woman with whom he has had illicit sex (i.e. sex without the prior payment of *wariabu* brideprice). Payments now vary with size according to the marital status of the woman.
Nogo timu	L>D	2>30	22>625	Payment for a victim of war made by the opposing *wai tene* to the victim's kin. Like compensations made to allies, these payments are conducted in two phases: preliminary *dabua* and major *abi* stages.
Marriage / Childhood				
Ma hiralu	D	1	1-10	The former celebration of a infant's survival to the first year, marked by the father killing a pig. Replaced since mission contact by the "birthday" celebration.
Nogo ndi tingi	D	1	x	Pig killed by a man to celebrate his first marriage, of which a quarter section is given to the wife and the stomach is given to an older woman giving instruction (*dagia gamu*) to the wife; also known as *nogo bo dawa hana*.
Nogo tuai	D	1	x	Pig killed by a man before having sexual intercourse with his wife for the first time.
Nogo wariabu	L	14-17	30-45	Pigs paid by a man and his kin as brideprice to the kin of his wife. Effectively a form of compensation, as implied by the etymological gloss *wari* [*wali*] (woman) + *abu* [*abi*] (compensation) (Goldman 1981b).

Form / *Type*	**State**	**Size 1**	**Size 2**	**Description**
Ritual:				
Gebe nogo	D	1-25	x	Pigs given to *gebeali* ritual officiants by individuals sponsoring performances of *gebe* rituals; also known as *burugu abi nogo*.
Iba tiri nogo	D	1	x	Individual pigs sacrificed in the course of *dindi bayabaya* rituals at major *gebeanda* ritual sites; known at the Bebenite *gebeanda* as *nogo yabe*.
Liru nogo	D	1-3?	x	Pigs given to *liruali* ritual officiants by individuals sponsoring a ritual involving *liru* ritual stones.
Tege nogo	D	20-120	x	Inclusive category for all pigs killed and sacrificed at *tege* rituals; terms for pigs employed in individual components of the *tege* ritual include: *balu nogo, pari nogo, wa nogo, guru nogo, ngui mago*.

KEY

State	State of pigs in transaction: L (Live) / D (Dead)
Size 1	Common size of payment in 1940s and early 1950s.
Size 2	Common size of payment in 1980s and early 1990s.
>	Denotes sequence of payments (e.g. 3>30 = 3 pigs in first phase, 30 in second phase of payment).
x	Form of compensation now defunct.
/	No preference for live or dead state in payment.
?	State/size of payment not known.

TABLE B22

AGRICULTURAL POTENTIAL OF DIFFERENT LAND TYPES IN THE TARI REGION

LAND TYPE/ Environmental zone	Mean sweet potato yield (t/ha/yr)	Ratio of pigs/people	Wetlands as %age of total area	Population density 1 (no/km²)	Population density 2 (no/km²)	Yield decline (t/ha/yr)
PEATY WETLANDS						
Haeapugua swamp	11.3-13.8	2.17	40.9	93	137	0.37-0.63
Wabia plains	13.0	2.14	25.6	149	166	0.05
COLLUVIAL/ALLUVIAL PLAINS						
Debi floodplain	10.3	1.71	15.9	188	196	0.006
VOLCANIC ASH PLAINS						
Tari plains	6.3	1.71	3.6	135	138	0.50
Poro plains	8.2	1.56	1.1	92	93	0.43-1.21
Andobare plains	6.9	1.21	1.2	68	70	1.22-1.60
Paijaka plateau	5.1	1.08	0.9	37	39	1.03-2.52

Notes:

1. Population Density 1 provides the raw figures as given by Wood (1984).
2. Population Density 2 represents a recalculated population density which excludes the unoccupied wetland areas of each zone.
3. All figures in this table, other than the recalculated Population Density 2, are derived from Wood (1984).

TABLE B23

A REGISTER OF HULI FAMINE FOODS

auwa ibilira	Cardamine hirsuta
ayage	pith of the black palm (Areca sp.)
emberali	infloresence of Setaria palmifolia cv. (Highland pitpit)
gereba	Rungia klossii (Acanth spinach)
gondo	Floscopa scandens / Commelina sp.
hai	banana pseudostem hearts
hima	inflorescence of Saccharum edule (Lowland pitpit)
hina wai	sweet potato vines and leaves
homa	Pueraria lobata (Kudzu)
homa bawi	"wild" Pueraria (possibly a wild Dioscorea, see Sillitoe 1983:44, n.15 on the Wola *bawiy* tuber, an apparent cognate for the Huli *bawi*)
mamunali	Rubus rosifolius (Raspberry)
tigibi poroporo	Oenanthe javanica (Javanese dropwort)
poge, pogeli	Ficus spp. (Fig leaves and fruit)

taro (*ma*) leaves
bamboo shoots
various mushrooms and fungii (*nano*, *ira lumbi*)
various ferns (Cyathea spp., Cyclosurus spp.)
small sweet potato tubers foraged from fallow gardens, steamed in bamboo tubes (because roasting would consume them completely)

TABLE B24

A CHRONOLOGY OF "NATURAL" HAZARD AND CATACLYSMIC EVENTS OF THE TWENTIETH CENTURY IN THE TARI REGION

? = attribution of date to event not confirmed independently

1912	?Severe drought and frost
1914	?Severe drought and frost
1922	19th Jan.: Major earthquake in Tari region at 10 pm, epicentre at Bosavi (7.5 on Richter scale)
1925	?Very severe drought, known to Huli as "*Ambuamo*"; major food shortage, with heavy mortality
1934	Sept.-Dec.: Minor drought
1935	Severe wet period and ensuing famine concluding in February 1936 [Glasse (in press) probably wrongly attributes this event to 1936]
1938	Heavy rains for 6 to 8 months, moderate food shortages
1941	?Severe drought with frosts and bushfires; Tagali river dries up completely; subsequent major food shortage extending into 1942, with heavy mortality
1943	Heavy rains in early 1943 ?Start of major porcine anthrax epidemic
1945	?Heavy rains for 4 to 5 months; moderate food shortage ?Influenza, dysentery (*ti darama*) epidemics
1954	Anthrax epidemic 3rd Mar.: Major earthquake near Tari, VII on Modified Mercalli scale of felt earthquakes, some fatalities 4th Mar.: Major earthquake near Tari, VI on Modified Mercalli scale of felt earthquakes Sept.-Oct.: Minor food shortage
1955	Oct.-Nov.: Food in abundance Nov.: Major earthquake at Tari, 6 on Richter scale
1956	May: Minor food shortage, Haeapugua Aug./Sept.: Tagali river in flood
1957	Minor food shortage in Koroba area after heavy rains
1958	Anthrax epidemic
1959	Pneumonia epidemic at Margarima
1960	June?: Bushfires at Paijaka 5th Aug.: Full eclipse of the moon noted at Tari Heavy rains, minor food shortage
1961	Heavy rains, minor food shortages Sept.: Minor frosts at Tari

1962	Jan.: Influenza epidemic 4th Feb.: Full eclipse of the sun noted at Tari June: Measles epidemic Nov.: Minor food shortage
1964	24th Apr.: Major earthquake near Tari, V-VI on Modified Mercalli scale of felt earthquakes Apr.-May: Dysentery epidemic
1965	Drought; minor food shortages, followed by good karuka pandanus harvest
1972	Severe frost and drought; minor food shortages
1982	July-Nov.: Severe frost and drought; minor food shortages
1984	1st June: Excessive rain; minor food shortages Flooding in Koroba
1985	17th May: Debi river in flood
1986	28th Oct.: Tagali river in flood
1989	Sept.: Hail storm in Pi-Nagia area destroys crops; minor local food shortage
1990	26th Apr.: Flooding throughout Tari region
1991	4th Mar.: Debi river in flood June-August: Heavy rains, flooding at Dalipugua and Haeapugua 15th Aug.: Flood covers Haeapugua completely
1993	25th Feb.: Heavy rains, floods cover Haeapugua completely July: Major landslide in Puyaro area destroys settlements; no casualties reported 20th Aug.: Major earthquake shock received at 3.05 pm at Tari; District Office breaks in two, no fatalities.

Sources:

Allen et al. 1989; Ballard field and interview notes; Dent 1974; Glasse in press; Leahy 1943; South Pacific Post, 19/9/61; Tari Patrol Reports: 3-54/55:2; 4-54/55:2; 6-55/56:2; 1-57/58; 1-58/59:15; 1-59/60:9; 6-60/61:6; 8-60/61.

TABLE B25

HULI FLUID SUBSTANCE TERMS

iba - water

ibane - grease, fat, sap, juice

> *andu ibane* - breastmilk
> *wi ibane* - semen
> *dindi ibane* - soil "grease"
> *ira ibane* - tree sap

habane/habahe - human fat/grease

> *nogo habane* - pig fat/grease

darama - blood (also *yada* - Goldman 1981a:50)

> *pugua* - menstrual blood
> *kuyanda* - infected, "bad" blood

angibu - pus

hugu - vaginal secretion

pipini - corpse fluids (also "bad" breastmilk - Goldman 1983:94)

gabuni - dryness, menopausal woman

> *dindi gabu* - dry, infertile soil
> *ira gabu* - dry, dead wood

TABLE C1

WOOD'S MODEL FOR AGRICULTURAL EVOLUTION IN THE TARI AREA

PHASE	APPROX. DATES (years B.P.)	AGRICULTURAL DEVELOPMENT		KEY FACTORS
		WETLANDS	DRYLANDS	
1	9000-5000	intensive cultivation	low intensity shifting cultivation	. greater fertility and productivity of wetland soils . concentration of activities in wetlands
2	5000-300	intensive cultivation	gradual intensification with shorter fallow periods	. population increase . ecological requirements of taro and yam . environmental degradation
3	300-30	decrease in population and dis-intensification in some areas	intensification involving expansion of cultivation and longer cropping periods	. different ecological requirements of sweet potato . increased numbers of people and pigs
4	30-present	intensification with expansion of area under cultivation	disintensification in degraded environments	. environmental degradation . greater fertility of wetland soils . population increase . population mobility

Source: Wood 1984, Vol.I: Table 7.2

TABLE C2

CHANGES IN THE AREA OF UNRECLAIMED WETLAND AT HAEAPUGUA, 1959 - 1992

Year	Unreclaimed wetland (km^2)	Inter-coverage period (years)	Inter-coverage change (km^2)
1959	8.3139		na
1972	3.6619[a]	13	na
1978	7.1114	6 (19)	- 1.2025 (85.5%) (1959-78)
1989	7.0788[a]	11	na
1992	7.6054	3 (14)	+ 0.494 (106.9%) (1978-92)

Maximum and minimum areas of unreclaimed wetland, 1959 - 1992 (km^2):

Maximum:	9.3548
Minimum:	5.3330
Max./Min. differential:	4.0218

[a] = only partial coverage of map study area

TABLE C3

HAEAPUGUA WETLAND HOLDINGS BY PARISH

Clan	Wetland area (km^2)[b]	Percentage of total area
Wenani	0.683	7.4
Munima	0.326	3.6
Walete[a] (Tani)	1.931	21.1
Dobani	0.858	9.4
Taibaanda[a] (Tani)	3.254	35.5
Yumu	0.075	0.8
Hiwa[a]	0.102	1.1
Dumbiali[a] (Tani)	0.412	4.5
Telabo[a]	1.528	16.7
TOTAL	9.172	

Notes:

[a] - Yari phratry clans
[b] - calculated using figures for the maximum extent of the map study area wetlands between 1959 and 1992.

TABLE C4

HULI TERMS FOR STONE AXE BLADES

Term:	**Comment:**
abina	Traded from *obena* (Ipili/Enga). Possibly a generic label for blades from the Jimi Valley sources, where one of the quarries is called Apin (Burton 1984:179). A similar term, *apina*, is used by Enga trade sources and is presumably the immediate origin of the Huli term.
dongoma	Traded from *obena* (Ipili/Enga). Literally 'light-coloured'.
gundina	Traded from *obena* (Ipili/Enga). Reflects the use by Enga trade sources of the term *kundina*, which Burton (1984:221) suggests is a possible corruption of the name of the major Tuman River quarry at Kunjin and which may correspond to blades from that source.
mugalo	Traded from *obena* (Ipili/Enga). Refers to Mt. Mugalo, on the upper Lagaipa river, a prominent feature along the major trade route from central Enga to the Huli.
pongorali	Traded from *obena* (Ipili/Enga). Probably a corruption of the name of the locale, Porgera, through which these blades reached Huli.
warabia	Traded from *duna* (Lake Kopiago: Duna-speakers). Possibly a corruption of the name of the closest western source, the Wario river, which has been identified as the source of at least some lenticular *warabia* blades acquired from Huli (Swadling 1983:82).
dindi ayu	Literally 'earth axe'. Refers to blades manufactured by Huli from local stone, but also (confusingly) to blades from any other source found buried in the soil and reworked.
tamabu	Traded from *hewa* (Lake Kutubu: Fasu- and Foi-speakers).
batagua	Large ceremonial axe blades from the Jimi and Tuman quarries traded to Huli briefly and in very small numbers only after contact.

Note:

Glasse (1968/69) recorded two additional Huli terms for axe blades, komoga and kombi, but I have been unable to find anyone who could confirm or elaborate upon either term.

TABLE C5

AN INVENTORY OF TYPES OF HULI RITUAL STONE (*LIRU*)

Stones employed in Huli rituals are sometimes referred to under the generic label of *liru*, after the most common form of ritual stone, though specific terms are more usually used. Another generic term for ritual stones, which appears to be Duna in origin as it has no specific referent amongst Huli, is *auwi*. Of the specific categories listed below, all except *guru wali* have been indentified with the aid of examples of the stones in question. The description of *guru wali* stones draws on three independent accounts which are all in close accord with one another.

Huli term:	Comment and description:
bari numbi	circular stone club heads with drilled central holes, employed in the *yabo* ritual.
erepole	"broken-back": corrugated crescent-shaped fossils, generally dark in colour. Of two specimens examined, one was identified as an ammonite, the other as an Inoceramus mussel (J.Chappell pers.comm.).
guru wali	"*guru*-woman" (male *dama* spirit): cylindrical stones with appendages held to be "arms", sometimes sufficient in number to include "legs".
hone	"light-coloured": tan- or light-coloured cylindrical stones, varying in cross-section from oval to circular (cf *ni hone*, *wanelabo keba*).
igiri labo	"boy-water spirit": stone pestles of all shapes and sizes.
liru / *liru kui*	"*liru*-bone/real": a broad category referring to rough-surfaced spherical or slightly elongated stones.
nanabe	a general category employed for most carved stone figures, including anthropomorphs, birds, etc..
ni tangi	"sun-hat": stone mortars of all shapes and sizes.
ni habane	"sun-egg": smooth, black spherical stones, commonly 8-12 cm in diameter, employed in *toro* sorcery. Two examples have been identified as chert cobbles (J.Chappell pers.comm.).
ni hone	see *hone*.
wane labo / *wane labo keba*	"female water spirit-digging stick": cylindrical stones, similar in form to *hone* though usually "flatter" in section, and generally light green in colour.
wane labo andu	"female water spirit-breast": thin black glassy stones.

TABLE C6

WALOANDA SURFACE SURVEY COLLECTION

Block	Area (m²)	%E	BD	Artefacts						AN	MN	AD
				Fl	A/AF	*Liru*	CS	O	TB			
1	12425	30	D	13	1		10+			14	47	3.8
2	3609	15	D	2						2	13	3.6
3	5286	80	DD	8						8	10	1.9
4	6147	10	M	3	1					4	40	6.5
5	3830	2	L							0	0	0
6	6950	5	L							0	0	0
7	2222	5	D							0	0	0
8	8702	30	D							0	0	0
9	5264	60	L	8		1				9	15	2.8
10	11646	35	LL	39	3		40+	1	1	44	126	10.8
11	3177	30	M	5						5	17	5.4
12	3392	35	LL							0	0	0
13	5325	45	L	5	1					6	13	2.4
14	12857	25	L	52	1		10+	1		54	216	16.8
15	5504	25	L	6						6	24	4.4
16	4242	40	LL	8						8	20	4.7
17	5040	95	LL	6						6	6	1.2
18	11466	85	L	5						5	6	0.5
19	6670	55	L	63		1				64	116	17.4
20	10136	66	L	48		1				49	74	7.3

[Column notes on next page]

Column Notes, Table C6

%E - percentage of block surface area exposed
BD - impressions of background density of non-artefactual stone material in exposed surface: DD (very dense), D (dense), M (medium density), L (low density), LL (very low density)
Artefacts: Fl - Stone flakes
A/AF - Axes/Axe fragments
Liru - Ritual stones (mortars, pestles, stone carvings, *liru kui*)
CS - cooking stones
O - ochre stubs
TB - tanged blade
AN - Artefact numbers (total number of artefacts, excluding cooking stones)
MN - Modified number (AN/%E x 100)
AD - Artefact density (predicted surface density of artefacts per 1000 m2; AD = MN/Area x 1000)

TABLE C7

LAYER DESCRIPTIONS FOR THE BASAL WHITE CLAY UNIT AT HAEAPUGUA

This composite description of the stratigraphy of the basal "white clay" unit at Haeapugua draws primarily on descriptions from the LOB site, but also incorporates observations made at the LOC and LOD sites (Appendix C10). The sequence is described from the known base, layer 1, up to the highest layer located in association with other identifiable components of the sequence.

Layer	Shell	Description
1		Olive (5Y/5/3) silty clay, weak pedality, slightly sticky, faint internal organic banding.
2		Dense black (5Y/2.5/1) silty loam, crumbly, weak pedality, slightly sticky, with massive woody content.
3a	x	Olive (5Y/5/3) silty clay, weak pedality, slightly sticky, faint internal organic banding.
3b	x	Thin (0.1 - 0.2 cm) shell band.
3c	x	Very dark greyish brown (2.5Y/3/2) light sandy clay loam, brittle/crumbly, apedal, slightly sticky.
3d	x	Olive (5Y/5/3) light clay, apedal, slightly sticky, faint internal organic banding.
4	x	Very dark greyish brown (2.5Y/3/2) light sandy clay loam, brittle/crumbly, apedal, slightly sticky.
5	x	Olive (5Y/5/3) light clay, apedal, slightly sticky.
6		Black (2.5Y/N2) silty loam, crumbly, weak pedality, slightly sticky, massive wood content increasing in size towards the top of the layer where the top 10 cm is solid wood, capped by a thin 1 cm band of carbonised organic material. Also contains small fragments of limestone (<5%).
7		Dark olive grey (5Y/3/2) fine sandy tephra, brittle, non-sticky, moderate pedality.
8a	x	Very dark greyish brown (2.5Y/3/2) light sandy clay loam, brittle/crumbly, apedal, slightly sticky.
8b	x	Olive (5Y/5/3) light clay, apedal, slightly sticky, faint internal organic banding.
9		Dark olive grey (5Y/3/2) fine sandy tephra, brittle, non-sticky, moderate pedality.
10	x	Olive (5Y/5/3) light clay, apedal, slightly sticky, faint internal organic banding.

Layer	Shell	Description
11		Dark olive grey (5Y/3/2) fine sandy tephra, brittle, non-sticky, moderate to high pedality.
12a	x	Very dark greyish brown (2.5Y/3/2) light sandy clay loam, brittle/crumbly, apedal, slightly sticky.
12b	x	Olive (5Y/5/3) light clay, apedal, slightly sticky, faint internal organic banding.
13		Dark olive grey (5Y/3/2) fine sandy tephra, brittle, non-sticky, moderate to high pedality.
14	x	Olive (5Y/5/3) light clay, apedal, slightly sticky, faint internal organic banding.
15		Very dark grey (5Y/3/1) fine sandy tephra, brittle, non-sticky, strong pedality above water table, "cemented" below water table.
16		Olive (5Y/5/3) light clay, apedal, slightly sticky, faint internal organic banding.

x = freshwater shell fragments present

TABLE C8

DIMENSIONS OF HOLE FEATURES FILLED WITH DARK GREY CLAY, DOBANI / WALOANDA AREA EXCAVATIONS

Site	Feature	Max.width (cm)	Max.depth (cm)
LOB(ii)	E	6 x 15	9
	F	5 x 5	7
	G	9 x 10	8
LOC	C	13 x 13	12
	D	11 x 13	27
LOI	A	9 x 12	6
LOJ	C	4 x 6	5
	D	5 x 7	11
	E	20 x 25	10
	F	6 x 10	5
	G	8 x 8	7
	H	8 x 10	7
	I	10 x 14	6

TABLE C9

RADIOCARBON RESULTS FROM ARCHAEOLOGICAL SITES IN THE TARI REGION, BY PHASE

Phase	Cal BP result	Site/sample	ANU code
2C	560 (**310**) m	LOQ/c	8809
	770 (**490**) m	LOU(i)/b	8310
	660 (**490**) 240	LOU(ii)/b	8757
	690 (**500**) 50	LOJ/d	8754
	670 (**540**) 430	LOC/a	7808
	780 (**630/610/560**) 420	LOL/3a	8307
2B	1280 (**1130/1110/1090**) 960	LOJ/e	8755
	1710 (**1130/1110/1090**) 630	LOJ/f	8756
	1420 (**1160**) 770	LOQ/b	8808
	1280 (**1170**) 1060	LOF/a	7624
	1420 (**1300**) 1160	LOE/a	7625
2A	2500 (**1990**) 1520	LOI/a	7806
	2940 (**2350**) 1880	LOJ/a	7800
1C	9400 (**9260**) 9140	LOO/a	8758
1B	14,250 (**12,900**) 10,980	LOA/c	7623
1A	18,840 (**18,130**) 17,340	LOC/b	7809
	19,040 (**18,710**) 18,400	LOJ/b	7801
	21,550 (**21,040**) 20,490	LOJ/c	7802

TABLE C10

ARCHAEOLOGICAL PHASES AND PALAEOENVIRONMENTAL ZONES IN THE TARI REGION

Age BP	Archaeological Phases	Palaeoenvironmental Zones
>36 000	x	Ia
	x	
33 000	x	----------
	x	
21 000	----------	
		Ib
	1A	
18 000	----------	----------
	x	
13 000	1B	
	x	II
9500	1C	
	x	
8500	x	----------
	x	
	x	
	x	IIIa
	x	
	x	
3200	x	----------
	x	
2500	----------	
	2A	IIIb
2000	----------	
	x	
1700	x	----------
	x	
1300	----------	
	2B	
1000	----------	IVa
	x	
600	----------	
	2C	
200	----------	----------
	3	IVb
0		

x = no archaeological evidence

TABLE C11

SWAMPS AND CATCHMENT AREAS OF THE TARI REGION

Swamp	Elevation (m)	Swamp area(km^2) [S]	Catchment area(km^2) [C]	S/C Ratio [S/C]	C/S Ratio [C/S]
Lebani	2250	7.77	143.83	0.054	18.5
Mogoropugua	1870	7.60	63.58	0.119	8.4
North	1870	4.11	24.28	0.169	5.9
South	1870	2.87	38.69	0.074	13.5
Wabupugua (Yaluba)	1790	1.32	63.91	0.021	48.5
Dalipugua (Koroba)	1705	6.97	231.44	0.030	33.2
Haeapugua	1650	17.10	1075.99	0.016	62.9
Urupupugua (Tari basin)	1610	3.32	5.11	0.650	1.5

LIST OF APPENDICES

APPENDIX A1

THE IPOMOEAN REVOLUTION DEBATE

1. Introduction

This appendix sets out some of the details of the Ipomoean revolution debate; the significance of this debate for my thesis is described in Chapter A2. A review of Watson's initial formulation of an Ipomoean revolution and the subsequent criticism this attracted is followed by a double movement, from the early archaeological results in the Wahgi valley, to anthropological models developed from those results, and back to the re-interpretation of the archaeology. A concluding section offers a broad critique of the ahistorical character of the debate taken as a whole.

2. J.B.Watson, 1964-1967: an "Ipomoean Revolution"

As a member of the first "wave" of anthropologists to work in the Papua New Guinea Highlands (Hays 1992), the period of Watson's fieldwork in the Kainantu area of the Eastern Highlands (Figure A2), starting in 1953, furnished him with a sense of the changes that had accompanied administrative contact (Watson 1983:327), a perspective not afforded to many later ethnographers of the Central Highlands valleys. This sense, in turn, prompted him to consider the scope for change in pre-contact society and to propose, in a series of papers (1964, 1965a, 1965b, 1967), that 'the Highlands which ethnographers have been examining for about three decades do not, in many fundamental respects, represent a long-established or stable situation, socially or culturally' (1965b:442).

At the core of this assertion lay Watson's observation that the sweet potato, the staple crop throughout much of the Highlands region, appeared to be a recent introduction; in the only archaeological writing on the Highlands then available to Watson, Susan and Ralph Bulmer had speculated that none of the staple crops available prior to sweet potato - taro, kudzu (Pueraria lobata), banana or yam - could have maintained the population densities then sustained by sweet potato (S. and R. Bulmer 1964:47). The Bulmers' three-stage system for the historical development of Highlands societies drew on their recently published radiocarbon date of 10,350 ± 140 BP (Y-1366) from the rock-shelter site of Kiowa (S.Bulmer 1964). An initial period of Highlands occupation, Phase I, was characterised as a 'pre-neolithic' hunting and gathering economy (S. and R. Bulmer 1964: 72-74). Phase II, heralded by the appearance of lenticular-sectioned axe-adzes, saw the development of agriculture based on taro, banana, yam, Pueraria lobata, and sugar cane, and Phase III the introduction of intensive sweet potato cultivation. This introduction, they suggested, must have been followed by 'economic and social revolutions' (ibid:52) and 'major redistributions of population' (ibid:47). Watson's contribution was to pursue the likely consequences of this introduction.

Watson's evidence for the recency of sweet potato was largely synchronic, reflecting his belief that local history was inscribed upon the present. Unlike the presumed pre-Ipomoean staples, sweet potato had almost no ritual significance in the region; the Huli were said to distinguish in their genealogies between "men of taro" and "men of sweet potato"; even those groups, such as the Agarabi and Tairora of the Eastern Highlands with whom Watson worked, who maintained that they had "always" had sweet potato, identified external origins for all known cultivars of the crop; finally, the 'incomplete' adoption of sweet potato within the region suggested that the crop had been available to groups such as the Telefolmin, who were still committed to other staples, for only a short period of time. A comparison of the relative antiquity ascribed by Highlanders to other New World crops such as tobacco, maize and cassava allowed Watson to speculate on variation in the rate of acceptance and incorporation of the different crops. Noting that the tuberous Pueraria lobata was identified in some communities as a functional equivalent for sweet potato, Watson then raised the possibility that this little-known tuber might have served as the pre-Ipomoean staple (1964).

Defining as "Ipomoean" 'that which has developed with the adoption of the sweet potato... or which is attributable to it' (1965b:443), Watson proposed that 'the Central Highlands of New Guinea have been remade within the last three centuries through the introduction of... sweet potatoes, which, under the prevailing conditions, proved to be an innovation of radical possibilities' (1965a:307). He proceeded to outline some of these possible changes in five fields: subsistence, demography, social structure, warfare and work patterns. Changes in subsistence, other than the obvious switch from existing staples to sweet potato, may have included the development of new technologies: complete soil tillage, fencing and tree-fallowing. More significant was 'the possibility that swine-keeping either developed or achieved its present importance largely thanks to the new horticulture' (1965b:444). Demographic change may have taken the form of a population explosion, and the adjustments required of groups adapting to restricted territories and increased numbers could perhaps explain the 'development of unilineality' in Highlands social structure and the origins of warfare on the scale known from early accounts of contact. In an aside, Watson suggested that the common identification of the pre-Ipomoean staples as "male" and sweet potato as a "female" crop might reflect changes in the sexual division of labour, from a male labour-intensive economy prior to the adoption of sweet potato, to a sweet potato economy that required higher commitments of female labour.

More interesting, perhaps, than Watson's specific vision of historical change, was his general model of the dynamics of a crop revolution. The advantages of sweet potato now apparent to Highlanders or agronomists would not have been self-evident to people already commited to other staples and other economies. Existing traditions might well have served as a 'brake' on the shift to sweet potato (1965b:449), and Watson pointed to the Telefolmin and Ok Sibil groups as examples of "taro areas" in which the sweet potato had not emerged as the dominant staple. But if 'the taste of a strange root... alone [were not] enough to recommend it' (1965b:442), the advantages of sweet potato as pig fodder, and the "Jones effect" (ibid:442), the need to keep up with neighbours benefiting from such a productive advantage, would have served equally as incentives to experiment with the innovation. The probable success of initial experiments with sweet potato as pig fodder might then have 'accentuated a commitment to the new crop, giving a kind of ecological feedback' (1965b:444). Local differences in pre-Ipomoean economies and cultural preferences were thus reflected in variation in the extent and recency of adoption of sweet potato. Significantly for the argument about agency in my thesis, he matched the persistence of some inter-regional pre-Ipomoean cultural differences against the tendency of sweet potato adoption to eclipse other forms of variation (1965b:449).

Aware of the complexities and the scope for variation that he had already canvassed, Watson drew on these insights to propose four different models for the impact of the introduction of sweet potato (1965a:302-303):

1) The "explosive" model in which pre-Ipomoean economies founded on hunting and gathering with 'supplementary' horticulture were radically transformed by the introduction both of sweet potato and intensive horticultural techniques.

2) The "gradual" model in which an established pre-Ipomoean system of horticulture supplied up to half of food requirements. Sweet potato subsequently displaced existing staples and allowed for expansion into new areas, effecting a minor revolution with agriculture providing up to 90% of subsistence needs.

3) A combination of the gradual and explosive models reflecting regional variation in pre-Ipomoean economies.

4) A 'slow and gradual transition to dependence upon the sweet potato [as] a logical fourth possibility', which envisaged pre-Ipomoean populations 'already dense, preponderantly horticultural and sedentary'.

With little but the marginal evidence of rock-shelter excavations available to him, Watson declared his preference for the first model, the most radical of the available choices: that 'the Central Highlands were occupied by scattered bands of hunters practising supplementary cultivation until the introduction of sweet potato' (1965a:301). As Feil (1987:29) has suggested, Watson's preference reflected his understanding of the conditions in the Kainantu region with which he was most familiar. Nevertheless, it was a choice that led him then to the difficult position of having to propose annual rates of population increase of up to 1.5% to account for the transition from hunter-gatherer bands to the dense ethnographic population of the 1960s in only 300 years (1965a:302)[1].

The lasting value of Watson's contribution to the debate rests not on his specific vision of the past but in the method of his approach, which he described as 'ethnological reconstruction' or 'conjectural history' (1965b:442). Throughout, his writing maintained a sense of the range of possible historical action and decision, often qualifying (to the point of contradicting) his own proposals: sweet potato, while revolutionary in its implications, may have served 'as an accelerating and consolidating factor, probably not as the one which initiated horticulture' (ibid:441); he 'hesitate[d] to conclude that complete tillage arose only after the adoption of sweet potatoes' (1967:95); and his concern with the "gradualist" view of change was 'not to attempt to dispose' of it (ibid:92), but rather to explore its implications.

Watson's emphasis on the range of influences brought to bear on the decisions of historical actors was crucial: 'We need a notion of this revolution... that does not neglect the sociological factors in favour of the purely technological ones or in favour of the simple concept of a more efficient commissariat rationally chosen by men afforded the choice' (1965b:442). In placing human society in the Highlands at the centre of his conception of history, Watson was also adamant that those societies had to be viewed historically: '[t]hat major ecological and demographic changes may have occurred in the Highlands in recent times is obviously not a possibility to which the social or cultural anthropologist can be comfortably indifferent, any more than the geographer or prehistorian' (1967:98).

3. The Canberra Seminar, 1967

The discovery in March 1966 of wooden artefacts in the swamp at the Manton site in the Wahgi Valley (Figure A2) led to the excavation there of buried drainage systems during June and July of the same year. Shortly after, a wooden digging stick from the site yielded a radiocarbon result of 2300 $\pm$ 120 BP (ANU-44) (Golson et al. 1967, Lampert 1967). In the absence of Jack Golson, a principal member of the archaeological team at the Manton site, a three-day seminar was convened in Canberra in April 1967 by Peter White and Harold Brookfield in order to reconsider Watson's proposed Ipomoean Revolution in light of the new finds. Papers were given at the Canberra seminar by an archaeologist (White), anthropologists (Chowning and Dornstreich), a linguist (Wurm), geographers (Brookfield and Waddell), palynologists (Wheeler - later Powell, and Flenley), and a demographer (Van de Kaa). Handwritten

1. Throughout, Watson's calculations of the dates of population growth or sweet potato adoption were hampered by his belief that the volcanic 'time of darkness', identified as a critical temporal marker in oral historical traditions across the Highlands, referred to the eruption of Krakatoa in 1883 (1963). Blong (1982) has since argued that this event represented not Krakatoa but a tephra fall from an eruption at Long Island dated to between 1640 AD and 1680 AD; further discussion of the dating of this event is contained in Appendix A3. Parts B and C of this thesis deal extensively with the effects of the Long Island eruption in the Tari region.

or typed summaries and transcripts of the papers by Wheeler (1967), Dornstreich (1966) and White (1967a) give some idea of the general tenor of the seminar, described by its convenors in their published summary of proceedings as 'critical of Watson's argument and assumptions' (Brookfield and White 1968:44)[2].

The summary by Brookfield and White ignored many of Watson's own qualifications and represented his 'hypothesis' as a single, unitary construct, derived from his preference for the most radical of the proposed models, a misrepresentation that has subsequently become entrenched in the literature (eg Lampert 1967:308, Powell et al 1975; Golson 1976d:205 is perhaps the exception that proves the rule). While Watson would have done 'better to await the diachronic evidence now beginning to emerge' (Brookfield and White 1968), his use of the synchronic evidence was itself challenged. His characterisation of Highlands societies was questioned, as were his models of population growth and his vision of pre-Ipomoean 'patrilocal' bands.

But, continued Brookfield and White, 'the most telling single piece of evidence against any hypothesis of an "Ipomoean revolution" in <u>cultivation methods</u>' (1968:47, my emphasis) was deemed to be the archaeological discovery of the Wahgi drainage systems. '[N]o major <u>technological</u> revolution... was required to permit the adoption of sweet potato' (1968:49, my emphasis), and the authors felt that a position had been reached 'in which the introduction of the sweet potato might cease to be of major relevance <u>to the development of agricultural methods</u> in the New Guinea Highlands' (1968:50, my emphasis). This association of revolution with radical technological change appears to have missed completely the focus of Watson's proposals, which took broader social change as the measure of revolution[3].

The substitution of an emphasis on technological change for Watson's social changes then allowed Brookfield and White to dismiss his other proposals: they found it 'extraordinary that Watson should suggest a necessary association between pigs and sweet potato, for pigs are omnivorous' (1968:47), and countered with

> a very simple hypothesis... Sweet potatoes may simply have become dominant in those areas where they offered a notably higher return for comparable inputs of land and labor - a pragmatic hypothesis which accords with what we know of New Guinea farmers and has minimal need of Watson's differentially operating "Jones effect"
>
> Brookfield and White 1968:49[4]

Watson's papers, including his plea for an emphasis on the sociology of agricultural change, could now be dismissed with a reference to their refutation by the archaeological evidence from the Wahgi Valley (Yen 1974:318, Golson 1976d:206).

The Canberra seminar was to have a lasting effect on the course of archaeological research in the Papua New Guinea Highlands; some of the more significant legacies are considered here. The first of these was the belief in the primacy of the archaeological record over 'the perilous quagmire of conjecture' (Brookfield and White 1968:51)[5].

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2. Criticism of Watson at the Canberra seminar and in the summary by Brookfield and White was perhaps exacerbated by the rather hasty and inelegant application of his model by Heider (1967).
3. A clearer definition of what the Canberra seminar may have perceived as the requirement of a revolution emerges from White's later writing: 'a fairly swift economic change associated with the arrival of some new artifacts, something which one could call a "neolithic revolution"' (1972:148).
4. The use of the term "farmer" is itself revealing, imparting a universal individualism to agricultural practice which implies that "farmers" in New Guinea behave independently and make "rational" decisions in much the same way as "farmers" elsewhere. It also neatly divorces "farming" decisions from other cultural contexts.
5. Curiously, within the same sentence, Brookfield and White cited the 'speculations' of the Bulmers (in a paper the Bulmers themselves introduce as 'avowedly speculative' (S. and R. Bulmer 1964)) as support for their own model.

This position, apparently untroubled by questions of interpretation, both obscured the role of conjecture in all archaeological reconstruction and effectively severed dialogue between archaeologists and anthropologists for the next decade. The preference for 'evolution' rather than 'revolution' in explaining 'agricultural transformations' reflected Brookfield's earlier 'working hypothesis' (conjecture?) 'that the highland concentrations are of very long standing, and that they have long depended on tuber cultivation... locally modified to suit local conditions over a long period of time' (1961:444). This gradualist assertion has, over time, assumed the status of a creed:

> the complexity of contemporary Highlands societies has its roots not in single events, such as the introduction of sweet potato or pigs, but rather as a natural outcome of uninterrupted processes which have lasted for more than 9000 years
>
> Gorecki 1986:165[6]

Closely related to this preference for "evolutionary" explanation was the focus proposed by Brookfield and White on ecology, technology and population as the principal variables in history:

> No Ipomoean revolution is necessary to explain the evolution of intensive methods of agriculture, and the question is thus turned back properly to that of population concentration.
>
> Brookfield and White 1968:50[7]

Human agency, in this view, operated through the medium of population growth and technological innovation in reaction to ecological change, and the section that follows illustrates the application of such theory to the archaeological site at Kuk. For archaeologists, the principal response to this initial exchange between archaeology and anthropology was to take their cue from the work of ecologically oriented geographers working in the Highlands region (Clarke 1966, Waddell 1972a,b).

4. J.Golson, 1966 - 1977: the Site Complex of Kuk

After the discovery and initial excavation of the Manton site at Warrewau Tea Plantation in 1966, reported at the 1967 Canberra Seminar, attention shifted to the nearby Kindeng site where a season of excavation was undertaken in 1968. The discovery in 1969 by Jim Allen of the major site at Kuk plantation (Figure A4) then led to a series of six field seasons of excavation, directed by Golson, between 1972 and 1977 that produced the bulk of the archaeological material now available[8]. The complex of sites referred to here collectively as "Kuk" dominates the archaeological landscape of Highland New Guinea, by virtue of its size and internal complexity, the research effort and analytical literature devoted to it and its significance[9]. The significance of Kuk, both for the region, and for world archaeology over the 9000 year span of the site, has been carefully sketched out over twenty-five years by its principal investigator, Jack Golson. The long shadow cast by Kuk over the archaeology of the rest of the Highlands has led to charges of a "Kuk-centric" view of regional archaeology

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6. See also F.J.Allen 1977:186, White with O'Connell 1982:189, White 1984:1.

7. A claim that found a precedent in Brookfield's earlier conclusion that the 'question [of the correlation between population density and agricultural intensity] is thus thrown back to the problem of population increase itself' (1962:253).

8. By 1976, Golson could refer to the results from the digging of 2000 m of drains, the recording of a further 4000 m of drain wall, the clearance of almost 100,000 m^2 of grass to examine surface features, hand-probing of a 28,000 m^2 block to plot the most recent drainage system and the excavation of five house sites (1976d:210).

9. The term "Kuk" is used here to refer to the individual site of Kuk plantation, and "the Kuk complex" to refer to the entire complex of Wahgi valley wetland sites, including those at Draepi/Minjigina, the Manton site, Kindeng, Kuk, Mugumamp, and the North Wahgi swamp. The locations of these sites are illustrated by Golson (1976d:Fig.2) and Harris and Hughes (1978:Fig.1).

(V.Watson 1989); but with little opportunity for research on a comparable scale in the foreseeable future, the attention paid to Kuk must be seen increasingly as a virtue made of necessity.

Golson's interpretation of components of the Kuk sequence has altered since 1977 but the theories current during the period of excavation, expressed in a series of publications from 1967 to 1977, obviously influenced his approach to fieldwork on the site and significantly structured the collection of the archaeological evidence. Full publication of the archaeological results from Kuk has been delayed[10], reflecting both the material complexity of the site, and the changing influence on Golson's thinking of new results and ideas from other disciplines. Indeed, the development of what Golson refers to as 'a series of provisional statements' (1990:140) provides extensive insight into the relationship between changes in evidence and explanation in archaeological reasoning. A brief generalized summary of the sequence at Kuk is followed by a more focused discussion on the form of Golson's explanations for reclamation and abandonment of the Kuk wetlands, with particular emphasis on his account of the impact of sweet potato.

The main Kuk site consists of an alienated block of 700 acres of wetland, hemmed in to the north by Ep Ridge and bordered on the south and west by a lahar fan deposit from the Mt Hagen volcano from which a gently sloping alluvial fan extends into the southern margins of the swamp. A complex suite of archaeological features has been exposed in drains dug at Kuk for a Tea Research Station. The basic stratigraphy at Kuk has been described in some detail by Golson (1976d, 1977a), and is summarized in a composite form in Figure A5. The most striking feature of the site is the sequence of successive phases of reclamation and abandonment of the swamp, evident in the form of infilled networks of ditches. Golson has identified six major phases of use, separated by periods in which the ditch system became infilled and the swamp gardens were apparently abandoned.

Figure A5 provides a summary of the phases of use, together with the radiocarbon or inferred dates of swamp phase initiation and abandonment, and a tabular account of Golson's changing interpretations over time[11]. The basic distinction drawn by Golson within the sequence is between Phases 1 to 3, on the one hand, and Phases 4 to 6 on the other: 'During phases 1-3 the drainage works necessary to make the wet land fit for gardening consist of a single major disposal channel... During phases 4-6 the drainage works are more elaborate, as though the wet land had become progressively more difficult to manage' (1982a:300-301). Phases 4 to 6 are the more significant for this thesis, but reference is made to Golson's analyses of the earlier phases where they illuminate the structure of his broader argument.

As the anthropologist Nicholas Modjeska has noted, 'the major problems [at Kuk] have to do with the delineation of their phases and their interpretation as a meaningful sequence of stages' (1977:29, my emphasis). For approximately 2300 of the last 6000 years, the swamp has been abandoned, and much of Golson's writing has addressed the circumstances of abandonment and reclamation. His early views accorded well with the sentiments of the Canberra seminar: '[t]he conditions that governed the course of New Guinea Highlands agricultural history were the crops that were grown, the methods by which they were cultivated and the environment in which the cultivation took place' (1977b:47). At Kuk,

> [e]ssentially the story is of periodic innovations in agricultural technology in response to crises in the practice of shifting cultivation brought on... by its very success as measured by the growing populations

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10. The first details of one of the Kuk phases are now available (Bayliss-Smith and Golson 1992a, 1992b); these are discussed further below.
11. Human activity in the Kuk swamp catchment is inferred from about 20 000 BP on the basis of an increase in inwashed sediments (Golson and Hughes 1980:296-297).

it could sustain,

a process witnessed archaeologically as,

> an alternation of periods of swamp reclamation and swamp abandonment whenever some further innovation in agricultural technology took place. The agricultural system is thus seen to be in continuous adjustment to the effects of the transformation of the environment for which its operations are responsible.
>
> Golson (1977c:17)

In taking constant population growth as the source of pressure on the system on the one hand, and technological innovation as the means of release from such pressure on the other, Golson (1970, 1977c) drew his inspiration explicitly from Boserup's theory of population-led economic transformation. Golson's model for the agricultural systems and the particular forms of technological innovation at Kuk derived, however, from the writings of local geographers such as Brookfield, Waddell and Clarke, who were themselves heavily influenced by Boserup (Clarke 1966:357, Waddell 1972a:218-219). A key element in this model was the distinction between wet- and dry-land subsystems within the broader agricultural system. It was argued that the greater labour inputs required to permit wetland cultivation acted as a deterrent, to be over-ridden only through the pressure of stress on available dryland created by an increasing population. Wetland cultivation thus served as a 'temporary solution' to alleviate dryland stress until the 'long-term solution' (Golson in Henderson 1977:19) of a technological innovation permitted a return to emphasis on the dryland subsystem, with consequent abandonment of the wetlands. Successive abandonments of the Kuk wetlands, therefore, were attributed to the innovations of complete soil tillage (marking the end of swamp Phase 3 at 2500 BP), tree fallowing (the end of swamp Phase 4 at 1200 BP) and raised-bed gardening (the end of swamp Phase 5 at 250 BP), each of which allowed a more intensive form of dryland cultivation and dispensed with the need for labour-demanding wetland cultivation.

One of the consequences of a history in which dryland degradation is the critical marker of change has been a heavy reliance on insights gained from geomorphology and palynology. In part, this reliance stems from the fact that Golson has been attempting essentially to write a history of dryland agriculture from what he has defined as its negative pole - wetland cultivation. The difficulty of identifying dryland systems at Kuk comparable to those in the wetlands has been the topic of a doctoral thesis by Paul Gorecki (1982), discussed further below. The perceived ability to identify forest degradation and the development of grassland communities encouraged Golson to link his explanations for the wetland drainage systems directly to pollen evidence for dryland degradation.

The limitations of Golson's early models for swamp reclamation and abandonment at Kuk are most clearly exposed in his interpretation of Phases 5 and 6 and in his treatment of the impact of sweet potato on the drainage system. Waddell and Clarke, amongst others, had demonstrated that sweet potato possessed clear advantages over any possible pre-Ipomoean staples in terms of its yields at altitudes above 2000 m, and its tolerance of poorer soils (see Table B7). If sweet potato were to be deployed as an innovatory release, then the agricultural model would predict an expansion of dryland cultivation onto poorer soils and an increased productivity at higher altitudes, creating 'room at the top' (Golson 1977a) and an immediate abandonment of the wetlands upon adoption of the new crop (Golson 1976c:21-22). However, this prediction, consonant with the general model underlying the explanation of all the other phases at Kuk, sat awkwardly with the archaeological evidence for the phases when the introduction of sweet potato might have been expected.

The presumed sixteenth-century date for the post-Columbian introduction of sweet potato to Southeast Asia (see Section A2.3) falls precariously close to the date of

370 ± 70 BP (K-2643) that marks the initiation at Kuk of Phase 5 of drainage (Golson and Steensberg 1985:375-6). Golson's response was to identify an internal distinction within Phase 5, conveniently demarcated by the presence of the Tibito ash, then dated at about 250 BP (see Appendix A3), between a more extensive system from 370 BP to 250 BP (Phase 5), and a contracted, more intensive drainage network from 250 BP to about 100 BP (Phase 6) (1977a:628). The latter phase, he proposed, could be interpreted as the consequence of the introduction of sweet potato to the Kuk system. Yet this was not only in conflict with the agricultural model of wetland abandonment following on innovation, but implied that the wetland system was finally abandoned at 100 BP at a time when maximum pressure on the dryland system could be assumed - precisely the conditions under which wetland reclamation had been predicted for earlier phases. In part, this second problem could be explained by the transfer of a further innovation, the raised-bed technology of Phase 6, from the wetlands, where it had been developed for sweet potato, to the dryland system (1976a:8). But Golson still found it 'difficult to believe that a plant with the proven advantages of the sweet potato... would have been almost immediately brought into swamp cultivation, particularly when a special effort was necessary to render swampland suitable for its cultivation' (1976a:7), or that sweet potato could have reached the Highlands so shortly after its presumed post-Columbian introduction:

> acceptance of this hypothesis requires us to believe that within 150 years of its introduction, the plant had spread into the Mt Hagen district, been accorded a primary role in agriculture and despite its requirements for dry, friable soil, been incorporated into systems of cultivation in drained swamp that had not operated for 900 years.
>
> Golson in Powell et al 1975:45

A more elegant solution proposed by Golson in order to preserve the integrity of the technological model was an earlier introduction for sweet potato, to coincide with the end of Phase 4, at 1200 BP (Golson 1977a, 1977b). The pollen record for this period showed both an increase both in forest degradation and in the values for the common tree-fallow species, Trema (since renamed Parasponia) and Casuarina (1977b:51-52). Taken with the evidence from Kuk of a total abandonment of the drainage network of Phase 4, this proposal was seen to fit 'the prediction that labour demanding agricultural operations would cease when the agronomic potential of the sweet potato was discovered' (1976c:25). In an aside, Golson wondered if 'the practice [of tree fallowing] was handed over together with the sweet potato when that plant made its entry' (1977a:625). The pollen evidence for widespread clearance thus reflected, according to this explanation, the expansion of settlements exploiting the agronomic advantages of sweet potato, a move which led in turn to increased dryland degradation and ultimately to the need to reclaim the wetlands in Phase 5 (1977b:52).

Apart from the obvious lack of any direct evidence for sweet potato in New Guinea at such an early date, Golson was quick to acknowledge that there were other problems with this speculative "early" introduction model: the possibility of a later abandonment of the Manton site, which would accord better with what he called the "orthodox" model for late sweet potato (1976c:28, 1977b:51), while the obvious recency of much high altitude settlement with sweet potato in the Highlands also implied a late introduction (1976c:33-34). A retraction of the early model came only, however, with the recognition that the relevant pollen diagrams consisted of relative frequencies and not absolute counts (1977b:54)[12]; the apparent reduction of forest taxa at 1200 BP might thus be interpreted as a relative increase in Trema and Casuarina pollen, rather than an absolute decline in forest pollen. If this were the case, the innovatory release at 1200 BP could perhaps be referred to the increased use of tree fallowing on dry land, obviating the need for sweet potato as an explanatory *deus ex machina.*

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12. The relevant pollen diagrams from the Wahgi valley (Powell 1970) reflected the relative proportions of different species from only the first 200 pollen in each sample.

Golson's earlier writings, between 1966 and 1977 (Appendix A2), thus reflected a view of social change determined by the technological limits on a continuously increasing population, with consequent land degradation forcing ever more labour-intensive short-term solutions such as wetland reclamation, and technological innovation serving as a longer-term release upon labour inputs. The scope for human agency, under these terms, consisted largely of the tension between population pressure and the acceptability of labour inputs. One of Golson's few direct references in his earlier writings to local social factors influencing the sequence at Kuk was his discussion of the scope for disruption of the drainage network through loss of control of the main channel outlets (1977a:619). Elsewhere, Golson suggested that 'because the settlements of the cultivators have not been found, we have no idea of the relationship of developments in agriculture to developments in society' (1977c:18). His more recent writing, from 1980 up to the present (Appendix A2), bears the traces of many of the assumptions of this earlier period but radically readdresses the role of society in agricultural change, reflecting the influence upon Golson's thought of a second wave of anthropological speculation, which is the subject of the following section.

5. Social Production, Social Logic and Social Evolution

In terms of the Ipomoean Revolution debate, 1977 marked the Year of the Pig. After a decade in which the issues raised by Watson had apparently ceased to interest anthropologists in the region, three authors, Morren, Modjeska and Watson himself, simultaneously redirected attention to the importance of pig husbandry in the development of modern Highlands societies. Morren (1977), from a rather narrowly ecological perspective, asserted that the key dilemma facing regional subsistence economies threatened by population increase was access to sufficient meat and fat. As the destruction of forest limited the availability of non-domesticated sources of protein, an intensification of agricultural practices developed from the need to support larger numbers of domesticated pigs. This process Morren described as a 'very slow "revolution"... Susian rather than Ipomoean' (1977:313), an obvious expression of sympathy with the Canberra seminar model.

Watson, in a delayed response to Brookfield and White, found their "simple" hypothesis for sweet potato adoption unconvincing in its invocation of 'the force of efficiency as the motive for change. It contemplates isolated actors [Brookfield's "farmers"]. And it projects a materialism uncluttered by social or cultural cross-currents' (1977:58). To explain <u>why</u> the sweet potato should have been adopted so extensively and quickly, Watson argued, in a "Pig Fodder Addendum" to his "Jones Effect" theory, that the success of sweet potato hinged upon its exceptional performance as pig fodder. As evidence for this he cited the synonymy within various languages of the words for sweet potato and fodder, the exclusive use of sweet potato as fodder amongst those groups that preferred taro for human consumption, and the correlation of intensive pig production with intensive sweet potato cultivation.

From this basis, Watson suggested that the prestige of owning and exchanging pigs had led to a 'chainlike escalation' in pig production and exchange in which the cost of maintaining pigs needed to be balanced against 'the cost of not having pigs', the latter being 'a good measure of the Jones Effect' (ibid:64). The prestige accorded to pig transactions thus made 'the ipomoean conversion of people after people a compelling force for their neighbours' (ibid:60). Typically, Watson then proceeded to speculate on the broader implications of an increase in pig numbers: with an increase in the ratio of fodder to forage in pig subsistence, a dispersal of settlement might be expected; there would also be an increased need for controlled movement of herds and protection of gardens with fences and ditches, and for sweet potato gardens segregated from mixed crop gardens and devoted to pig fodder.

Modjeska's 1977 doctoral thesis, still one of the more influential pieces of anthropological writing on the New Guinea Highlands, marked a return to Watson's "sociological factors" of explanation, with particular emphasis on the notion of production[13]. Modjeska's use of the concept of social production had its roots in part in the later writings of Brookfield who, in revising his stance at the 1967 Canberra Seminar, had begun to qualify his Boserupian assumptions: Brookfield now allowed for the possibility of disintensification, noting that populations could decline as well as increase (1972:35). Much as Watson had earlier suggested, Brookfield acknowledged that production in the Highlands, most noticeably in association with major cycles of pig exchange, far exceeded subsistence needs[14]. Taking a largely invariable level (relative to population size) of production for subsistence needs as a basic requirement of any subsistence strategy, Brookfield identified further levels of production for "social" and "trade" purposes, neither of which could be linked directly to environmental conditions or ecological cycles (1972:37-38). Investigation of these factors would require 'an understanding of human needs and motivation' that he had not previously considered, and 'a much more adequate theory of production... which will relate production to society as a whole, and rid the subject of its long-lived calorific obsession' (1972:46) - a task, as Brookfield later noted (1984:15), that he was unable at the time to address.

Both Watson's and Brookfield's insights found fuller expression in the writing of Modjeska for whom the key to an understanding of production lay in identifying the historical transformation of human needs and motivation, tracking the development of 'the concept and social reality of value to its core, to pursue value's subject, here principally the pig, to its basis in human labour and life' (1982:51). Strongly critical of the assumption of the Canberra seminar that intensification followed necessarily from population growth, Modjeska echoed Watson in advocating an emphasis on the role of human agency in changes in productive intensity: '[i]nstead of assuming that societies are propelled passively from one technological system to another by naturally increasing population and the principle of least effort, one can assume that the transformation of production systems begins with human intervention' (1977:73).

If the decision to increase labour inputs reflected cultural ideologies and the relations of production particular to any given society, then 'possession of the sweet potato alone [did] not automatically bring about the intensification of production' (1977:49). Variations in the level of agricultural intensity and commitment to sweet potato thus implied different relations of production and different forms of motivation, or economies of value. Taking eight Highlands societies of variable population density described ethnographically, Modjeska then sought to demonstrate the existence of a broad correlation between the gross size of linguistic units, population density, the ratio of pigs to people, the intensity of horticultural production and the elaboration of systems of exchange (1982: Table 1). He found that the clearest means of ordering these societies along a continuum of increasing productivity was to take pig production as the key index of horticultural intensification more generally (1977:45).

These correlations Modjeska assumed to be related causally, and he proposed two cycles, one of ecological use-value, the other of exchange value, to model the process of intensification (1982: Figures 1 and 2). The crucial element in both cycles was the pig: as a substitute for declining wild game and a contributing factor in the rise of populations (the ecological use-value cycle), and as the key item in the increased need for social mediation, particularly in warfare indemnities and brideprice payments, in expanding populations (the exchange-value cycle). The revolutionary move in this process Modjeska identified as the transformation in the value of the pig to a position

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13. Modjeska's 1977 thesis remains unpublished, and its influence often unacknowledged, but the (marginally modified) propositions of the thesis are more widely available in the form of an essay published in 1982.

14. Over time, Brookfield has successively reintroduced many of Watson's original insights: the role of conservative brakes on change (1984:34), the recognition that innovations can be social, as well as technological, in character (1984:16), and the significance of the Jones Effect in the spread of exchange networks (Brookfield and Allen 1988:7).

where it could be deployed as 'a mediative substitute for lost human life' and as a valuable that could be exchanged for rights in humans through marriage (1982:55-57). The 'ethnographic sequence' identified by ordering the eight different groups along a continuum of increasing intensity of productivity could then be used as a model of the history of intensification, as 'empirical examples of so many stages in the development of such a process' (1982:51). The question then posed by Modjeska was whether such a process of intensification could be detected archaeologically.

Having already criticized the gradualist foundations and crude technological determinism of the position adopted by the Canberra seminar, Modjeska argued that archaeological evidence had to be seen 'in relation to the active creation of social relations by human beings conceived of as something more than the passive victims of autonomous forces' (1977:93). His reading of Golson's interpretation of Kuk thus addressed the influences of the Canberra seminar, evident in the assumptions that swamp reclamation was only a response to the pressures of population increase upon dryland systems, and that swamp agriculture was simply a more labour-intensive form of, and thus less preferable substitute for, dryland agriculture. Noting Clarke's observation that swampland drains produced a highly fertile cover of upcast soil, Modjeska suggested that 'the swamp cultivation phases at Kuk represent periods in which increased absolute amounts of labour were invested to create systems offering improved ratios of productive efficiency' (1977:85). Subsistence may not thus have been 'the only important call on production' (Golson 1981b:62) at Kuk; social factors could also have provided the motivation for the heavy initial investments in drainage systems that would yield more highly over time.

What role did the sweet potato therefore play in the evolution of Highlands societies, and particularly in the development of the systems of ceremonial exchange that appeared to coincide with the centres of highest productive intensity? The revolutionary effect of sweet potato, Modjeska suggested, reflected its adoption in areas such as Kuk where intensive systems of wetland production in which taro was the staple had already forged 'the relations of production which made the Ipomoean revolution possible' (1977:88)[15]. Although he allowed for the possibility that pigs may already have constituted the principal exchange valuable created with pre-Ipomoean wetland surpluses, the established connection between pig husbandry and sweet potato as fodder led Modjeska to advance an alternative 'even more speculative suggestion': that the stone mortars, pestles and other carvings found throughout the Highlands region represented a comparable pre-Ipomoean valuable, deployed in a way that prefigured the exchange of pigs after the adoption of sweet potato (1977:88-92). No archaeologist has attempted to pursue this possibility, but the more immediate value of Modjeska's speculation is that it identifies society more broadly as the appropriate context in which to comprehend the impact of sweet potato:

> the gap between the low intensity, taro based societies of the ethnographic sequence and the high intensity, sweet potato-based systems cannot be bridged by the introduction of sweet potato alone. For a transformation of production systems to have taken place, new relations of production were required in addition to new materials. People had to choose to work harder in order to produce more.
>
> Modjeska 1977:87

Modjeska's focus on the historical significance of change in the construction of value has influenced attempts by two French ethnographers, Maurice Godelier and

15. Modjeska took Golson to task for his account of the impact of sweet potato at Kuk: the introduction of sweet potato could not be invoked for both of the swamp abandonments at 1200 BP and between 250 BP and 100 BP; if sweet potato was introduced (to account for events at) at 1200 BP, it could not then have the same revolutionary effect at 250 BP. Further, the abandonment of intensive systems of wetland taro agriculture, at either 1200 BP or at 250 BP implied, however negatively, that the impact of sweet potato adoption was indeed revolutionary.

Pierre Lemonnier, to specify the exchange principles, or logics, that underwrite different social formations in the Highlands. Where Modjeska took the production of pigs, expressed in the form of pig-to-person ratios, as the critical index to such change, Godelier used types of political leadership to distinguish between different logics of exchange. Finding that the "big-man" form of leadership, identified by Sahlins as characteristic of leadership in the Highlands, failed to describe adequately conditions amongst the Baruya-speakers with whom he worked, Godelier proposed "great-men" as the precipitate of an alternative "global social logic" (1982:31). The two contrasting leadership types were founded on different principles of exchange: the principle of equivalence amongst great-men societies and that of non-equivalence amongst big-men societies. In the first, direct exchange of valuables equivalent in both quantity and quality prevailed, expressed in the ideals of sister-exchange and homicide revenge, ideals which were reproduced through the institution of initiation ceremonies. Big-men emerged 'as a particular variety of great men, arising wherever competitive exchanges have diminished the relative importance of war and warriors... wherever exchangeable material wealth can be exchanged for anything, and above all for women' (1986:185). The ability to substitute wealth for life (or rather the rights to life) and the development of finance as a mechanism of exchange marked off big-men societies from all others in the region.

Lemonnier (1990) subsequently expanded on Godelier's typology, introducing an intermediate type, that of the "leader", to describe the majority of Highlands societies in which the principles of equivalence and non-equivalence were combined with varying degrees of emphasis. Big-men and great-men logics thus 'form two poles of a vast system of structural transformations' (Godelier 1991:276), logical types rather than historically specific forms. As for Modjeska, however, the temptation existed for Godelier and Lemonnier to perceive in their hierarchies a model of historical transformations culminating in the emergence of big-men systems amongst societies of the Enga and Western Highlands provinces. Both were conscious of the limitations of evolutionary sequences (Lemonnier 1990:65), and tended to shy away from any attempt to ground their transformational sequences in historical evidence or even to pronounce on causal relationships between variables such as pig numbers and social structures, preferring to talk of 'theoretical passage[s]' (Lemonnier 1991:27) and 'logical transformations' (Lemonnier 1993:52), and referring to attempts to historicize the transformations as exercises in 'social science fiction' (Godelier 1991:301), or as '*histoires imaginaires*' (Godelier 1990:19).

Yet there were traces of ambivalence in their writing: big-men logics were referred to as 'emerging' from great-men logics and Godelier has speculated on the relationship between the development of ceremonial exchange systems and the disappearance of initiations (1986:184). Most recently, goaded by Modjeska's (1991:238-239) charge that he had balked at an historical understanding of this transformation, Godelier has described the transformation of great-men societies into big-men societies as a historical change in the relation of dominance between the two underlying principles of equivalence and non-equivalence (1991:284), declaring that 'these two logics could be considered to be two stages of an evolution which corresponded to an as-yet undiscovered socio-historical process' (1991:276). The latter statement, interestingly, declines to privilege either pole historically: there is no assumption that big-men societies emerge historically from great-men societies, or vice-versa.

In the work of Daryl Feil (1985, 1987, 1989), the themes raised by Watson, Modjeska and Godelier were brought to bear upon a comparative synthesis of a huge body of both ethnographic and archaeological material. Although Feil's grasp of the ethnography of the region was impressive, the results of his analysis were disappointing, and it is instructive for archaeologists to understand why this should be so. Feil's work rested on the claim that he had 'spurned synchronic or structural comparisons between societies in favour of an evolutionary one' (1987:271). Yet when he searched for a diachronic overview of the past on which to ground his understanding of Highlands ethnography, 'there was none to be found' (1989:119). His own account of Highlands archaeology thus drew explicitly on a long tradition of anthropological speculation (1987:11). Nowhere else within this tradition, however, are the difficulties involved in reading the past from the present more evident.

Feil's definition of the Highlands region was restricted to the area of the Enga, Western Highlands, Simbu and the main valleys of the Eastern Highland provinces, with occasional forays wider afield to the Baruya or to Southern Highland groups such as the Huli (Figure A3). Within this area, he argued, fundamental differences between the environments of the eastern and western ends of this geographical continuum, particularly in the seasonality of rainfall, had fostered radically different pre-Ipomoean subsistence strategies. This environmental variation was reflected in the respective archaeological records of the two regions: in the west, Kuk was regarded as the '"birthplace" of highlands agriculture and the efflorescence of social and cultural practices associated with an intensified agricultural regime' (1985:88). The long Kuk sequence, indicating a pre-Ipomoean presence for intensive taro and pig production, was contrasted with the situation in the east where 'the pattern of mixed hunting, collecting and nascent agriculture occurred until very late' (1987:29). This model was thus effectively a regionally specific retention of Watson's original "preferred" model in the Eastern Highlands. Successive technological and social innovations which were introduced at Kuk diffused, often millennia later, to the east: these included pig husbandry, the use of casuarina in fallows, and complete tillage of the soil.

According to Feil, the impact of sweet potato on these vastly different economies further confirmed their already 'divergent lines of development'. Amongst the intensive production systems of the west, the superiority of sweet potato over existing staples and fodders was immediately appreciated. Sweet potato here 'was taken in stride by an agricultural complex already geared to surplus production' (1987:8) and exploited in the intensification of pig husbandry and the further development of systems of financed exchange. In the east, with its 'shallow' history of agriculture, the sweet potato was adopted more gradually, with a further delay in the recognition of its value as pig fodder; consequently, the development of pig husbandry and pig-related exchange witnessed in the west was 'still-born before it could take off' in the east (1987:34). Production in the east remained 'domestic-oriented, constraining, inward-looking, narrow, and with limited objectives' (1987:30).

Feil argued that these different rates of change were evident ethnographically in 'a continuum of intensifying agricultural production from east to west'. Intensity, interpreted as the level of inputs of 'capital, labour, skill and so on' into agricultural production, operated as a broad, but not constant, index to variation in agricultural practice, settlement pattern, political integration, land tenure, the size of language groups, and the numbers and densities of pig and human populations. The correlation of these different indices produced distinct configurations of intensity, 'constellation[s] of elements which <u>logically and empirically</u> go together' (1987:168, my emphasis); these configurations were most clearly expressed, as for Modjeska, in the relative size of pig herds. Indeed, Feil declared that 'agriculture itself is almost epiphenomenal (or at least a dependent variable) to the concern with pig husbandry' (1987:40). When ranked on a scale of relative intensity, these configurations revealed a continuum running from low-intensity configurations in the east to high-intensity configurations in the west. Feil's major concern was to show how this continuum was expressed in terms of east-west variation in warfare, political formation, social structure, gender relations and ceremonial exchange - a rather conventional list of "institutions" that lacked only ritual and religion to be complete.

This analysis of the regional ethnography has been subjected to some criticism (e.g. Brown 1989, A.Strathern 1990), as has Feil's interpretation of the figures for pig-person ratios (Bourke 1988: Table 2.3), but most problematic was the way in which Feil combined ethnography and archaeology to speculate about history. Yet although subsequent archaeological evidence has not supported his conjectures about pre-

Ipomoean economies in the eastern Highlands (see below), this cannot be taken as grounds for rejecting Feil's broader statements; the lesson of the Canberra seminar should have alerted us to the dangers of a hasty dismissal of speculative contributions from beyond archaeology. But it was precisely Feil's conception of the past, and of the relationship between past and present, that was the most disappointing feature of his argument.

While Feil appeared to work from an understanding of the past towards the present, in which ethnographic difference 'merely echoes the prehistoric pattern' (1987:49), the direction of his analysis in fact reversed this claim. Archaeological evidence was not so much examined as marshalled in 'confirmation' (1987:13) of his ethnographic analysis. In his concern for the integrity of the east-west continuum, Feil's use of archaeological evidence served instead to raise doubts about the strength of his configurational approach. For example, Feil's claim that the localised concentration of stone mortars, pestles and other carvings in the western highlands reflected 'their early association with agriculture, and their lack of spread to the eastern highlands with its absence there' (1987:33) grossly distorted the published evidence for the distribution of stone mortars, and posited precisely the sort of relationship that needed to be demonstrated and explained, not asserted in a compilation of further support for his dichotomy[16].

More troubling from a historical perspective was Feil's ordering of the past. This was firmly rooted in his understanding of the present:

> as one moves westward in the highlands... there is strikingly intensified production (by any measure) geared to the intensified production and maintenance of pigs. This fact above all else provides the rationale of the production process, <u>at least at the western end of the continuum</u>.
>
> Feil (1987:40), my emphasis

Why then, it should be asked, were communities at the eastern end of the continuum ranked according to principles of value generated in, and possibly specific to, the western end? This privilege accorded to a particular configuration in the tabular space of the "ethnographic present" was transformed by Feil into a telos, or end-point, for the history of all Highlands communities. The ethnographic continuum, underpinned by a confirmatory past, now represented a 'particular evolutionary sequence' or 'evolutionary continuum' (1987:272).

Although Feil made frequent reference to 'divergent' lines of development, a temporalizing tendency evident in his writing has imparted a distinctly unilineal quality to his history. Like Modjeska, Feil felt that it was possible to 'glimpse in the contemporary pattern of divergence across the highlands the evolutionary sequence which has taken place', in which the eastern end represents the '"developed", flourishing western highlands... only in embryonic form' (1987:91) and societies of the west were regarded as a '<u>final</u> configuration' (1987:7, my emphasis)[17]. History on these terms was

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16. Stone mortars and pestles are fairly evenly distributed from east to west in the Highlands. In fact, their greatest concentration in New Guinea appears to be in the Kainantu area, at the extreme <u>eastern</u> end of Feil's continuum. The more obvious spatial variation is a decline in distribution from north to south, an axis not addressed by Feil. The irony of this misreading of the archaeological literature is compounded by the fact that Feil used Swadling's published report on the archaeology of the Arona Valley (1973) to establish the absence of pre-Ipomoean agriculture in the east but ignored the numerous references to, and illustrations of, stone mortars and pestles contained in the same report.

17. Feil's (1987) text is saturated with temporally loaded descriptions of ethnographically "contemporary" societies: features of eastern societies are described repeatedly as 'nascent' (pp 29,49,60,65,269), 'poorly' or 'under'-developed (pp 49,60,125), or 'late' (pp 23,29), versions of their western counterparts. To 'lack' (pp 18,125) in the ethnographic present is to be at an 'early stage' (p 231) of development, to 'not yet' (pp 47,60,104,166) have 'achieved' (p 36) full evolutionary potential, or even to be 'underproductive' (1982:65).

conceived of as a 'developmental path' (1987:9, see also pp 5,53), leading towards the intensified agricultural and pig production of the west, which societies in the east then 'follow' (1987:272); modern differences between east and west were thus the function of a 'lag in economic transformations' (1987:88). Effectively Feil replaced unicausality, which he rejected in determining variations in productive intensity (1987:8,39), with a unilineality in the trajectory of historical change that valorised a particular social configuration in both space and time. This, as E.P.Thompson (1968:13) would have it, is

> history in the light of subsequent preoccupations, and not as it in fact occurred. Only the successful (in the sense of those whose aspirations anticipated subsequent evolution) are remembered. The blind alleys, the lost causes, and the losers, are themselves forgotten.

Though far more comprehensive in its treatment of the regional ethnography and archaeology than any previous work, Feil's thesis thus suffered from its commitment to an over-rigid continuum or sequence, however 'overriding [an] order and pattern' (1987:5) he might have discerned in the evidence. Where the models of Watson and Godelier provided for some flexibility in application, Feil offered a "totalizing" account of the past, a model which ran the risk of being less amenable to the incorporation both of other regions, such as the Southern Highlands or the Baliem valley in Irian Jaya (A.Strathern 1990), and of new ethnographic or archaeological evidence.

6. Kuk and Beyond, 1981-1992: Second Thoughts and Extended Horizons

Modjeska's critique had an immediate impact on Golson's interpretation of Kuk[18]: in his next wave of 'provisional statements', Golson acknowledged that his earlier position had accorded human agency 'an essentially negative role, acting only in reaction to environmental changes' (1981b:62). In his major response to Modjeska, Golson (1982b) set out his most imaginative reconstruction of the Kuk sequence: published in the context of a volume on inequality in Highlands societies, Golson's paper addressed the genesis of the social stratification witnessed at contact in the Wahgi valley. Access to the productive swamplands, Golson argued, would have generated distinct local inequalities in the ability of different communities to produce crops and pigs. The introduction of sweet potato reduced the productive "edge" of swampland communities as it enabled other communities to engage in intensive production on the dry lands and on poorer soils. The move by established elites from pigs to shell as a more exclusive valuable maintained their relative status but this, in turn, was destroyed by the early European use of shell in the 1930s, introduced in massive quantities and breaking the ties of exchange formerly monopolised by the elites.

This bold excursion into ethnographic history entailed a revision by archaeologists of the view of swampland drainage systems as unattractive, labour-intensive alternatives to dryland agriculture. Gorecki's (1982) attempts to locate dryland systems associated with the wetlands at Kuk had yielded only one phase of dryland gardens beneath the Tibito ash fall (305 - 270 cal BP), leading him to support Modjeska's speculation that the dryland systems may have been 'complementary, if not marginal' (Gorecki 1985:342) within the overall economy of those groups with access to wetlands. Gorecki proposed instead that drained-garden technology might in fact have been regionally continuous throughout the extent of the Kuk sequence but <u>locally</u> discontinuous within the Wahgi wetlands, generating the impression at Kuk of phases of use and disuse (1986:165): a process that Golson, drawing on his own ethnographic observations at of Haeapugua swamp in the Southern Highlands, has since dubbed the

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18. The "break" in Golson's writing induced by his reading of Modjeska occurred in about 1980 (Appendix A2: Golson 1981a, 1981b, 1982b) even though, in papers written shortly after these, he still adhered to the view that the 'path which the environmental modification follows calls repeatedly for developments in agricultural technology and determines the form which agricultural intensification takes' (1982a:301).

"palimpsest effect" (1990:142).

This increasingly sophisticated modelling of wetland use has not, however, alleviated Golson's difficulties in accounting for the phases of use and abandonment at Kuk itself. A late introduction of sweet potato is still invoked as the cause of abandonment of the larger part of the Kuk wetlands at 250 BP, with Gorecki's (1979) case for the onset of malaria epidemics held to account for the abandonment of both dry- and wetlands on the floor of the Wahgi valley after 100 BP (Golson 1982b:135, Golson and Gardner 1990:407). Significantly, the possibility of an earlier arrival for sweet potato has also been intermittently reintroduced to explain the abandonment of Phase 4 at 1200 BP, a move that effectively betrays the continuing ecological tendency in explanation at Kuk.

The discovery in 1976 of a wooden spade dated to 4000 BP (Golson and Steensberg 1985:376) from the Tambul site at an altitude of 2240 m in the upper Kaugel valley (Bayliss-Smith 1985a, Figure A4) raised the question of the scope for intensive taro production at high altitudes prior to the introduction of sweet potato, a possibility not previously considered for such environments. An experimental study of taro productivity in the Wahgi valley and at Tambul by Bayliss-Smith (1985a) suggested that taro swidden was a plausible basis for a subsistence economy over 2000 m, but that the labour requirements would have prohibited wetland drainage for taro. While he identified the initial expansion of taro-based agriculture and permanent settlement to higher altitudes as a "Colocasian revolution", Bayliss-Smith still acknowledged that the major transformation in terms of crop yields, population density and pig husbandry would have required sweet potato. Drawing on this experimental data on taro productivity, Bayliss-Smith and Golson have since attempted to model the scope for intensive production during Phase 4 at Kuk, describing the onset of Phase 4 as 'the genesis of Wahgi society as known ethnographically' (1992b:23).

The description that Bayliss-Smith and Golson offer of the Phase 4 system is the first comprehensive analysis of any of the wetland data from Kuk, and the level of resolution permitted by the archaeological material affords some insight into the stratigraphic complexity of the site as a whole and the impressive scope it offers for reconstruction of wetland technology. In keeping with the emphasis of this review, my interest here is in the forms of explanation generated for the initiation and abandonment of Phase 4. Broadly, these explanations draw on the views propounded by Golson since his earliest reflections on Kuk in 1976, with some modification to accommodate Modjeska's critique. Bayliss-Smith and Golson propose that Phase 4 was initiated in response to a crisis in dryland agriculture which could not be alleviated through expansion with intensive techniques to higher altitudes. In accounting for the form of the response, Modjeska's "pull" factors are noted:

> Intensification was the only answer, and the opportunity for surplus production provided a substantial compensation, and perhaps ultimately a rationale in itself, for wetland drainage.
>
> Bayliss-Smith and Golson 1992a:15

But the preference for ecological or technological determination is still evident in the description of the grounds for wetland abandonment. Phase 4 terminates with the releasing effect of the innovation of tree fallowing (1992a:19), and the political instability leading to the collapse of the Phase 6 drainage network is seen to reflect the lack of ascribed leadership in Upper Wahgi society, an example of 'technology outstripping the ability of the social structure to control it' (Golson 1990:142-143).

While there has been little further collection or excavation of new material from Kuk since 1981 (Golson pers.comm.), there have been considerable advances in the development of a regional context for the Kuk results, which is seen as confirming the antiquity of many of the components of the Kuk sequence (Golson and Gardner

1990:412)[19]. The three new archaeological regions of principal importance are those of the Jimi, Baliem and Arona valleys. The Yeni swamp sites of the lower Jimi valley (Figure A4), immediately to the north of Kuk, were excavated by Gorecki (1989) with the intention of recovering the postulated lower-altitude antecedents for Kuk[20]. While no evidence for occupation, much less agriculture, preceding that of Kuk has been forthcoming from the Jimi valley, the much smaller Yeni swamps have yielded a sequence of tephras and garden features from about 5100 BP that approximate the Kuk sequence (Gorecki 1989). To the west, in the Baliem valley in Irian Jaya, pollen and sedimentary evidence suggests that major clearance was initiated by 7000 BP, and that an increase in Casuarina pollen to match that from the Wahgi valley occurred at about 1100 BP (Haberle et al. 1990). Significantly, Golson and Gardner note, there 'is no indication in the [Baliem valley] diagram of major changes after the presumed [ie late] arrival of the sweet potato' (1990:410). There have been no archaeological excavations in the Baliem valley to shed further light on its agricultural history. Finally, in the Arona valley, at the eastern edge of the Central Highlands and of Feil's west-east continuum, there is evidence for settlements associated with field systems dated to 4100 ± 140 BP (ANU-6185) (Sullivan and Hughes 1987, Sullivan, Hughes and Golson 1986, 1987, Ballard n.d.a), with corresponding evidence from the nearby Noreikora swamp for forest disturbance and associated sedimentation from 4500 BP (Haberle n.d.). Intriguingly, low tree pollen counts after 1600 BP suggest an early development of the contemporary Arona grasslands, and Casuarina pollen appears from about 750 BP, implying that similar technological developments were occurring in the Eastern Highlands, if at a later date than in the Wahgi. The point to be made here is that the detail and richness of the Kuk site tends to obscure the infancy of our understanding of the archaeology of the broader Highlands region. New archaeological finds will continue to pose radically challenging alternatives to the range of existing models of social and technological development. Golson's most recent paper concludes with a note of mild despair:

> A quarter of a century later we are still in the speculative stage of reconstruction in which the Bulmers explicitly placed their pioneering paper.
>
> Golson (1992:489, my emphasis)

7. Writing History

I have tried, in reviewing the development of the Ipomoean revolution debate in an approximately chronological form, to bring to the fore the historical relationship between anthropological speculation and archaeological revelation. One consequence of this particular perspective has been a focus on the rhetoric surrounding the deployment of archaeological evidence, by which I mean to imply that the debate can be viewed as a set of competing narratives about the past in which much of the archaeological evidence has often been either irrelevant or unsuited to the questions asked of it. Of greater importance to the actual character of the debate have been the assumptions informing the structure of the different models, expressed as a set of key "tropes" or forms of figurative writing. A brief review of these tropes provides a means of exploring the ways in which Highlands history has been conceived in both archaeological and ethnographic writing.

One set of key themes or tropes that appears to prefigure most narrative accounts of Highlands history, whether archaeological or ethnographic, can be gathered broadly under the label of "evolutionism". This refers to the tendency towards progressivism,

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19. The results of further analyses undertaken on Kuk material since 1981 include work by Hather on plant macrofossils (Golson pers.comm.) and by Wilson (1985) on phytoliths; some further fieldwork has been undertaken by geomorphologists associated with Kuk project (Hughes, Sullivan and Yok (1991) and Yok (1988)).

20. Golson (1982a:299) has proposed that '[A]griculture came into the highlands from lower altitudes in step with rising temperatures and the elevation of daily cloud formation'.

where the assumption underwriting accounts of the past is that, over time, populations rise inexorably, social formations become more complex, and so on. Strongly linked to this progressivist theme is the assumption that such change leads, inevitably, along a single path of development, resulting in a unilinear account of evolution. This reflects an often tacit assertion that the nature of causative relations between, for example, intensification in pig husbandry and the development of particular social formations, is a stable one - an assumption founded, in turn, upon a strong universalism which views the agronomic potential of sweet potato, for example, as self-evident, as a fixed, "natural" property immanent in the crop itself and needing only to be discovered. These all-pervasive tropes lie at the roots of "Western" historicity - but this does not guarantee either their essential validity or universal application. First ethnographic and then archaeological accounts of the past are considered in the light of this claim.

The attempts by Modjeska and Feil to write ethnography from a historical perspective, discussed above, clearly lend themselves to an "evolutionist" reading. Despite Feil's claim that he did 'not regard highland New Guinea societies... as representing some evolutionary stage' (1987:7), there is sufficient evidence in his text to demonstrate the operation of an "evolutionism" internal to the region he addressed. Both Modjeska and Feil described ethnographic societies, ranked them hierarchically according to indices such as productive intensity ("the ethnographic sequence"), and then converted this ranking into a trajectory for historical development ("the evolutionary sequence")[21]. In his critique of the deployment of time in anthropology, Fabian (1983) has described the process whereby diachrony, the reduction of time to the status of an alternative axis in taxonomic projects, is substituted for any attempt to engage time as history. The result is a spatialized notion of time, producing a tabular space on which societies, irrespective of their historical circumstances, can be plotted. For example, great-men systems, once identified as 'the logical-historical origin point of the evolutionary sequence' (Modjeska 1991:241), are simply mapped onto a taxonomic matrix laid out in terms of single or complex sets of indices. This has the effect of eliminating serious inquiry into the genesis of individual societies or even the process of their transformation from one "stage" to the next, a process already defined, under the terms of their inclusion, as a logical succession.

It is important to recognise that this rather cavalier treatment of contemporary societies draws on a general and largely deliberate ignorance of the historical contingency of the "ethnographic present", an ahistoricism that is deeply engrained in both Highlands ethnography and, as Fabian seeks to demonstrate, in anthropology as a discipline. While Highlands ethnographers have drawn fine temporal distinctions in discussing individual groups[22], such caution appears to have been suspended in broader comparative projects. Thus Feil, all the while stressing that 'warfare must be seen as a product of historical forces' (1987:66), drew on observations made during a period of over 40 years to compare warfare across the Highlands in the terms of an ethnographic present; this flattening of history became even more convoluted when he assigned the renewal of warfare during the 1970s and 1980s to a "post-ethnographic present" (1987:272). The focus on the ethnographic present in Highlands ethnography has tended to obscure the very conditions which generate the ethnographer's observations: these include the impact of contact, the largely neglected effects of pre- and

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21. Neither are exceptional in their application of this method, which finds wide acceptance within ethnographic writing in the region. Watson (1965a:301) proposed Telefolmin, Wissel Lakes (Irian Jaya) and Karimui groups as type societies for his three-tiered evolutionary sequence; Morren (1977:301) represented the pig-husbandry techniques of the Miyanmin, Maring and Raiapu Enga as 'standing for points in a developmental continuum'; for further examples see Clarke (1966:347-348), Waddell (1972a:212, 1972b), and Sorenson (1976:93).

22. Two examples (drawn from writings that are both used by Feil as sources for his Highlands-wide "ethnographic present"): '[I]t is hard now [writing in the late 1950's] to reconstruct how Moka leadership and war leadership were related [prior to contact in the 1930's]' (R.Bulmer 1960a); 'it would be unrealistic to make comparisons too directly between Mendi clan-groups in 1954 and Hagen clan-groups in 1964' (A.Strathern 1972:193).

immediately post-contact epidemics, and the historical recency of the development of pig exchange in some areas.

A recent volume of papers on the ethnography of groups of the southern fringe of the central Highlands (Weiner (ed.) 1988) has taken history as one of its central themes, providing a strong critique of the functionalism and materialism of the Highlands ethnography typified by Modjeska and Feil (Weiner 1988a). Kelly's (1988) detailed analysis of pig husbandry amongst the small and scattered communities of Etoro-speakers, in particular, has undercut the neat equation of simple pig-per-capita figures with intensification in other social spheres. As Etoro ratios exceed all but a few of the figures from central Highlands groups, Kelly argued that our focus should instead be upon the cultural allocation of prestige. But again, the treatment of history in the volume favours explanations founded upon diachrony (as in the seasonal oscillation of activities) or, at best, post-contact changes in residence and population drawn from patrol reports and aerial photographs, over any more complex understanding of historical process[23]. There is an unwillingness to address indigenous accounts or representations of the past that is surprising given the reputation of this community of ethnographers for attention to indigenous exegesis of symbolism.

The writing of history by archaeologists in the Highlands, even less of a topic for debate than it is amongst ethnographers, subscribes to much the same set of "Western" or "evolutionist" assumptions. Golson (1977c:18), albeit in a public lecture, has suggested that in

> half the time that an agricultural economy has been practised in New Guinea, societies in other parts of the world developed such leadership, and some passed beyond to the creation of the type of society we call civilization. It is possible that, given time and if left to themselves, some New Guinea societies would tread at least part way along this path.

Golson then qualified this proposition by adding that it 'may well be, however, that the path they have so far trodden is a real evolutionary alternative', but his use of the term "path", and his confirmation of the similarity between the archaeological evidence from Kuk and more recent ethnographic models of social evolution in the Highlands (1990:145) suggest an acceptance of the "internal evolutionism" of Modjeska and Feil. Thus Golson and Gardner refer to agricultural intensification and political integration amongst the Dani of the Baliem valley as 'the apogee .. in the Highlands overall' (1990:409), and relate changes over time in axe-production to current regional variation in strategy: 'at one period all groups would have been like Eastern Highlanders of recent times.' (1990:404). The general criticism of such writing that needs to be made is that no groups have ever been 'like' the Eastern Highlanders of recent times, other than in individual details such as pig:person ratios abstracted from the wider social and cultural contexts which give those very details meaning.

There are other problems that are peculiar to the archaeological writing of history: these have to do with issues of agency and scale, and their expression in the use of archaeological evidence and the deployment of analogies. The difficult task of integrating "social" and "environmental" factors in historical explanation has already been raised in Chapter A1. If agency is to be reserved to self-conscious subjects and denied to "natural" phenomena (Johnson 1984:218), then in writing history we must be vigorous in maintaining the distinction between explanations founded on "cause" - factors such as environmental change - and those that reflect "meaning" - the

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23. Most surprising was Kelly's admission, in a footnote (1988:175, n.3), that the Etoro had suffered losses, in epidemics, of between 50 and 55 percent of their population between 1935 and 1968. While he contended that this had not altered per capita pig holdings within a limited part of the Etoro territory (a curious recourse to the materialist position), the resultant decline in social networks was surely of more significance, particularly given the thrust of his argument on the importance of social density and exchange.

intentionality of agents (Gardner 1989). Golson seeks to explain change at Kuk in terms of environmental factors, but writes of change in terms of the decisions of social groups, effectively offering narratives of cause masquerading as narratives of meaning. It is important to view this distinction not as one of scale but rather as a difference in perspective. An environmental explanation of the phases at Kuk is adequate as such, as an explanation of the role played by environmental change, land degradation and the introduction of new species. But this is not history, where the subject of history is accepted to be human society. What we require is an understanding or a model of intentionality and of social process. The dilemma this poses for archaeology is one of scale: how do we detect human decisions on a scale appropriate to the capacity for resolution of archaeological techniques?

It is hard to disagree when Gorecki (1986:163), commenting on the interlude between Phases 1 and 2 at Kuk, observes that it, 'took 3,000 years for people to come back to Kuk plantation, a time-span long enough for improvements to have occurred in wetland cultivation techniques'. The difficulty of conceiving of the scope for social or technological change over such a span of time is common to most archaeological writing, but especially poignant when discussing a single site with a relatively restricted range of functional possibility. The enigma of Kuk is that it represents a negative image, as it were, of changes in Wahgi society that are likely to have occurred largely beyond the physical boundaries of the site itself.

In his interpretation of Kuk, Golson employs a model of "analogical distance" in which the strength of an analogy is held to decrease with increasing temporal distance from the baseline of contact:

> indications of continuity between the archaeological and the ethnographic situations, together with the short time span separating the end of one and the beginning of the other, inspired confidence in using the evidence from New Guinea ethnography to interpret the latest phase, Phase 6, at Kuk swamp.
>
> Golson (1990:141)

Analogies drawn from post-contact Wahgi society are in fact held to be applicable to Phases 4, 5 and 6, but not to Phases 1, 2 or 3 (1990:143,145). This creates an awkward distinction between the earlier phases, for which explanations continue to rest on environmental change, and the latter phases which are interpreted in the light of ethnographic analogies: Phase 4, which witnesses 'the genesis of Wahgi society as known ethnographically' (Bayliss-Smith and Golson 1992b:23) serves as the marker between these two contrasting domains of explanation.

Golson has identified a significant problem for archaeologists using analogies, but are we to accept that the role of society in the creation of the archaeological record at Kuk somehow diminishes between Phases 4 and 3? Much of this thesis is devoted to addressing questions of the validity of inferences drawn from ethnographic analogies and I restrict myself here to observing that the theory of knowledge sketched in Chapter A1, which regards history, in the sense of "what really happened", as essentially unknowable, has the effect of freeing us from the hopeless task of locating analogues that match up to the requirements of a "concrete" past. Rather, our analogues should be a means of raising further questions about the past by simultaneously extending and refining our understanding of what, given certain criteria, is both possible and probable. This, I would argue, is a model for history writing more generally.

APPENDIX A2

A CHRONOLOGICAL BIBLIOGRAPHY OF GOLSON'S WRITINGS ON KUK

In addressing the historical development of Jack Golson's thought and writings on Kuk, it is often necessary to distinguish between the date at which a paper was written and the date of its subsequent publication. This bibliography lists Golson's published and unpublished writings on Kuk in the chronological order in which they were written. The first date given is the year in which the draft paper was largely completed, the second the year in which the paper was published. Comments in bold at the end of each entry are drawn from annotations made by Golson (JG) to an original draft of this bibliography. Except where otherwise indicated, all papers are authored by Golson alone. A near-complete list of Golson's published works in chronological order of publication is also available (Anon. 1993).

1966	1966	'Prehistoric research in Melanesia.' Ms. 52pp.
	1968	'Archaeological prospects for Melanesia.' In I.Yawata and Y.K.Sinoto (eds.) Prehistoric Culture in Oceania: a symposium. Honolulu: B.P.Bishop Museum, pp 3-14. **{Written in 1966 for the 1966 X Pacific Science Congress in Tokyo, with the addendum (pp.11-12) added in 1967 to the much-delayed galleys close to publication}**
1967		Golson, J., R.J.Lampert, J.M.Wheeler and W.R.Ambrose
	1967	'A note on carbon dates for horticulture in the New Guinea Highlands.' Journal of the Polynesian Society 76(3): 369-371. **{Drafted by JG in Port Moresby in 1967 and subsequently altered by the other authors in Canberra}**
1970	1970	'A hydraulic civilisation in the Wahgi Valley.' Seminar paper, RSPacS, ANU. Ms. 17pp.
1973	1976d	'Archaeology and agricultural history in the New Guinea Highlands.' In G.de G. Sieveking, I.H. Longworth and K.E. Wilson (eds.) Problems in Economic and Social Archaeology. London: Duckworth, pp.201-220. **{Written in 1973}**
1974		Powell, J.M., A.Kulunga, R.Moge, C.Pono, F.Zimike and J.Golson
	1975	Agricultural Traditions of the Mount Hagen Area. Department of Geography, University of Papua New Guinea Occasional Paper No.12. **{Last section on archaeology written by JG in 1974, after an Australian Institute of Aboriginal Studies conference in May 1974, hence his reference to 1977e}**
1975	1977e	'Simple tools and complex technology: agriculture and agricultural implements in the New Guinea Highlands.' In R.V.S.Wright (ed.) Stone Tools as Cultural Markers: change, evolution and complexity. Canberra: Australian Institute of Aboriginal Studies, pp.154-161. **{Written for an Australian Institute of Aboriginal Studies conference in May 1974 and revised for publication in the first half of 1975}**
	1976b	'Aspects of the agricultural history of the New Guinea Highlands.' In K.Willson and R.M.Bourke (eds.) 1975 Papua New Guinea Food Crops Conference Proceedings. Port Moresby: DPI, pp.79-80. **{Published abstract of a paper delivered at the 1975 conference}**

1977d 'No room at the top: agricultural intensification in the New Guinea Highlands.' In J.Allen, J.Golson and R.Jones (eds.) Sunda and Sahul: prehistoric studies in Southeast Asia, Melanesia and Australia. London: Academic Press, pp 601-638. **{Written in 1975 for XII Pacific Science Congress, Vancouver, then rewritten for publication in 1976}**

Golson, J. and P.J.Hughes
1976 'The appearance of plant and animal domestication in New Guinea.' In J.Garanger (ed.) La Préhistoire Océanienne. Paris: Centre de la Recherche Scientifique, pp.88-100. **{Written for, and published in, a preprinted volume for the IX Congress of the International Union of Pre- and Protohistoric Sciences at Nice in 1976 - thus probably late in 1975, or early in 1976}**

Golson, J. and P.J.Hughes
1980 'The appearance of plant and animal domestication in New Guinea.' Journal de la Société des Océanistes 36(69): 294-303. **{Unrevised version of Golson and Hughes 1976 paper}**

1976 1977b 'The making of the New Guinea Highlands.' In J.H.Winslow (ed.) The Melanesian Environment: change and development. Canberra; ANU Press, pp.45-56. **{Written in 1975 for the Waigani Seminar in May 1975. All of the text, bar the addendum which was added close to publication, was rewritten in the first half of 1976.}**

1976e 'Archaeological investigations at Kuk Tea Research Station, Mount Hagen: an enquiry into the agricultural history of the New Guinea Highlands.' Ms. 4pp.

1976c 'The history of the sweet potato in the New Guinea Highlands.' Ms. 34pp. **{Written for H.E.Maude's festschrift but withdrawn because of the considerations set out in Golson 1977b:54-55}**

1976a 'The last 10,000 years in the New Guinea Highlands and beyond.' Ms. 8pp. **{Revised version of 1977b}**

1977 1977c 'The Ladder of Social Evolution: archaeology and the bottom rungs.' Australian Academy of the Humanities, Proceedings 1977: 39-56. Reprinted as a separate paper by Sydney Unviersity. **{Written in the first half of 1977}**

Henderson, K.
1977 'Ditches before time.' Hemisphere 21(2): 13-21. [Interview with Golson and Philip Hughes]

1980 1982b 'The Ipomoean revolution revisited: society and the sweet potato in the Upper Wahgi Valley.' In A.Strathern (ed.) Inequality in New Guinea Highlands Societies. Cambridge: Cambridge University Press, pp.109-136. **{Initially developed from a seminar given to the Anthropology Department at Cambridge in 1978 and then reworked over 1979 and 1980}**

	1981c	'Agriculture in New Guinea: the long view.' In D.Denoon and C.Snowden (eds.) A Time to Plant and a Time to Uproot: a history of agriculture in Papua New Guinea. Port Moresby: Institute of Papua New Guinea Studies, pp.33-42. **{Written as a single long article with 1981a and 1981b in early 1980, reflecting the thinking of 1982b. Split into three separate papers by the editors}**
	1981a	'Agricultural technology in New Guinea.' In D.Denoon and C.Snowden (eds.) A Time to Plant and a Time to Uproot: a history of agriculture in Papua New Guinea. Port Moresby: Institute of Papua New Guinea Studies, pp.43-54. **{See 1981c}**
	1981b	'New Guinea agricultural history: a case study.' In D.Denoon and C.Snowden (eds.) A Time to Plant and a Time to Uproot: a history of agriculture in Papua New Guinea. Port Moresby: Institute of Papua New Guinea Studies, pp.55-64. **{See 1981c}**
	1980	'The Kuk Project.' Australian Quaternary Newsletter 15: 13-18. **{Republished as Golson 1980/81}**
	1980/81	'The Kuk project during 1978 and 1979.' Research in Melanesia 5(1/2): 15-24. **{Republication of Golson 1980}**
	1985	'Agricultural origins in Southeast Asia: a view from the East.' In V.N.Misra and P.S.Bellwood (eds.) Recent Advances in Indo-Pacific Prehistory: proceedings of the International Symposium held at Poona, December 19-21, 1978. New Delhi: Oxford and IBH Publishing Company, pp.307-314. **{Paper first written in 1980, though commissioned for proceedings of 1978 conference. Published without significant revisions}**
1981	1982a	'Kuk and the history of agriculture in the New Guinea Highlands.' In R.J.May and H.Nelson (eds.) Melanesia: beyond diversity. Canberra: RSPacS, ANU. Vol 1: 297-307. **{Written for the Annual School Seminar Series at the Research School of Pacific Studies, held in October/November 1980. Rewritten for publication in 1981, with reference to 1982b added later. Written in the light of 1982b}**
1982	1983	'Man in the Central Highlands.' Journal of Human Evolution 12(1): 42-50. **{Written late 1981 and early 1982, in the light of 1982b}**
1983	1984	'A proposal to proclaim a historic site at Kuk agricultural research station, Mount Hagen, Western Highlands Province.' Ms. 10pp. **{A note in the Department Annual Report for 1983 states that this was submitted in 1983. Stems from correspondence in June and July 1982 initiated by the National Museum Director, Geoffrey Mosuwadoga which Philip Hughes and JG then discussed with Western Highlands Provincial Government officials in October 1982}**

	1990	'Kuk and the development of agriculture in New Guinea: retrospection and introspection.' In D.E.Yen and J.M.J.Mummery (eds.) Pacific Production Systems: approaches to economic prehistory. Canberra: Prehistory, RSPacS, ANU, pp.139-147. **{Written in 1982 for the 11th IPPA Congress, part of the XV Pacific Science Congress at Dunedin in February 1983, submitted with minor revisions in 1983; references updated just before publication}**
1984	Golson, J. and A.Steensberg	
	1985	'The tools of agricultural intensification in the New Guinea Highlands.' In I.S.Farrington (ed.) Prehistoric Intensive Agriculture in the Tropics. BAR International Series 232. Part I: 347-383. **{Written early in 1984, having abandoned the original spoken paper given at a conference in Canberra in August 1981}**
1986	1989	'The origins and development of New Guinea agriculture.' In D.R.Harris and G.C.Hillman (eds.) Foraging and Farming: the evolution of plant exploitation. London: Unwin Hyman, pp.678-687. **{Paper delivered at World Archaeology Congress, Southampton, 1986; published without significant revisions}**
1987	Natuni	
	1987	'New Guinea agriculture.' Natuni 6: 16-17. [Interview with Golson]
1989	Golson, J. and D.S.Gardner	
	1990	'Agriculture and sociopolitical organization in New Guinea Highlands prehistory.' Annual Review of Anthropology 19: 395-417. **{Written late in 1989}**
1990	1992a	'Bulmer Phase II: early agriculture in the New Guinea Highlands.' In A.Pawley (ed.) Man and a Half: essays in Pacific anthropology and ethnobiology in honour of Ralph Bulmer. Auckland: Polynesian Society, pp.484-491. **{Written in 1990, based on a seminar delivered in Canberra in 1990}**
	Bayliss-Smith, T.P. and J.Golson	
	1992a	'A Colocasian revolution in the New Guinea Highlands? Insights from Phase 4 at Kuk.' Archaeology in Oceania 27(1):1-21. **{T.P.B-S and JG worked on the basic data in Canberra in April 1990. T.P.B-S wrote the framework of the article in August 1990 and JG added his input late that year in the light of Golson and Gardner 1990 which had then appeared in print}**
	Bayliss-Smith, T.P. and J.Golson	
	1992b	'Wetland agriculture in New Guinea Highlands prehistory.' In B.Coles (ed.) The Wetland Revolution in Prehistory: proceedings of a conference held by The Prehistoric Society and WARP at the University of Exeter April 1991. Exeter: WARP and The Prehistoric Society, pp.15-27. **{As for 1992b, but this article then produced largely by T.P.B-S}**

1991	1992c	'The New Guinea Highlands on the eve of agriculture.' Bulletin of the Indo-Pacific Association (1991) 11: 82-91. **{Written in the first half of 1991; not originally delivered at Yogyakarta IPPA conference in 1990}**
1992	1992b	'Introduction: transitions to agriculture in Oceania.' Bulletin of the Indo-Pacific Association (1991) 11: 48-53. **{Written in 1992 as an introduction after the submission of papers from the 1990 IPPA conference at Yogyakarta}**

APPENDIX A3

DATING THE TIBITO AND OLGABOLI ASH FALLS

The Tibito and Olgaboli tephras, material deposited in volcanic ash showers, have played a crucial role in Highlands archaeology as chronological markers during the period of the last 1200 years. Blong (1982) describes the history of their discovery in association with the Kuk archaeological project (Section A2.2) and proposes criteria for their identification in the field, together with more accurate methods of chemical characterization.

On the basis of his chemical "fingerprinting" analysis, Blong has identified Long Island, off the north coast of New Guinea (Figure A4) as the most likely source for both the Tibito and Olgaboli tephras. Radiocarbon dates bracketing each of the tephras have enabled Blong to propose a pooled mean date for Tibito tephra of 230 $\pm$ 40 BP for and the range 1100 - 1200 BP for Olgaboli.

Calibration of the ^{14}C results bracketing Tibito tephra using the range of different calibration curves then available yielded a scatter of corrections between 270 cal BP and 420 cal BP (Blong 1982:192). Through his analysis of the historical records from European ships passing Long Island between the 17th and 19th centuries, Blong concluded that the most likely period for the eruption that produced Tibito tephra was between 1630 AD and 1670 AD, though he could not rule out the possibility of a date at any point in the eighteenth century (1982:193).

Haberle (1994) has recently reviewed the radiocarbon evidence for the dating of Tibito and Olgaboli tephras. On the basis of his analysis and using the most recent calibration program (CALIB 3.0.3: Stuiver and Reimer 1993a, 1993b; see Appendix C11), Haberle assigns a pooled mean age of 1188 $\pm$ 45 BP to Olgaboli tephra, which calibration constrains within the period 1190 BP - 970 BP (980 AD - 770 AD). The pooled mean age of 232 $\pm$ 28 BP for Tibito tephra yields a calibrated age of 305 BP - 260 BP (1645 AD - 1680 AD). These calibrated ranges are adopted in this thesis as the best current estimates for the dates of the Olgaboli and Tibito tephras.

APPENDIX B1

A HISTORY OF CONTACT AND LIST OF NOTABLE EVENTS FOR THE TARI REGION

By most measures, including those of Huli history itself, the period of contact between Huli-speakers and the former colonial state was brief. Two broad phases in this period leading up to the establishment of the independent state of Papua New Guinea in 1975 are distinguished for the Tari region: an "early colonial" period from 1934 to 1945 and a "late colonial" period from 1950 to 1975. The events of "first contact" between Huli-speakers and European mining prospectors, so precious to colonial accounts of the history of the Papua New Guinea Highlands, were both shocking and incomprehensible to most Huli eyewitnesses: the two Fox brothers, accompanied by sixteen armed carriers, crossed Huli territory from west to east during two weeks in November 1934, killing more than forty-five Huli as they passed (Ballard and Allen 1991, Ballard 1992b). No Huli has suggested to me that there was any knowledge of whites or of the colonial state prior to 1934. There is similarly no evidence, prior to 1934, for the trade of steel goods or other "European" materials into the Tari region. The first sightings of airplanes and the subsequent passage through the Tari region of at least nine administration patrols between 1935 and 1945 provoked considerable interest but, other than introducing new crops and the first steel tools, induced little immediate change in the lives of most Huli. Small numbers of Huli men were employed by patrol officers as carriers and guides during this period and were thus introduced to the patrol posts at Lake Kutubu, Wabag and Mt Hagen.

A far more substantial impact was sustained through the spread of a series of epidemics during the 1940s, though no direct connection between these events and Europeans was established by Huli at the time. Of these, the most virulent was probably the dysentery epidemic (*ti darama*: "faeces-blood") of 1945/46. People alive at the time describe the appalling casualties sustained in the major basins, an impression borne out by the testimony of genealogies from this period:

> Some time after the whites (*honebi*) came to Hoyabia [1938], there was a great sickness, *ti darama*, which killed "a thousand" people in Haeapugua alone. But people didn't fight each other, as everyone could see that all were affected in the same way. There had been no big sicknesses before this, so everyone just stayed where they were.
>
> Togoli, 19.10.89, Interview Notes

Other epidemic events during this period, known as *moge* and *tiwa moge*, are remembered and named for the sores (*moge*) that erupted on people's bodies. Major epidemics of porcine anthrax (*nogo kę kenekene*), which may have been present in Tari earlier, also claimed a heavy toll amongst Huli pigs during the same period.

After a five-year lapse in administration contact, government officers from Lake Kutubu began patrolling Huli territory again from 1950, ultimately establishing the first permanent patrol post and airstrip among Huli-speakers at Rumurumu (Tari) in 1952. This permanent government presence marked a major watershed in Huli colonial history; where patrols had previously been content to observe wars without interfering, the intention of the administration to bring the region under control was clearly signalled by the immediate intervention of an armed patrol in a war at Haeapugua. 1952 also marked the arrival of the first missionaries, and within four years of the establishment of Tari station, four different missions had staked claims to distinct areas within the immediate Tari area, to be followed by a further two new missions in the Koroba area[1].

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1. These missions included (in order of their establishment) the Methodist Overseas Mission (later United Church) at Hoyabia in 1952, the Unevangelized Fields Mission (later Asia-Pacific Christian Mission, later Evangelical Church of Papua) at Halenguali in 1952/53, the Capuchin Roman Catholics at Gubari in

The administration initiated an ambitious road- and bridge-building programme, extending control to the Komo and Koroba areas and supervising the mass migration of Huli men as labourers to coastal plantations under the Highlands Labour Scheme[2]. Political autonomy was returned to the Tari region in a series of steps, with Local Government Councils set up in 1964, National Independence in 1975, and a Provincial Government for the Southern Highlands in 1978; Huli political leaders have been active in all three bodies. Three of the more significant developments of recent years have been the widespread adoption of a cash economy, substantially fuelled through the profits of small coffee-holder production; the completion in 1981 of the Highlands Highway link to Tari from the provincial capital at Mendi, the first widely available means of access to the rest of the country; and the minerals exploration and exploitation boom of the late 1980s and 1990s. This last phenomenon, which includes the extraction of gas from the Hides field on the Gigira range, a major gold rush at Mt Kare to the north of the Tari basin, and the discovery of alluvial gold in most of the major Huli basins, appears likely to overshadow all other forms of "development" (Clark 1991, Ryan 1991, Vail 1991). The following list of "notable events", which I have compiled for the demographic program at the Tari Research Unit, provides a bald chronology for the Tari region during the twentieth century.

1954/55, the Seventh Day Adventists at Habare in 1956, the Christian Missions in Many Lands (CMML) at Gunu near Koroba in 1958 and the Wesleyan Mission at Fugwa (Mogoropugua) in 1961.

2. According to Glasse (in press:5), 34% of all adult Huli men migrated as labourers under the Scheme.

NOTABLE EVENTS LIST FOR THE TARI REGION

Dates have been determined from a combination of oral historical accounts, the sources listed below and a diary kept by John Vail of the Tari Research Unit (for the period 9.6.84 to 21.5.91). Question marks (?) denote entries for which the date is not independently verified and relies solely on oral historical evidence.

1912	?Severe drought and frost
1914	?Severe drought and frost
1922	19th Jan.: Major earthquake in Tari region at 10pm, epicentre at Bosavi (7.5 on Richter scale)
1925	?Very severe drought, known to Huli as "Ambuamo"; major food shortage, with heavy mortality
1934	Sept.-Dec.: Minor drought
	Oct.: Airplane sent from Mt Hagen to find Fox brothers turns back over Margarima (and thus not seen in the Tari basin)
	Nov.: Fox brothers pass through from the Strickland river to Koroba, Pureni, Dauli, Tigibi, Tari Gap, Margarima and then to Mendi; their party consisted of 2 Europeans, 16 armed carriers and no police or dogs.
	Hiwa vs. Telabo war in Haeapugua basin (after the passing of the Foxes)
1935	May: Hides/O'Malley patrol passes from Bosavi region to the Hegigio river, Benalia and then to Margarima through the Ne/Gereba pass; their party consisted of 2 Europeans, police, and carriers
	Severe wet period and ensuing famine, concluding in Feb. 1936
1936	1st Feb.: Aerial reconnaissance flight (seen in Dauli, Margarima and Haeapugua areas) (containing L.Lett, J.Hides, J.Taylor, F.E.Williams, I.Champion) passes from Tari Gap to Dauli and Yumu and returns along same route
1937	Lake Kutubu police post established
	Aug.-Sept.: C.Champion/Anderson patrol passes from North to South Basin and out to Kutubu (2 Europeans, police, carriers)
1938	Feb.-Mar.: I.Champion/Adamson patrol from Kutubu to Hulia river and back to Kutubu
	May-Jul.: Taylor/Black (Hagen-Sepik) patrol camps at Hoyabia; air drops made
	Heavy rains for 6 to 8 months, moderate food shortages
	?Earthquake in Tari region
1939	Nov.-Dec.: I.Champion/Timperley patrol from Kutubu passes from Mananda to Hiwanda, Walete, Hare, Karida, Eganda, Rumurumu, Bai, Yangali, Dagia valley and back to Kutubu (2 Europeans, 11 police, 37 carriers)
1940	June: Adamson patrol ex-Kutubu
	Kutubu station closed
1941	?Severe drought with frosts and bushfires; Tagali river dries up completely; subsequent major food shortage extending into 1942, with heavy mortality
1943	Heavy rains in early 1943
	Sept.: D.J.Leahy patrol from Wabag to Hoyabia via Wage valley; Huli carriers taken to Mt Hagen
	?Start of major porcine anthrax epidemic
1944	?Large numbers of allied warplanes fly over Koroba and Tari from the south (very widely seen)
1945	Mara Gamu cult imported to Tari basin from Porgera
	Sept.: N.Blood patrol to Hoyabia to interrupt Mara Gamu cult and to return Huli carriers from Mt Hagen
	?Heavy rains for 4 to 5 months; moderate food shortage
	?Influenza, dysentery (*ti darama*) epidemics
1950	D.J.Clancy patrol from Lake Kutubu to Lower Tagali

1951 Smith/Clancy/Neville patrol from Lake Kutubu to the Tari basin in an abortive attempt to establish an airstrip and permanent post at "Rumurumu" (Tari)

1952 Carey/Neville patrol to Tari from Lake Kutubu; establishes permanent post and builds air strip
Tani/Tigua war stopped
Sept./Oct.: M.Garlick and J. Erkkila of Unevangelized Fields Mission (later A.P.C.M., now E.C.P.) walk to Tari
Sept./Oct.: Methodist Overseas Mission (now U.C.) established at Hoyabia

1953 L.Twyman establishes A.P.C.M. base camp at Tari (Halenguali)

1954 Anthrax epidemic
First medical patrols in Tari and Haeapugua basins
Oil patrol to Lebani and Strickland Gorge led by Clancy with Zehnder, Llewellyn and Duke; Huli carriers drown in Strickland river
3rd Mar.: Major earthquake near Tari, VII on Modified Mercalli scale of felt earthquakes
4th Mar: Major earthquake near Tari, VI on Modified Mercalli scale of felt earthquakes
Sept.-Oct.: Minor food shortage

1955 Mar.: Roman Catholic Mission established at Gubari
Apr.: R.Glasse starts ethnographic fieldwork at Hoyabia
Oct.-Nov.: Food in abundance
Nov.: Major earthquake at Tari, 6 on Richter scale

1956 Seventh Day Adventist Mission established at Habare
E.C.P. Tani Walete mission initiated by Jim and Joan Erkkila (station formally established 1957)
May: Minor food shortage, Haeapugua
Aug.-Sept.: Tagali river in flood
Nov: R.Glasse completes first fieldwork visit

1957 Tagali Bridge completed by Berard Tomasetti and Neil Grant
Minor food shortage in Koroba area after heavy rains

1958 20th Mar.: "Haibuga Marsh" and "Huriba" areas derestricted by Administration
Anthrax epidemic

1959 Pneumonia epidemic at Margarima
Sinclair replaced at Koroba by Desailly
June: R.Glasse begins second fieldwork visit

1960 Feb.: R.Glasse completes second fieldwork visit
Hiwanda - Tagali Bridge road completed
June?: Bushfires at Paijaka
5th Aug.: Full eclipse of the moon noted at Tari
Heavy rains, minor food shortage

1961 Heavy rains, minor food shortages
Full administrative control established
Andabe Kepa appointed as Member of the Legislative Council
D.P.I. introduces coffee
6th Sept.: Wesleyan Mission established at Fugwa
Sept.: Minor frosts at Tari

1962 Jan.: Influenza epidemic
4th Feb.: Full eclipse of the sun noted at Tari
Jun.: Measles epidemic
A.P.C.M. establish mission station at Mananda (Komo)
Nov.: Minor food shortage

1963 July: Food in abundance

1964 Local Government Council established at Tari
24th Apr.: Major earthquake near Tari, V-VI on Modified Mercalli scale of felt earthquakes
Apr.-May: Dysentery epidemic
National Elections

1965	Drought, minor food shortages, followed by good karuka pandanus harvest
1966	Benalia airstrip opens
1968	Ian and Betty Rowse are E.C.P. missionaries at Tani, Normans at Mananda, Sinclairs, Merriweathers and Erkkilas at Tari.
	National Elections
1971	2nd Feb.: Dauli Teacher's College opened.
1972	Tari airstrip improved, extended
	National Elections
	Severe frost and drought; minor food shortages
1974	Mar.: Christian revival movement ("Rebaibal") begins at Homa; one man, Pororo, killed
	E.C.P. print press established at Halenguali
1975	16th Sept.: National Independence for Papua New Guinea
1977	Mar.: L.Goldman begins ethnographic fieldwork at Yaluba
	S.Frankel begins ethnographic fieldwork at Hambuali.
	National Elections
1978	Aug.: L.Goldman completes ethnographic fieldwork at Yaluba.
	25th Aug.: Southern Highlands Provincial Government established at Mendi
1979	S.Frankel completes ethnographic fieldwork at Hambuali.
	May-Aug.: R.Glasse doing ethnographic fieldwork near Hoyabia
1980	Aug.: Southern Highlands Premier Andrew Andaija killed in plane crash at Tari Gap
1981	All-weather highway to Tari completed
1982	June: National Elections
	Jul.: Fighting at Tauanda - c.3 killed
	Sept.: Fighting at Idauwi, at least 3 killed
	July-Nov.: Severe frost and drought; minor food shortages
1983	First social clubs set up outside Tari station
	Sept.: Police station opened at Tari
	Tari station roads sealed
1984	2nd Feb.: Westpac open branch at Tari
	1st June: Excessive rain; minor food shortages
	Floods in Koroba
	28th Aug.: Payback killing at Telabo outside S.D.A. church
1985	12th Feb.: Hangabo war for two days
	26th Feb.: War between two Pureni clans - 2 men drowned in Tagali and speared in back
	Apr.: Idipu war (Pi vs Piribu at Andoware)
	17th May: Debi river in flood, Bai bridge covered, heavy silt deposits
	June: Yaungtine Koromba wins Southern Highlands Provincial Elections
	26th June: Piribu-Hambuali war
	11th Aug.: Ambua Lodge opens
	13th Nov.: Westpac branch at Tari closes
1986	Mar: C.R.A. start sampling at Mt Kare
	2nd Apr.: Prime Minister Wingti visits Tari
	28th Oct.: Tagali river in flood
	1st Nov.: Tumbeli-Pureni war over death of Hambuali man
	6th Dec.: Tani-Pureni war
	21st Dec.: Haro-Dabuda war
1987	9th Mar.: Komo war
	28th Mar.: Wingti and Chan visit Tari
	May: British Petroleum set up camp at Kobalu
	8th July: Tari District Office burnt down after National Elections
	28th Aug.: Hadani-Pi war
	25th Sept.: Koroba war
	7th Oct.: Sullivan's wholesale tradestore opens at Tari
	31st Oct.: Hela Cultural Centre started
	31st Oct.: Funding for Tari Women's Guest House approved

1988	12th Apr.: Halimbu-Waralo war
	Apr.: Mt Kare gold rush starts
	25th Apr.: Halengoali war
	16th June: Dauli Hydroelectric Station starts operating
1989	4th Jan.: Gigida 1 war
	26th Mar.: Hedemali war (over dispute at Kare goldrush)
	21st June: New District Office opened
	13th July: Barili-Yaguari war
	Sept.: Hail storm in Pi-Nagia area destroys crops; minor local food shortage
	3rd Nov.: Wabia-Biango war
1990	26th Apr.: Floods throughout Tari region
	Jun.: Albert Mogai wins Provincial elections
1991	4th Mar.: Debi river in flood
	24th Apr.: Hides power line completed
	June-July: Heavy rains, floods cover Haeapugua and Dalipugua
	15th Aug.: Haeapugua floods completely
1992	Telabo-Dumbiali war
	June: National Elections, Wingti returned to power (takes office in July)
1993	25th Feb.: Heavy rains, floods cover Haeapugua
	Dobani-Hagu war
	Hoyabia-Piwa war
	Komo - major wars
	July: Major landslide in Puyaro area destroys settlements; no casualties reported
	20th Aug.: Major earthquake shock received at 3.05pm at Tari; District Office breaks in two, no fatalities.

Sources:

Adamson 1939/40; Anon. 1936/37; Ballard and Allen 1991; Blood 1946; Carey 1952; C.Champion 1937/38; I.Champion 1936, 1937/38, 1939/40; Clancy 1951/52; Fox n.d.a.; Glasse in press; Hides 1935; Leahy 1943; Light and Life (E.C.P.); A.Sinclair pers.comm.; South Pacific Post 19/9/61; Tari Patrol Reports: 3-54/55, 4-54/55, 6-55/56, 1-57/58, 1-58/59, 1-59/60, 7-59/60, 6-60/61, 8-60-61.

APPENDIX B2

A NOTE ON HULI ORTHOGRAPHY AND A GLOSSARY OF HULI TERMS USED IN THIS THESIS

I have attempted to render Huli phrases and terms according to the orthography employed in the language materials produced by the missionaries Murray and Joan Rule (W.M.Rule 1974, W. and J.Rule n.d.). There are other orthographies available for Huli, such as that proposed by Gabriel Lomas (1988) in his doctoral thesis on Huli language. But a large number of Huli are now literate in Huli and most are familiar with the standard orthography set out by the Rules which is the basis for a Huli-English dictionary (Huli Language Conference 1971) and a Huli translation of the New Testament.

Pronunciation of Huli terms differs most notably from English in the following instances:

Huli letter	**Pronunciation**
a̲, i̲, e̲, o̲, u̲	Nasalised vowels
h	More heavily frictionised than the English equivalent
y	Pronounced with friction (approximating a soft English "j") except between e-a or o-a vowels or after a nasalized vowel (and here also, after "ai")

Huli is a tonal language, with three distinct tone patterns: a high falling tone (\), a level mid tone and a low rising tone (/) (the tonal notations given here follow Goldman (1983) in reversing the slopes initially given by the Rules). While these tones are critical in speech, with tonal differences giving rise to entirely different meanings for the same lexeme, context is usually sufficient to identify the sense of a word in text unmarked by tone. Consequently, tones are not marked in the text here, other than for contrasting pairs where the distinction is of critical importance, as between *ab́a* ("father") and *aba* ("mother's brother, affine").

The major point of difference between the standard orthography and that used here relates to composite words where one of the vowels is elided, which are spelt here in full; hence *eganda* becomes either *egaanda* ("bird nest") or *egeanda* ("cave"), and *gebali* becomes *gebeali*.

The following glossary lists short translations for the Huli terms employed in the text of the thesis. More complete lists are given elsewhere for Huli terms for soils (Table B3), grasses (Appendix B3), trees (Appendix B4), crops (Appendix B7), fauna (Appendix B8), birds (Appendix B9), leaders (Table B19), stone axe blades (Table C4) and ritual stones (Table C5); these terms are not repeated in this glossary.

aḇa - mother's brother, affines
ab̃a - father
ababuni - father's brother
abi - form of compensation payment
agali - man
agali haguene - head man
agandia - man's house (see also *balamanda*)
agau wandia - rite performed for human fertility in *dindi gamu* ritual
aịnya - mother or those that one's mother calls 'sister'
ala - early, ancient, prior
anda - house (ungendered); private area
andaga - home, homewards
angi - time
angibuni - sow
aria - cognatic kindred
are - flaked stone piece
áyu - now
ayu - axe
ba - to kill, to sacrifice, to hit
baile - relative(s)
balamanda - men's house
bamba - before
baya horo - mythical cannibal giant
bayabaya - sacrificial role in Huli ritual (see *dindi bayabaya*)
bi - speech, talk
bi bai - in between / tied between, describing individuals with links to both of two lineages
bi laga - orator
bi tene - speaker, "source" of the talk
da pindu - "sky stuff", an alternate term for *mbingi*
da togo - "sky bridge", route of the sun
daba - generation
dabu - form of compensation payment
dama - spirit, either ancestral or unrelated
dama angi - era of the spirits (see also *ira goba naga*)
dama dindi tene - original earth spirit
damba bi - speech form, often incorporating *dindi malu*, delivered by *agali haguene*
damene - cognatic kindred
dandayi - policeman ("bow-bearer")
dange - cowrie shell
dange hende - rope of cowrie shells
darama - blood
de gana - shallow internal ditches marking garden plot boundaries
deba - rite in the *tege* ritual sequence
dindi - land, earth, soil
dindi ab̃a - land owner
dindi anduane - land owner
dindi bayabaya - former fertility rite
dindi dumbidumbi - earthquake
dindi gamu - a complex of former rituals ("earth spells")
dindi hameigini - parish territory (see *hameigini* [II])
dindi kuni - original territory
dindi malu - clan origin myths and genealogies
dindi pongo(ne) - the root of the earth
dindi pongoyi - ritual leader knowledgeable about the root of the earth
dindi tene - land owner
dinini - ghost, spirit of recently deceased
dodo - dirt, polluting substances
dombeni - stomach, middle

dombeniali - middle man, mediator
dugu - row (as of vines)
duguba - a cardinal orientation towards the south
Duguba - peoples of the Papuan Plateau
duna - a cardinal orientation towards the west and northwest
Duna - Duna-speaking people
e - swidden garden
e ma - swidden taro garden (ancestral)
ega - rite in the *tege* ritual sequence
emene - small
gabu - dry, dead
gabua - wild
gaea - drought
gaea timbuni - major drought
gamu - spell
gamuyi - spell-holder
gamugamu - spells
gana - ditch
gebe - ancestor (see also *mama*); also ancestor-focused ritual
gebe anduane - sponsor of *gebe* ritual performance
gebe hagama - rite performed at Gelote mimicking the lifestyle of the earliest ancestress
gebe nogo - pigs sacrificed for ancestors
gebeali - ancestor or ritual leader
gebeanda - ancestral ritual site
gewa - cane, component of dindi pongone
gomia - early ritual form and associated dance style
guruanda - long house associated with *tege* rituals
guruma igiri - young male initiates in *tege* rituals
habane - egg, core, centre
habe - life (contrasted with *homa*)
hama - public forum, open space
hameigini^{I} - agnatic clan or lineage, a descent construct
hameigini^{II} - parish territory, parish co-residents
hana - moon (see *Hona Hana*)
hane - front, facade, entrance end of house
hari - mountain, sky
hariga or *bambali hariga* - walkway, track
haroali - male bachelor cult member (see also *ibagiya*)
haroali tigi - bachelor cult grove
hege - swear word
Hela tene - origins of Hela people (Huli, Duna et al.)
hewa - non-Hela people (Foi, Fasu, Hewa); also a cardinal orientation towards the southeast
heyogone - youngest, junior
himugu - rite in the *tege* ritual sequence
hina - sweet potato
hina angi - era of sweet potato, modern era
hina gari - famine, shortage of sweet potato
hina naga - era of sweet potato, modern era
homa - death (contrasted with *habe*)
homa haguene - rite performed for ancestral skulls
homama - cold, sickness
homogo - rich man or woman
Hona Hana - moon (see *hana*)
Hona Ni - sun (see *ni*)
honebi - light-hued, European
hugu - vaginal fluid
huli or *hulihuli* - Huli-speaker, also a cardinal orientation towards the southern Tari basin

huli ore - the southern Tari basin, "real Huli"
iba - water
iba dama - severe rain
iba kuyama - deep pool, usually a ritual site
iba li - flood
iba puni - drainage ditch or channel
iba tiri - male water spirit; also rubbish man (of humans)
ibagiya - male bachelor cult member (see also *haroali*)
ibane - grease
ilili - taboo, ritual proscription
ira - wood, tree, fire
ira dugu - rotten wood, buried swamp forest, associated with early *dama*
ira goba naga - era of the spirits (see also *dama angi*)
irabu - forest
kai - praise
kai mini - praise term
kamianda - ancestral ritual site (often a cave)
keba - digging stick
ko - bad
kuni - bone
liru - ritual stones
liruali - ritual leader associated with *liru* ritual; also senior officiant at *tege* ritual
liruanda - building containing *liru* ritual stones
ma - taro
ma angi - time or era of taro, preceding modern period of sweet potato
ma gari - taro famine, ancestral famine
ma hiraga - ritual performed for infants
ma lara - wetland taro garden (ancestral)
ma naga - time or era of taro, preceding modern period of sweet potato
ma uli - taro hole
mabu or *mbabu* - permanent garden
mabu anduane - garden owner
mabu tene - garden owner
mago - filthy, disabled
malu - genealogy
mama or *mamali* - ancestor
mana - custom, knowledge, lore
manayi - individual knowledgeble about *mana*
mane or *manemane* - headwaters; a cardinal orientation, generally towards the north and north-east
mbagua - mineral oil
mbagua yole - tigaso tree oil
mbi - darkness
mbi dindi - Tibito tephra ("darkness sand")
mbi mu - Tibito tephra ("darkness sand")
mbingi - time of darkness; refers specifically to the Tibito volcanic ash fall
moge - a boil, sickness
mondo - mound
mu - sand
muguni - trace, evidence, mark
nabaile - non-relative(s)
ngoe - earthworm
ngu - taint (of women)
ni - down there
ni - sun (see *Hona Ni*)
ni doma - rainbow ("sun bridge")
ni habane - rounded stone used in ritual ("egg of the sun")
ni tangi - stone mortar used in ritual ("hat of the sun")
nogo - pig

nogoanda - pig hut
nogo dugudugu - pig droveway
nogo (bara) tambugua -
nu - string bag, placenta
oali - local, person of this place
obena - a cardinal orientation towards the north-east and east
Obena - Enga-speaking people
pabe - fence
panamondo - small mound
pibiya - frost
pindu - thing, stuff
pipini - breast milk
pobo - heat; female pollution
pugua - menstrual blood
pugua - swamp
puni - channel, stream
pureromo - adage, formal saying
puya - snake
tara - other, non-cognate
tayaanda - forest
te - grove
tee (Enga) - major form of ceremonial exchange practiced by Enga-speakers
tege or *tege pulu* - recent ritual complex
tege anduane - sponsor of *tege* ritual
tege bi - ritual speech appropriate for performances of *tege*
tege tene - sponsor of *tege* ritual
tene - agnatic parish resident
tene hamene - cognatic parish resident with a long history of local residence by ancestors
tene te - origin myth
ti darama - dysentery ("shit blood")
timbuni - big, large
timu - form of compensation payment
tole - stone
tomia - poison
tomo - food
uriali - junior officiant at *tege* ritual
uru wagia hale - torch employed in *dindi gamu* ritual
wabi or *wabiwabi* - lowlands, generally a cardinal orientation towards the south and southeast
wahene - eldest
wai - war
wai biaga - war leader
wai tene - individual responsible for a war and for associated reparations ("war source")
wali - woman
wali haga - non-cognatic parish resident
walia - mark, trace, evidence
wandari - girl, young woman
wandia - woman's house
wane - daughter
wane labo - female water spirit
wariabu - brideprice
yabo - early form of ritual
yagibano - poor, worthless
yagogo - haze
yamuwini - non-agnatic parish resident ("placed by woman")

APPENDIX B3

HULI TERMS FOR GRASSES, SEDGES, MOSSES, FERNS AND SHRUBS

This list provides Huli terms and species identifications for some of the more common grasses, sedges, mosses, ferns and shrubs of the Tari region. Formal species identifications are based largely on the work of Powell, Wood and Haberle; the primary contribution of this list is an attempt to render the Huli terms according to the standard orthography (Appendix B2). Variations in the spelling of Huli terms given by different authors are provided, where these differ from the standard orthography. Individual Huli terms are often applied to a number of different scientific species; where known, these different species are listed, with the species most commonly identified by the Huli term listed first.

Conventions:

[*bandu*] synonyms
(POTO) alternative spellings from other sources

Source abbreviations:

d Huli Language Conference (1971)
f Frankel (1986)
g Goldman (1981a), (1983)
h Haberle (1991)
p Powell with Harrison (1982)
w Wood (1984)

Generic terms:

malingi - fern
tani / datani - grass / weed
gama - moss

Specific terms:

adiba gadiba - unidentified grass sp.
agibaba - Cyathea atrox (grassland tree fern) (d)
alibali - Echinochloa crus-galli / Eleusine indica
amolo - Marattia novoguineensis
andaguru / andagulu - unidentified grass sp.
andugubali - Hoya sp. (p/ANDUKUBALI)
angigali - Saccharum spontaneum
angugani - Saccharum robustum
aulai - Helichrysum bracteatum / Xyris capensis (w/AULEI)
ayambu - Flagellaria indica (d)
babeya - unidentified fern sp.
bandu - Coix gigantea; Hagen pitpit [*hongo bandu*]
baya - Holochlamys sp. (p/PATIA)
bodo - Merinthosorus hieronymi / Drynaria sp. / Microsorium commutatum / Aglaomorpha drynariodes (p,h/POTO)
bolange / bolage - Ischaemum polystachyum / I. timorense (p/PORLAKE, h/PORLAGE)

var. *mindibi*
var. *bebe*

dabale - Xanthomyrtus sp.
dagi - Gleichenia milnei
dambale giao - Plectranthus scutellariodes (p/TAMPALAKIAN, w/DAMBALEGEAO)
dambe - Euphorbia buxoides / Machaerina rubiginosa (p/TAMBE)
dangi - Imperata cylindrica (p/TANGI)
debedebe - Polygonum spp. / Pouzolzia sp. / Alternanthera sessilis / Gonostegia hirta (w,p,h/TEBETEBE)
dewgre - Viola arcuata (g)
dibiribi - Dennstaedtia sp / Sphaerostephanos unitus / Cyclosurus unitus
didibali - Tephrosia sp. / Desmodium sequax (d) (p/TITIBALI)
dibugandu - Claoxylon sp. (d)
diwi - Wikstroemia androsaemifolia (p/TIWI)
dombeda - Piper sp. (d)
duguba aduba - Erechtites valerianifolia / Crassocephalum crepidioides [*mbua mbua*]
dunduyame - Leersia hexandra / Isachne globosa/arfakensis (h/TUNDIYAME, p/TUNDIYEMA)
elepene - unidentified grass sp.
gabutugu / gabitugu - Cyathea sp. / Dicksonia hieronymi
gambali - Blumea arnakidophora/lacera (p/KAMVARI)
gambe - Miscanthus floridulus

var. *angibali*
var. *angiyali*
var. *angunali*
var. *igibali*
var. *ingiyali*
var. *kolo*
var. *wabiale*

ganga / kiangu - Elatostema blechnoides/beccarii / Procris sp. / Dichroa febrifuga / Pilea effusa/melastomoides (p/KANGA)
garegare - Impatiens hawkeri / Ophiorrhiza nervosa / Plectranthus scutellariodes / Pogostemon stellatus / Pilea sp. (p,h/KAREKARE, d/KARAKARA)
gebe tani - Paspalum conjugatum / Polygonum chinense / Drymaria cordata (p/KEBITANE, KAPITANE, w/KEBITANE)
gigibaya / gigipaya - Scleria ciliaris / Carex sp. / Schoenus sp. / Cyperus sp. / Dianella ensofolia / Ghania sieberiana / Fuirena umbellata (p/KIKIPATIA)
gilinapu / gilinaba - Geitonoplesium cymosum
girolalemame - Rhododendron macgregoriae (p/GIRINILAMA, w/GIRALEMAME)
gombabu - Kyllinga brevifolia/melanosperma (p/KOMBAPU)

var. *hende gombabu*

gonalia puhaga - Sacciolepis myosuroides
gonalia tani - Setaria montana
gondale / goandale - Urena lobata (h/KONDALE)
gondo - Commelina paleata/diffusa / Floscopa scandens (d/GONDU, p/KONDO)
guoyubugunu - Alpinia sp (p/KWOYUBUKUNU, w/KUOYUBUKUNU)
gurubu - unidentified grass sp.
hamanoma / hamamoma - Eleusine indica
hangabo - Cyathea aenifolia / Phyllanthus flaviflorus [*malingi*?]
hawalia - Schoenoplectus mucronatus / Lipocarpha chinensis
hewaliabu - unidentified purple daisy sp.
hina pole - Siegesbeckia orientalis (p/HINAPALA)
hombore - unidentified grass sp.
hongo bandu - Coix gigantea [*bandu*]

hura - Eleocharis dulcis [*tare*]
ibendenge - unidentified moss sp.
igibu - Calamus sp.
kanekane - unidentified grass sp.
kuabu - Celastrus novoguineensis
kuheko? - Freycinetia sp. (p)
kulina - unidentified vine sp. (d)
lobolobo / *lobaloba* - Bidens pilosus / Dichrocephala bicolor / Siegesbeckia orientalis / Drymaria cordata (h/LOPALOPA)
mabua - Schizomeria sp.
madai / *madau* - Ludwigia octavalvis (w/MADAI, p/MADAING, h/MATAU,MATANG)
malingi - Cyathea aenifolia / Phyllanthus flaviflorus [*hangabo*?]
mangara - Saurauia sp. (d)
manunani - unidentified vine sp. (d)
magu - Solanum torvoideum (p/MARGU)
mbombera - unidentified grass sp. (d/BOMERA)
mbuambua - Erechtites valerianifolia / Crassocephalum crepidioides [*duguba aduba*] (w/BUAMBUA)
nabiya - unidentified sp.
nengalo - Pycreus unioloides
ngolo - Miscanthus floridulus
nigi - Laportea sp. (p,w/NEGI)
nogo biniwa - Lycopodium sp. (p/NOKOBINIWA)
nogo hane - Sacciolepis indica (p/NOKOHANE)
nogo iba - Ageratum conyzoides / Adenostemma hirsutum / Eupatorium odoratum / Siegesbeckia orientalis / Orthosiphon sp./ Plectranthus sp. (f/NOGO IBA LOBA LOBA, p/NOGOIPA)
nogo pindu miaga - unidentified sp. [= *nogo tau miaga*?]
nogo tau miaga - Polygonum nepalense [= *nogo pindu miaga*?]
nogombi tani - Hedyotis lapeyrousii / Lycopodium sp. (p/NOGOBITANA)
obena mandiyame - unidentified grass sp.
padu - unidentified sp.; Huli pitpit
palawaya - Helianthus annuus?; Sunflower
palima - Melastoma sp. (d)
pani - unidentified vine sp. (d)
paula - Acorus calamus (p/PAWLA)
pimbi tani - Polygonum nepalense / Isachne brassii / Dimeria ciliata / Digitaria violascens / Setaria montana /Sacciolepis sp. (p/PIMBITANE)

var. *mindibi* - Sacciolepis myosuroides

piwa - Equisetum debile
poro - Dimorphanthera sp. / Rhododendron sp. (d)
pu - Medinilla sp. (p/PUU)
tabayia - Smithia sensitiva / Aeschinomene indica (p/TAPATIA)
tare - Eleocharis dulcis [*hura*]
tere tani - Lactuca laevigata / Bidens pilosus (p/TERETANE)
tibu / *tibunali* - Alpinia sp.
tola - Phragmites karka
tongole - unidentified sp.
toro - Nephrolepis acuminata
tugubili - Freycinetia sp. (p/TUGIBILI)
wagamabu - Embelia sp. / Blumea sp. / Cissus aristata (p/WAKAMAPU, WAGAMAPU)
wandiyame? - Erigeron sumatrensis (w) [= *obena mandiyame*?]
wango /*wangoli* / *wangoma* - Saurauia sp.?
yagua - Pteridium aquilinum / Diplopterygium sp. / Histiopteris incisa
yu - Cyclosurus sp.

APPENDIX B4

HULI TERMS FOR TREES

This list provides Huli terms and species identifications for some of the more common trees of the Tari region. Formal species identifications are based largely on the work of Powell, Wood and Haberle; the primary contribution of this list is an attempt to render the Huli terms according to the standard orthography (Appendix B2). Variations in the spelling of Huli terms given by different authors are provided, where these differ from the standard orthography. Individual Huli terms are often applied to a number of different scientific species; where known, these different species are listed, with the species most commonly identified by the Huli term listed first.

Conventions:

{*bibi ayaga*}	*kai mini* praise term
[*embo*]	synonyms
(p/AYEGE)	alternative spellings from other sources

Source abbreviations:

d	Huli Language Conference (1971)
f	Frankel (1986)
g	Goldman (1981a), (1983)
h	Haberle (1991)
hr	Holdsworth and Rali (1989)
p	Powell with Harrison (1982)
w	Wood (1984)

Generic terms:

ira - tree
yuni / *duni* - leaf

Specific terms:

abare {*mau walo*} - Pandanus conoideus; Marita pandanus
agarugua - Planchonella sp.
alia - Planchonella sp.
aliange - Ficus sp. / Streblus sp. (p/ALIENGE)
aluahina - unidentified tree sp.
aluguai - unidentified tree sp.
andira - Nothofagus sp.
anga {*doro wale*} - Pandanus julianetti; Karuka pandanus
anona - unidentified tree sp (d)
apona? - Rapanea sp. (p)
ayaga / *ayage* (*aidege* in Koroba area) {*bibi ayaga*} - Areca sp.; Black palm (p/AJAGA, g/AYEGE)
ayoba - Libocedrus papuana
bai - Castanopsis acuminatissima; Oak (p/PAI)
bai werira - Symplocos sp. (p/PAIWERIRIA, w/BAIBURIRI, d/PAIWERIDI,PAUTIDI)
balimu - Melastoma affine (w,f/BALIMA)
bara - Euodia latifolia / Evodiella cauliflora (p/PARA)
bauwa / *baowa* - Casuarina oligodon (p,h,w/PAWA,d/POAWA)
bebogo - Macaranga warburgiana (p/PEBEKO)

bogabaro - Astronia sp.
dagialo / dagilagu - Dicronopteris linearis (h/TAGILAGU)
dagiruba - Nothofagus sp.; Southern beech
dego / degua - Elaeocarpus sp.
dgya - Trimenia papuana (p/DIJER,DI'ER,d/DANIA)
dobeya - Octamyrtus behrmannii (d)
dombe - Octamyrtus sp. / Sapium sp.
dugu liwa - Dacrydium nidulum; Swamp pine
dumbi - Elaeocarpus sp.
egemaria - Timonius sp. / Guettardella sp. (p/EKAMARIA)
eli - Octamyrtus pleiopetala / Planchonella sp. (p/ERI)
embo - Homalanthus novoguineensis/nervosus (g) (d/IMBO) [*momage*]
emo - Gordonia papuana
eno - unidentified tree sp.
ere - Octamyrtus pleiopetala/fruticasum
gabi - unidentified tree sp. (g)
gaea - unidentified tree sp.
galoma - Alphitonia incana (p/KALOMA)
gambara - Syzygium sp. (p/KAMBARA)
gana - Phyllocladus hypophyllus
gato - unidentified tree sp.
gebo / gibi - Myristica sp. / Podocarpus sp. / Horsfieldia spicata (p/KEBO,KEPOKANA)
gedere - Pandanus sp.; Wild pandanus sp. (p/KETERE)
gendegende - Talauma oreadum / Magnolia candollii (leaf of this is *gingali*?)
gerebaya - Carpodetus arboreus (p,h/KEREBUYA)
gibaro - Gardenia sp. / Ficus sp. (p/KIBARO)
gingali - Elaeocarpus sp. (w/KINGALI)
gore - Pandanus sp.; Wild pandanus sp.
gubaro - Saurauia congestiflora
gubi - Dysoxylum sp?
gugu - Pandanus sp.; Wild pandanus sp. (h/KUGU)
guhabia - Memecylon hepaticum (w/NGUABI)
gulina - unidentified sp.
gumu - Litsea sp. (d)
guraya / guriya {*gubiraya*} - Araucaria cunninghamii
habe - unidentified tree sp.
habeno - Conandrium polyanthum / Rapanea acuminatifolia
habia - Schefflera sp. (p/AVIA)
habono - Eurya sp. / Ardisia sp.
hagohago - Blumea riparia / Ficus sp.
hgio - Ficus pungens (p/HIYO)
harapira - unidentified tree sp.
hale - Elmerillia sp.
harege / hariago - unidentified tree sp. (g)
haro - Lithocarpus rugo-villosus (p/ARO)
hebare - Alstonia glabriflora (p/HEPALI)
hembolome - Prunus grisea var. grisea (p/HEMBELOME)
hewe - Quintinia nutantiflora / Memecylon torricellense (p/HEWA)
hiluwa - Macaranga pleiostemona/pleionura (p/HILUWE)
hiribi - Ficus adenosperma
hiwa - Metroxylon sagu; Sago tree
holi - unidentified tree sp.
homa - Polyosma sp.
homai - Timonius spp. (h/HOMIA)
homai {*yuwi*} - Pandanus brosimos; Wild pandanus [*mundiya*]
hubi - Ficus calopilina (hr) (p/HUPI, d/UBI)
hungi - Piper gibbilimbum (p,h/HUGI)

var. *hungi haruli* - Piper macropiper (p/HUNGIHALULI)

ibi gobe - Prunus pullei (w/IBI KOBE)
idama - Cyathea rigens
ingidi - unidentified tree sp.
kepopuni? - Riedelia monticola (p)
ketene - unidentified tree sp.
kiabu - Podocarpus bracteatus (p/KEBU, d/KIBI)
kuandi - Caldcluvia brassii/celebica (d/GONDI)
kuangia - Sloanea sp. (h/KWANGIA, w/KUONGIA)
kueda - unidentified tree sp.
lai - Dodonaea viscosa
laulau - Medinilla sp. / Eria sp. / Rhododendron sp. (p/LAULO)
lelenge - Pandanus sp.(brosimos?); Wild pandanus sp. (p/ILINGE)
londo - Pandanus sp.
mandalo - Cupaniopsis macropetala / Alectryon sp. (p/MANDARO, w/MANDOLO)
mandara - Graptophyllum pictum / Dichroa febrifuga

var. *baoni* (p/MANDARA-BAU)
var. *deledele*

mandi - Acalypha sp. / Macaranga sp.
maugu - Harmsiopanax aculeata (d)
mbada - Euodia latifolia / Gunnera macrophylla (p/BATU)
mbuli - Glochidion pomiferum / Ilex arnhemensis (p,w,h/BULI)
mehago - Drimys piperita
meria - Cinnamomum clemensii
mindira - Gymnostoma papuanum [formerly Casuarina papuana] (w,p/MINDIRIA, d/MINDIYA)
momage - Homalanthus novoguineensis [*embo*]
mugu - Garcinia dulcis (Roxb.) Kurz
mundiya {*yuwi*} - Pandanus brosimos; Wild pandanus (w/MUNDIA, h/HULIMUNDIA) [*homai*]
nagira - Eurya sp. (p/NAGIRI, d/NAGIA)
nano - Ilex sp.
ngoatagiatagia - unidentified tree sp.
nguai mano - unidentified tree sp. (g)
ngubibi - Dysoxylum variable (h/GUPIPI, p/GUPI-VI)
ogobura - Schuurmansia henningsii (d/OBBO, h/OKOBURA)
pa - Maesa bismarckiana (p/PAR)
pagu - unidentified tree sp.
palamba - unidentified fir sp. (d) [*baraba* / *ayaba*]
pele / *peleda* - Vaccinium sp. / Styphelia suaveolens (h,p/PELETE, d/PELA)
pendene - Neuburgia sp.
perege - Pittosporum sp.
pilibu - unidentified tree sp.
pini - Dacrycarpus expansus
poge - Ficus copiosa; Fig (p/POKE,FORKE, h/PORGE)

var. *dendene*
var. *manguni* / *maguni*

pogepoge - Ficus wassa; Wild fig (h/PORGEPORGE)
puliwa - unidentified tree sp.
punguna tone? - Fagraea sp. (p)
tabayia - Albizia fulva/falcataria
taia - Trimenia papuana / Debregeasia sp. (p/TAER)
tawa - Pandanus antaresensis
teletele - Breynia sp. / Phyllanthus sp. (p/TELITELI)

tibabo - Platea excelsa / Cryptocarya sp.
tondo - Broussonetia papyrifera; Mulberry
tugu - Dacrydium nidulum
ubua - Solenospermum sp.
uruloba / urunu / uruwaba - Wendlandia paniculata (p/URUNA)
wabara - Flindersia sp.
wagara - Saurauia sp.
wali - Garcinia spp.
walu - Celtis sp. / Garcinia spp.
wangoma / wangama - Saurauia sp. / Psychotria sp.
yagombe dibu - unidentified tree sp.
yaluba - Araucaria hunsteinii
yulutima / yuludima - Amyema strongylophyllum / Henslowia sp./ Decaisnina hollrungii (w,p/YURIDIMA, d/YULADIMA)

APPENDIX B5

DETAILS OF HULI SACRED GEOGRAPHY

This appendix expands upon the short account of the "root of the earth" (*dindi pongone*) given in B2.6. Details of the exact line of the two routes of *dindi pongone* between each of the major *gebeanda* are commonly known and said to be matched in each case by a sacred river which flows upstream from southwest to northeast. These rivers are known most commonly as Tade and Girabo. A short section of one of the sacred rivers, the Girabo, runs (mostly upstream) along the following route between the *gebeanda* sites at Bebealia Puni and Mbibi Baite, beginning as the Dogayu river, which flows through the vast natural tunnel that constitutes the site of Bebealia Puni; from there it becomes the rivers Bume and Deme in the Yaluba valley, then the Girabo river at the Gelote *gebeanda*, before plunging beneath Haeapugua swamp, surfacing briefly in the swamp's centre at Habodaya lake and then at the eastern margin of the swamp at Abago, where it enters under Lagali ridge and emerges again as the Wada river in the Tari basin.

The easternmost of the two routes of *dindi pongone* is initiated at a site known to Huli as Malaya (Frankel 1986:20) or Malea (Allen and Frankel 1991:97), which may correspond to the Onabasulu ritual site of Malaiya. Malaiya may be the site visited and mapped by Frankel (1986:20), though an ethnographer of the neighbouring Kaluli suggests that there are two sites of the same name, the more significant of which has not yet been located precisely (E.Schieffelin pers.comm.). The approximate location given on my map for Malaiya reflects that plotted by Schieffelin (1991: Map 5).

This eastern root extends from Dangi Tene to Hari Hibira, amongst bilingual Onabasulu/Huli speakers south of Komo, and then under the Lower Tagali river to Bebenite in the southern part of the Tari basin, before ending at the Tuandaga site amongst bilingual Huli/Enga speakers. The western route has its origins at the spectacular site of Bebealia Puni, where the Dogayu or Baia river plunges into a natural tunnel. From here, the root runs beneath the Gigira range to Gelote, on the Pureni side of Haeapugua basin, and then through the Paijaka plateau to the high-altitude site of Tai Yundiga and on to its terminus amongst Paiela-speakers at Mbibi Baite.

There are alternative interpretations of this portion of *dindi pongone* amongst Huli as well as their ethnographers. Yet there have been other regenerative ritual projects also associated with *dindi pongone* but founded on totally different cosmogonic myths. The major alternative cosmogonies trace the origins of the universe to different margins of Huli territory, including the Bebealia Puni site to the south and the site known to Huli as Hewari Gambeyani, on the Pori river, amongst Duna-speakers. Other ritual networks are similarly available, including the *nogo bara tambugua* routes which link the *gebeanda* at Irari and Gelote to ritual sites in Duna, and beyond to Oksapmin (N.Haley pers.comm. and N.Modjeska pers.comm.), and the *baya horo* track which runs from the Lebani valley towards Ambua (L.Goldman pers.comm.). These alternatives are not unrelated to *dindi pongone*, in intention or in symbolic detail, but none provides the apparent unity of purpose or geographic extent evident for *dindi pongone*, at least from the perspective of Huli. It is sufficient to note here, however, that Huli sacred geography comprised a multitude of strands and levels of understanding and that its presence was evident throughout the Huli landscape.

APPENDIX B6

HULI CLANS AND GENEALOGIES

The documentation of genealogies was perhaps the most time-consuming of field tasks, but it was an undertaking that was necessary in order to understand both Huli history, in its detail, and Huli historicity - the way that Huli conceive of and reproduce the past. Genealogies were documented for some 98 Huli clans; these varied in detail from single lines for a clan to attempts, as for Tani and Dobani clans at Haeapugua, to identify as many agnates (*tene*) and non-agnatic cognates (*yamuwini*), living and dead, as possible. This appendix briefly describes the nature of Huli naming and genealogical practices in order to provide a background to the use of genealogies and clan names in reconstructing the history of land ownership and land use at Haeapugua (described in Part C) and the histories of migration (summarized in Chapter D1). Details of Huli kinship are provided by Frankel (1986) and Goldman (1983, 1988) and in Chapter B3 of this thesis.

Clan Names, Praise Terms, Patronyms and Matronyms

An understanding of the dispersed nature of Huli residence and the practice of multiresidence requires consideration of the ways in which Huli themselves identify clans and clan agnates. Table 2 of this appendix is a list of clans whose members speak Huli either as a first language or equally with another language. 244 clans are listed but, on the basis of the areas such as the Paijaka plateau which I have not visited, I would estimate that there are as many as 300 Huli clans for which *tene* agnates are still recognised. The clans are listed alphabetically, with three other types of name which correspond to each clan: *kai mini* or *nogo mini* praise terms, agnatic patronyms and agnatic "matronyms"[1]. The list is incomplete and provisional and I would welcome any further corrections or corrections.

Kai mini ("praise name") or *nogo mini* ("pig name") terms are those employed in formal contexts and narratives to identify specific clans (and, in rare instances, all or both of the clans of smaller phratries); in Narratives C2, C3 and C4, for example, clans are referred to as often by their *kai mini* as by their clan names. Ideally *kai mini* terms are composed of two lexemes. In the simplest forms, the first of these is the clan patronym and the second the clan name; most *kai mini*, however, employ neither source and consist instead of terms whose origins are not immediately obvious but which often refer to historic individuals or events associated with the clan. There is no substitute for specific knowledge of the correspondence between clan and *kai mini* names. Most adult Huli men and women know the *kai mini* for most of the clans represented in their immediate area or basin.

Agnatic patronyms serve to distinguish the clan in which an individual is agnate, irrespective of his or her parish of residence. Both men and women are accorded patronyms, though there is an element of respect implicit in the use of a patronym and younger men and women are not generally acknowledged in this way. Patronyms are sometimes clan-specific, but are more often shared by all or most of the clans of a phratry (see Table B5). Following Frankel (1986), I have distinguished patronyms in the text by inserting a hyphen between the patronym and an individual's proper name; hence Hubi-Morali is an agnate from Bai clan (where the patronym is Hubi-) whose proper name is Morali.

Agnatic "matronyms" have not previously been described and are an obscure

1. Glasse (1987) has previously published a list of 77 'parish agnate surnames' (patronyms); our lists differ on matters of orthography but are essentially in agreement. More fundamental differences of opinion with Glasse over the significance of patronyms and the nature of Huli social structure are discussed in Chapter B3.

category which I was able to distinguish only through comparison of a wide number of genealogies. Strictly speaking, these terms are not matronyms though, in some instances, they appear to function similarly to agnatic patronyms: for example, the woman Nano, an agnate from Tani clan, is often referred to as Taya-Nano (see Gen.2 below), using the "matronym" associated with her agnatic clan. More commonly, a consistent pattern emerges in genealogies whereby many of those female agnates of a clan through whom significant consanguineal relationships are established with other clans are identified by the same name. In Tani clan and in the other clans of Yari phratry, most female agnates identified at more than five or six generations above the present generation are known simply as "Taya"; specific examples of Taya are given in Gen.1, where the sister of Doromo and Hewago is said to have been the first woman thus identified, and in the genealogies for Tani Doromo (Gen.2), Tani Hewago (Gen.3) and Hiwa (another clan of Yari phratry) (Gen.5). Similarly, women who married into Tani clan were formerly known not by name but by their agnatic "matronym"; a woman from Dagabua clan married to a Tani man would thus be known to her Tani descendants as "Buria". The process of uncovering and confirming these "matronyms" requires detailed genealogical work within each clan and, as a consequence, only a few of these "matronyms" are listed.

Genealogies

Huli genealogies (*malu*) are unusual, within a Highlands context, for their depth, breadth and level of detail[2]. Most genealogies that seek to describe the full depth of a clan's history from the earliest *dama* ancestors through to living individuals range between 12 and 20 generations (*daba*) in depth; in rare instances, I have recorded genealogies of 21 or 22 generations and, in one exceptional instance, a genealogy of 30 generations. The public recitation of genealogies was formerly restricted to formal occasions such as disputes where the senior man of a lineage would describe a single line of descent, usually linking himself to a *dama* ancestor[3].

Genealogies are typically composed of two distinct types of being: *dama* spirits and *agali* humans. The first three to five generations of most clan genealogies consist of individuals described as *dama*, to whom the social sanctions in force in "modern" Huli society did not apparently apply. In many, but by no means all clans, the first *dama* took the form of an animal, such as a cassowary, pig or dog. Subsequently, a named individual is usually identified as the first human in the genealogy; the boundary between humans and *dama* is described as *dama agalila tu* ("spirit-human-together-boundary"). In some clans (as for Yari phratry in Gen.1), one or two individuals are described as being half human and half *dama* (*dama agali*).

The exceptional depth of Huli genealogies is matched by the ability of most Huli to trace complex kin connections "laterally". The importance of consanguineal *aba* kin and the significance of the principle of precedence, both described in Chapter B3, render these connections, both amongst the living and in the deeper past, highly important in daily Huli life. Consequently, there is a significant emphasis in Huli genealogies on the ability to recall not just "vertical" sequences of descent but "lateral" sequences of marriage, siblingship and birth order. In order to exploit the cognatic possibilities of Huli residence, most Huli retain a keen sense of the genealogies not just of their agnatic lineage but also of as many of the clans with which they are affinally linked as they can remember or deem important. At any public dispute, therefore, the recitation of a genealogy will be closely monitored by a wide range of individuals with different agnatic identities.

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2. Goldman (1983:62) suggests the following etymology for the term *malu* ("genealogy"): *ma* ("before, ancestor") + *lu* ("long").

3. Goldman provides a transcript account of one such formal delivery of a genealogy (1983:133) and details of the nature of genalogical recitation (1983:151).

Goldman (1988:89-90) has suggested that genealogies are subject to artificial lengthening, particularly in the context of disputes over land where precedence greatly strengthens claims to land. As he has earlier suggested (1983:121), however, this form of invention of tradition is largely restricted to the *dama* section of genealogies where, as he and Frankel (1986:48) have both pointed out, there is greater scope for inconsistency of recall. *Dama* sections of genealogies are critical in asserting claims to land and in establishing the nature of relationships with other clans in the present; they do not generally display the degree of "lateral" elaboration which is demonstrated for the human sections.

Genealogical Estimation (GE)

My assumption is that the laterally elaborated human sections of Huli genealogies are, if not entirely accurate reconstructions of the past, at least sufficently consistent internally to allow the generation of a form of relative chronology. The key to this chronology is the identification of specific individuals from different clans or lineages in narratives about historic wars (*wai tene*). Estimates of the dates of birth of a range of individuals named in association with a particular historical event almost invariably tally closely enough for them to have been contemporaries as adults.

It is necessary to make a number of assumptions, specific to Huli society, about the ages of men and women at significant moments, such as first marriage or the birth of a first child. These lifespan models are set out in Table 1 of this appendix. Huli men formerly married later in life than men of many other Highlands societies, reflecting the degree to which men's anxiety about female pollution was inculcated through the *haroali* bachelor cult. The comment is frequently made that it was a matter of pride and appropriate behaviour for a man not to marry until he had observed the first white hairs in his beard. Birth spacing, through the observance of post-partum tabus, appears to have been in the order of four to five years for a woman.

The considerably less elaborate model of the lifespan of a historical Huli woman reflects the limited role played by women in male conceptions of society, both now and in the past. As in the genealogies which these lifespan models address, women feature in corporate historical narratives largely as wives, mothers and daughters, and are seldom identified by their individual names. Indeed, the emergence of the form of "matronym" describe above reflects the practice of referring to married women not by their proper names but through the use of teknonyms, as "mother-of-X".

Estimates of the age of a historical individual proceed from an estimate of the date of birth of a living descendant, usually the narrator; where birth dates are given for living people, they are distinguished by the prefix "B" (e.g. B: 1954). By cross-referencing a number of different stages of an individual's lifespan with the dates listed in Appendix B1, it usually possible to estimate the date of birth of a living individual to within two or three years; these Estimated Birthdates are given as "EB: 1930". If a man, born in 1930, is the first-born son of a first wife, his father's age in 1930 is assumed to be 35 and this father's birthdate is then estimated to be 1895; where the estimate of the date of birth of a deceased person is made indirectly through a living relative, it is given as a Genealogically Estimated Birthdate (GEB). In some cases, where there is little scope for cross-checking with other genealogical lines of access, a range of possibility is expressed that allows for the birth of a first-born child when the father is between 30 and 40; with each generation, this range of possibility expands by a further five years in each direction. The prefixes "B", "EB" and "GEB" thus denote a scale of decreasing confidence in the date thus identified. Specific dates for events such as wars that have been derived through the process of genealogical estimation are prefixed by a question mark (e.g. ?1855).

Where the level of detail in the genealogical material permits, this Genealogical Estimate (GE) can be narrowed down. Knowledge of birth-order (including dead infants and childless siblings) is often held and allows for adjustments to be made where an individual is known, for example, to be the second-born child of a first wife. A gross assumption that men were unlikely to amass sufficient bridewealth after a first marriage to take a second wife within five years allows for further estimates to be made, for example, for the third-born child of a man's second wife.

This process of genealogical estimation is necessarily crude, but it does allow for an independent test of the internal consistency of Huli genealogies, either where several individuals identified as protagonists in the same war are traced from different sources, or where the same individual is traced through a number of different lines of genealogical access. The results of this form of testing are encouraging, as the attempts to date specific wars and wetland reclamation events suggest (see Appendices C3, C4 and C6). The chronological accuracy of the method is obviously debatable, and susceptible to increasing error with increasing temporal depth, but it is considerably more accurate, at least over the last two centuries, than radiocarbon results, which carry a minimal range of 100 years at a single standard deviation.

APPENDIX B6, TABLE 1

GENEALOGICAL LIFESPAN MODELS FOR HULI MEN AND WOMEN

Male:

0-7	Living with female relative in *wandia*
7+	Living with male relative in *balamanda*
16	Starts to grow hair for wig
18	Enters *haroali* bachelor cult
20	Attains *haroali* status
25-30	First marriage
30-35	First child Second marriage
35-40	Second child from first wife First child from second wife Third marriage
40-45	Third child from first wife Second child from second wife First child from third wife Fourth marriage, etc.
60	Last possible child
70-75	Maximum possible age (rare)

Female:

0-20	Living with female relatives in *wandia*
15	First marriage
20	First child
25	Second child
30	Third child, etc
45	Last possible child
70-75	Maximum possible age (rare)

APPENDIX B6, TABLE 2

PRAISE NAMES, PATRONYMS AND MATRONYMS FOR HULI CLANS

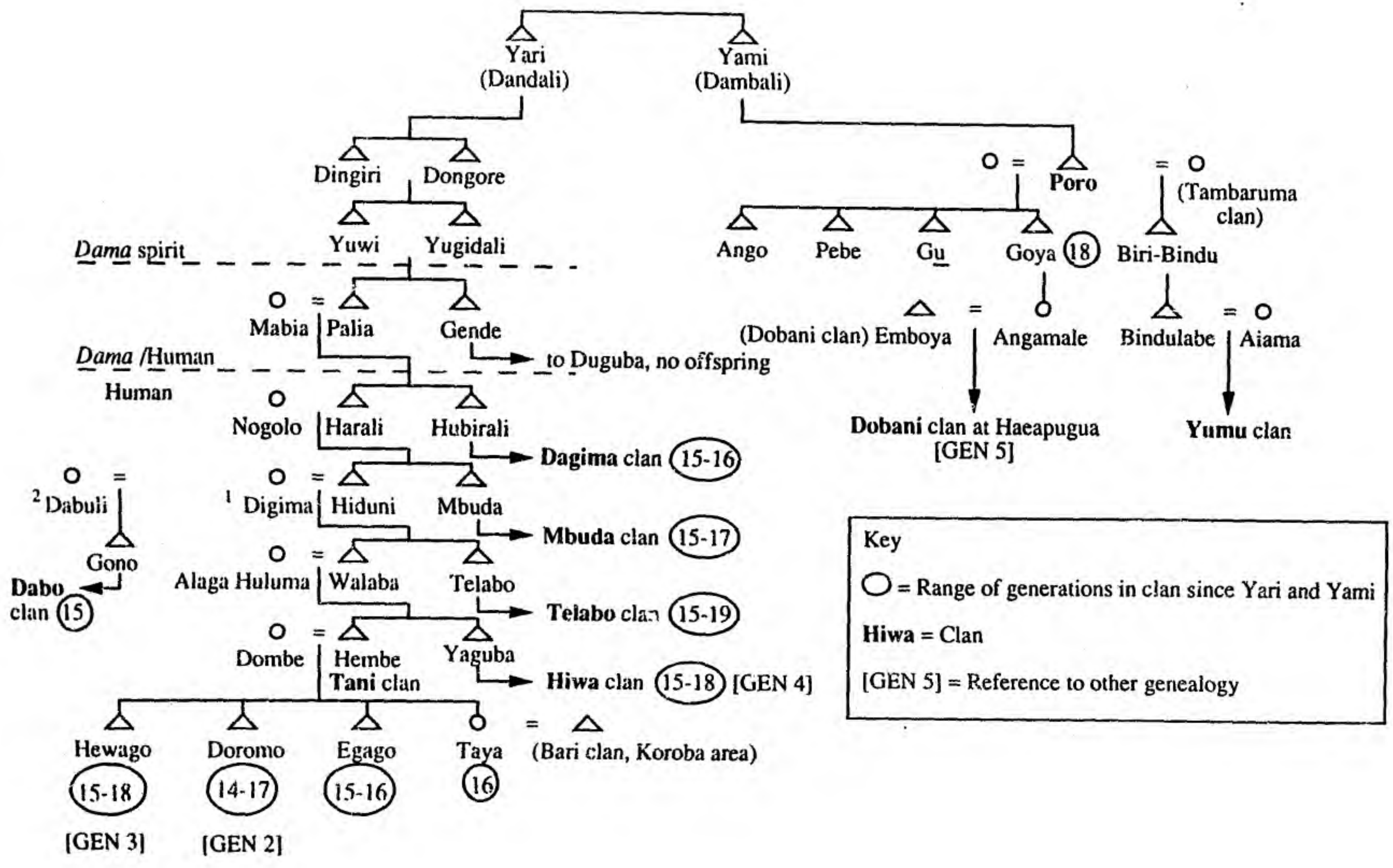
Clan	*Kai mini*	Patronym	Matronym
AGALA	BAI HEWE	HAU	
AGANA	PALI AGANA	PALI	
AGUBA	AGU NALIYA	AGUARABIA	
AGUMA	DALI AGUMA	DALI	
ALIA			
AMBURU	HIRUA KOBIA	HILUWA	AMBURU
ANDAGUA		DALI	
AROMA	AU PORO	ARO	
ARUA	IRI GUMA	MAIYA	LINABE
ARUBA		HULU	
AUWI		HULU	
AYAGO	BIBI AYAGO	GOLOBA	
AYANE	HOYA GUNDU	AYA	
BABU		MAIYANI	
BAGADA	ANDAUWA BAGADA	PIWA	
BAI	HUBI TILIA	HUBI	BAI
BAIBUALI	BERABU HUNDIA	BERABU	BAIBU
BAIRAMA	BAI YALO	YALIDUMA	
BANGOBI		HOMABU	
BARI		HUBI	
BARU	KAYA BARU	DALI	
BEANDALI		ABU	
BEBEGA	HULU BEBEGA	WALU	
BERABOLI	IBA GURUBUYA	DALI	
BIANGO		BARU	
BIBI	WALU BIBI	UGUMA	
BILINI		HIWA	
BINA	WADAGA BINA	HUBI	
BOGORALI	YALE TOGO	NGOARI	BAIYALE
BOLABU		BARI	
DABAMU		TABAYA	
DABERO		HI	
DABU	HAU WALE	HAGUA	DABULI
DABUDA		MUNA	
DAGABUA	BAI DAGABUA	YALIDUMA	BURIA
DAGIMA	IRABI DAGI	NGOARI	
DANGA	PALI DANGA	PALI	
DARAGALI	HIRU MOGONI	HIRUMA	
DAUWALI		GABIA	
DEGA	WALU WABIYA	DALI	
DEREBAYA		BAI	
DIBA	BI DIBA	DABU	DAGOLA
DIGIBI		BARU	
DIGIMA	DIGI MBURU	DIGI	DIGIMA
DILEYA	WARAGO IGINI	DAGE	
DIWINI		WAYA	
DOBANI	WALU PUBU	WALUBU	DOBA
DOBO			
DOGOMO	DOGO NE	HOGA	
DOLO	KUARI DEBULE	KUARI	

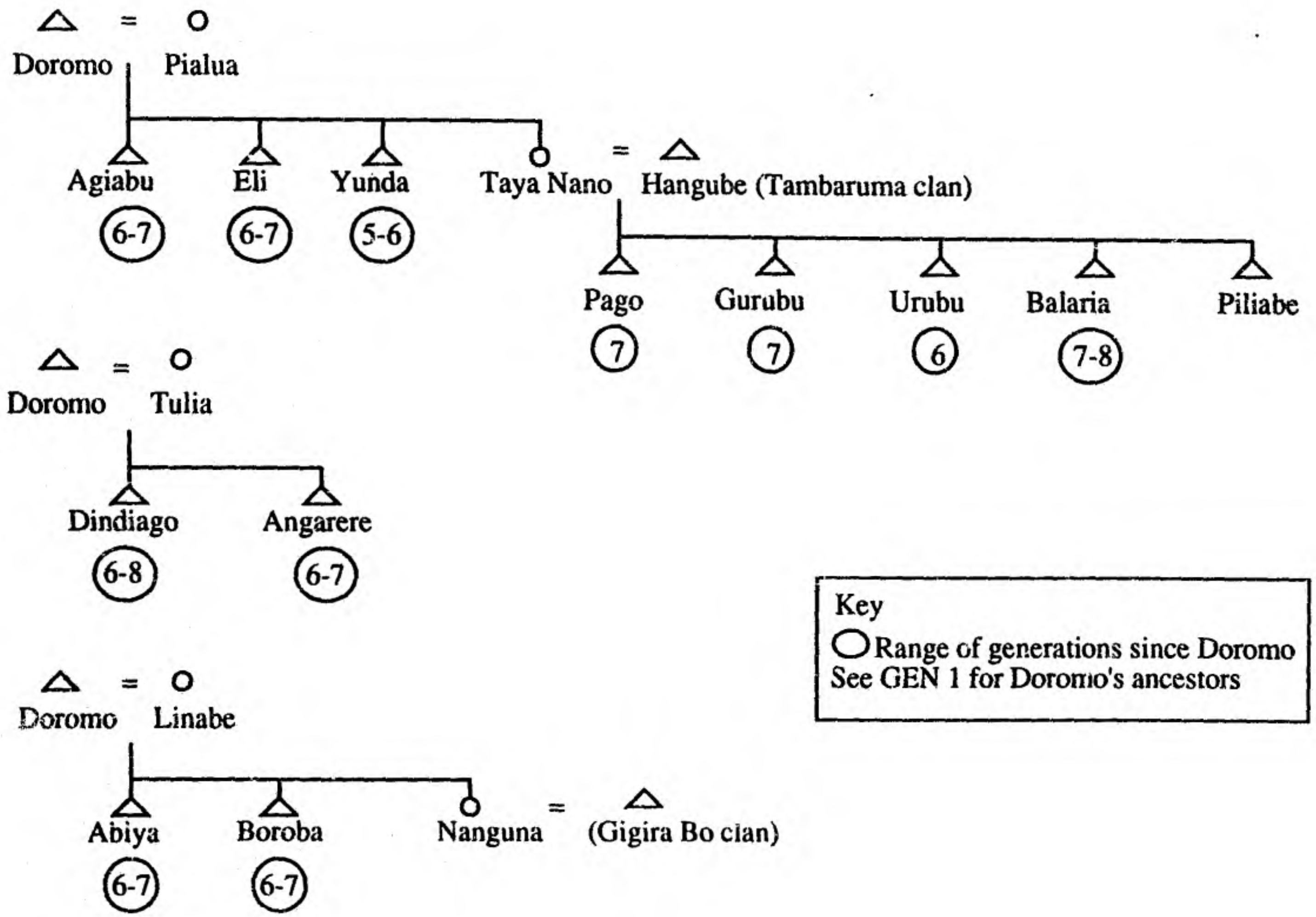
Clan	*Kai mini*	Patronym	Matronym
DOMA		DOMALIA	
DOMBE	PIRI DOMBE	ARI	DOMBE
DOMBE KAUWE		ARI	DOMBE
DOMBE HALE		UGUMA	DOMBE
DORIA	ANGALI DORIA	ANGALIA	
DUGUBA ALO		WARA	
DUGUBA BEBE	HILUWA MUBI	HILUWA	
DUGUBA DAGA		WARA	
DUGUBA DIMALI	DIMALIA ABIA	DIMALIA	
DUGUBA GAYUMBA		WARA	
DUGUBA HANA		WARA	
DUGUBA KUARA	WARA WARA	WARA	
DUGUBA LEBE		WARA	
DUGUBA MABULU		WARA	
DUGUBA MINA		WARA	
DUGUBA PADA	WARA PADA	WARA	
DUGUBA PARAYA		WARA	
DUGUBA TAGOBALI	TAGOBA HOMANI		
DUGUBA YAGARO	YAGARO YOGO	YAGARO	
EMABU	GURIYA EMABU	MAIYA	
EREBE	ANGALI EREBE	ANGALIA	
EREYA		PIRI	
EWANALI	EWA HULUMA	EWA	
GANDEBO			
GANGUA	PELA GOBIYA	OGOBI	
GANIMU		YALA	
GARUA	TIBI TIGI	TIBI	GARULI
GAIYALU	PORO GAIYA	DALI	
GENAMO		KIGAYA	
GENDO		HULU	
GIGIDA	IBI GINGIA	DABU	DAGOLA
GINIBA		BARI	
GOBERA	GARO HOBO?	KARU	
GOBIYA	DALI GOBIYA	DALI	DAGUA
GOGOMA	BAI MALO	YALIDUMA	BURIA
GOLE	BAI DARO	BAI	
GOLIA	DAGONI GOLIA	DAGONI	
GOMA		HUBI	
GOMIA		HULU	
GUBA		GUBA	
GUDAMA	GUDA EMBE	GUDEMBE?	
HADANI	DUGU DAYA	DUGU	
HAGONI			
HAGU	BALI TINA	HOGA	
HALE		HALE	
HALENGO	WAI BERIA	WAYA	WAYAGA
HALIALI	HALI HALENE	IBARA	
HALINDIA			
HAMBUALI	HAMBUALI YULI	HAMBUALI	HAMBUA
HARIA		HULU	
HARO	HARO BAGO	HULU	HAROBA
HAWA			DUBIA?
HAYA	HAYA HULA	PALI	
HEDARUBI	URU WAGIA	HEDA	
HEGANI	BI TOBE	AYA	HEGA
HELI			

Clan	*Kgi mini*	Patronym	Matronym
HIMU		HALU	
HIRANE	HIRA HIRAYA	HIRA	
HIRI	HIRI HIRIWAGA		
HIWA	NULU HIWA	NGOARI	TAYA
HIWA PORO	NULU HIWA	TUGU	
HOBI	HALE HOBI	HALE	
HOGANI		DAGA	
HOMA	HOMA YAGUA	GAMBE	BURIA
HONAGA	HOGO YUWI	HULU	
HONDOBE	WABU HONDOBE	DABU	
HONOMANI	HONO LIBI	PIWA	
HORA	DAU HORA	DAU	
HOYAMO		MAIYA	
HUBI	LINA HUBI	MAIYA	LINABE
HUGUNI	AYA HUGU	HUGU	
HUMBURU	PIWA MOBE		
HUMIYA	HULU HAGUAI	HULU	
HURI	HULU GINU	HURIBA	
IBA HULI			
IBANE	ANDA IBANE	GAMBE	
IMINI	IGI MOMO	DAU	
IROGE	IRAUWI TUBITUBI	IRAUWI	
KABIALI	WAYA PIMBANO	WAYA	
KALE	WANA KALE	BARI	
KAMBILI	DALI DEGA?	DALI	
KARIDA	PUYA KAIYA	PUYA	
KAUWI	HAYA KAUWI	HOMA	
KAYA	WANGADE KAYA	WANGADE	
KENDAIYA			
KENYA HONGOYA		PIWA	
KERO	WANA KERO	WANA	
KEWA	ANGORA KEWA	ANGORA	
KUNIA	KARI BUNI?	KARU	
LAIYALA	HOI IBIDI	DAU	DAGUA
LALAGA	KARU LAGA	KARU	
LERO	ANDAUWA LERO	PIWA?	
LEWA	ANDAUWA LEWA	PIWA	
LIBI		PIWA	
LIBURA		MINDA	
LINABINI	TAU MAIYA	DILIYA	
LOMO	PIRI LOMO	PIRI	
LUGUNI	BAI HAGUENE	BAI	
MABIALI	MAI/MABI IBILU	MAIYA	MABIA
MABIANI			
MADABA	NALI PORUBA	AYA	
MAIYA		NGOARI	
MAGABO		MINDA	
MAIYUNI		PAGUA?	
MALUALI		MALU	
MAMALI	IGI MAMA	GABIA	
MAMU			
MARINI		HAMUALI	
MBUDA	IRAUWI MBUDA	NGOARI	TAYA
MINIBA	HABONO MINIBA	HABONO	MINIBA
MORA		HUBI	
MUALI		HIWAGO?	

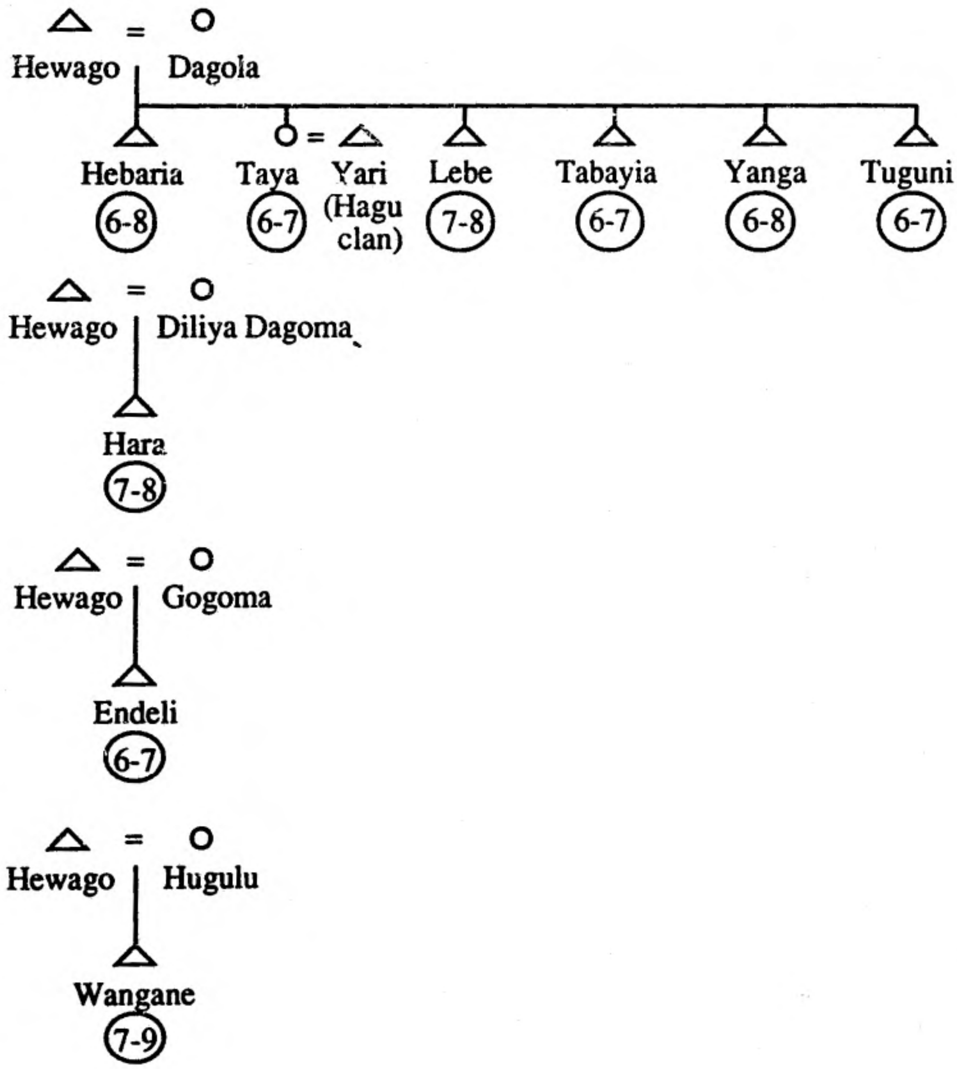
Clan	*Kai mini*	Patronym	Matronym
MUGUA	YALI HONGOLI	MUGU	
MUNIMA	GURI YULA	MAIYA	LINABE
NALIBA	BERALI	DALI	NALIMA
NELE			
NENE	DAU NENE	DAU	
NENEGE		WAYA	
NOMANDA		HULU	
OGE	KUARI OGE	KUARI	
OGOLI	NALI OGOLI	YALIDUMA	
PAGE	PORO PAGE	PORO	
PAGO	GAMBE PAGO	GAMBE	
PAILI			
PARIAGA			
PEDA	NGOLO PEDA	GOLOBA	
PEGENI	ILU PAGO	ILUBA	
PELA	IBANE PELE	GAMBE	
PI	ABU HIGI	DARAMA	
PIALIBA	HOIYA TIMA	HOIYA	
PIRAGALI			
PIRIBU	EGA PIRI	PIRI	PIRIYA
PORALI	HIRIBI TAUWALIA		
PORO	PORO WALE	HAEA	HAEA
PULUMANI		LULU?	
PUNI		DALI	
PUYAMU	ANO GUGU		
PUYARO	PUYA LUNI	PUYA	
TABAYIA		MABU	
TAGORIA		PIRI	
TALIBU		ANDAUWA	
TALOANDA		BARU	
TAMBARUMA	DABURA YALE	DABURA	
TAMBURU/A	WABI OGO	WABI	
TAMEYA	GAU TAMEYA	DAU	
TAMIRA			
TANI	IRA WALE	NGOARI	TAYA
TEGE		ANGALIA	
TEGELA	BAI HEWE		
TELABO	IRABU TELABO	NGOARI	TAYA
TIAGANI	YURU BARI		
TIANI	TIMA TIANI	TUBI	
TIGUA	HUBI TIGUA	HUBI	DIGIMA
TIMANI			
TINALI	BALI TINA	BARI	
TIRI	AU TIRI	MAIYA	
TOANDA		MANDA	
TOBE	HEGANI TOBE	AYA	
TORO	GAMBE TORO	GAMBE	
TUBALI		LAU	
TUGURE	BARA GILIA	BARA	
TULIANI	BAI HEWE	PALI	
TUNGUBE	AU TUNGU	YALIDUMA	
TUNUGUA	WAI TUNUGUA	WAYA	WADIA
UNDI		HULU	
UNDUBI	HARI UNDUBI	HARI	
URA	BAI URA	PIWA	
URABI		DABURA	

Clan	*Kai mini*	Patronym	Matronym
URIANI			
WABIAGO	UGU WABIA	UGUMA	
WABIMA		HAYA	
WABIRA		WAYA	
WAGE	IRAUWI WAGE	GONO	
WAIYU			
WALABINI		ALU	
WAMU	DIGU HULIA	WA	
WANDU	HULU WANDU	DALI	
WANGA	GAU WANGA	PALI	
WARABIA	OBA WARA	GABIA	
WAWE	PALI WAWI?	LAGI	
WENANI	KAI BELE	ABU	WENA
WIDA	BAU WAYA	BARU	PAWAPURI
YABO			
YALUMA	TENENI YALUMA	TENENI	
YAMA			
YAMBALI			
YANGALI	HUBI YANGA	UGUMA	
YARINI	TUGU GEWAI	TUGU	
YOBIYA	UNGU YABE	BARU	LINABE
YUGU	NOGO WANI	NOGO	WALE
YULA	MAI YULA	MAIYA	
YUMU	PIRI PINDU	BARI	GILIBU

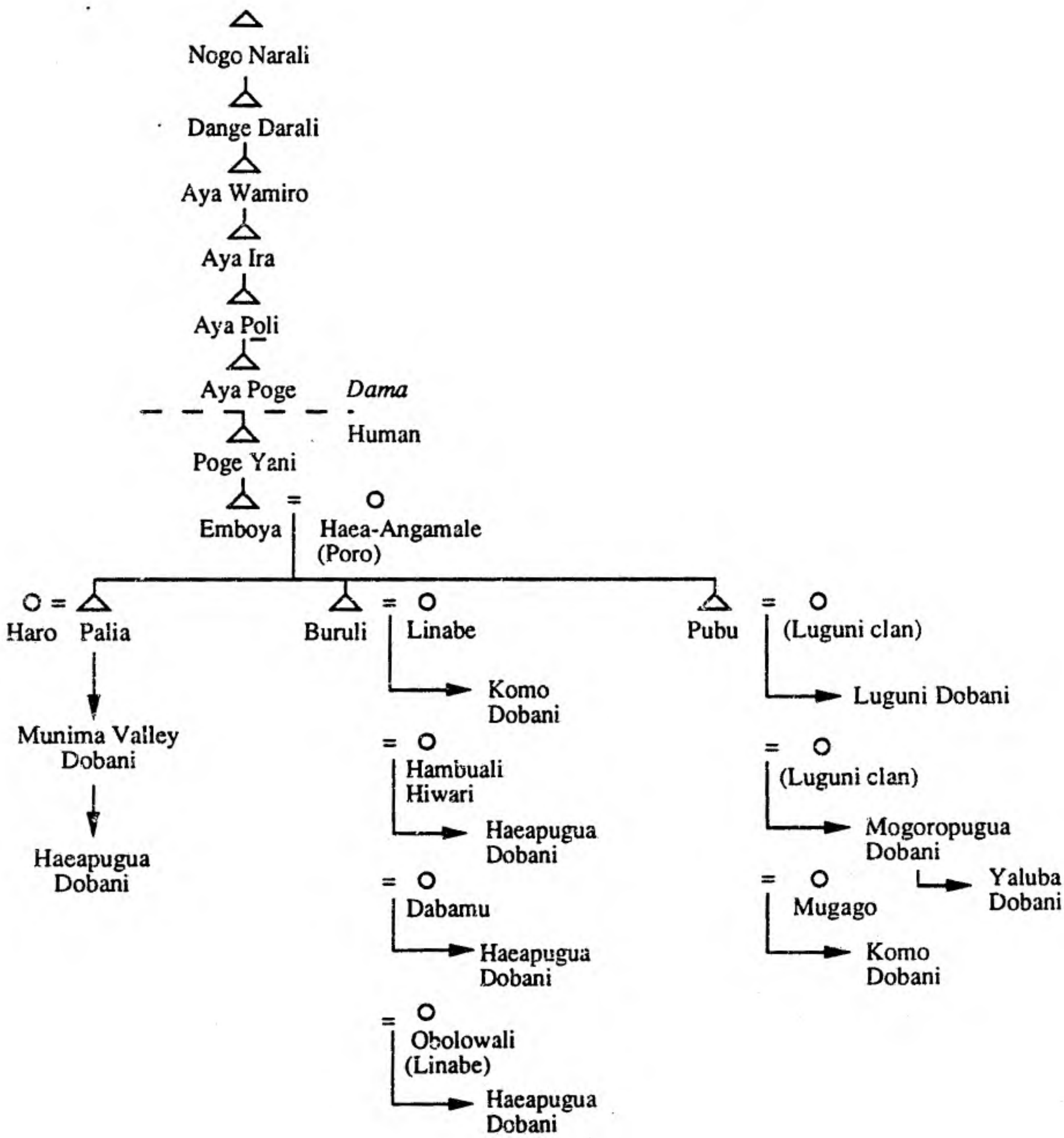

Yari
(Dandali)
Yami
(Dambali)
Dingiri
Dongore
Poro
(Tambaruma clan)
Yuwi
Yugidali
Dama spirit
Ango
Pebe
Gu
Goya 18
Biri-Bindu
Mabia
Palia
Gende
(Dobani clan) Emboya
Angamale
Bindulabe
Aiama
Dama /Human
to Duguba, no offspring
Human
Nogolo
Harali
Hubirali
Dagima clan 15-16
Dobani clan at Haeapugua
[GEN 5]
Yumu clan
2 Dabuli
1 Digima
Hiduni
Mbuda
Mbuda clan 15-17
Gono
Alaga Huluma
Walaba
Telabo
Telabo clan 15-19
Dabo clan 15
Dombe
Hembe
Tani clan
Yaguba
Hiwa clan 15-18 [GEN 4]
Hewago
15-18
[GEN 3]
Doromo
14-17
[GEN 2]
Egago
15-16
Taya
16
(Bari clan, Koroba area)
Key
= Range of generations in clan since Yari and Yami
Hiwa = Clan
[GEN 5] = Reference to other genealogy



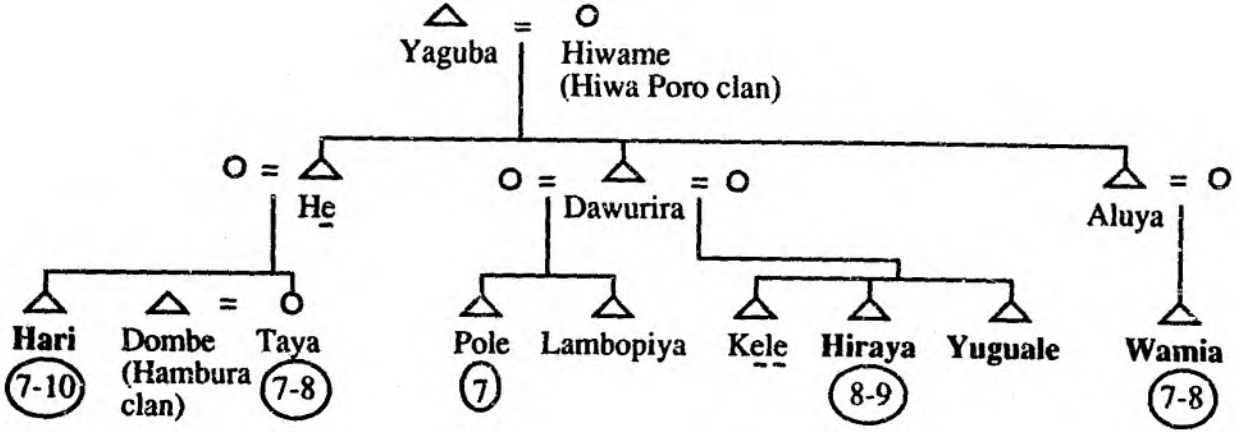
Gen.2 Tani Doromo genealogy



Gen.3 Tani Hewago genealogy



Gen.4 Dobani clan genealogy



Key

Hari = subclan resident at Haeapugua

○ = range of generations since Yaguba

See GEN 1 for Yaguba's ancestors

APPENDIX B7

CROP SPECIES AND CULTIVARS OF THE TARI REGION

This list provides Huli terms and species identifications for the more common crops found in the Tari region. Formal species identifications are based largely on the work of Powell, Wood, Rose and Haberle. The primary goals of this list are to extend the range of cultivar terms and to attempt to render the Huli terms according to the standard orthography (Appendix B2). The compilation of ethnobotanic terms by Haberle (1991), which incorporates an earlier field draft of this list, illustrates the extent of duplication of Huli terms through difference in orthography: variations in the spelling of Huli terms given by different authors are provided here, where these differ from the standard orthography. Species or cultivar terms not confirmed by my own enquiries are denoted by a question mark.

Conventions:

{*hundu aluba*}	*kai mini* praise term
[*mogia*]	synonyms
(p/ARUWA)	alternative spellings as per above source

Source abbreviations:

d	Huli Language Conference (1971)
f	Frankel (1986)
g	Goldman (1981a), (1983), (1986)
h	Haberle (1991)
p	Powell with Harrison (1982)
r	Rose (1982)
w	Wood (1984)

***Abare* {*mau walo*}** - Pandanus conoideus - Marita pandanus

andaya
gabu (p/KABU)
gandumia / *gandume* (p/KADOMEA)
gogoba (p/KOKOPA)
kende (p/KENDI)
kuyu
mundu hagua (p/MUNDU) [*tuabo*]
nagua
nguimu
puyu (p/PIYU)
tili? (p)
tuabo [*mundu hagua*]
yubi (p/TUBI)

***Aluba* {*hundu aluba*}** - Amaranthus spp. - Amaranth spinach (p/ARUWA)

giliaba
hundu balua
lai (p/LAILUBA)
mbudugu (p/BUTAIJA,BUTUKU)

var. *honeni*
var. *mindini*

uruloba (p/LOBLOB-BA) - Amaranthus ?bidentata

Amolo - Marattia novoguineensis - Fern

Anga {doro wale} - Pandanus julianettii - Karuka pandanus

Locations where variety term is recognised:

[*h*] - Haeapugua
[*p*] - Paiyaka
[*l*] - Lebani

andirerai (d)
ayugualu (d)
dabali / debali (d)
dagura? [*l*] (h)
deio [*p,l*] (r/TENYON, h/DAIO)
gebeali [*h,p,l*] (p/KEPALI, r/KEBALI)
gebo
giligi (d)
gurubu / gurugu / gurubu nenege [*h,p,l*] (d/KURUGU, h/KURUKU) (wild species?)
habanda
hagalia? [*l*] (h)
hagirara [*h,p,l*] (p/HAGIRARE)
hagua [*h*]
henga [*h,p,l*] (p/HENGE)
herega? [*l*] (h)
hinanana [*l*] (h)
hiru [*h,l*] (p/HERU)
homagalibe [*p*]
honde [*p*]
hunguai? [*l*] (h)
kai [*p,l*]
kakanabe [*h,l*] (p,h/KAKANAPE)
kane (h/KARNE)
kaule (d)
kaurua [*l*] (d) (h/KARUA)
kerage (d)
mabu [*p,l*]
mandaio
marako? [*l*] (h)
mimu [*l*]
ngoari [*h,p,l*] (d/NGUELI)
nguale [*h,p,l*] (= *ngoari*?) (h/UNGUALI)
padua [*h,p,l*] (p/PATUA)
pari
tabuna / tabuna hende [*h,p,l*]
tolo [*p*]
tumbu [*p*]
ugitigibi? [*l*] (h) (possibly *ugu tigibi* - Oenanthe javanica)
urira [*l*] (h/URIDIA,UURI)
walia? [*l*] (h)
yagada (d)

Aniani - Allium cepa - Onion

Aniani - Allium cepa var. aggregatum - Shallot

Auwa {*gaya auwa / auwa ogoea*} - Rorippa spp. - Crucifer spinach

auwa auwa (p/AWA)
auwa ibilira (p/AWA IBILIDIA, w/AWA ABALIDIA) - Cardamine hirsuta

Babeya - Unidentified fern (p/PAPEYA)

Bambo - Cucumis sativus - Cucumber

Bambuli / Bambogini - Cucurbita moschata - Pumpkin

karoyali

Be - Bambusa vulgaris - Bamboo (w/PE, p/PER)

bene (p/PENA)
bindi (w/PINDI)
gobi? (p)
haraya
kayamba
male
pongone
tegelabo (p/TAGALAPO)
tiribi? (p)
tola (p/TORA)
wala dogo (p/WALATOGO)

Dalo / Lamba - Xanthosoma sagittifolium - Chinese taro

Damado - Lycopersicon esculentum - Tomato

Du {*hiwa tege*} - Saccharum officinarum - Sugarcane

angabone
awa / awawa (w/AWA NEIO)
danda
daramabi
igibu
kerere? (g)
pabea
pili? (g)
tagobe (w/TAROBE)
tiambu
wabena (w/WABENA NEPO)
yole (p/YURE, w/YORE)

kiabi? (p) - Saccharum sp. var.
hai? (p) - Saccharum sp. var.
gambagua - wild black sugarcane

Egagiba - Phaseolus lunatus - Lima bean (p/EKAKIPA)

Gabidi - Brassica oleracea - Head cabbage

Gaugau / Pateta - Solanum tuberosum - Irish potato

Gereba {*uru gereba*} - Rungia klossii - Acanth spinach

da

degondo
emola / emolo / lemola
giligilibi
hayama (p/HAJAMA) [*mbalapaya*]
lai
mbalapaya (p/BALAPAJA, w/BALFIA) [*hayama*]
mindibi
nogombi (p/NOKOMBI)
togayu (p/TOKAJU)

Gobi - Coffea arabica - Coffee

Gora - Brassica chinensis - Chinese cabbage

Habia - Abelmoschus manihot - Aibika (p/HAPIA)

honebi
mbalape
mindini
pele
tokatoka? (p)
tunitibi

***Hai* {*habi waya*}** - Musa cvs. - Banana

Variants:

h	*honeni*
m	*mindini*
a	*abai*
b	*bambone*

abuma (short-fruited variety of *tili aluya*)
agali kope
"*banana*"

var. *tumagi* (short fruit)

dagobe
dagua (p/DUGU)
dalima
dongoma (p/TOGOMA)
dugu
emolo? (d)
giabi (*m,h,b*) (p/KIABU)
gundubu
"*hagen*"
hagua
hangi
hogolo (*m,h*) (p/HOKOLO)
hohola? (p)
honda / hondo / hondoa (*m,h*)
iba wane / iba wali (p/IBUWARI)
lemoko? (p)
lemola [*tidali*]
maremare / miaramara (p/MARAMARA)
miago (*a,m*) (p/MIAKO)
"*rabaul*"
tarima (*m,h*)

tidali [*lemola*]
tigua / *tigo* (*m,h*)
tili aluya
waya
wero

Wild species:

garo / *garoa* (p/KAROA)

Hima - Saccharum edule - Lowland pitpit

Hina {***alu muguba***} - Ipomoea batatas - Sweet potato

abu hege (p/APUEKE)
adini / *dere adini*
aliga (p/ALIYA,OLIKA, w/ALEGE,ARIGA)
aluguai / *aroguai* (p/AROKOI)
ambua / *ambuapoya* (d) (h/ABUAPORE)
angibu
auweri / *aguari* (h/AWUARI)
bagai / *bagaya* (p/PAKAI) [*barabia, magaya, mogai*]
barabia (p/PARABIA) [*mogia, magaya, bagai*]
bawa? (h)
beleya / *biliraya* (p/PELEYA)
benalia (h/PENALIA)
biyawe (h/PIYAWE)
biyu / *bigu* / *piyu* (h/PIU) [*padua*]
bo
dabero / *daberedo* (p/TAPORO)
dabura (w/DABUDA, p/TAPORO) [*tigibi*?, *tugulu*?]
dama hina (p/TAMAHINA) [*gebe, mame*]
dambali (h/TAMBALI)
dambera (h/TABERA)
dandayi (p/TANDAJE, w/TANDAYE)
daria / *dalia* (p/TARIA)
didiman / *dirimane* [IBA]
digi / *digima* [MUGUBA]
dugi? (d)
dumbi / *dunbi* (p/TUNBI)
egahaba
gabutugu (p/KAPUTUKU) [= *kabituya*?]
galobe
gangade (p/KAGATE)
gaume? (d)
gawe / *gawa* (p/KAWA, w/KAU)
gebe [*dama, mame*]
gewai igiri
giambu / *gimbu* (p/KIABU, h/KIEMBU)
gondoma / *gandoma* / *gunduma* (p,w/KUNDUMA)
gonimi / *komini* [= "okinawa"]
gonoma (h/KONOMA)
gora awa (p/GORO(WA)) [*parima, mole*]
habare? (w)
habia (p/HAPIA)[*mara*]
hagapuki? (p)
hai
halari? (d)
hangabo (p/HAGAPO)

harima
heme [*kenekene*?]
hene (p/HINI)
hewa? (w)
higi
hoyabia
huru nigidi (h/HURU)
iba [*didiman*]
irali / *iba irali* (p/IRALI)
iri
iriyale
kabi / *kabituya* [= *gabutugu*?]
kaburng? (p)
kage? (h)
kalugo (h/KALUKU)
kandugu (p/KADUKA)
kauwa / *kau*
kayani / *kayali* (h/KAYENI)
kebuku? (h)
kenekene? (p)
kuli {*gayawi kuli*} (p/AKURI,KULI)
limbawi
lini
ma hina
maga (not *magaya*)
magai
magaya (w/MAKAYA, p/MAKAJIA) [*bagai*, *mogia*]
mame / *mami* (p/MEME) [*midi*, *dama*, *gebe*]
mamuni
mandiyame / *mandiyanda* / *mandigame* / *mandiyane* (p/MUNDIGRAMAN)
mara / *marai* [*habia*]
mau / *mauwe*
mbala
midi [*gebe*, *dama*, *mame*]
minalu? (h)
mindi
mogia (p/MUKIA, h/MORKIA) [*magaya*, *bagai*]
mole (h/MORLE) [*parima*, *gora awa*]
muguba (p/MUKUPA) [*digi*]
munima? (w)
padara (p/PATARI?)
padua (p,w/PATUA) [*biyu*]
pango / *pangu*
parima [*gora awa*, *mole*]
pe
pitin? (p)
poro
putiri (p/PATARI,PUTIRI)
tebolopaia (p/TEPOLOPAYA)
tele
ti? (p)
tianobi / *tenabi* / *tanibi*
tigibi [*dabura*?, *tugulu*?] (p/TIKIPI)
tigoli
tiri
tolo
tugulu [*dabura*?, *tigibi*?] (p/TUKULU)
ulula
undiaba / *undiyabe* / *windiaba* (p/UNDIAPA)

undubi
wanmun / wanmuni
waralibagabua
windu? (p)
yangali
yapiya? (h)

Hiwa - Metroxylon sagu - Sago

Homa - Pueraria lobata - Kudzu

Homa bawi - Dioscorea sp.? / Pueraria sp.? (p/HOMA PAWI)

Homai / Mundiya {yuwi} - Pandanus brosimos (w/MUNDIA, h/HULIMUNDIA)

Hongo - Coix lachryma-jobi - Job's tears

dumbi / tumbi - dried and wrapped tobacco leaf
bambone
munduni
yuluba (p/TULUBA)

Ira Damado - Cyphomandra betacea - Tree tomato

Ira Hina - Manihot esculenta - Cassava

Ira Lumbi - generic term for wood fungus; species include:

ade - wood fungus sp.
alungi - wood fungus sp.
gobangia - brown wood fungus sp.
hororo - wood fungus sp.
hoia - wood fungus sp.
irigiyidi - wood fungus sp.
manda budi - wood fungus sp.
mandalo - wood fungus sp.

Karot - Daucus carota - Carrot

Kuni anga / Guni anga / Dama anga - Zea mays - Corn

Ma {hubi gaea} - Colocasia esculenta - Taro

Colour variants:

[h] *honeni*
[m] *mindini*

abarapu [h,m] [*kanekane*?, *gedere*, *belebele*]
audua / ardua (p/ARTUA) [*lamba*?]
belebele [*gedere*, *kanekane*?]
belema [*ira pungama*]
biango (p/PIANGO)
bogaya
dabagua
dandayi [*simbu*]
dangalina (p/TANGALINA) [*parambagua*?, *hubikundu*?]
gaea (p/KAEYA, h/KIAUA)
gedere (p/KETERE) [*abarapu*, *belebele*, *kanekane*?]

gihagua [*gihe*]
gihe / yia [h,m] (p/KIYE) [*gihagua*]
hewe [*honagahiwa*]
honagahiwa [*hewe*]
hubikundu (p/HUPIKUNDU) [*parambagua*?, *dangalina*?]
ira puagama [*belema*]
kanekane / kenekene (p/KENAKENA) [*abarapu*?, *gedere*?, *belebele*?]
kindia? (h)
lagabe [h,m] (p/LAKAPA)
lamba [*audua*?]
maliama / maliame [not *milima*] (p/MALEMA)
mamalema
midi
milima / minima [h,m] [not *maliama*]
mindima [not *minima*]
paike? (h)
parambagua [*hubikundu*?, *dangalina*?]
pimbi
simbu [*dandayi*]
tirima [h,m]
waliwali
uguabo
yade (found only in Duguba)

Wild taro species - ?Alocasia spp.:

andaguru
dale / tale (f/TALEMBARIA)
tumbu

***Malingi / Hangabo*?** - Cyathea aeneifolia / Phyllanthus flaviflorus - Fern

Mamurali - Rubus rosifolius - Edible raspberry

Mamunani - Rubus moluccanus - Inedible raspberry

Mbada - Persea americana - Avocado

Mbagua / Mbaguali {mbagua ugumi} - Lagenaria siceraria - Gourd (p/BAGWA,BAGWABE)

Cultivar terms refer to differences in gourd shape:

geruni
hewamu (p/HEWEMU)
nguimu
timuande (p/TIMUANDI)

Mburuyi - Passiflora edulis - Purple passionfruit

Muli - Citrus limon - Lemon

Muli - Citrus aurantifolia - Lime

Mundu {uru lumuni / uru mundu} - Nicotiana tabacum - Tobacco

Nandi {nendi gae} - Dioscorea alata - Yam

degu (p/TEIA'U)

hade
gae (p/KAE)
gambepi (p/KAMBEPI)
gangade
pi habe
piyu (p/PIJU)
puya
tabi / tabayame

Nano - generic term for fungus; species include:

adai - edible fungus sp.
andiandime - edible fungus sp.
andobe - fungus sp.
aredeme - edible fungus sp.
budi - mushroom sp.
dayabu - fungus sp.
hagaba - fungus sp.
heberolo - Polyporus arcularius; mushroom sp. (g)
kuabe - fungus sp.
malipungu - fungus sp.
mbalupe - fungus sp.
mqnani - mushroom sp.
ngoedali - Russula ?emetica; mushroom sp. (f)
umbe - mushroom sp.

Narabale - Nasturtium officinale - Watercress

Orens - Citrus sinensis - Orange tree

Paboro - ?Psophocarpus tetragonolobus - Winged bean

Paboro / Honebi paboro - Phaseolus vulgaris - Common bean

Painabo - Ananas comosus - Pineapple

Palena {palena garo / pongo wabe} - Zingiber officinale - Ginger (p/PARANA)

palena
pongorali (p/PONGARALI)

Payabu - Cordyline fruticosa - Cordyline (p/PAJEBU, w/PAYEBU)

beberaya
dago
daro
dawolene
demogo
denge
gayumba
gondoba
gulu
hagare
mbiyame
megu
piru
pongone
tukibi
yogora

Pinat / Ngaludi - **Arachis hypogaea - Peanut**

Pisum sativum - Pea

Podama - **Acorus calamus - Bog iris**

Poge - **Ficus copiosa - Fig (h/PORGE, p/FORKE,POKE)**

dendene
maguni / manguni

Sili - **Capsicum frutescens - Chili**

Tiabu {goloba anguma} - **Setaria palmifolia - Highland pitpit**

ayage **(p/AJAKE)**
banguma **(p/PANGUMA)**

var. *honeni*
var. *mindini*

bebohe **[*iriri*?]**
domboga
emberali **(p/ENVALALI,EMBELALI)**
"*hagen*"
huluanda **(w/HURUANDA)**
iriri **[*bebohe*?]**
mbu **(w/BU) [*ngui pongo*?]**
ngui pongo **(p/GUPONGO) [*mbu*?]**
***pongone*? (w)**
walena **(p/WALENO, w/WELINA)**

Tiama - **Artocarpus communis - Breadfruit**

Tigibi / Dabura {ugu tigibi} - **Oenanthe javanica - Water dropwort / Javanese dropwort**

dugubaya **(p/TUGPAJIA) [*gurugayane*]**
gurugayane **[*dugubaya*]**
poroporo **(wild variety, not planted)**
tei

Togo - **Sechium edule - Choko**

Wiru - **Lablab purpureus - Hyacinth bean**

Yu {mali wango} - **Cyclosurus spp. / Cyathea spp. - Fern (p/JU)**

bere
***dibiribi*?**
erebe
nogo
poregedu
tambu
tuma

yu wango / wangoli / wangoma - **Saurauia sp.?**

Capsicum annuum - Capsicum

Glycine max - Soya bean

Solanum melongena - Eggplant

APPENDIX B8

FAUNA OF THE TARI REGION

This list provides a summary of identifications and possible identifications for the more common species of fauna in and around the Tari region. A particular debt is owed to Peter Dwyer for providing me with a copy of his unpublished list of Huli mammal terms collected at Komo (Dwyer 1992).

Conventions:

{*wai puya*} - *kai mini* (praise term)
{**yanegali**} - **tayaanda tuha** - "forest talk" term (L. and H.Goldman 1977)

Super-generic terms:

angibuni - all female animals and birds
ega {**pudupudu**} - birds

Class Mammalia:

Generic terms:

gabua - large wild animals
huru - (small?) rodents
hali - wallabies (including Macropus spp. and Thylogale spp., but probably not Dorcopsis spp.)
nogo - large domesticated animals
tia - possums, cuscus, maybe also large rats (Mallomys spp. and Hyomys goliath)

Domesticated animals:

biango / honebi biango {**yanegali**} - Canis familiaris; domestic dog
biango dudu - Canis familiaris; New Guinea wild dog
busi - Felis catus; cat
nogo {**gu**} - Sus scrofa vittatus x Sus celebensis; pig
  nogo angibuni {**gu angini**} - sow
  nogo tau - boar
nogo gabua / nogo dangani - Sus scrofa vittatus x Sus celebensis; wild pig
honebi nogo - Sus scrofa; introduced pig breeds
(*nogo*) *bulamakau* - Bos taurus: cattle
(*nogo*) *meme* - Capra sp.; goat
(*nogo*) *sibisibi* - Ovis aries; sheep
(*ega*) *kagaruk* (also *honebi ega / ega masin*) - Gallus domesticus: chicken

Specific terms:

abai {*urulumu abai / gulu wabe*} - Spilocuscus maculatus; Spotted Cuscus
andaya / tia andaya / humai {*poboanda*} - Dendrolagus dorianus notatus; Doria's Tree Kangaroo
angamariabe {*hulu angamariabe*} - unidentified rodent sp.
balana / balena - probably Pseudochirus forbesi; Painted Ringtail
bayawe - unidentified cuscus / possum / giant rat sp.
borere - Dasyurus albopunctatus; Marsupial Cat / New Guinea Quoll
buri - probably Rattus verecundus; Slender Rat
daboru - unidentified bat sp., possibly Dobsonia moluccensis
dindi borage / dindi pubu {**yugumi porombe**} - Zaglossus bruijni; Long-Beaked

Echidna

du maia / ugu maia (*ugurmania*) {**nduindui**} - unidentified bat sp., possibly also a generic label for bats

ega gamia / dala gamia - unidentified bat sp., possibly Dobsonia moluccensis; Bare-Backed Fruit Bat, or Pteropus sp.

gumbani - unidentified bat sp.

haguanda {**kenda**} - Phalanger sericeus; Silky Cuscus, or possibly Phalanger carmelitae; Mountain Cuscus

homage - unidentified possum sp.

horia {**wabele**} - Phalanger gymnotis / Strigocuscus gymnotis; Ground Cuscus

huru (*huli huru*) - large pre-contact mouse sp.

huru hingidi {**pigi pogo**} - Rattus exulans / Rattus steini; Small Spiny Rat

ibaria - unidentified mammal sp.

limbu - unidentified mammal sp.

lubendele - unidentified mammal sp. (= *dele / ndele*?)

mali - Echymipera kalubu; Spiny Echimipera (bandicoot)

nambiya huru - small house mouse, recently introduced

ndele / dele - Petaurus sp.; Sugar Glider

pagane / pagana {**ngaragali**} - Uromys caudimaculatus; Mottle-Tailed Tree Rat

palena {**hangarine kani**} - unidentified possum sp.

pongorali - Dactylopsila trivirgata; Striped Possum, or possibly Dactylopsila palpator?; Long-Fingered Triok

poreya - unidentified mammal sp.

tanduya - unidentified mammal sp.

tegani - unidentified mammal sp.

tinaga / tinage {**momonagua**} - possum sp.

toya - unidentified mammal sp.

tulubaya - unidentified mammal sp.

[Huli term not known] - Synconycteris / Macroglossus sp. - bat
[Huli term not known] - Nyctophilus sp. - bat
[Huli term not known] - Miniopterus sp. - bat

Class Insecta:

Generic terms:

{**amiano**} - generic forest talk term for all insects

damane / timamu / timanu - caterpillars, grubs and bugs

gamuni - spiders

gangade / gagate - snails

mone {**diya mone**} - wasps and bees

tede {**pigi pogo**} - fleas

uguruli / ugurili / uburili - ants

Specific terms:

alibi biaga - centipede sp.

alibi habo - centipede sp.

amua - grub

andabilo - beetle sp.

badaru - horse fly sp.

biri pabua - butterfly / moth sp.

bombo - cricket sp.

bungane - butterfly sp.

bunguna - house fly sp.

danilina - blue bottle fly sp.

dereparia / derebara dere - grasshopper sp.

diahorogere - cockroach sp.
dingi donge - sandfly sp. / mosquito sp.
emo - louse sp.
giligalo - waterbug sp.
gindi - leech sp.
gonalia - cricket sp. or beetle sp.
gonania - scorpion sp.
gowamana - stag beetle sp.
gulu hayare - snail sp.
gununu - humming beetle sp.
himi - maggot sp.
hinabibi {**yagalogua**} - mosquito sp.
hinagigi - mosquito sp.
ira mbombara - termite sp.
ira pubu - sago grub
karayake - cicada sp.
karayano - cicada sp.
kari yala - cicada sp.
kuia / kua - flea / louse sp.
manda pibiya/pibiyu / mando logaya/logayu - cockroach spp.
nero - small beetle sp.
pagaya / pagohaya - grasshopper sp.
perange - beetle sp.
pupudira - wood bug sp.
tani / tamia / tania / teni - white ant sp.
tibugende - Mantodea sp.; praying mantis
tonge - grub sp.
wage - cicada sp.
wagumbi - dragonfly sp.
wayumbi - crab-shell spider sp.
yabo - wood borer sp.
yagiyari - stick insect sp.
yakundi - firefly sp.
yangora / yawadiri - large-winged green insect

Class Reptilia:

abagua / habagua - very large lizard / crocodile
dalaga - unspecified snake sp.
dalapari - unspecified snake sp.
daria {*dawene daria*} - unspecified snake sp.
diwa - death adder sp.
gau - unspecified snake sp.
guru ibia / guribia - crocodile sp. [also eel]
guru wali - unspecified lizard sp.
hingini {*ara hingini*} - unspecified snake sp.
lebage {*guriya lebage*} - unspecified snake sp.
nogombi {*guriya nogombi*} - unspecified snake sp.
puya {*wai puya*} - unspecified python sp.

[Huli term not known] - Lobulia elegans - skink sp.
[Huli term not known] - Lobulia stanliana - skink sp.

Class Amphibia:

Generic terms:

wayabu - eels
wena / *iba wena* - fish
yago - frogs

Specific terms:

aio - frog sp.
angalamu - crab/crayfish sp.
engo - frog sp.
gare / *gara* - frog sp. (brown)
gigiya - frog sp.
haia / *haiya* / *haea* - tadpole / frog
ibia {*guru ibia*} - eel sp.; probably Anguilla marmorata
kurara / *guarere* - frog sp.
luabi - frog sp.
mbola - frog sp. (small green frog)
mbu - frog sp.
mburumbara - tadpole
nge - frog sp.
payali - large fish sp. (either carp or rainbow trout?)
pereliba - frog sp.
tengode / *tengoda* - frog sp.
ya - green tree frog sp.

(*huli*) *wena* - Glossogobius Species 6 (G.Allen 1991:184-5); Twinspot goby
honebi wena - Cyprinus carpio; Cantonese carp
wena harehe - scaled fish sp.

[Huli term not known] - Litoria angiana - frog
[Huli term not known] - Cophixalus cryptotympanum - frog
[Huli term not known] - Phrynomantis wilhelmi(?) - frog

Worms (Annelida, Platyhelmithes):

ngoe - generic term for worms

guriya - pre-contact worm sp.
hagoli - pre-contact worm sp.
kau ngoe - Pontoscolex corethrurus - introduced worm sp.
pedere / *pedera* - Amynthas corticus - pre-contact (but not indigenous) worm sp. ("wriggler")
[Huli term not known] - large white pre-contact worm sp. fed to pigs

Sources:

G.Allen 1991, pers.comm.1993; Ballard fieldnotes; Dwyer 1992; Flannery 1990; Frankel 1980; L.and H.Goldman 1977; Haberle pers.comm.1990; Huli Language Conference 1971; Smith 1980.

APPENDIX B9

BIRDS OF THE TARI REGION

The generic Huli term for all birds is *ega* (including *ega yari* for cassowaries). Species without Huli terms include some of those species that have been identified by ornithologists as living in the Tari area (M.Laska pers.comm., Frith and Frith 1992). This list has been compiled partly on the basis of field identifications, but largely through the use of the illustrations in Beehler et al. (1986); though all birds listed here have been identified in the Tari region (Frith and Frith 1992), this list should thus be regarded as only a preliminary attempt at matching Huli terms with scientific species.

Conventions:

yari - Huli term
{*hono gaga*} - *kai mini* praise term
Casuaris bennetti - scientific term
Dwarf cassowary - common term

Source abbreviations:

@ - Goldman (1981a)
d - Huli Language Conference (1971)

A. Generic Huli terms for birds:

bai: generic term for parrots
gope alua: generic term for honeyeaters, sittellas and treecreepers
habo: generic term for ducks
ndi ndu / ndi ndulu: generic term for swiftlets
ngoe pengeda: generic term for honeyeaters?
urubu: generic term for parrots
yagua / nene: generic terms for hawks, goshawks and buzzards

B. Bird species of the Tari region, listed by Huli term:

abua hege / abua haga (d) / *abuage* (@): Cacatua galerita; Sulphur-crested cockatoo
abua yale / wabula (@) {*buale* (@)}: Rhyticeros plicatus; Blyth's hornbill
alu mala: Ninox theomacha; Papuan boobook
alua: Melidectes belfordi; Belford's melidectes
anduya: Rallus pectoralis; Lewin's rail
aro goeabe: Tanysiptera nympha; Red-breasted paradise-kingfisher
aro goeabe / aragoiabe (@): Paradisaea rudolphi; Blue bird of paradise
bai mope: unidentified parrot sp.
bai nana / bai hinana / bai hinini / hinayaga (d): Alisterus chloropterus; Papuan king-parrot
biyakuya: Phylloscopus trivirgatus; Island leaf-warbler
bomboyate: Lanius schach; Long-tailed shrike
buruni: unidentified bird sp.
demogo: Mino dumontii; Yellow-faced myna
demogo: Melipotes sp.; Common smokey honeyeater
demogo: Melidectes torquatus; Ornate melidectes
denge denge: Arenaria interpres; Ruddy turnstone
dongeldgware: Coturnix australis; Brown quail
egehabo: Anhinga melanogaster; Darter
ewa tia: Tyto tenebricosa; Sooty owl
ewa tia: Tyto capensis; Grass owl

gambegoba: Clytomyias insignis; Orange-crowned fairy-wren
gangade (@) {*tima gangade*}: Pteridophora alberti; King of Saxony bird of paradise
gapiago / gobi hagua (d): Egretta ibis; Cattle egret
gihende: Erythrura papuana; Papuan parrot-finch
giundia: unidentified parrot sp.
gomia / komia (@) {*gulu gomia / gulu wambia*}: Paradisaea minor; Lesser bird of paraise
gula / gula gula: Epimachus meyeri; Brown sicklebill
gula / gula gula: Epimachus fastuosus; Black sicklebill
habo: Anas waigiuensis; Salvadori's teal
hai nole: Melidectes princeps; Long-bearded melidectes
hajo: Rallus philippensis; Buff-banded rail
halangai / dagia / halengau: Ninox connivens; Barking owl
hariawe / hari tawe (@,d) / *hariyawa* (d): Harpyopsis novaeguineae; New Guinea harpy-eagle
hengedo (@): Trichoglossus goldiei; Goldie's lorikeet
hombedagua (@) / *homabaragua* (d): Amblyornis macgregoriae; Macgregor's bowerbird
kabale: Astrapia stephaniae; Stephanie's astrapia
kandi (@) {*kandi ayu/guru kandi*}: Parotia sp.; generic term for Parotia spp.
kele kele (@): Trichoglossus haematodus; Rainbow lorikeet
kibi: Gallinula tenebrosa; Dusky moorhen
kudaga: Philemon buceroides; Helmeted friarbird
kugu: unidentified shrike-thrush sp.?
kui ega: Lonchura spectabilis; Hooded mannikin
kuliya ale: Porphyrio porphyrio; Purple swamphen
kurega: Charmosyna josefinae; Josephine's lorikeet
kurega: Charmosyna pulchella; Little red lorikeet
lilau: Gerygone palpebrosa; Fairy gerygone
malibu: unidentified bird sp.
ndi ndu / ndi ndulu: Collocalia sp.
nedau / nedai (d): Haliastur indus; Brahminy kite
ngoai pengeda: Ifrita kowaldi; Blue-capped ifrita
ngoe pengeda: Halcyon macleayii; Forest kingfisher
obedobe: Peneothello sigillatus; White-winged robin
padarembo: Oreocharis arfaki; Tit berrypecker
parige: Falco peregrinus; Peregerine falcon
piagoli: Rhipidura albolimbata; Friendly fantail
piagoli: Rhipidura leucophrys; Wille wagtail
piagoli: Petroica bivittata; Mountain robin
ponge: Lophorina superba (female only; male: *yagama*); Superb bird of paradise
pongo: Rallina forbesi; Forbes' forest-rail
tapaya yuwi: unidentified bird sp.
teletele: Malurus alboscapulatus; White-shouldered fairy-wren.
tendebeno / tendabiyane (d): Rhipidura brachyrhyncha; Dimorphic fantail
tengetenge: Sericornis nouhuysi; Large scrub-wren
timbiyuli: Peltops montanus; Mountain peltops
tolagili?: Sericornis perspicillatus; Buff-faced scrub-wren
tuba: unidentified bird sp.
ubiya: Paradisaea raggiana; Raggiana bird of paradise
umi: Podargus sp.; Frogmouths
undia (@): Neopsittacus musschenbroekii; Yellow-billed lorikeet
uru kamia: Probosciger aterrimus; Palm cockatoo
urubu gela: unidentified parrot sp.
urubu hegele: unidentified parrot sp.
urubu ngawe: Charmosyna papou; Papuan lorikeet
yagama: Lophorina superba (male only, female: *ponge*); Superb bird of paradise
yagombe / yatagobe (d) / *yagobe* (d): Mearnsia novaeguineae; Papuan spine-tailed swift
yagua: Henicopernis longicauda; Long-tailed buzzard

yagua?: Eudynamys taitensis; Long-tailed koel
yamama / yamoma / timuhumbi?: Coracina caeruleogrisea; Stout-billed cuckoo-shrike
yamama / yamoma: Coracina melaena; Black cuckoo-shrike
yame / yami / yari mindi {*bebe yame / bebe alu*}: Casuaris casuaris; Southern cassowary
yange {*elabe yange* (@)}: Astrapia mayeri; Ribbon-tailed astrapia
yari {*hono gaga / habo yari / habo lima / ugura* (@)}: Casuaris bennetti; Dwarf cassowary

APPENDIX B10

MBINGI GENEALOGICAL PROOFS

MBINGI PROOF 1 (Dagima clan; source: Dabale Timuria)

△	Mbi	b. ?1810 **?1770** ?1740	Born during *mbingi*
△	Tumbira	b. ?1840 **?1805** ?1780	
△	Habagua	b. ?1870 **?1840** ?1820	
△	Wagoya	b. ?1900 **?1875** ?1860	
△	Toleba	b. ?1930 **?1910** ?1900	
△	Gaiyalu	b. ?1950 **?1945** ?1940	

MBINGI PROOF 2 (Tani Dindiago; sources: Pudaya, Mabira Hege, Tumbu)

△	Ngoari-Gaea	b. ?1842 **?1822** ?1782	Born on first day after *mbingi*
△	Ngoari-Yula	b. ?1872 **?1857** ?1842	
△	Ngoari-Pabe	b. ?1902 **?1892** ?1832	
△	Ngoari-Pora	b. ?1932 **?1927** ?1922	
△	Ngoari-Tamiteli	b. **1962**	

MBINGI PROOF 3 (Hubi clan; source: Dimbabu)

△	Maiya-Dalibe	b. ?1840 **?1815** ?1810	Said to have lost crops due to *mbingi*
△	Maiya-Toneya	b. ?1870 **?1860** ?1850	
△	Maiya-Tawa	b. ?1900 **?1895** ?1890	
△	Maiya-Yanabe	b. **?1930**	

MBINGI PROOF 4 (Pi clan; source: Pudaya)

Pari	b. ?1814 **?1794** ?1774	Alive during *mbingi*
Gelaya	b. ?1844 **?1829** ?1814	Born after *mbingi*
Ayu	b. ?1874 **?1864** ?1854	
Aio	b. ?1904 **?1899** ?1894	
Pudaya	b. **?1934**	

MBINGI PROOF 5 (Tani Hebaria; sources: Pudaya, Tumbu)

Mbiyago	b ?1868 **?1853** ?1838	Born during *mbingi*
Andali	b ?1898 **?1888** ?1878	
Bareagua	b ?1928 **?1923** ?1918	
Mogai	b **1958**	

MBINGI PROOF 6 [Bai Yabe; source: Hubi-Morali]

Hubi-Yabe	b ?1796 **?1776** ?1756	Provoked *mbingi*
Hubi-Pindu	b ?1826 **?1811** ?1796	Named after *da pindu*
Hubi-Kuliya	b ?1856 **?1846** ?1836	
Hubi-Mabi	b ?1886 **?1881** ?1876	
Hubi-Morali	b **?1916**	

APPENDIX B11

CROP *GAMU* SPELLS

HAI GAMU (*gamu* for bananas), Gomengi, 28.8.91, 91/19A:145-151

This *gamu* would be said when the hole to plant a banana had been dug:

Hela Obena mbaliya
Let us go to Enga
Dugu Yawini mbaliya
Let us go to Duguba
Mirila mbaliya
Let us go to Duna
Ngui dara dabe
So bear 15 rows [of bananas]
Pi dara dabe
Or bear 10 rows
Hombe dara dabe
Or bear 12 rows
Danda habe
And bear them facing inside [towards the house where they can be seen, and away from others who might be tempted to steal them]

MA GAMU (*gamu* for taro), Gomengi, 28.8.91, 91/19A:151-155

This *gamu* would be said when the hole had been dug to plant a taro sett:

Hulia tole wibe
Alua tole wibe
Ayana tole wibe
Angalia tole wibe
Is this a boulder from the banks of the Hulia, Alua, Ayana and Angalia rivers that I am planting?

[An exhortation to the taro to grow to the size of the large boulders found in the named rivers]

HINA GAMU (*gamu* for sweet potato), Gomengi, 28.8.91, 91/19A:164-169

'When we wanted to plant the *heme*, *hangabo*, *mandiyame* and *kuli* varieties of sweet potato, to ensure that they grew firm tubers, we would say:

Giri gere labe
When you bear, may they hang, hang
Bingi bungu labe.
When you bear, may they fill, fill [the mound].'

APPENDIX C1

AERIAL PHOTOGRAPHIC COVERAGE OF THE TARI REGION

This Appendix lists and briefly describes all of the aerial photographic coverage of the Tari region available for this study. The coverage is described in terms of the different photographic "series" arising from daily aerial "sorties", the sequences and directions of the "runs" which comprise each sortie and the individual "frames" shot along each run.

Although the earliest flights over the Tari region included brief sorties over Margarima in October 1934 and over the southern ends of the Tari and Haeapugua basins in February 1936 (Appendix B1), neither these nor any later pre-war flights appear to have taken aerial photographs of the region. Tari was not a field of military operations during the Second World War, when much of the rest of the country was mapped from the first intensive aerial photographic coverage. The first known aerial photographs of the Tari region are a short oblique black and white sequence from a Trimetrogon sortie flown on 1 November 1948, running directly over the high altitude Andabare basin to the east of Tari along a roughly north to south route[1]. Although the quality of prints from this run is high, they provide only a tantalizing glimpse at a low angle of the eastern Tari basin, with the Haeapugua, Dalipugua and Mogoropugua basins visible just beneath the horizon. Further prints from either this or associated sorties may be extant, but have not been traced.

The first nationwide coverage, initiated in 1954 and commonly referred to as the "CAJ" series, provided an excellent aerial photographic baseline at an altitude of 25 000' for the entire Tari region in 1959. A second national coverage was undertaken by the RAAF between 1972 and 1975 in its "Operation Skai Piksa" (also identified by the "CAJ" prefix but distinguished here as the "Skai Piksa" series). This yielded a much less satisfactory quality of print, shot at an altititude of 36 000' and often with a high incidence of cloud coverage. One set of two 1972 sorties over the Tari region was presumably undertaken as an early part of the "Skai Piksa" exercise, but shot along similar lines to the earlier "CAJ" series at altitudes of slightly over 25 000'; unfortunately neither sortie covers the Haeapugua area.

The most recent extensive coverage of the Tari region was commissioned by the World Bank-funded Southern Highlands Rural Development Project in 1978 and provided the basis for the maps of parish boundaries and land use produced by Allen and Wood (Allen, Wood and Vail 1990, Wood and Allen 1982). The coverage of this series was restricted to the Tari, Haeapugua and Dalipugua basin areas, but the high quality of the frames, shot at an altitude of only 9950', renders this the best material for my purposes. Since 1978 there has been only sporadic aerial coverage of the Tari region for specific projects, the Department of Works 1990 "Tagari River" series being one example.

Other than these fixed photographic sorties, there have also been a number of manual or hand-held oblique sorties undertaken independently by researchers working in or visiting the Tari region. The authors and dates of those manual sorties that I have been able to locate that cover Haeapugua include R.J.Lampert and J.Golson, in 1972, B.J.Allen in 1981, and myself in October 1992.

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1. Trimetrogon photography, commonly employed during and immediately after the war, consisted of three cameras, one mounted vertically and two obliquely to either side.

1948 TRIMETROGON SORTIE
[b/w, oblique]

RT - 5RGL - M - 1087 - 338RS - 1 NOV 48 - L 6 [63 - 68]

From north to south over the Andabare Basin, view over eastern Tari basin, Haeapugua, Dalipugua and Mogoropugua just visible beneath the horizon.

1959 ADASTRAPHOTO "CAJ" SERIES
[b/w, vertical]

Good resolution but small-scale print size.

DAGIA RIVER - RUN 1 - 24.5.59 - 25 000' - [CAJ 120/5110-5119]

From west to east, over N.Wabupugua, N.Haeapugua to the Paijaka Plateau.

DAGIA RIVER - RUN 2 - 24.5.59 - 25 000' - [CAJ 116/5110-5119; 5120-5135]

From east to west over the central Tari basin, Haeapugua and Wabupugua.

DAGIA RIVER - RUN 3 - 17.6.59 - 25 000' - [CAJ 120/5095-5109]

From east to west, picking up from Doma Peaks Run 3 in the central Tari basin across S.Haeapugua basin and the Lower Tagali and Hanimu valleys.

DAGIA RIVER - RUN 4 - 17.6.59 - 25 000' - [CAJ 120/5001-5007]

From west to east, starting over Nogoli in the Lower Tagali valley crossing the Dagia River and the S.Tari basin to Mt.Ambua.

DAGIA RIVER - RUN 5 - 17.6.59 - 25 000' - [CAJ 119/5051-5055]

From east to west, crossing over the Lower Dagia river and the Dagia-Tagali junction.

DOMA PEAKS - RUN 3 - 17.6.59 - 25 000' - [CAJ 120/5080-5094]

From east to west following the Alua river across the Tari basin from its headwaters as far as Urupupugua; CAJ 120-5094 links to Dagia River Run 3 CAJ 120-5095.

Also:

CAJ SORTIE 122 - 18.6.59 - 25 000'

Covers Paijaka Plateau, Mogoropugua and Dalipugua basins.

1972 R.J.LAMPERT AND J.GOLSON
[b/w and col, manual low oblique]

An undated and unnumbered set of 11 colour slides and 21 black and white prints shot from a fixed-wing aircraft, covering Wabupugua and Haeapugua.

1972 COMMONWEALTH OF AUSTRALIA "CAJ" SERIES (EARLY "SKAI PIKSA")
[b/w, vertical]

DAGIA RIVER - RUN A1 - 28.7.72 - 25 400' - [CAJ 1483/1719-1744]

From west to east, over southern parts of E Mama, Lebani, Mogoropugua and Dalipugua basins to the Upper Tagali river and Paijaka plateau.

DAGIA RIVER - RUN 5 - 7.9.72 - 25 800' - [CAJ 1479/5249-5258]

From east to west, starting over Dauli (S.Tari Basin) and proceeding across the Dagia, over Nogoli and the Gigira (Hides) range.

1973 "SKAI PIKSA" SORTIE
[b/w, vertical]

WABAG SORTIE 17, RUN 24 [169-187], 24.4.73, 36 000'

Full coverage of the Tari, Haeapugua and Wabupugua basins and the Lower Tagali and Hanimu valleys. Fair resolution but original prints at too small a scale for detailed ground work.

1975 "SKAI PIKSA" SORTIE
[b/w, vertical]

WABAG SORTIE 241, RUN 23A [26-46], 8.7.75, 36 000'

Full coverage of the Wabupugua, Mogoropugua, Dalipugua, Haeapugua and Tari basins and the Paijaka plateau. Fair resolution but original prints at too small a scale for detailed ground work.

1978 MAPMAKERS SERIES
[col, vertical]

RUNS 1-27, 4.9.78 - 15.11.78, 9950'

Full, low-level coverage in a series of parallel runs along a NW - SE axis, of the Tari, Haeapugua and Dalipugua basins. Excellent resolution.

1981 B.J.ALLEN
[col, manual low oblique]

4 colour slides of Haeapugua shot at a low oblique angle in February 1981 from a helicopter.

1990 DEPARTMENT OF WORKS "TAGARI RIVER" SORTIE
[b/w, vertical]

RUN 1, 1:6,000, 20.11.90, [1-5]

From SE to NW over the Tagali River bridge along the route of the Highlands Highway for the Department of Works. Poor resolution and very limited coverage, but comparable in scale to, and thus complementing, the 1978 Mapmakers series.

1992 C.BALLARD
[b/w, manual low oblique]

23 handheld low and high oblique black and white prints of Haeapugua shot from a helicopter in October 1992.

APPENDIX C2

A SUMMARY OF CLAN ORIGIN (*DINDI MALU*) NARRATIVES FOR SOME OF THE HAEAPUGUA CLANS

Multiple versions of narratives of clan origins (*dindi malu*) were recorded for most of the clans of the Haeapugua basin. Brief summaries of some of these narratives from those clans in the vicinity of the Haeapugua wetlands are given here, together with basic genealogical structures.

1. YAMI AND YARI PHRATRIES

Narratives relating to the cassowary brothers, Yari and Yami, are acknowledged as *dindi malu* for most of the clans now resident in the Haeapugua area. The significance of this narrative complex extends far more widely than this, however, and versions of the Yari and Yami narrative have been documented amongst Duna (where the narratives are situated in Haeapugua) and as *dindi malu* amongst some of the Huli clans at Margarima who trace their ultimate origins to Haeapugua. The abbreviated version given here comments upon and summarizes elements from some fifteen different versions of the narrative given at Haeapugua:

> The *dama* Huriba Hui and Huriba Ui find a cassowary egg in the bush at Bebealia Puni in Duguba (the *dindi pongone gebeanda* ritual site in Bedamini territory to the south of Huli) and carry it back to Halianda, the residence of Hali-Tulubi (ancestor of Haliali clan at Pureni on the western side of the Haeapugua basin). The egg hatches, revealing two boys, Yari (*yari* - Casuaris bennetti: Dwarf cassowary) and Yami (*yami* - Casuaris casuaris: Southern cassowary). Hali-Tulubi crafts a bow, Danda Gegeano, and gives it to the brothers. They fight over it, and the bow leaps from their hands and flies off into the air making a noise, "*gununu, gununu*". They follow it until it lands at the *dindi pongone gebeanda* at Gelote. There, as they prepare to seize it, it flies off again, landing this time at the *gebeanda* at Irari. Each time it lands, they attempt to grasp it, but each time the bow eludes them and flies off to another ritual site. The bow crosses the current path of the Tagali river (the river was not there at this time) and lands at Birimanda, then at Iba Habodaya on Dobani land in the centre of Haeapugua swamp, Waloanda, Tere Kamianda, Egaanda, Taibaanda, Yabira, Dibinipu (in the Tari basin), Garaleanda, Daburaanda, Bebenite and ultimately back to Lambarepugua in the Haeapugua basin, where it sticks fast in the upper branches of a tree[1]. A woman, Dangi Beleme, reaches up and hands them the bow before giving them new names: Yari is to be Dandali, Yami's name is now Dambali. Dandali stays at Taibaanda, but Dambali crosses Haeapugua to the Pureni side and the Tagali flows into its current course behind him, separating the two brothers.

The descendants of Yari/Dandali include the clans of Tani, Dagima, Dabo, Mbuda, Telabo and Hiwa; those of Yami/Dambali are the clans Poro and Yumu (Appendix B6: Gen.1).

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1. In some versions when the bow landed at Daburaanda it was seized by the *dama* spirit, Dabura Yale (the ancestor of Tambaruma). The bow was then kept in a hut within the ritual site at Daburaanda where it was a focus for ritual until some point after contact when it was lost in a fire. Ngoari-Mandiga, a *dindi gamuyi* ritual leader for Tani clan, recalls visiting the hut at Daburaanda and being shown the "bow" which he described as a flat strip of wood about 30 cm long, rotted through. A Gobiya clan ritual leader also saw the Danda Gegeano bow, and described it as a short stick with a hole in the centre through which a rope had been threaded; this "bow", he said, was then swung around on the end of the rope, producing the sound "*gununu, gununu*". Evidently, Danda Gegeano was actually a bull-roarer, an artefact employed in cults in the Papuan Gulf and occasionally on the Papuan Plateau (T.Ernst pers.comm.).

2. DOBANI

Dobani were resident at Haeapugua initially as *yamuwini* to Goya subclan of Poro clan, when Poro were still *tene* there. After Poro Goya and Poro Gu retreated from Haeapugua to land belonging to the Poro Ango and Poro Peive subclans in the vicinity of Lake Alibu, Dobani continued to reside at Haeapugua, initially holding the land as *yamuwini* in anticipation of Poro Goya's return, but subsequently assuming *tene* status to the land in their own right. Dobani origins lie ultimately in Duguba, though the route to Haeapugua has been circuitous, and there are Dobani clan members resident as *tene* in two other parishes, to the south in the Komo basin and at Yangome in the southern Tari basin, and as *yamuwini* in the eastern Tari basin, in the Lower Tagali valley, at Mogoropugua and at Yaluba (where Goldman (1983) identifies them as "Tobani"). The much abbreviated account below summarizes Dobani *dindi malu*, drawing on narratives documented at Komo, Yangome and Haeapugua.

> Dobani are ultimately descended from Gebeali, whose descendants lived in Duguba, to the south of Komo. Ira was the first to come to Komo, living at Wongoba, Tumbubalu, Dange Iba and Maloba. He and his son, Narali, both married women from Duguba Muguli. Narali then crossed the lower Tagali river and bore Walubu-Pǫne or Pǫli at Yangome, in the southern Tari basin. While at Yangome, Pǫne encountered the *dama* Gayabi Tilialigo at Gayabi *gebeanda*, now the central *gebeanda* for Dobani. Gayabi Tilialigo performed the *uru kamia* ritual for Dobani, and they prospered and proceeded to marry and settle widely.
>
> The Dobani lineages now resident at Haeapugua came from Yangome some eight generations before the present adult generation, after they were routed in a major war with clans from the Hoyabia area. As they had been fighting in the cause of their *aba* from Poro clan, they sought refuge with Poro. Poro hid them from their pursuing Hoyabia enemies on the Abagopugua portion of Poro's Haeapugua land, on the far side of Lagale Mandi ridge; Dobani have been resident there since, with many individuals maintaining dual residence between Yangome and Haeapugua prior to contact.

Haea-Yoge provides a Poro perspective on the process of land assumption that followed the flight of Poro, incidentally illustrating the category roles of *yamuwini* and *dombeniali*:

> *Iraga headago ogoni angi dindi walu ibini.*
> It was at this time that we left our land.
> *Dobani amu bereago, i ini biraabo henego, Dobani mo minigo beda laro.*
> Where Dobani sit over there, I sat before, and I told them to stay there.
> *O dai buwa unu heagoni wandari urume wini, bi bai uru, Tani baile uru, dai bu dindi wu hai hene, ka, purogo lene ndo.*
> Those who were born of [Tani] women [i.e. Tani *yamuwini*], those who were in between (*bi bai*) [i.e. *dombeniali* related to both Tani and Poro], those who resided (*baile*) with Tani, they returned and stayed there.
> Haea-Yoge, 25.6.91, 91/7A: 427-451

A skeletal genealogy for Dobani clan that seeks to demonstrate the nature of the relationship between the widely scattered sub-clans and lineages is provided in Appendix B6: Gen.4.

3. BOGORALI

Bogorali, who were evicted from Haeapugua by Tani in the 1890s, trace their origins in myth to the Ipili/Paiela-speaking groups of Mt Kare and the Porgera area; the name Bogorali literally means "men-of-Porgera" (*Bogora* (Porgera)-*ali*).

> The Bogorali ancestor, Layuni, was chased by his brothers from Porgera in disgust at his habit of biting the heads off possums. They pursued him to Hawa and Daburaanda in the Tari basin and then to Poro land at Haeapugua. When Layuni crossed the Tagali river to the *dindi pongone gebeanda* of Irari on the Pureni side, Poro blocked the brothers' passage and they turned back to Porgera. Layuni married a woman from Dabu clan, the owners of the Irari site, and returned across the Tagali to settle on Poro land.

4. MUNIMA

Munima claim ultimate origins at Lake Kutubu to the southeast of Huli territory. Their land in the Haeapugua basin was held initially as *yamuwini* to Bogorali, though they have assumed *tene* status there since the flight of Bogorali in the 1890s. The following summary of Munima *dindi malu* traces their movement from Kutubu to Haeapugua.

> The *dama*, Gurubu, lived at Iba Gurubu [Lake Kutubu], where he bore Pogono. Pogono and his wife Duta left their home at Malibu in the Kutubu area and walked to Hari Mbagua, then to Yula in the Irauwi area, to Ayagele and then to Homare in the centre of Haeapugua where the Tagali now flows. There Duta bore their son, Yula, who continued to travel to Irari, then to Lamba Irabu and Ega in what is now Munima parish and on over Lagale Mandi ridge to the Munima valley. Yula's son Lande married a Bogorali woman, and it is presumably through this connection that Munima came to be resident in Haeapugua as Bogorali *yamuwini*.

5. TAMBARUMA / LUGUNI / TIGUA

Tambaruma, Luguni and Tigua are all member clans of a single phratry which claims Duguba origins. All three formerly resided in massive parallel parishes running from the Tereba river in the Haeapugua basin south as far as the Tagali river in the lower Tagali valley. The link between the three clans is slightly obscure but also unusual in that it consists of an illicit congress between one or more ancestral *dama* and two sisters. The following composite account briefly describes the major features of *dindi malu* for the three clans.

> The original Tambaruma ancestor, Hamani, was a *dama* spirit living at Hari Abaga [Mount Bosavi?] in Duguba. His son, known as Buluanda Diwa or Diwa Hamani, travelled from Abaga to Iba Maliama, Behibirila, Tabayale Kuyama, Dalihuni, Daguali and ultimately to Yalegambe, the *gebeanda* for Tambaruma clan, which lies in the southern portion of Dumbiali parish. He travelled on to Dumbiali clan in Obena to acquire a wife. She bore a son, Daburaya or Lemola. Daburaya then slept with two sisters, Yoleme and Dereme, both from Dabu clan in the Pureni area of Haeapugua, but paid no brideprice. Luguni narratives identify a different heritage in the male line from an Obena *dama*, Beanda Bai, whose son Beandali travelled through Hambuali to Duguba. Beandali's son Haguanali then returned from Duguba to Haeapugua, where he also slept with the sisters Yoleme and Dereme. From these unlawful unions

came the immediate ancestors of Tambaruma, Tigua and Luguni, who settled around Haeapugua.

Interestingly, the critical connection established through marriage or illicit sex between the immigrant ancestors of Bogorali, Tambaruma, Tigua and Luguni, and women from Dabu clan possibly indicates that Dabu clan, former owners of the Irari *dindi pongone gebeanda* on the Pureni side of the Haeapugua basin, may once have been principal landowners on both sides of the Tagali river.

APPENDIX C3

DATING THE TANI-TAMBARUMA WAR

A number of individuals are commonly named in narratives from a wide range of clans as having played a part in the war between Tani and Tambaruma that led to the eviction of Tambaruma from their Haeapugua lands[1]:

1. Hebaria, the Tani Hewago *agali haguene* (Appendix B6: Gen.3), was killed an unspecified period of time before the war, providing Tani with the initial motive for revenge against Tambaruma. A GEB of ?1765 AD for Hebaria places him as approximately 55 when his last child was born in ?1820 AD. This provides a *terminus post quem* for Hebaria's death, which is also unlikely to have been much later, given his GEB, than about ?1840 AD.

2. Abiya (Tani Doromo; GEB: ?1799 AD) is said to have instructed his ally Ari-Magola (Dombe *tene*, Hiwa He *yamuwini*; GEB: ?1788 AD) to collect rope vine from an area adjacent to Tambaruma territory; Magola was killed by Tambaruma and this led immediately to the Tani-Tambaruma war. As Magola fathered just three children from his only wife before he died, a normative male age of 35 at the birth of the first child and birth-spacing of 5 years thereafter would imply a GE date soon after ?1833 AD for his death.

3. At an undetermined point after the war had ended, Agiabu (Tani Doromo; GEB: ?1818 AD) is said to have called upon his *aba* kin amongst Tambaruma to return to live at the newly named parish of Dumbiali. Agiabu's sister's husband, Dabura-Hangube (Tambaruma; GEB: ?1770 AD), is said still to have been alive during the war. Hangube's sons, Gurubu (GEB: ?1805 AD) and Pago (GEB: ?1812 AD) are the individuals who led their Tambaruma lineages back to settle at Dumbiali (Appendix B6: Gen.2). Presuming that Agiabu, Gurubu and Pago are identified in the narrative because they were adult leaders at the time of this rapprochement, it is unlikely to have occurred much before ?1838.

Given these different strands of evidence, the following grounds are proposed for a date for the Tani-Tambaruma war: the GEB of Ari-Magola's last child at ?1833 AD is the most precise genealogical reference to the onset of the war. This accords well with a date for Hebaria's death after ?1820 AD and with the GEBs for the prominent individuals identified in narratives of the war and its aftermath. On this basis, a GE date of around ?1835 AD is proposed for the Tani-Tambaruma war.

1. The conventions employed in generating Estimated Birth (EB) and Genealogically Estimated Birth (GEB) dates are described in Appendix B6.

APPENDIX C4

DATING THE TANI-BOGORALI WAR

Due to the relative recency of this event, large numbers of individual ancestors are identified as having participated in the war between Tani and Bogorali that led to the eviction of Bogorali from their Haeapugua parish territory. The identities of many of these individuals are confirmed in narratives from a wide range of different clans. Some of the key grounds for nominating a date for the war are as follows[1]:

1. The most secure Bogorali genealogy that I recorded was that of Ninumali sub-clan. Within this sub-clan, Ngoari-Mala (GEB: ?1813 AD) and his first son (and first child) Ngoari-Hege (GEB ?1848 AD) are both said to have been alive during the war, only shortly before the marriage of Hege to his second wife and the birth of her first son, Ngoari-Homogo (GEB: ?1893 AD).

2. One of the wives of Ngoari-Gobe (GEB: ?1860 AD), a Bogorali leader during the war, is said to have given birth to their son Ngoari-Kulu (GEB: ?1895 AD) during the flight of Bogorali from Haeapugua.

3. The second phase of the Tani-Bogorali war opened with the death during an attempted truce of an old Tani man, Ngoari-Luni. Luni was born within the GE range of ?1805 - ?1820 - ?1835 (where the middle estimate is that employing an average generational length between first sons of 35 years). Assuming a maximum possible age of 75 years for adult men, the war could not thus have occurred much later than the range ?1880 - ?1895 - ?1910.

4. The major fight leaders on the Tani side included Ngoari-Pomia (Tani Yanga; GEB: ?1865 AD), Maiya-Toneya (Hubi *tene*, Tani Lebe *yamuwini*; GEB: ?1860 AD), Ngoari-Bualu (Tani Boroba; GEB: ?1863 AD) and Ngoari-Agibe (Tani Wangane; GEB: ?1845 AD). Assuming that these men were all adults of at least 25 years by the time of the war, this suggests that the war could not have taken place much earlier than the range ?1870 AD - ?1890 AD.

On the basis of the above evidence, a date for the Tani-Bogorali war during the early 1890s is proposed. This allows for the births of Ngoari-Kulu (?1895) and Ngoari-Homogo (?1893) while straddling the period of overlap between the possible lifespan of Ngoari-Luni, given his GEB of ?1820, and the attainment of adulthood by the Tani fight leaders listed.

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1. The conventions employed in generating Estimated Birth (EB) and Genealogically Estimated Birth (GEB) dates are described in Appendix B6.

APPENDIX C5

CENSUS FIGURES FROM HAEAPUGUA

The most reliable guides to the size and distribution of the population of the Tari region are the figures maintained on a regular basis by the Tari Research Unit of the Papua New Guinea Institute of Medical Research, which has monitored population size, health and mortality for the Tari basin, parts of the Paijaka plateau and the eastern half of the Haeapugua basin since 1970. Patrol officers conducting early censuses in the 1950s and 1960s were clearly aware of the limits to their comprehension of the complexities of Huli social structure and residential practices and were in no doubt that their figures were generally underestimated, often attempting to estimate that proportion of the population which they thought they had not seen. Census figures fluctuated initially, generally increasing dramatically and then stabilizing as the local population became familiar with census proceedings. The 1980 National Census is widely held to have been the most accurate nationwide survey since Independence in 1975, with comparison of the 1980 and 1990 census results below supporting the contention that the latter census was, in places such as the Haibuga-Munima Census Division which takes in the Haeapugua basin, wildly inaccurate. Possibly more accurate for the Tari region are the Provincial Census surveys of 1979 and 1983 (Crittenden and Puruno 1984).

Haibuga-Munima Census Division

Year	Population	Source
1970	3639	P.Williamson (1972)
1972	3235	Tari Patrol Report No.3 for 1969/70
1979	6360	Crittenden and Puruno (1984)
1980	5474	National Survey Office (1990)
1983	6964	Crittenden and Puruno (1984)
1990	2571	National Survey Office (1990)

Map study area parish populations:

	1958	1962	1985	1991
Tani[a]	782	1001	1568	-
Egago	86	102	173	-
Hewago	401	627	1037	-
Doromo	261	272	358	-
Dabo	34	-	-	-
Dobani	139	121	233	152
Dumbiali	243	292	-	-
Hiwa	194	302	-	-
Telabo	328	588	-	-
Munima	472	533	-	-
Yumu	-	121	-	-
Wenani	-	88	-	-

Sources:

1958: Jensen-Muir 1958
1962: Foreman 1962
1985: John Vail pers.comm. (for figures from the Tari Research Unit Clan-Residence Survey, 1985)
1991: Ballard field notes

Notes:

[a] - Populations for both Tani parishes (Taibaanda and Walete) included together.

APPENDIX C6

WETLAND GARDEN CASE HISTORIES

The following case histories provide details of the oral history of wetland drainage and garden use within four areas of the southern part of Haeapugua swamp, identifying individual drain-diggers and locating them genealogically. The named areas of the swamp are to be found in Figures C3 and C4. The conventions employed in generating Estimated Birth (EB) and Genealogically Estimated Birth (GEB) dates are described in Appendix B6. The chronological conclusions at the end of each of the case histories are summarized in Figure C24.

CASE HISTORY 1. Iba Hagia / Iba Haeawi area (Dobani).

Dobani, who were resident in Haeapugua initially as Poro *yamuwini*, have lived on the dryland margins of Haeapugua at their current location for at least 10 or 11 generations; ironically (given their initial *yamuwini* status), together with those few Tani lineages who have maintained continuous residence at Taibaanda, Dobani thus boast the longest tradition of continuous residence along the margins of Haeapugua swamp. The first Dobani resident to garden in the swamp was Walubu-Habolo (Dobani *tene*; GEB not determined), who cut drains around the first row of gardens along the original margins of the swamp. The Haeawi *iba puni* channel, which drains from the resurgence of the Haeawi river at the base of Lagale Mandi ridge, is said to have been dug to the Tagali river in a single event by Walubu-Bayale (Dobani *tene*; GEB not determined), who began the drain at the Tagali and worked upstream to capture the Haeawi flow. The Hagia river was extended in stages <u>into</u> the swamp from the margins, initially by Ngoari-Aw<u>e</u> (GEB: ?1860 AD), Ngoari-H<u>o</u>li (GEB: ?1860 AD) and Ngoari-Hiraya, all Tani Tabayia *tene* and Dobani *yamuwini*, and Walubu-Layawe (Dobani *tene*; GEB: ?1850 AD). The generation of their sons, who included Ngoari-Waigo (GEB: ?1900 AD) and Ngoari-Andagua, are said to have completed the task of linking the Hagia *iba puni* to the Haeawi channel. Part of the central stretch of the Hagia *iba puni* was apparently dug by Walubu-Alima (GEB: ?1875 AD). Though the Haeawi channel was apparently initiated before the Hagia channel, this event cannot yet be dated. The initiation of the Hagia *iba puni* probably took place no earlier than about ?1880 AD; Alima's extension of the Hagia occurred no earlier than about ?1895 AD; and the final link between the Hagia and Haeawi channels was effected no earlier than about ?1920 AD.

The first Dobani residents then to exploit the *iba puni* and dig gardens in the swamp centre (and not simply as marginal extensions from dry land) were Walubu-Bolangaya (GEB: ?1893 AD), Walubu-P<u>o</u>ali and Walubu-Ngibe (GEB: ?1908 AD). This phase of use could thus have begun as early as about ?1913. Certainly there was active extension of the drain network and use of the drained blocks for gardens during the early 1920s, when Dobani and Hagu fought a bitter war over contested swamp land along the southern side of the Haeawi *iba puni* (see Case History 2 below). The bulk of the wetland Dobani gardens appear to have been abandoned in about 1932, for unspecified reasons; thereafter, there has been only sporadic drainage and use of individual or adjacent wetland blocks and the wetland centre has reverted to full swamp with a surface cover of water.

Two such wetland cultivation events are visible in the 1959 and 1978 AP coverages; both required the initial reclearance of the Hagia or Haeawi *iba puni* channels, followed by drainage of the block perimeters. The 1959 shows two adjacent blocks in use alongside the Haeawi channel; this brief phase of use was undertaken jointly by Walubu-Mabira and Walubu-Wangiyu (both Dobani *tene*), Dali-Gangoea (Gobiya *tene*, Dobani *yamuwini*), Hubi-Iralia (Tigua *tene*, Dobani *yamuwini*), Egabaga and Ngoari-Dimbabu (Egago *tene*) (all Dobani residents at the time), who divided the drained blocks into plots for use by their individual families. The 1978 AP coverage shows a single large block in use midway between the Hagia and Haeawi channels, on the Tagali side of the Iba Habodaya lake (Figure C12); this was another case of brief drainage and use of an isolated area, in this instance by Ngoari-Handawi (Tani Lebe *tene*, Dobani *yamuwini*; EB: 1932 AD). Throughout this period, the first two to three rows of blocks along the dryland/wetland margin were being brought continuously into and out of use.

The most recent phase of wetland activity has been the reclearance of the Haeawi and Hagia *iba puni* channels in 1991. This event, which involved a total of 32 men working in daily groups of 10 to 12 each Tuesday, Thursday and Saturday for eight weeks, was organized by three young men from Dobani parish, Walubu-Aluya (Dobani Buruli *tene*; B: 1963), Hulu-Undialu (Honaga *tene*, Dobani and Tani Tabayia *yamuwini*; B: 1964) and Dayanda Hayabe (Tani Egago and Dobani Buruli *yamuwini*; B: 1958); the volunteer work crew was "recruited" largely amongst *aba* relations and through ties of friendship from amongst residents of Dobani and both the Tani (Taibaanda and Walete) parishes. By organising this project and committing themselves personally to the bulk of the labour, the leaders have acquired a position from which they can dispose of rights to garden owners wishing to link their garden drains to the Haeawi channel; any garden owner who proceeded to drain a block into the Haeawi or Hagia rivers would be expected to provide some form of compensation to the channel-clearers or run the risk of having the crops pillaged from their new wetland gardens. Interestingly, the initial act of drain reclearance was not immediately followed by block drainage; instead, the project leaders suggest, they will leave the water table of the swamp area within the catchments of the Haeawi and Hagia to lower for a number of years and then proceed, as needs and the circumstances of climate dictate, with block drainage and gardening.

Mention should be made here of the curious set of small, irregular blocks closest to the Tagali river, on the northern side of the Hagia *iba puni*. These are drained directly to the Tagali river by a small channel, Nano Puni. Nano Puni, and the perimeter drains for the blocks, were initially dug by Dali-Dara (Tani Agiabu and Laiyala *yamuwini*) with the assistance of Walubu-Bolangaya (Dobani *tene*; GEB: ?1893 AD), at an unspecified time during the phase of extensive Dobani wetland use in the late 1910s and 1920s. Their intention was apparently to establish gardens for their extensive pig herds and to build a house in the swamp from which to watch over both the gardens and pigs; so near to the Tagali river, people lived in constant fear of pig-rustling raids from the Pureni side of the Tagali. Later, the blocks were re-drained and used by Ngoari-Mawi (Tani Agiabu *tene*; GEB: ?1911 AD), who also lived there to tend his pigs. Alembo, Mawi's son (EB: 1951), remembers living in the swamp house as a small child, but the Nano Puni blocks were certainly abandoned by 1959, when they appear as such in the AP coverage of that year, and have not been re-used since.

In summary, the use of wetland blocks along the dryland margins of what is now Dobani parish appears to date to at least the mid-1800s. Drainage of the Haeawi and Hagia channels followed two quite distinct strategies, the Hagia channel being initiated in about ?1880 AD, at an undetermined period of time after the initiation of the Haeawi channel; in either case, Dobani residents co-operated with the residents of the adjacent Tani parishes of Taibaanda and Walete. The gradual extension of the Hagia was not completed until about 1920, when it was linked to the Haeawi channel. Use of the wetland gardens can be presumed to have begun in tandem with the drainage of these two channels, but there was a definite expansion of activity within the wetland centre between ?1913 and about 1932 when large-scale drainage of the Dobani wetlands appears to have been abandoned. Since the 1950s there has been a series of sporadic wetland garden projects, with individual or adjacent blocks in use in 1959 and 1978. A major re-clearance of the Haeawi and Hagia channels in 1991 presages a return to use of parts of the Dobani wetlands.

CASE HISTORY 2. Iba Haeawi area (Tani Hagu).

The mythic origins of Hagu clan lie to the west in the Lebani basin and, ultimately, amongst Tsinali-speakers of the Lower Strickland river area. Within the Haeapugua basin, most Hagu clan agnates are resident at Waloanda as *yamuwini* to Tani and are descended from Pali-Hogoyawi, whose father, then residing with Bogorali at Haeapugua, married Ngoari-Hewago's daughter and eldest child, Taya[1]. Hogoyawi (GEB: ?1825) is held to have begun the process of swamp drainage at Waloanda, presumably after at least ?1845 AD, though his gardens were restricted to the immediate dryland margins of the swamp. Of his many sons, Pali-Gjwa, Pali-Ambua, Pali-Pama, Pali-Pari, Pali-Hiwaligo, Pali-Nganego and Pali-Waigo, all born (though of different mothers) within the GE range ?1860 AD - ?1885 AD, are identified as having dug most of the drain network in the wetlands between Waloanda and the Tagali river, assisted by Dali-Pelego (Gobiya *tene*, married to a Tani Hebaria woman; GEB: ?1863 AD), from ?1880 at the earliest and more probably after ?1890; their crucial role in the excavation of the Haeawi *iba puni* secured for them control over the wetland area on the Tani side of the drain. The next three generations of Hagu, including individuals such as Pelego's son Demindi (GEB: ?1898 AD), Pama's son Damatimu (GEB: ?1898 AD) and Damatimu's sister's husband, Palari (Haro *tene*, Hagu *yamuwini* GEB: ?1883 AD) in the first generation, Palari's son Tumbu (EB: 1929 AD) in the second, and Tumbu's sons in the third, have all gardened in the strip of wetland blocks along the southern side of the Haeawi *iba puni*.

Use of the Hagu wetlands appears to have been virtually uninterrupted from the initial phase of drainage after ?1880 until the 1940s, with continuous "infilling" or "tightening" of the ditch network and re-clearance of existing drains. In about 1922, Dali-Demindi (GEB: ?1898), who was married to a Dobani woman, Lebai, set about draining a series of garden blocks, in an area known as "Tola", along the centre stretch of the Haeawi channel, just above its junction with the Hagia. Dobani disputed Demindi's right to garden the Tola land, claiming that Walubu-Mara (Dobani Palia *tene*; GEB: ?1853 AD) had earlier dug drains in the Tola area. A Dobani *tene* recalls the origins of the war:

> *Ani biyagola, o wai tene, o mbabu unu tola mbaria ayu unu ti pirimiyago.*
> The cause of the war was Tola garden down there which you went down to just now.
> *Pirimiyago Iba Haea o domarimiyago amu, Ngolo iba puni wia yagi, Tola obago garere, tigua Demindi Tola layagola.*
> Tola lies over there between the Haeawi river and Ngolo's *iba puni* drain; Demindi Tola they [Hagu and Hebaria] called it [i.e. belonging to Demindi].
> *O Hebaria tinaga, tigua Mara Tola lowa.*
> Hebaria said it was their's, but we called it Mara Tola [i.e. belonging to Walubu-Mara].
> *Obagoriani keba yalu uyu Dobanime puwa gana walu hearia.*
> Dobani had taken digging sticks over there and were digging a *gana* ditch.
> *Tanime wai bopene...*
> Tani shot [first] and started the fight...
> Walubu-Mabira, 9.1.91, 90/2A:170-226

After heavy casualties had been sustained, on the Dobani side in particular, the war ended in truce, with Hagu retaining the disputed land.

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1. Note that it is not Taya's status as the oldest (*haguene*) of the Tani siblings that accounts for Hagu's presence along Tani's external boundary, but rather her status with respect to her full brother, Heberia, the eldest of Hewago's sons, who thus stood in an *aba* relationship with Hogoyawi's children.

Tumbu recalls the abandonment after the 1941/42 famine of those blocks farthest into the swamp, adjacent to the Haeawi-Hagia junction, an area that has not since been redrained for gardens. At some point after the 1959 AP coverage, which shows only two reclaimed wetland Hagu blocks close to the dryland at Waloanda, there was a further phase of wetland drainage and gardening in the Hagu area, which terminated in 1975; this was co-ordinated jointly by Tumbu and his *aba*, Demindi's son Gangoea (Gobiya *tene*, Tani Hebaria and Dobani *yamuwini*; EB: ?1938). The 1972 oblique AP coverage confirms Tumbu's recollection, clearly showing three of the Hagu swamp centre blocks in use. A further round of drain clearance and gardening was initiated early in 1978; a single block is shown in use on the 1978 AP coverage, shot later that year, illustrating nicely the sequential process in which garden blocks, usually lying in series alongside an *iba puni*, are drained together and then brought into use one after the other. There were no wetland blocks in use in the Hagu area between 1989 and 1992.

In summary, the drainage of the Hagu wetlands appears to have taken the following course: drainage of the wetland margins as an extension of the dryland network from a date no earlier than ?1845; major wetland drainage from a date no earlier than ?1880 but lasting, probably sporadically, until about 1942; and finally, two recent phases of wetland centre drainage and use from the mid-1960s until 1975 and again from 1978 until about 1985.

CASE HISTORY 3. Torogopugua / Iba Bombowi / Ngolo Puni area (Tani).

The large swamp area between the Hagu gardens along Haeawi *iba puni* and the Herebe Puni channel is owned jointly by several Tani sub-clans, including Lebe, Eli, Tabayia and Abiya, and a lineage of Hubi clan (resident in Tani parish as Lebe *yamuwini*); that part of the swamp closest to the Tereba and Tagali, which is almost permanently inundated, is known as Torogopugua. Ngoari-Loya (Tani Lebe; GEB: ?1814), Ngoari-Habolima (Tani Lebe; GEB: ?1834), Darama-Gelaya (Pi *tene*, Tani Lebe *yamuwini*; GEB: ?1815), Abu-Tiga (Wenani *tene*, Tani Lebe *yamuwini*; GEB: ?1815) and Uguma-Pali (Yangali *tene*, Tani Lebe *yamuwini*; GEB: ?1834) are identified as amongst the first individuals to drain gardens along the immediate edge of the swamp in the area around the Bombo source. There is general agreement that the central wetland area was first gardened by Uguma-Pali's son, Uguma-Ngolo (GEB: ?1869 AD). Ngolo excavated an *iba puni* channel (now known as "Ngolo Puni") for the Bombowi river, starting from its junction with the Tereba and working up towards the Iba Bombo stream resurgence at the base of Lagale Mandi ridge. Other named wetland gardeners of this period in the Ngolo Puni and Embo Puni areas include Abu-Payabu (Wenani *tene*; Tani Lebe *yamuwini*; GEB: ?1850 AD), Darama-Ayu (Pi *tene*, Tani Lebe *yamuwini*; GEB: ?1849 AD), Ngoari-Gugubaga (GEB: ?1860 AD) and Ngoari-Erele (both Tani Tabayia *tene*), Ngoari-Yomo (GEB: ?1853 AD) and Ngoari-Bagu (GEB: ?1860 AD) (both of Tani Wangane), Ngoari-Giya (Tani Abiya) and Pi-Mandiga (Tani Abiya *yamuwini*; GEB: ?1859 AD). The range of GEBs for these individuals suggests that this phase of wetland gardening could not have been much earlier than the late 1880s or early 1890s.

Ngoari-Paiaba (Tani Lebe; EB: 1907 AD) claims that he was about 8 years old when he saw Uguma-Ngolo digging Ngolo Puni, which would date that event at about 1915. This could be taken to indicate either that Ngolo is remembered as a senior man co-ordinating this first drainage event in 1915 or, more probably, that the event witnessed by Paiaba in 1915 was a second or later phase of drain clearance and reuse by Ngolo of the same area. Walubu-Bolangaya (Dobani Palia *tene*, Tani Eli *yamuwini*; GEB: ?1893 AD), Darama-Aio (Pi *tene*, Tani Lebe *yamuwini*; GEB: ?1884 AD), Abu-Arogo (Wangane *tene*, Tani Lebe *yamuwini*; GEB: ?1885 AD), Ngoari-Burili (Tani Lebe; GEB: ?1889) and Ngoari-Obara (Tani Lebe; GEB: ?1884), all of a later age cohort than the first group of drain-diggers above, are identified as some of the individuals who took part in this post-1915 phase of drainage and gardening in the Ngolo Puni area.

Almost two decades of continuous gardening around the Ngolo Puni area followed the 1915 drainage until the swamp centre gardens were abandoned in the mid-1930s. Paiaba claims that the wetland garden drains were destroyed during a war between Walaba (Tani and Hiwa) and Telabo during the early 1930s; he is adamant that there were no gardens in the area from this time until the most recent phase of major wetland gardening which is clearly visible in both the 1972 and 1978 APs as a set of some 20 adjacent reclaimed blocks. Since the ?1915-?1930s wetland gardening phase in the area, the water had returned to neck-high levels in the blocks around Ngolo Puni. This latest phase was initiated by Paiaba's son, Ngoari-Dagiabu (EB: 1942 AD) who, with the assistance of some 30 men from Hebaria and Lebe, cleared Ngolo Puni in about 1970. The swamp centre gardens in this drainage phase were also maintained for approximately a decade before they were finally abandoned; certainly, only three years after the 1978 AP series, by the time of the 1981 oblique AP series, the Ngolo Puni area blocks had been abandoned. They have not been reused since.

Brief mention must be made of the use of an isolated set of three blocks in the Torogopugua swamp centre area during the late 1950s, visible in the 1959 AP coverage (Figure C10). While most of the drainage projects described in this Appendix involved labour groups of 20 or more and usually resulted in the drainage and use in series of between about 5 to 20 blocks, individuals and their families were also capable of staging the reclamation of quite small areas, which they drained and maintained without wider assistance. The three swamp centre blocks in use in the 1959 APs are widely acknowledged to have been the work of Ngoari-Mandiga (Tani Boroba; EB: 1918). In interview, Mandiga confirmed this, adding that his father, Ngoari-Hiraya (GEB: ?1883), had previously maintained gardens in the same blocks; also that his grandfather, Ngoari-Yumogo (GEB: ?1838-?1843-?1848), had been the first of his ancestors to have gardens anywhere in the swamp.

In conclusion, the following chronology is proposed for wetland use in the Iba Bombo / Ngolo Puni area of Haeapugua: partial drainage and use of the wetland margins from no earlier than ?1854, followed by a major initial phase of drainage of the wetland centre after about ?1890. Use of the wetland blocks drained by Ngolo Puni may have been virtually continuous from this point until their abandonment after war in the early 1930s, with two distinct age cohorts involved in gardening in the area. There followed a long period of disuse until about 1970, when blocks were drained and maintained until approximately 1980; since then, there has been no wetland reclamation in the Iba Bombowi / Ngolo Puni area.

CASE HISTORY 4. Mabu Gobe and the Iba Gobe area (Dumbiali and Telabo).

Leaders of the clans of Luguni and Tambaruma, the former residents of the current parishes of Telabo and Dumbiali respectively, claim that there was no drainage or garden use of the wetland areas of these parishes prior to the Tani-Tambaruma war. Dabura-Pago (GEB: ?1812 AD) and Dabura-Gurubu (GEB: ?1805 AD), the leaders of the Tambaruma lineages that returned after the war to live at Dumbiali with their Tani *aba*, are held to have dug the first channel for the Gobe river that extended beyond the dryland margins; this presumably took place some time after they had both attained adulthood, by about ?1832, and after the GE date for the Tani-Tambaruma war of ?1835 (Appendix C3). Even then, the river channel, which marked the boundary between Telabo and Dumbiali parishes, went only as far as the width of one or two blocks before diffusing into the swamp. From this point, subsequent generations of their descendants co-operated with Telabo residents in extending the Gobe *iba puni*, block by block, increasing their garden area in strips the width of a block each time.

I do not have the means to attempt a general review of wetland use in this area, but can describe in some detail the history of use for one particular block, known as Mabu Gobe (located in Figure C4). In the late 1920s or early 1930s, a work group that included Ngoari-Goiama (Tani Dindiago *tene*; GEB: ?1894 AD), Baru-Irari (Yobiya *tene*, Tani Hebaria *yamuwini*; GEB: ?1895 AD), Ngoari-Haeawigo (Tani Tabayia *tene*; GEB: ?1885 AD), Hulugu (Tani Tabayia *yamuwini*; GEB: ?1889 AD), Galube (Tani *yamuwini*; GEB: ?1905 AD) and Ngoari-Gula (Tani Dindiago *tene*; GEB: ?1890 AD) extended the Gobe Puni channel beyond the point of its current junction with Iba Diriba as far as the Mabu Gobe garden, which they then drained and used for the first time. Mabu Gobe was certainly in use during 1934 when the Fox brothers passed through the southern part of Telabo parish, but was abandoned in approximately 1938 during a major earthquake. In 1954 or 1955, shortly after the establishment of Tari station in 1952, some of the sons of this first work group, led by Kamiali Goiama (EB: 1929), Abiale Hulugu (EB: 1924) and Nigiba Galube (EB: 1940) cleared out the old drains at Mabu Gobe and gardened there for several years. Finally, in 1989, Kamiali again organised the redraining of Mabu Gobe. At the time, Mabu Gobe was the garden farthest into the swamp on the southern side of the Tereba river; the block was still being used in October 1992, though its crops had been pillaged and destroyed during the war between Telabo and Tani earlier that year.

The Gobe channel was not finally linked to the Tereba channel until the late 1950s, in an event co-ordinated by a group of young Telabo and Dumbiali men, including Tabaya-Togoli (Dabamu *tene*, Telabo Hogobia *yamuwini*; EB: 1931) and Dabura-Endeli (Tambaruma Gurubu *tene*, Tani *yamuwini*; EB: 1936); certainly the channel was completed by the time of the 1959 AP coverage.

In summary, the first attempts to channel the Gobe river appear to have taken place shortly after the Tani-Tambaruma war, in about ?1840. Further extension of the Gobe channel seems to have been a very gradual process, in which the channel was lengthened only as far as was necessary to bring a further strip of blocks into use along the existing wetland/dryland margin. The Gobe channel reached the Mabu Gobe area in the late 1920s or early 1930s, but was not finally joined to the Tereba river until the late 1950s.

APPENDIX C7

A SURVEY OF ARCHAEOLOGY IN THE TARI REGION

This appendix briefly reviews the available archaeological material from the Tari region and its immediate surrounds. A summary of the history of archaeological research in Southern Highlands Province is given in Section A3.1. Most of the archaeological sites of the Tari region, together with details of their locations, are listed in Appendix C8, and the artefacts collected from these sites are listed in Appendix C9. Locations for most of the sites are shown in Figures A4, C28 and C31. Further details of the excavated sites and of the radiocarbon results from these excavations are given in Appendices C10 and C11, respectively.

Megafauna

The Tari region is currently the richest source of megafaunal remains in New Guinea. An earlier discovery of the holotype of the zygomaturine diprotodontid Hulitherium tomasettii at the Pureni mission airstrip (LAC) in the Haeapugua basin (Williams et al. 1972, Flannery and Plane 1986) was matched on the eastern side of the basin by the discovery in 1987 of a Hulitherium mandible at the LOB site. In the course of my fieldwork, the LOB site was excavated without further remains being uncovered, but specimens of Protemnodon tumbuna, previously known only from fragments at the Nombe rock-shelter site in Simbu Province (Flannery, Mountain and Aplin 1983), were excavated from the nearby LOG and LOK sites (Appendix C10); further Protemnodon material was also recovered from a road cutting near Koroba (LLA) and similar discoveries of large bones have been reported in the course of garden activity along the Dalipugua and Mogoropugua swamp margins (LOR, LOS). Together with material recovered recently from the spoil of alluvial mining operations at Mt Kare (QGC), these new finds have all been formally described by James Menzies (Menzies and Ballard 1994). Although the Pureni megafaunal material is credited with an age of 38 000 BP on the basis of a radiocarbon date (Williams et al. 1972), this now appears to be a considerable underestimate (Haberle 1993; see Chapter C3); as yet no reliable dates have been determined for any of these finds, nor is there any suggestion of human association, though this has been demonstrated elsewhere in the Highlands region at Nombe rock-shelter (Flannery, Mountain and Aplin 1983).

Rock-shelters

Archaeological survey in the Highlands region has traditionally focused upon the identification of potential cave and rock-shelter sites as a means of establishing preliminary chronological "control" over a region (e.g. White 1972). The limited value of such an approach in the reconstruction of broader patterns of land use and their social contexts is discussed in Section A2.3; there is a role, however, for the deeper chronological frameworks supplied by cave deposits, and potential sites were recorded and, in some cases, briefly tested. As the Tari region limestones are relatively young and well-protected, cave development is not particularly advanced. However, cave formation is progressively more pronounced towards the west of the region, with more caves found in the Koroba and Lebani areas than around Tari (Dyke n.d.), including spectacular multilevel phreatic caves along the southern fall of the Muller Range (James 1974, ATEA 78 1980). Thus, the most promising cave sites all lie to the west of Haeapugua, including the Lake Kopiago sites (LAJ, LAK, LAL, LAM, LAN, LAO) explored by White (1974), the Waiya Egeanda cave (LKP) in the Nagia river gorge (Landsberg and Gillieson 1979, Dyke n.d.) and Yurika Egeanda (LSS) in the headwaters of the Nagia river catchment (Dyke n.d.).

White tested the deposits of most of the Kopiago area caves that he visited but the deepest of his test pits yielded only 50 cm of deposit and no samples were submitted for dating. The only western cave site tested in the course of my fieldwork was the site of Waya Egeanda (LOQ) at 2360 m in the Lebani basin. A pit dug at the cave entrance exposed an apparently shallow cultural deposit of only 35 cm, though the possibility that the basal sterile yellow soil caps further cultural deposit needs to be explored. Samples from the test pit returned two radiocarbon dates that were apparently inverted (Appendix C10); I suggest that the older date of 1230 ± 180 BP (1420 (1160) 770 cal BP) (ANU-8808) is valid for the lowest unit of the known cultural deposit. As occupation as early as 5440 BP (ANU-1015) has been demonstrated for cave sites at altitudes of up to 4000 m elsewhere in New Guinea (Hope and Hope 1976), the Waya Egeanda date is unlikely to represent early use or occupation, even of the high altitude Lebani basin, though it is currently the earliest archaeological date for occupation of the western Huli and Duna areas.

At Haeapugua, marginal overhangs along the length of Lagale Mandi ridge serve occasionally as sleeping spots for hunters and watchful pig owners, or as refuges for family groups and pigs during wars or police raids. They are also favoured as repositories for both cranial and post-cranial remains of ancestors which are coated in red ochre and, in the case of skulls, painted with specific designs. The most promising of these overhangs, the shelter of Embo Egeanda (LOL) in Wangane sub-clan land in Tani Taibaanda parish, provides a 14 m^2 floor area and is still used as a night shelter but also served, until very recently, as an ossuary. A small trench, 135 cm in length and 50 cm wide, was excavated to a maximum depth of 40 cm, but yielded only 25 cm of cultural deposit, of which only the lower 10 cm was fully consolidated. An ash sample from the upper layer of this consolidated unit returned a date of 610 ± 130 BP (780 (630,610,560) 420 cal BP) (ANU-8307), implying a date earlier than this for initial use of the shelter. Fragmentary human remains, largely cranial, mandibular and dental, and fragments of red ochre and cowrie shell were found through the full depth of the site, suggesting continuity both in the function of the shelter as an ossuary and also in the nature of the materials, ochre and cowrie, used in association with mortuary rituals at contact. The promise of much deeper deposits in the vicinity of Haeapugua, though not immediately bordering or overlooking the basin floor, is contained in the limestone hills between the Haeapugua and Yaluba basins and at the cave of Tamoli Egeanda (LNH), situated in a small doline in the hills in the southeastern corner of Tani Taibaanda parish, which was visited by Haberle but not by myself.

Rock Art

None of the figurative rock art common to most areas of the Highlands has been identified in the Tari region. Figurative rock art has been recorded in the Kopiago basin (LAJ), the Strickland river valley (LEZ, LFA, LFB, LOW, LOX, LOY), the Porgera valley (QCB) and in numerous sites to the east and southeast of Tari. Elsewhere in the Highlands region a close relationship between the distribution of barkcloth and figurative rock art is evident and it is interesting, in this light, to note that barkcloth was produced within or traded into each of these areas, but not within or to the Tari region[1]. Despite fairly intensive surveys in the Tari region of cave, shelter and cliff locations by myself and others, the only painted rock art known is that associated with ritual performances, which consists of the heavy application of red ochre to large surfaces of cave walls and roofs and to cliff faces. The interior surfaces of the cave that constitutes the inner sanctum at the *dindi pongone gebeanda* site of Gelote (LDQ) are almost entirely coated in red ochre; other sites with this form of rock art include Guana Egeanda (LNG) in Munima parish in the Haeapugua basin and Embo Egeanda (LOL), where there are patches of red ochre smeared across the rear wall of the shelter.

Another form of rock art is currently unique in New Guinea to the Tari region.

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1. Thus barkcloth caps worn by Tinali-speakers of the lower Strickland gorge are decorated with designs similar to those recorded at the Strickland valley rock art sites (Peter Dwyer and Monica Minnegal pers.comm.; see Appendix C10: sites LOW, LOX, LOY).

Digital fluting in what was formerly soft montmilch deposited on the walls of two cave sites, Kalate Egeanda (LOT) at Haeapugua and Waya Egeanda (LOQ) in the Lebani basin, is very similar in form to the parietal art described from cave sites in South Australia (Bednarik 1986). The panel of parietal art of Waya Egeanda is only 7.6 m from the mouth of the cave, but the larger panel at Kalate Egeanda is approximately 200 m from the entrance and was discovered only in the course of a recreational caving trip in 1989. A more detailed description of both art panels is provided in Appendix C10; the more immediate relevance of these sites is the interesting possibility, based on purely formal similarities alone, that this art may match the Pleistocene antiquity proposed by Bednarik for the South Australian sites. The floor beneath the Kalate art panel had been undercut and there was no scope for excavation; the older date from the test pit at Waya Egeanda of 1420 (1160) 770 cal BP (ANU-8808) may provide a *terminus post quem* for the art there, but further excavation would be required to extinguish the possibility that deeper deposits at the site might contain earlier cultural levels.

Stone Artefacts

Collections of stone artefacts from the Tari region made both in the course of my fieldwork and previously by other researchers have revealed a range of material forms common across much of the Central Highlands region of Papua New Guinea. From amongst this range, five principal categories of stone artefact can be distinguished: large core tools (conventionally described as "waisted" and "tanged" blades), ground axe blades, stone carvings, other flaked stone artefacts and cooking stones. The nature of these five categories in the Tari region and their occurrence in collections deriving from surface surveys are briefly reviewed here.

Waisted and tanged blades

Waisted and tanged blades are a significant element in the stone tool industry described for New Guinea, with waisted blades constituting the bulk of the artefactual evidence at the earliest occupation site on the island, at Bobongara on the Huon Peninsula (Groube et al. 1986), and associated at numerous other sites with Pleistocene levels (White, Crook and Ruxton 1970, Bulmer 1977); a review by Bulmer (1977) of the form and distribution of these artefacts suggests that their use extended from the Pleistocene until approximately 6000 BP. Although no large core tools have been recovered from securely dated archaeological contexts in the Tari and adjacent regions, the presence of a number of large core tools, including a waisted blade retrieved from the disturbed Tongoma site (LAI) near Lake Kopiago, a tanged blade acquired in the Tari area (LLI) and another tanged blade recovered in the course of a surface survey at Waloanda (LSH) in the Haeapugua basin (see Appendix C10: LSH site, for a fuller description of this artefact), is suggestive of a late Pleistocene or early Holocene antiquity for human occupation of the Tari-Kopiago region[2].

Ground axe blades

6000 BP is also the earliest date cited for ground axe or adze blades in New Guinea (White with O'Connell 1982:190), suggesting that the earlier core tool technology employed to produce large chopping tools was comprehensively replaced by a ground-blade technology. Stone axe blades were still widely employed in the Tari region until the late 1950s, when access to steel tools through the government station at Tari saw the rapid and near-complete abandonment of all stone tool use in the area. As the abandonment of stone tools essentially followed after the local establishment of a colonial presence, large numbers of stone axe blades were sold to administration officers, missionaries and tourists, rather than being discarded or retained. The stone blades employed by Huli fall into two broad categories: poor-quality blades produced

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2. This claim is further strengthened by recent finds of large core tools at a number of sites along the southern fall of the Highlands immediately to the southwest of the Tari region (Minnegal 1991, Swadling and Hope 1992).

from local stream sources and much finer, though often smaller blades imported from quarry sources to the east and north-west (Ballard 1994). Table C4 lists the different types of blade recognised by Huli, illustrating the significance for Huli of source, rather than physical form or size, in identifying blades; of particular interest is the fact that abandoned blades uncovered while digging gardens are reworked and identified as blades of "local origin" (*dindi ayu*), irrespective of their true origin.

Stone mortars and pestles and ritual stones

Stone mortars and pestles and stone carvings are almost ubiquituous within Highland New Guinea east of the Strickland river and are present in great numbers within the Tari region. Huli regard all of these artefacts as ritual items, classing them together with a wide variety of forms of natural stone as *liru* ritual stones. Table C5 lists the categories employed by Huli to identify different forms of ritual stone. The technological complex of stone mortars and pestles and other forms of carved stone is a persistent archaeological mystery in the New Guinea region, with no indication to date of a likely centre or centres for their manufacture and few finds from securely dated contexts with which to establish a chronology for their production and use[3]. Certainly the date of their production within or transfer into the Tari region exceeds the reach of Huli history, as Huli deny their status as human artefacts and have no sense of the presumed prior functions of such artefacts as mortars and pestles; in fact mortars (as *ni tangi*: "hats of the sun") are linked not to pestles but rather to naturally occurring rounded cobbles (*ni habane*: "eggs of the sun") traded from the Kopiago region[4].

Until the 1950s, *liru* were held largely within sacred *liruanda* or *gebeanda* enclosures, where they were focus of a wide range of performances in which the stones would be coated with red ochre and covered with pig grease or blood. The modern recovery of *liru* in the course of gardening activity almost invariably serves to identify the presence of former ritual sites; the numbers of *liru* in these sites can be gauged from a recent incident at Halere, a former *gebeanda* site in Dobani parish at Haeapugua, where the landowner filled three large coffee sacks with *liru* cleared from a single garden block, which he then proceeded to reduce to rubble for use as cooking stones.

Flaked stone tools

Huli flaked stone tool technology is similar to that described for the neighbouring Duna (White and Dibble 1986, White, Modjeska and Hipuya 1977, White and Thomas 1972) and western Mendi-speakers (Bartlett 1964, Sillitoe 1988), reflected in the regional homogeneity of the terms for stone flake scrapers (Huli, Duna: *are*; west Mendi: *are* or *aeray*). The functions of *are* appear to have been limited principally to the production of arrow shafts, axe hafts and bow staves, the shredding of cane fibre, finer decorative carving on such objects as arrow shafts, the paring of bone and the drilling of shell. Like stone axes, flaked stone tools were largely abandoned during the 1950s, their functions assumed by glass and steel implements, though during my fieldwork period a number of men persisted in making and using flake scrapers which they preferred over steel or glass for the manufacture of bow staves and arrow shafts.

Raw material for the production of flaked stone artefacts is widely available in the form of chert cobbles. Certain stream beds with particularly high quantities of chert cobbles, identified as "quarry" sources, are present in each of the major basins. Modjeska (n.d.) and White (1974) have identified four such quarries amongst Duna-speakers in the Yauwinena valley and a further two in the Upper Tumbudu valley. The highest of these, at Iba Yokona on Garua clan land, is also used by Huli-speakers. The

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3. White (White with O'Connell 1982:190-192) notes that mortar fragments have been recovered from levels dating between 3000 BP and 5000 BP at the Wañlek and NFB sites, and that their apparent absence from sites above 2000 m further implies a pre-Ipomoean antiquity.

4. A collection of *liru* donated to Father Paul Farkas at Dauli High School contains an illuminating sample of the sorts of materials deemed to be *liru*: an uncounted total collection includes 23 stone clubheads, 5 fossils, 37 *ni habane* and 10 stone carvings of various types, together with a large number of naturally occurring but unusually formed stones.

Huli sources, five of which I visited, generally lie along the uplifted eastern margins of the basins where deeply incised stream channels provide a regular source of cobbles; this is certainly the case in the Lebani, Mogoropugua, Dalipugua and Haeapugua basins where, in broad terms, the larger the channel, the deeper its incision into the ridgeline and the greater the supply of cobbles. Little value is placed on these sources, and access to cobbles is and was formerly freely available to or through any individuals with ties of kinship or friendship to residents of the parish in which the sources are located. On the eastern side of the Haeapugua basin, the major sources are both located in Dobani parish at Hundubalua, in the upper reaches of the Hagia stream and at Iba Arugu; the garden blocks on the fans at the bases of these streams are themselves important secondary sources of raw material.

Cooking stones

The fifth category of stone artefact, cooking stones (*tole*), reflects the Huli practice of cooking larger meals in steam ovens lined with pre-heated stones. A preference for certain types of stone and a particular size range is exercised. Though suitable material is widely available, the best cooking stones in the Haeapugua basin are said to come from Iba Darama in Hiwanda parish; like chert cobbles, these are made freely available to anyone prepared to carry them away.

APPENDIX C8

A REGISTER OF ARCHAEOLOGICAL SITES OF THE TARI, LAKE KOPIAGO AND PORGERA REGIONS OF SOUTHERN HIGHLANDS AND ENGA PROVINCES

This Register lists some of the sites in the Tari, Lake Kopiago and Porgera regions of Southern Highlands and Enga provinces that are documented on the National Site Register (NSR) maintained at the National Museum of Papua New Guinea; the list given here excludes most of the ethnographic artefact collection sites, concentrating largely on archaeological sites (LAB-LLI, QEB-QGC) and those sites initially recorded in the course of my doctoral fieldwork in the Tari region (LLA, LMA-LSX).

Codes:

NSR code: Three letter site code documented on the National Site Register (NSR).
Field code: Codes used by fieldworkers to distinguish sites in the field.
Grid reference: Refers to the 1:100 000 topographic map series for Papua New Guinea.
Location name: Refers to the local name for the site, or the immediate area.
Basin: Refers to the general basin or valley location of the site (Ur: Upper; Lr: Lower).
Site 1: Refers to the type of site, under the following codes:

- C - Cave or rock-shelter site
- O - Open site

Site 2: Refers to the type of site, under the following codes:

- A - Rock art site
- B - Burial site
- c - Artefacts or other material noted or collected
- E - Excavation
- F - Chert flake source
- M - Megafauna site
- R - Ritual site
- S - Surface site

Comment: Provides details of related reference works and site contents.

NSR code	Field code	Grid reference	Location name	Basin	Site 1	Site 2	Comment
Southern Highlands Province:							
LAB	-	YU0529	Hambuali	Komo	-	c	Stone mortar collected at Hambuali parish, Komo.
LAC	-	YU024534	Pureni	Haeapugua	O	MEc	Hulitherium type site (Flannery and Plane 1986).
LAD	-	XV528039	Alo	Yauwinena	O	F	Chert source in Aluni parish (White 1974:7).
LAE	-	XV550030	Kerere	Yauwinena	O	F	Chert source in Nauwa parish (White 1974:7).
LAF	-	XV650950	Arekana	Ur.Tumbudu	O	F	Chert source in Hareke parish (White 1974:7).
LAH	-	XV661035	Lane	Kopiago	O	ESc	Ditch fill dated to 430+/-110 BP (NSW 100) (White 1974:3).
LAI	-	XV515040	Tongoma	Yauwinena	O	Sc	Waisted blade collected (White 1974:5).
LAJ	-	XV645015	Kago	Kopiago	C	ABR	(White 1974:4).
LAK	-	XV650010	Marekanda	Kopiago	C	B	(White 1974:4).
LAL	-	XV520025	Tage	Yauwinena	C	BE	Shelter with > 15cm deposit containing carbon (White 1974:6).
LAM	-	XV659948	Arukanda	Yauwinena	C	Ec	Shelter with > 50cm deposit containing carbon (White 1974:6).
LAN	-	XV645014	Bolakanda	Kopiago	C	S	(White 1974:4).
LAO	-	XV635010	Tugwabi	Kopiago	C	S	Shelter with 20-30cm deposit (White 1974:4).
LDQ	-	YU016551	Gelote	Haeapugua	C	AR	*Dindi pongone gebeanda* site in Dagabua parish, including the painted inner sanctum cave (Goldman 1979, Frankel 1986:21, Figure 5).
LDR	-	YU172518	Daburaanda	Tari	O	R	*Gebeanda* ritual site (Hondobe clan).
LDS	-	YU158465	Bebenite	Tari	O	R	*Dindi pongone gebeanda* ritual site (Yangali clan).
LDU	-	XU735847	Kelabo	Ur.Tumbudu	O	R	"Human footprint" in rock in Kelabo area.
LEZ	-	XV458112	-	Strickland	C	A	(Hook 1963; White 1969)
LFA	-	XV452115	-	Strickland	C	A	(Hook 1963; White 1969)
LFB	-	XV450110	-	Strickland	C	A	(Hook 1963; White 1969; Hosei University Exploration Club 1979)
LFO	-	XV620952	L.Poko	Ur.Tumbudu	C	B	
LFP	-	XV657037	-	Kopiago	C	BR	Burial shelter in Aiyuguni parish.

NSR code	Field code	Grid reference	Location name	Basin	Site 1	Site 2	Comment
LIC	-	XV675045	Piri	Kopiago	C	B	Burial cave in Dilini parish (Hook 1963)
LIG	-	XU988438	Nogoli	Lr.Tagali	O	Sc	Axe blade recovered during construction of Nogoli sawmill.
LKP	-	XU992675	Waiya	Nagia	C	-	Large dry cave site with apparently substantial but untested deposit (Landsberg and Gillieson 1979).
LLA	-	XU914694	Tumbu	Koroba	O	ScM	Megafauna recovered from road cutting (Menzies and Ballard 1994).
LLI	-	YU153534	Tari town	Tari	-	c	Stone tanged blade collected by L.Bragge, 1989.
LMA	-	YU075528	Egaanda	Haeapugua	O	Sc	Surface artefact scatter.
LMB	WEN1	YU019562	Wenani	Haeapugua	O	Sc	Surface artefact scatter.
LMC	MUN1	YU043567	Munima	Haeapugua	O	Sc	Surface artefact scatter.
LMD	MUN2	YU042570	Munima	Haeapugua	O	Sc	Surface artefact scatter.
LME	MUN3	YU032556	Munima	Haeapugua	O	Sc	Surface artefact scatter.
LMF	DOB1	YU056553	Dobani	Haeapugua	O	Sc	Surface artefact scatter.
LMG	DOB2	YU057552	Dobani	Haeapugua	O	Sc	Surface artefact scatter.
LMH	DOB3	YU058547	Porodangi	Haeapugua	O	Sc	Surface artefact scatter.
LMI	DOB4	YU061551	Dobani	Haeapugua	O	S	Surface artefact scatter (not collected).
LMJ	DOB5	YU056553	Dobani	Haeapugua	O	Sc	Surface artefact scatter.
LMK	WAL2	YU056555	Walete	Haeapugua	O	Sc	Surface artefact scatter.
LML	WAL3	YU052557	Walete	Haeapugua	O	Sc	Surface artefact scatter.
LMM	WAL4	YU054555	Walete	Haeapugua	O	Sc	Surface artefact scatter.
LMN	WAL5	YU045560	Walete	Haeapugua	O	Sc	Surface artefact scatter.
LMO	WAL6	YU043547	Walete	Haeapugua	O	Sc	Surface artefact scatter.
LMP	WAL7	YU041556	Walete	Haeapugua	O	Sc	Surface artefact scatter.
LMQ	WAL8	YU042558	Walete	Haeapugua	O	Sc	Surface artefact scatter.
LMR	WAL9	YU040556	Walete	Haeapugua	O	Sc	Surface artefact scatter.
LMS	WAL10	YU047562	Walete	Haeapugua	O	S	Surface artefact scatter (not collected).
LMT	WAL11	YU047562	Walete	Haeapugua	O	Sc	Surface artefact scatter.
LMU	-	XU785655	Purigi	Lebani	O	Sc	Surface artefact scatter.
LMV	-	XU762625	Dagedage	Lebani	O	Sc	Surface artefact scatter.
LMW	-	XU771641	-	Lebani	O	Sc	Surface artefact scatter.

NSR code	Field code	Grid reference	Location name	Basin	Site 1	Site 2	Comment
LMX	TAP1	YU076528	Tani	Haeapugua	O	Sc	Surface artefact scatter.
LMY	TAP2	YU075524	Tani	Haeapugua	O	Sc	Surface artefact scatter.
LMZ	TAP3	YU072529	Tani	Haeapugua	O	Sc	Surface artefact scatter.
LNA	-	YU042566	Munima	Haeapugua	-	c	Artefacts donated by Alua Tiaya.
LNB	WEN2	YU024568	Yalima	Haeapugua	C	B	Ossuary.
LNC	WEN3	YU024568	Kemure	Haeapugua	C	B	Ossuary.
LND	WEN4	YU023563	Kamianda	Haeapugua	C	R	Cave ritual site.
LNE	-	YU040560	Yaguabi	Haeapugua	O	B	Open ossuary.
LNF	-	YU038565	Nogohama	Haeapugua	O	R	Sacrificial site in Munima parish.
LNG	-	YU041563	Guana	Haeapugua	C	AR	Painted ritual cave in Munima parish.
LNH	-	YU083525	Tamoli	Haeapugua	C	-	Substantial deposit reported by Haberle.
LNI	-	YU027570	Hagodanda	Haeapugua	O	R	*Gebeanda* ritual site in Hubi parish.
LNJ	-	XU950669	Iba Gunu	Koroba	O	R	*Gebeanda* ritual site of the Padarali clans.
LNK	-	XU740387	Bebealia Puni	Baia	C	R	Duguba Bebe *dindi pongone gebeanda*.
LNL	-	YU170542	Garaleanda	Tari	O	R	Gigida clan *gebeanda* ritual site.
LNM	-	XU740620	Mbagua	Lebani	O	R	Sacred mineral oil sources of the Lebani basin.
LNN	-	YU078508	Biangonga	Haeapugua	O	R	Yumu clan *gebeanda*.
LNO	-	YU017556	Halianda	Haeapugua	O	R	Haliali clan *gebeanda* (in Wenani parish).
LNP	-	YU070466	Agau	Lr. Tagali	O	R	*Gebeanda* of Aroma and Pi Tungube clans.
LNQ	-	YU125545	Palianda	Tari	O	R	Diba clan *gebeanda*.
LNR	-	YU105537	Bibi	Tari	O	R	Bibi clan *gebeanda*.
LNS	-	YU193478	Tambugua	Tari	O	R	Dombehale clan *gebeanda*.
LNT	-	YU071531	Tere Kamianda	Haeapugua	O	R	Tani clan *gebeanda*.
LNU	-	YU038558	Yalemali	Haeapugua	O	R	Bogorali clan *gebeanda* (in Munima parish).
LNV	-	YU092542	Geberubali	Tari	O	R	Mbuda clan *gebeanda* (in Haro parish).
LNW	-	YU085551	Wagaba	Tari	O	R	Poro clan *gebeanda*.
LNX	-	YU084542	Dama Tege	Tari	O	R	Haro clan *gebeanda*.
LNY	-	YU021549	Egeanda	Haeapugua	O	R	Dabu clan *gebeanda* (in Wida parish).
LNZ	-	YU018549	Irari	Haeapugua	O	R	Dabu clan *dindi pongone gebeanda* (in Wida parish).

NSR code	Field code	Grid reference	Location name	Basin	Site 1	Site 2	Comment
LOA	-	YU033557	Alua's	Haeapugua	O	E	cf. Appendix C10.
LOB	-	YU058547	Iralia's	Haeapugua	O	EM	cf. Appendix C10.
LOC	-	YU058546	Tumbu's	Haeapugua	O	E	cf. Appendix C10.
LOD	-	YU054515	Mundiya's	Haeapugua	O	E	cf. Appendix C10.
LOE	-	YU050515	Mangobe's	Haeapugua	O	E	cf. Appendix C10.
LOF	-	YU185494	Yangome	Tari	O	E	cf. Appendix C10.
LOG	-	YU055551	Mabira's	Haeapugua	O	EM	cf. Appendix C10; (Menzies and Ballard 1994).
LOH	-	YU032548	Birimanda	Haeapugua	O	E	cf. Appendix C10; *gebeanda* ritual site for the Yari and Yami phratry clans.
LOI	-	YU058545	Walobi	Haeapugua	O	E	cf. Appendix C10.
LOJ	-	YU059544	Hiribite	Haeapugua	O	E	cf. Appendix C10.
LOK	-	YU055551	Tone's	Haeapugua	O	E	cf. Appendix C10; (Menzies and Ballard 1994).
LOL	-	YU067540	Embo	Haeapugua	C	E	cf. Appendix C10.
LOM	-	YU058548	Aluya's 1	Haeapugua	O	E	cf. Appendix C10.
LON	-	YU058549	Aluya's 2	Haeapugua	O	E	cf. Appendix C10.
LOO	-	YU368404	-	Tari Gap	O	E	cf. Appendix C10.
LOP	-	YU371404	-	Tari Gap	O	E	cf. Appendix C10.
LOQ	-	XU794655	Waya	Lebani	C	AE	cf. Appendix C10.
LOR	-	XU875672	Fugwa	Mogoropugua	O	M?	Reports of megafaunal remains.
LOS	-	XU925704	Gondali	Koroba	O	M?	Reports of megafaunal remains.
LOT	-	YU025576	Kalate	Haeapugua	C	AR	cf. Appendix C10.
LOU	-	YU062533	Mbugua's	Haeapugua	O	E	cf. Appendix C10.
LOV	-	XU884664	Iba Kemo	Mogoropugua	O	F	Chert source at Iba Kemo.
LOW	-	XV476175	-	Strickland	O	A	cf. Appendix C10.
LOX	-	XV475184	-	Strickland	-	A	cf. Appendix C10.
LOY	-	XV474169	-	Strickland	C	A	cf. Appendix C10.
LOZ	-	YU075528	Taibaanda	Haeapugua	O	R	Tani clan *gebeanda* ritual site.
LQA	TER1	YU068517	Tereba	Haeapugua	O	Sc	Surface artefact scatter.
LQB	TAP4	YU079517	Tani	Haeapugua	O	Sc	Surface artefact scatter.
LQC	YUM1	YU077515	Yumu	Haeapugua	O	Sc	Surface artefact scatter.
LQD	YUM2	YU075514	Yumu	Haeapugua	O	Sc	Surface artefact scatter.
LQE	HIW1	YU064515	Hiwanda	Haeapugua	O	Sc	Surface artefact scatter.

NSR code	Field code	Grid reference	Location name	Basin	Site 1	Site 2	Comment
LQF	HIW2	YU064513	Hiwanda	Haeapugua	O	Sc	Surface artefact scatter.
LQG	HIW3	YU062507	Hiwanda	Haeapugua	O	Sc	Surface artefact scatter.
LQH	HIW4	YU066508	Hiwanda	Haeapugua	O	Sc	Surface artefact scatter.
LQI	HIW5	YU065507	Hiwanda	Haeapugua	O	Sc	Surface artefact scatter.
LQJ	HIW6	YU065508	Hiwanda	Haeapugua	O	Sc	Surface artefact scatter.
LQK	HIW7	YU068514	Hiwanda	Haeapugua	O	Sc	Surface artefact scatter.
LQL	DUM1	YU059507	Dumbiali	Haeapugua	O	Sc	Surface artefact scatter.
LQM	-	YU065514	Hiwanda	Haeapugua	O	B	Open ossuary.
LQN	DUM3	YU055064	Dumbiali	Haeapugua	O	Sc	Surface artefact scatter.
LQO	DUM4	YU059512	Dumbiali	Haeapugua	O	Sc	Surface artefact scatter.
LQP	DUM5	YU058517	Dumbiali	Haeapugua	O	Sc	Surface artefact scatter.
LQQ	TEL1	YU036524	Mabu Tewai	Haeapugua	O	Sc	Surface artefact scatter.
LQR	TEL2	YU042518	Telabo	Haeapugua	O	Sc	Surface artefact scatter.
LQS	TEL3	YU036524	Telabo	Haeapugua	O	Sc	Surface artefact scatter.
LQT	GEL1	YU014554	Gelote	Haeapugua	O	Sc	Surface artefact scatter.
LQU	ARUA1	YU026577	Arua	Haeapugua	O	Sc	Surface artefact scatter.
LQV	NOG1	XU979436	Nogoli S	Lr.Tagali	O	Sc	Surface artefact scatter.
LQW	NOG2	XU987438	Nogoli N	Lr.Tagali	O	Sc	Surface artefact scatter.
LQX	YAL1	XU903558	Yaluba	Yaluba	O	Sc	Surface artefact scatter.
LQY	YAL3	XU897554	Yaluba	Yaluba	O	Sc	Surface artefact scatter.
LQZ	YAL6	XU913558	Yaluba	Yaluba	O	Sc	Surface artefact scatter.
LRS	-	YU011592	Tagori	Hedamali	O	R	Nogo Tambugua ritual site.
LRT	-	YU004605	Ge Wi	Hedamali	O	R	Nogo Tambugua ritual site.
LRU	-	XU870654	Tunugua	Mogoropugua	O	S	Ditches exposed in coffee project drains (Golson n.d.).
LRV	YAL4	XU894539	Garai	Yaluba	C	-	Cave site.
LRW	YAL5	XU913554	Haeawi	Yaluba	C	-	Cave site.
LRX	YAL2	XU902558	Karapia	Yaluba	C	B	Ossuary.
LRY	-	-	Wabu	Yaluba	C	B	(Goldman 1981a:39, Plate 1).
LRZ	-	-	Tabari	Yaluba	C	B	(Goldman 1981a:39, Plate 2).
LSA	DOB9	YU058553	Dobani	Haeapugua	O	Sc	Surface artefact scatter.
LSB	-	YU253298	Tombeda	Benalia	O	Sc	Stone mortar collected from Tombeda *gebeanda*.

NSR code	Field code	Grid reference	Location name	Basin	Site 1	Site 2	Comment
LSC	WLO1	YU062544	Waloanda	Haeapugua	O	Sc	Surface artefact scatter.
LSD	WLO2	YU063544	Waloanda	Haeapugua	O	Sc	Surface artefact scatter.
LSE	WLO3	YU064545	Waloanda	Haeapugua	O	Sc	Surface artefact scatter.
LSF	WLO4	YU064544	Waloanda	Haeapugua	O	Sc	Surface artefact scatter.
LSG	WLO9	YU061545	Waloanda	Haeapugua	O	Sc	Surface artefact scatter.
LSH	WLO10	YU061546	Waloanda	Haeapugua	O	ScR	Yari phratry *gebeanda* site.
LSI	WLO11	YU063543	Waloanda	Haeapugua	O	Sc	Surface artefact scatter.
LSJ	WLO13	YU063542	Waloanda	Haeapugua	O	Sc	Surface artefact scatter.
LSK	WLO14	YU062542	Waloanda	Haeapugua	O	Sc	Surface artefact scatter.
LSL	WLO15	YU060543	Waloanda	Haeapugua	O	Sc	Surface artefact scatter.
LSM	WLO16	YU060542	Waloanda	Haeapugua	O	Sc	Surface artefact scatter.
LSN	WLO17	YU058544	Waloanda	Haeapugua	O	Sc	Surface artefact scatter.
LSO	WLO18	YU059545	Waloanda	Haeapugua	O	Sc	Surface artefact scatter.
LSP	WLO19	YU059546	Waloanda	Haeapugua	O	Sc	Surface artefact scatter.
LSQ	WLO20	YU058545	Waloanda	Haeapugua	O	Sc	Surface artefact scatter.
LSR	-	YU058510	Dumbiali	Haeapugua	O	R	Dumbiali *nogohama* ritual site.
LSS	-	YU962610	Yurika	Dalipugua	C	-	Cave site with significant deposit (Dyke n.d.).
LST	DALI1	XU934673	Aguma	Dalipugua	O	Sc	Surface artefact scatter.
LSU	PUR1	YU025541	Emepugua	Haeapugua	O	Sc	Surface artefact scatter.
LSV	DOB7	YU058547	Dobani	Haeapugua	O	Sc	Surface artefact scatter.
LSW	DOB8	YU057553	Dobani	Haeapugua	O	Sc	Surface artefact scatter.
LSX	-	YU784657	Iba Yogona	Lebani	O	Sc	Surface artefact scatter.

NSR code	Field code	Grid reference	Location name	Basin	Site 1	Site 2	Comment
Enga Province:							
QCB	-	YU546895	-	Porgera	C	A	(Sullivan and Hughes 1985:4).
QCC	-	YU454005	Piola	Porgera	C	-	(Mangi 1988c).
QCD	-	YU429979	Purepa	Porgera	C	E	(Mangi 1988c).
QCE	-	YU434009	Kuende 1	Porgera	C	-	(Mangi 1988c).
QCF	-	YU434009	Kuende 2	Porgera	C	-	(Mangi 1988c).
QCG	-	YU435983	Awaio	Porgera	O	R	*Kepele* ritual site (Tumu et al. 1988).
QCH	-	YU395968	Kairik	Porgera	C	-	(Mangi 1988c).
QCI	-	YU380591	-	Porgera	O	-	Old drain feature in road cutting (Tumu et al. 1988).
QCJ	-	YU411019	Lauandika	Porgera	C	-	(Mangi 1988c).
QCK	-	YU425003	Wanggia	Porgera	C	-	(Mangi 1988c).
QCL	-	YU409017	Paititi	Porgera	C	-	(Mangi 1988c).
QCM	-	YU433991	Likipari	Porgera	C	-	(Mangi 1988c).
QCN	-	YU429979	Popaiapoko	Porgera	C	-	(Mangi 1988c).
QCO	-	YU427978	Ipandaka	Porgera	C	-	(Mangi 1988c).
QCP	-	YU402000	Tumbulam 1	Porgera	C	-	(Mangi 1988c).
QCQ	-	YU402000	Tumbulam 2	Porgera	C	-	(Mangi 1988c).
QCR	-	YU404004	Aiakonga	Porgera	C	-	(Mangi 1988c).
QCS	-	YU409005	Kiaka	Porgera	C	-	(Mangi 1988c).
QCT	-	YU403979	Arokai	Porgera	C	-	(Mangi 1988c).
QCU	-	YU403970	Tundupulu	Porgera	C	-	(Mangi 1988c).
QCV	-	YU415947	Plaipaka	Porgera	C	-	(Mangi 1988c).
QCW	-	YU390976	Tuli	Porgera	C	-	(Mangi 1988c).
QCX	-	YU283938	Kindole 1	Porgera	C	-	(Mangi 1988c).
QCY	-	YU283938	Kindole 2	Porgera	C	-	(Mangi 1988c).
QCZ	-	YU379948	Sambsamb	Porgera	C	-	(Mangi 1988c).
QEB	-	YU187862	Tarapipi	Kare	C	Ec	(Mangi 1988b).
QEC	-	YU218846	Kare	Kare	C	E	(Mangi 1988b).
QED	-	YU164839	Piawin	Kare	C	-	(Mangi 1988b).

NSR code	Field code	Grid reference	Location name	Basin	Site 1	Site 2	Comment
QEE	-	YU196835	Yundiga	Kare	O	R	*Dindi pongone gebeanda* ritual site (Mangi 1988b).
QEF	-	YU199819	Tolowandia	Kare	O	R	(Mangi 1988b).
QEG	-	YU199819	Iba Labo	Kare	O	R	(Mangi 1988b).
QEH	-	YU225849	Tauwini	Kare	O	R	(Mangi 1988b).
QEK	-	YU362956	Mip	Porgera	C	-	(Mangi 1988c).
QGC	-	YU205861	Kare camp	Kare	O	Mc	Megafauna recovered from mining spoil (Menzies and Ballard 1994).

APPENDIX C9

ARTEFACTS COLLECTED DURING 1988-1992 FROM ARCHAEOLOGICAL SITES OF THE TARI REGION, SOUTHERN HIGHLANDS PROVINCE

This Appendix lists the artefacts recovered from archaeological sites in the Tari region of Southern Highlands Province between 1988 and 1992; also listed are those artefacts of megafaunal remains collected by others but discussed in this thesis (LAB - LAM, LLI). The artefacts are listed by site, following the site code system documented on the National Site Register (NSR) maintained at the National Museum of Papua New Guinea; the list given here excludes the ethnographic artefacts collected during this period, concentrating largely on those collections made during the course of my doctoral fieldwork in the Tari region.

Codes:

NSR code: Three letter site code documented on the National Site Register (NSR).

Field code: Codes used by fieldworkers to distinguish sites in the field.

Artefact codes - refer to the numbers of artefacts of each the following artefact types seen or collected at the site (* = more than 10 items of this category collected at the site):

AXES - ground stone axe blades and axe blade fragments

FLAKES - flaked stone material of all types

LIRU - sacred stones of various types

MISC - miscellaneous materials, including megafaunal remains, cooking stones, shell, ochre and whetstones

Comment: Provides details of related reference works and site contents.

NSR code	Field code	Axes	Flakes	*Liru*	Misc	Comment
LAB				1		Stone mortar.
LAC					*	Holotherium type site.
LAH		1		1		Stone mortar (White 1974:3).
LAI					1	Waisted blade (White 1974:5).
LAM		1	*			(White 1974:6).
LIG		1				
LLA					1	Single Protemnodon bone.
LLI					1	Stone tanged blade collected by Laurie Bragge, 1989.
LMA				1		Stone mortar.
LMB	WEN1		3			
LMC	MUN1		3			
LMD	MUN2		5			
LME	MUN3		2			
LMF	DOB1		1			
LMG	DOB2		*			
LMH	DOB3	1	*			
LMJ	DOB5		3			
LMK	WAL2		2			
LML	WAL3		4			
LMM	WAL4		*			
LMN	WAL5		*			
LMO	WAL6		1			
LMP	WAL7		*			
LMQ	WAL8		1			
LMR	WAL9		*			
LMT	WAL1		1			
LMU			*			
LMV			*		1	Stone knife(?).
LMW			*			
LMX	TAP1		*	*		
LMY	TAP2		1			
LMZ	TAP3		1			
LNA			4	3		Stone mortar, *ni habane*, *ni hone*.
LOB			1			Excavated from LOB(i) site.
LOC			2			Excavated from LOC site.
LOG			1		1	Carved stone cone, excavated from LOG site.
LOH						One cooking stone fragment recovered from exposed section.
LOJ			1			Excavated from LOJ site.
LQA	TER1		1			
LQB	TAP4		6	1		Stone mortar fragment.
LQC	YUM1		4			
LQD	YUM2		1			
LQE	HIW1		3		1	Cowrie shell fragment.
LQF	HIW2		4	1	1	Stone mortar fragment, whetstone.
LQG	HIW3			1		Ochre-covered *liru kui*.
LQH	HIW4	1	*			
LQI	HIW5		3			
LQJ	HIW6		1			
LQK	HIW7		*			
LQL	DUM1		2			
LQN	DUM3		*	1		*Liru kui*.
LQO	DUM4		2			
LQP	DUM5		10			

NSR code	**Field code**	**Axes**	**Flakes**	***Liru***	**Misc**	**Comment**
LQQ	TEL1		5			
LQR	TEL2		2			
LQS	TEL3	1	*		1	Whetstone.
LQT	GEL1		1	1		Small *liru kui*.
LQU	ARUA		4			
LQV	NOG1		*			
LQW	NOG2		7			
LQX	YAL1		*			
LQZ	YAL6		*			
LSA	DOB9			1		Stone mortar.
LSB				1		Small stone mortar.
LSC	WLO1	1	13	4	10+	*Ni habane*, cooking stones.
LSD	WLO2		2			
LSE	WLO3		8			
LSF	WLO4	1	3			
LSG	WLO9		8	1		Mortar fragment.
LSH	WLO10	3	39		2	3 axe blade chips, 1 red ochre stub, 1 tanged blade (?), also 40 cooking stones.
LSI	WLO11		5			
LSJ	WLO13					
LSK	WLO14	1	52			Also 10 cooking stones.
LSL	WLO15		6			
LSM	WLO16		8			
LSN	WLO17		6			
LSO	WLO18		5			
LSP	WLO19		63	1		*Liru kui*.
LSQ	WLO20		48	1		*Liru kui* fragment.
LST	DALI1		1			
LSU	PUR1		*			
LSV	DOB7		*			
LSW	DOB8		1			

APPENDIX C10

ARCHAEOLOGICAL SITE DESCRIPTIONS

This appendix provides details of the principal sites located during the course of my fieldwork. The individual site records are listed alphabetically by their three-letter National Museum Site Register codes, from LOA to LSH. A full listing of these and other sites of the Tari region is provided in Appendix C8. Further analysis and comparison of the results from the different sites are provided in Part C. Locations for the sites of the Haeapugua basin are mapped in Figure C28; locations for those sites in the Dobani / Waloanda area of Haeapugua are shown in Figure C31. Soil colours refer to the Munsell colour chart series; pH values were obtained with a Raupach Indicator set.

LOA
BARAGUA (ALUA'S SITE), MUNIMA PARISH, HAEAPUGUA
YU033557

Excavation of this site in October 1989 was undertaken in an attempt to explore reports of buried hearths and modified stakes uncovered during recutting of a *gana* ditch at the base of the Munima hills along the northern margins of the Haeapugua swamp. The landowner, Alua Tiaya, recalled having earlier seen this material as a young boy in the 1940s when he first cleared the ditch and suggested that the wood fragments and charcoal were evidence for the presence of an early house. After clearance and draining of the site, a 10 m^2 area, consisting of five 2 x 1 m^2 trenches with intervening baulks, was opened up from the edge of the modern ditch. This quickly established that the stakes were supports along the wall of a former ditch feature, running along the same course as the modern *gana*.

A sequence of two distinct layers of slumped, reworked clays falling in towards this feature overlay a layer of white clay, capping a basal dark brown organic unit containing massive woody material in the form of buried tree trunks, leaves and seeds (Figure LOA/1); these were identified by Alua as *ayaga* (Areca sp.) and *anga mundiya* (Pandanus brosimos). A single successful ^{14}C result, on a sample of charcoal from the lower of the two layers of reworked clay, was as follows:

ANU-7623 LOA/c 10980 ± 590 BP
14250 (12900) 10980 cal BP (100%Pr.)

A further outcome of this excavation was the auger and level transect extended from the site down towards the swamp, which established the presence of a buried clay fan extending into the swamp from the Munima hills. A depth for this clay of 3 m at a point 55 m upslope from the LOA site thinned down to about 1 m at the LOA site, before tapering out entirely a further 71 m into the swamp (Figure LOA/2). Viewed in this light, the ANU-7623 ^{14}C result may be taken to date part of the process of formation of this white clay fan.

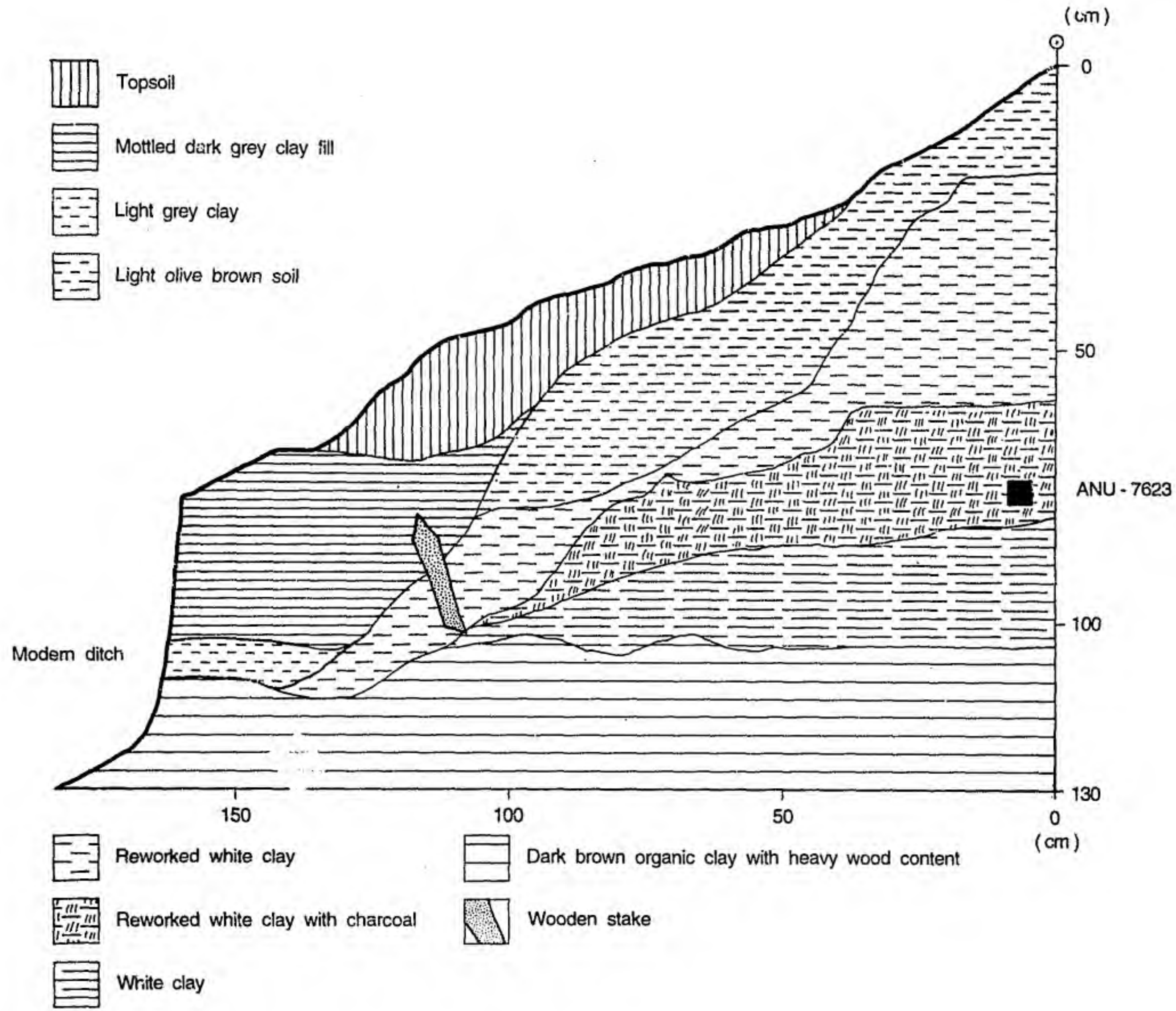
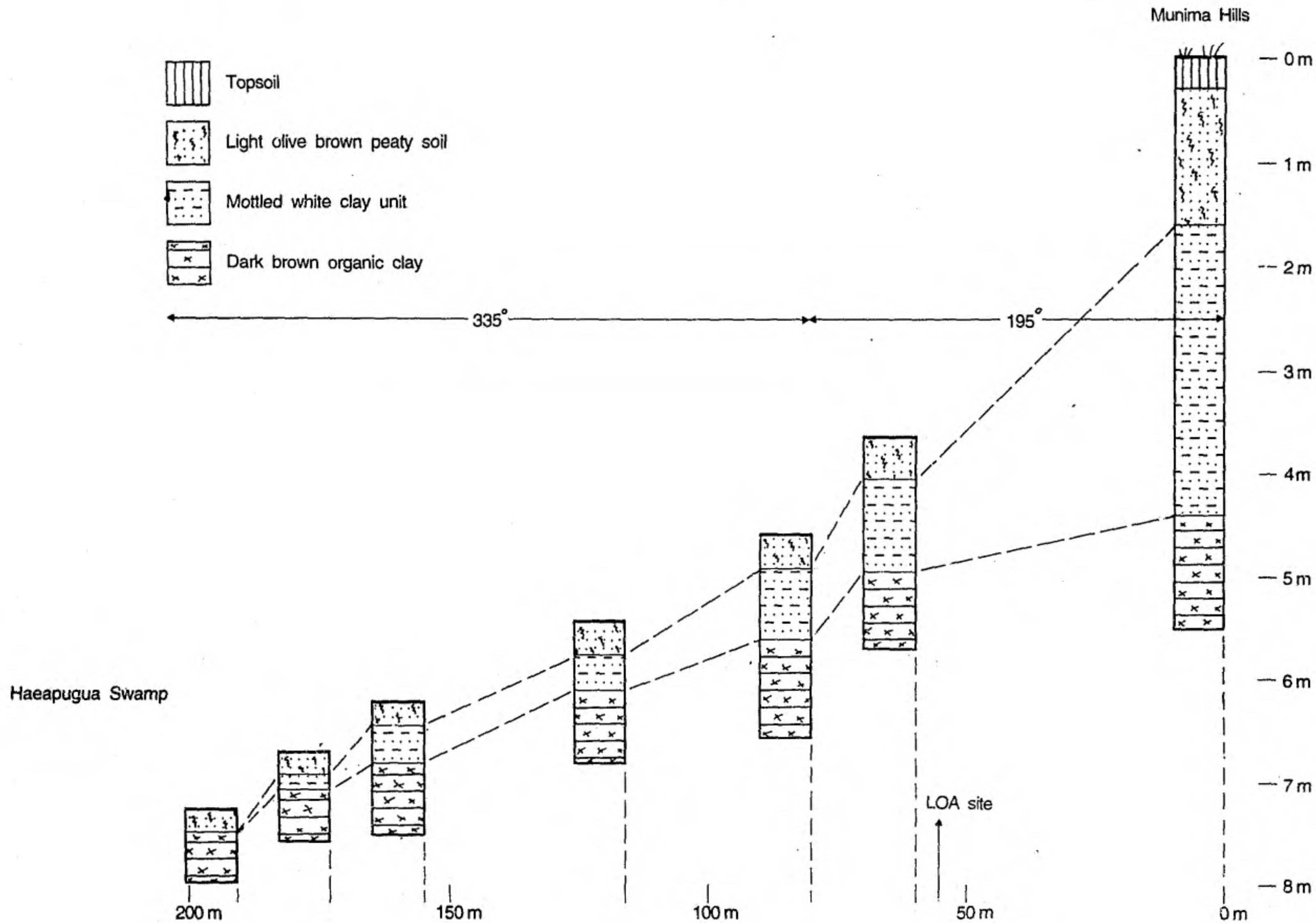


Figure LOA/1: Section, west wall, squares G6 and G7, LOA site.

Figure LOA/2: Auger transect from Munima hills towards swamp centre.



LOB(i)
IRALIA'S SITE, DOBANI PARISH, HAEAPUGUA
YU058546

The LOB site, situated in the wetland margins of Dobani parish, consists of an extensive section exposed in the wall of a *gana* ditch and two excavations of garden features (LOB(i) and LOB(ii)). The discovery in 1987 of the mandible of an extinct Hulitherium diprotodon by Hubi-Iralia (Tigua *tene*, Dobani *yamuwini*), in the course of recutting a *gana* ditch, led me to attempt to identify the fossil layer and to recover further fossil material through excavation of the LOB(i) site in November 1989. A 9 m^2 area was opened along the northern side of the ditch and excavated by spade and trowel to a depth of 90 cm; no further fossil material was recovered but the fossiliferous bed was tentatively identified by Iralia. During this initial excavation, both walls of the ditch were cleaned back, exposing a basal sequence of white clay and black organic layers, referred to collectively as the "white clay unit", over a 31 m distance. A pronounced dip in the beds towards the swamp, varying in angle from 10 to 15 degrees, considerably extended the "depth" of this sequence. The exposed sequence, 5.29 m in depth after correction for the effects of the dipping, was recorded along the south wall by me and then extended by Haberle to a maximum corrected depth of 9.13 m with the aid of an auger[1]. Figure LOB(i)/1 is a schematic illustration of the basal white clay unit sequence at the LOB site.

A series of features cut into the uppermost surface of these dipping beds was mapped in profile in 1989 and it was to examine these in plan that a small 2 x 1.5 m area immediately adjacent to the 1989 fossil LOB(i) excavation was opened in January 1991. In the ditch wall, these features were distinguished on the basis of the colour and texture of their respective fills. The two basic fill types common to most of the sites of the Dobani /Waloanda area were first recognised here: an upper dark grey clay infilling features that cut into both a lower light grey clay and the basal white clay layers. The light grey clay infilled features which were cut exclusively into the basal white clays. Further description and discussion of the significance of these different clay units is contained in the account of the LOB(ii) site below and in Part C.

The 1991 site was excavated following the apparent sequence of fills. Below a 5-10 cm topsoil, the surface of the dark grey clay appeared uneven but otherwise featureless. No features were identified within the dark grey clay, which was removed to reveal a level surface composed of light grey clay infilling a partially exposed basal white clay topography. A single feature (Feature A), a straight trench, 150 cm long and 20 cm deep, excavated through the surface of the light grey clay and into the white clay, was infilled with dark grey clay; this ran from NE to SW, sloping downwards in the direction of the swamp. A single flaked stone artefact (LOB(i)/1) was recovered from the dark grey clay fill of Feature A. Removal of the light grey clay exposed a complex white clay surface (Figure LOB(i)/2), consisting of shallow, interconnected runnels lying between large, deeper pits. One of these pits emptied out via a tunnel, also infilled with light grey clay, running within the white clay. The highest surfaces of the white clay contained a number of small, round pits, typically 5 cm in diameter and 6-9 cm in depth and infilled with light grey clay, which were interpreted in the field as the bases of crop holes dug from within the light grey clay.

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1. These corrected depths (b) were calculated assuming a constant 12 degree dip (A) for 5.41 m of exposed section and a further 3.93 m of augered section (c) (where b = c cos A).

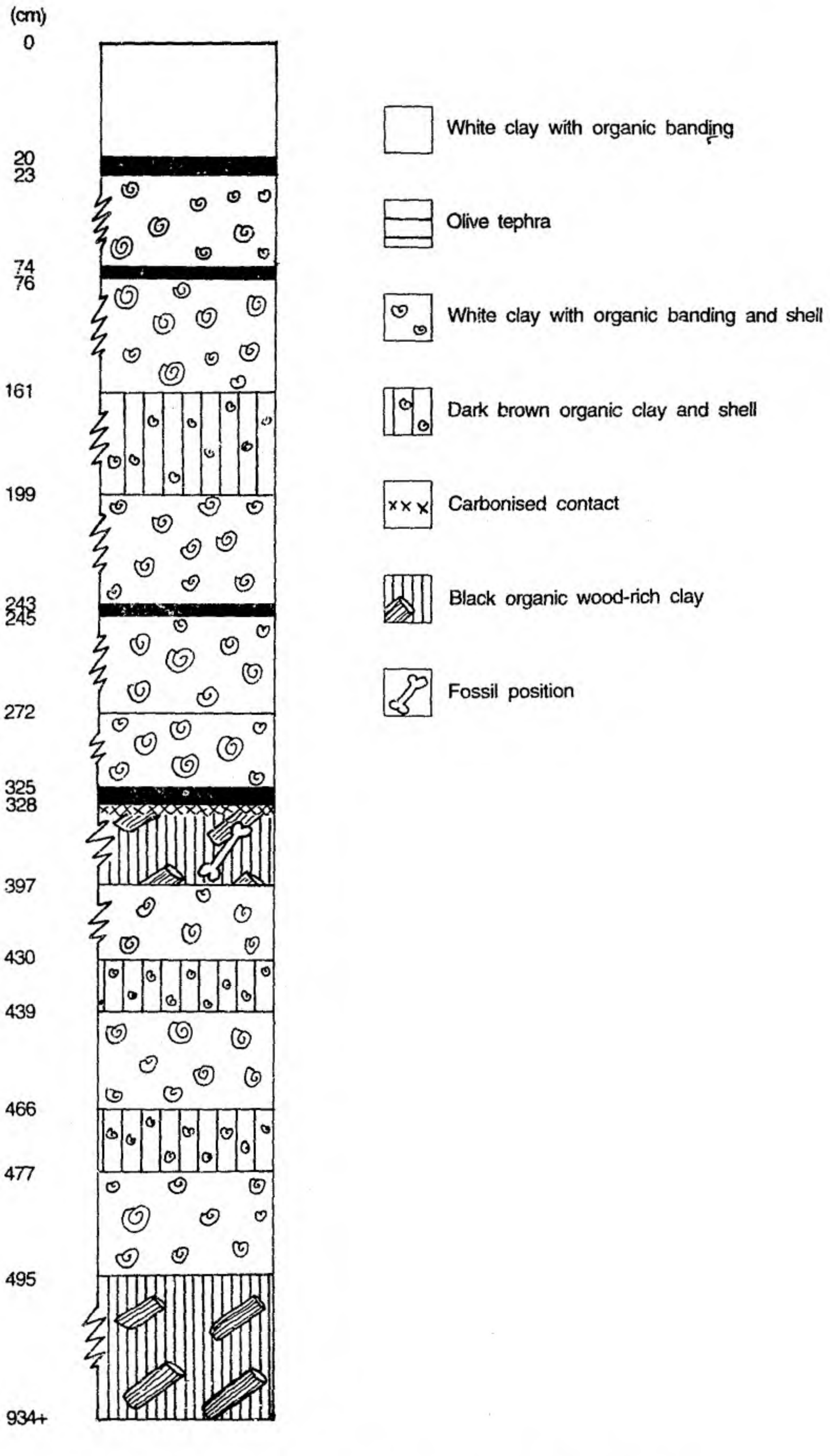
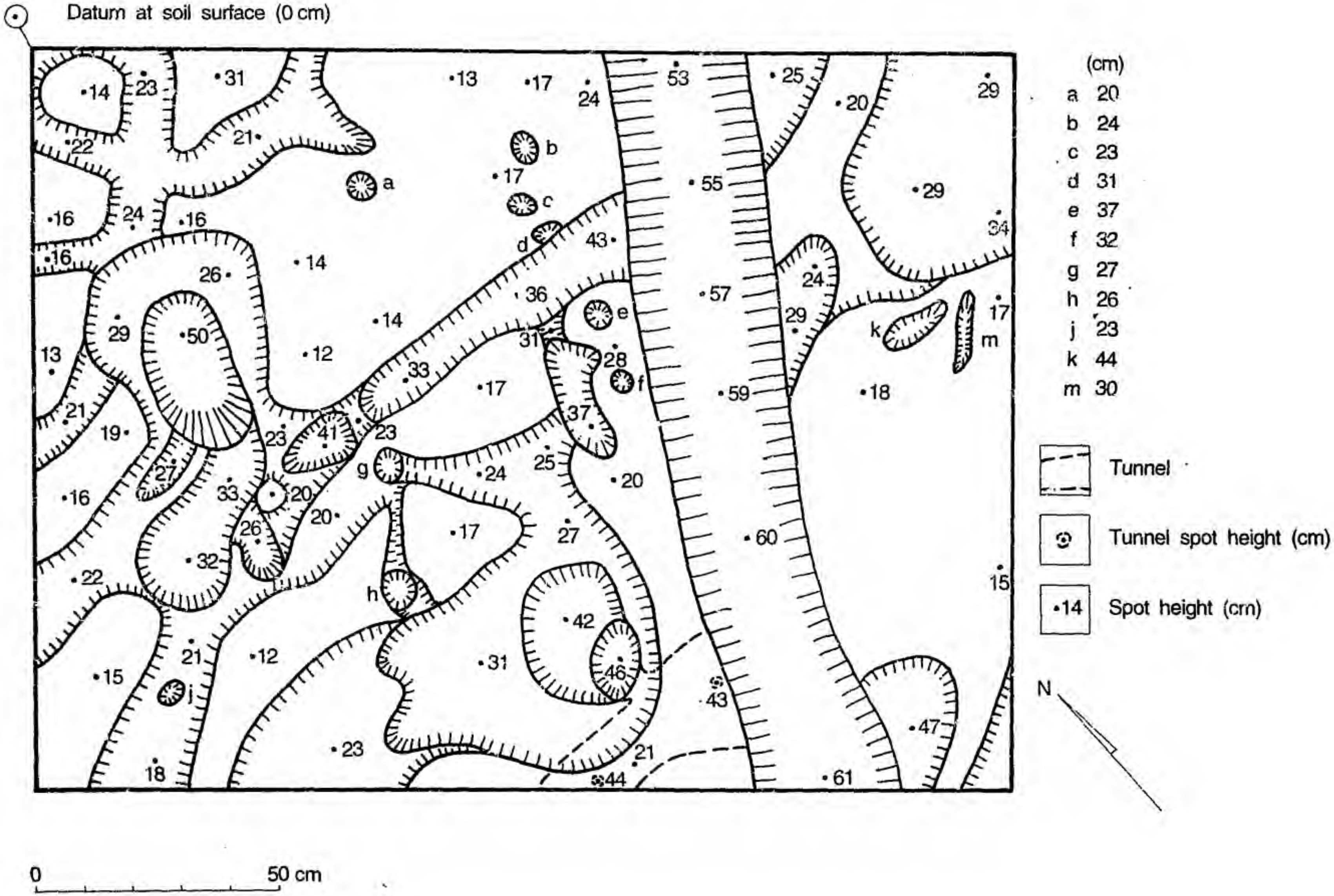


Figure LOBi/1: Schematic section of white clay unit, LOB ditch.

Figure LOBi/2: Plan of white clay surface, LOBi excavation.



LOB(ii)
BAYA'S SITE, DOBANI PARISH, HAEAPUGUA
YU058546

The LOB(ii) site consists of an excavation extending inwards from the northern wall of the LOB *gana* ditch, some 130 m to the south of the LOB(i) excavation; it is named after the owner of the garden in which the excavation was located, Baya Domabe (Tani Tabayia *tene*, Dobani *yamuwini*). The LOB(ii) excavation was opened in January 1991 and then further extended on two separate occasions, in February 1991 and October 1992, in order to examine the relationship between the dark grey clay- and light grey clay-filled features and one of the tephra bands contained within the basal white clays; a total area of 6 m^2 was opened over this period.

The basic sequence at LOB(ii) was familiar from LOB(i): a 5-15 cm topsoil overlying a dark grey clay layer infilling features cut into both the basal white clays and an intermediate light grey clay layer, with the light grey clay infilling features cut into the white clay alone. An unusual element in the stratigraphy observed in the ditch wall is the behaviour of a distinct tephra band, 1-2 cm in thickness and cemented to form a hard "pavement", which appeared to form part of the basal white clay unit (as Layer 12 in Figure LOB(i)/1). This tephra band rises at an angle of 12 degrees from the southern end of the site, running parallel to the other layers of the white clay unit. However it then breaks the surface of the white clay, entering the light grey clay virtually intact as a continuous cemented pavement. Only on contact with the base of the dark grey clay is the form of the tephra pavement substantially disrupted, though fragments of the pavement appear in the dark grey fill of features cut into the light grey clay. It was obviously important for the status of the features filled with light grey clay to observe the behaviour of this "transgressive" tephra in plan and successive phases of excavation thus pursued the tephra to the west as it dipped down into the white clay unit.

Removal of the topsoil exposed a lightly undulating dark grey clay surface. No differentiation was observed within the dark grey clay, which was excavated to the even surface of the light gray clay. A number of features infilled with dark grey clay were cut into the light grey surface, including rounded pits, 9-12 cm in depth, a more sinuous, bifurcating channel (Feature B) and a straight channel (Feature A) (Figure LOB(ii)/1). The abrupt intersection of Feature B by the straight Feature A channel suggests that the dark grey clay infills features from at least two distinct phases.

When the light grey clay was removed, a complex topography similar to that observed at LOB(i) was exposed, with deep rounded pits linked by sinuous runnel features (Figure LOB(ii)/2). As at LOB(i), tunnels running within the white clay unit, infilled with light grey clay, appeared to connect some of the pit and runnel features. The exceptional features here were two straight channels, Features Y and Z, running parallel to one another along an orientation similar to that of the dark grey clay-filled Feature A; unlike the channel features infilled with dark grey clay both here and at LOB(i), which maintained a regularly formed flat or slightly curved base along their full extent, the bases of Features Y and Z tapered to a crack and fluctuated dramatically in height. At least one of the tunnels appeared to feed directly into Feature Z. At the conclusion of the February phase of excavation, the tephra had been traced to a point in the western corner of the excavation where it lay at the base of Feature A and within the light grey clay fills of Features Y and Z, but appeared set to enter the white clay beneath the light grey features (Figure LOB(ii)/3). However, in the opposite eastern corner of the excavation, the tephra lay a clear 15 cm above the base of Feature Z.

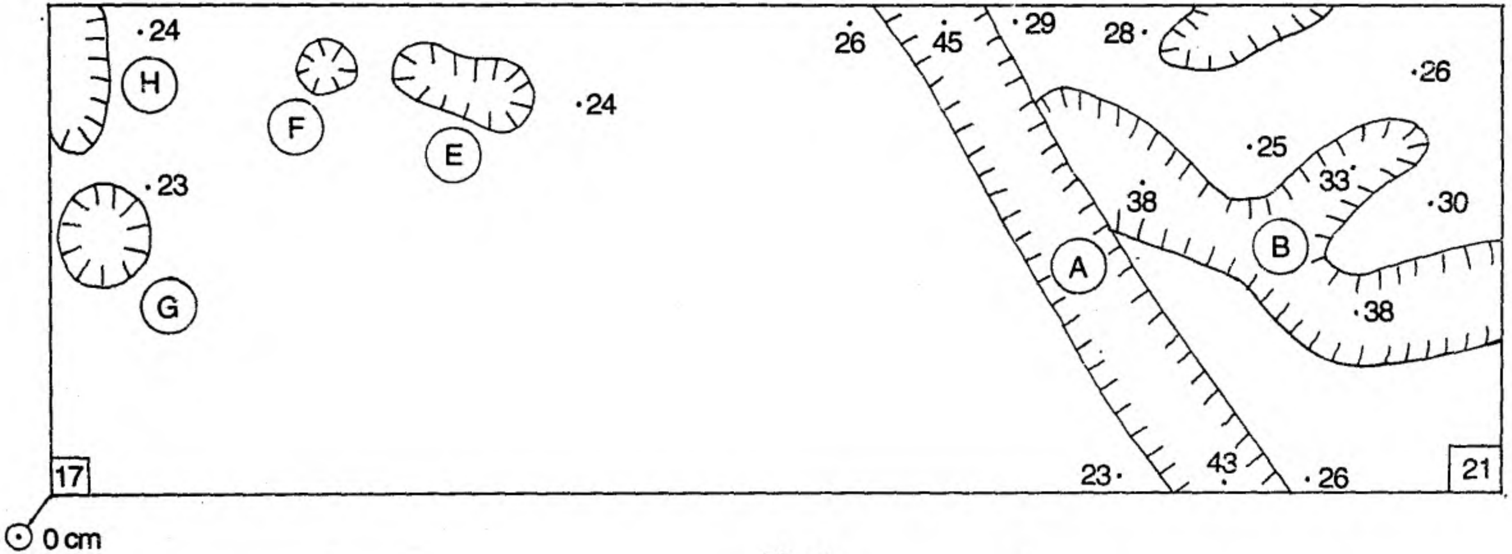
The 1992 extension, undertaken with the assistance of Jack Golson, sought to track the dipping tephra in order to confirm whether or not it disappeared entirely into the white clay unit beneath the light grey clay. This was found to be the case. Removal of the white clay layer overlying the dipping tephra also confirmed that the tephra subsequently conformed to the general angle of dip of the other components of the white clay unit. Significantly, Feature Z tapered out to nothing shortly after the tephra dipped beneath the feature's base into the white clay.

The only attempt to date features at LOB(ii) was a sample of charcoal taken from the base of Feature A, which returned the following result:

ANU-7807 LOB(ii)/a 410 ± 170 BP
660 (490) 240 cal BP (83%Pr.)

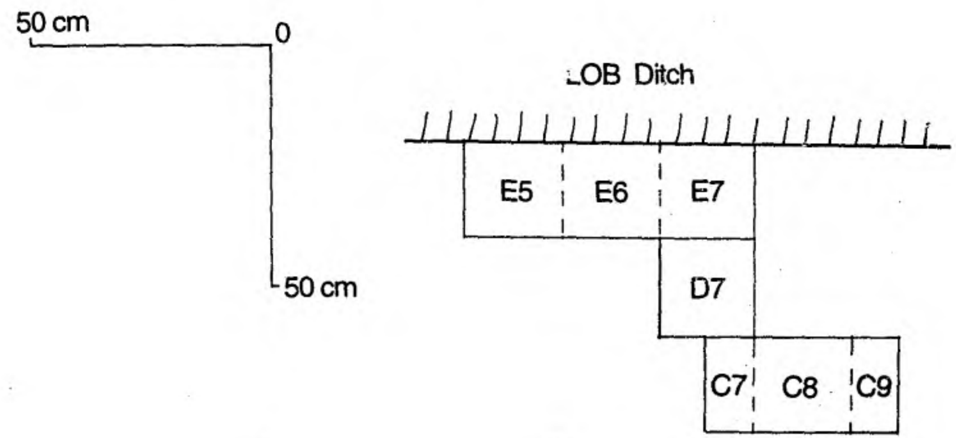
This result is taken to date the broad period of use and the event of infilling with dark grey clay of Feature A.

Figure LOBii/1: Plan, light grey clay surface, LOBii excavation.



Depth of base (cm)

C	33
E	33
F	31
G	32
H	31



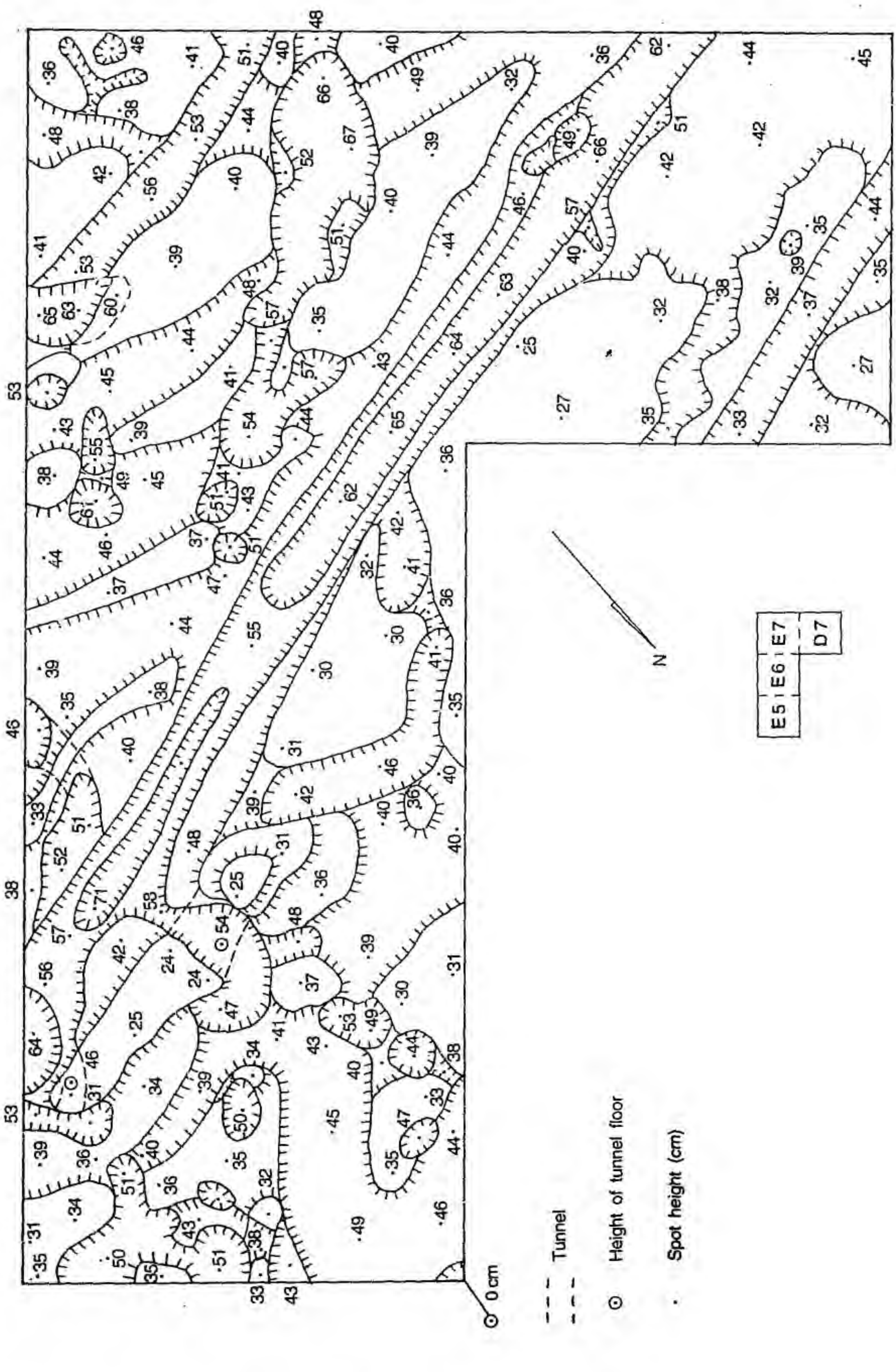


Figure LOBii/2: Plan, white clay surface, LOBii excavation.

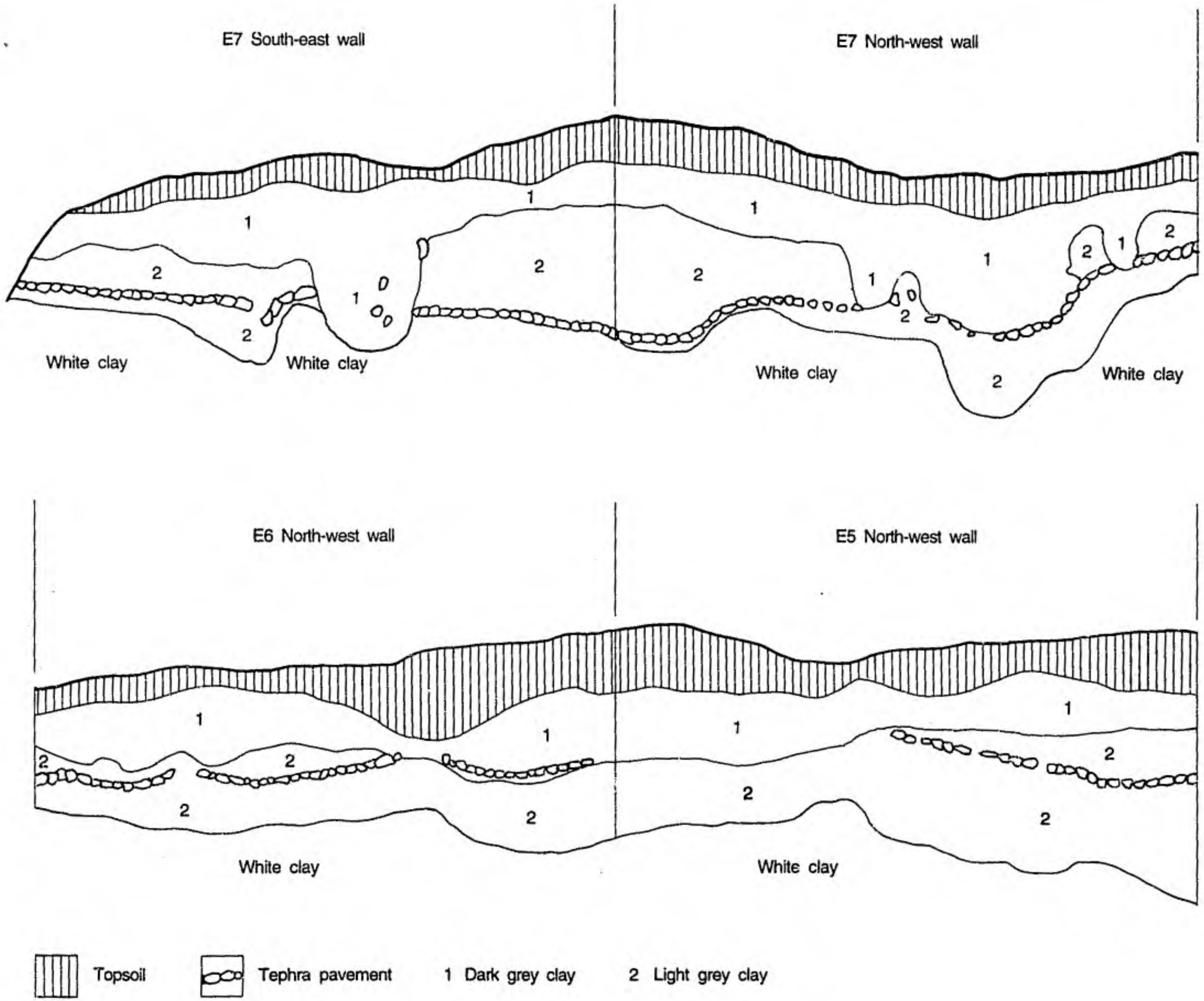


Figure LOBii/3: Section of north-west and south-east walls, squares E5, E6 and E7, LOBii excavation.

LOC
TUMBU'S SITE, TANI (TAIBAANDA) PARISH, DOBANI PARISH
HAEAPUGUA
YU058545

The LOC site, like the LOB site 130 m to the north, consists of an excavation of buried garden features associated with an extensive ditch exposure; the site is named after the block's owner, Hulu-Tumbu (Tani Hagu *yamuwini*, Haro *tene*).

A tilted basal sequence of organics, tephras and white clays exposed over a 146 m length of *gana* ditch walls was identified in the course of work at LOB in 1989 and was recorded after the face of the southern wall had been cleaned back. At LOC, this basal sequence extends into the swamp from the 2-3 m high face of the bench scarp that runs along parts of the eastern margin of Haeapugua. A pronounced dip in the beds near the scarp of about 12 degrees downwards in the direction of the swamp gradually corrects before proceeding to tilt back upwards, correcting again to become level at the end of the recorded section. The most likely origin for the bench scarp, which runs parallel to the limestone ridgeline of Lagale Mandi, is deformation following tectonic uplift; possible causes for the dipping in the basal white clay beds, discussed in further detail in C3.3, include deformation associated either with uplift activity, differential pressure loading under clay and peat, or a combination of the two.

The basal sequence at LOC, illustrated schematically in Figure LOC/1, is almost identical to the sequence recorded at LOB (see Figure C32 for a direct comparison), adding an extra white clay layer beneath the organic woody layer at the base of the LOB sequence but lacking the uppermost tephra/white clay pair at the top of the LOB sequence. A detailed description of this basal sequence is given in Figure LOC/1. As at LOB, the basal white clay unit is truncated along a level roughly parallel to the current soil surface. The relative positions of the light grey and dark grey clay units, and the unusual behaviour of the tephras of the basal unit, are similar to those observed at LOB, as the following discussion of the excavation illustrates.

The excavation was positioned 2 m to the south of the LOC ditch wall, initially to examine in more detail the most promising of the features exposed in the ditch wall section. This feature consisted of an apparent channel in cross-section, infilled with light grey clay grading to a darker grey/brown clay towards the base of the channel. Fragments of cemented tephra appeared dispersed within the light grey clay fill, but in a narrowed slot at the base of Feature 3, a distinct and level band of uncemented tephra was observed; interestingly, though this lower tephra appeared "fresh" and loosely structured in 1989, by the following year it had hardened to a cemented pavement where exposed. A 7 m² trench was opened by spade in December 1990 in order to locate this channel feature; unfortunately, once exposed, the base of the channel proved to be only slightly higher than that of the modern *gana* ditch and the garden's owners expressed their unwillingness for work on this scale and at this depth to continue and required that the channel be immediately refilled.

Attention was then focused on the dark and light grey clay-filled features nearer the soil surface and a further 9 m² area was excavated by trowel in January 1991 to examine these features. From a level surface, a variable depth of topsoil, ranging from 8 cm to 22 cm, was removed, exposing a dark grey clay surface with a prominent linear depression running from north to south across the site. Two flaked stone pieces were recovered from the topsoil layer, one each from Squares E5 and E7.

In the course of removing the dark grey fill, two channels (Features A and B) and two round holes (Features C and D), all infilled with dark grey clay, were revealed (Figure LOC/2). It is possible that the two channels represent contemporaneous features, as Feature B lies at a conventional right-angle to Feature A; no difference in the fills of the two features could be discerned. A sample of charcoal from the basal fill of Feature A returned the following result:

ANU-7808 LOC/a 540 ± 90 BP
670 (**540**) 430 cal BP (95%Pr.)

The light grey clay was then excavated; although distinct features infilled with light grey clay could be seen in the walls of Feature A, there was nothing to distinguish between the fill material of these features and the overlying light grey clay. The light grey clay-filled features could thus be documented in plan only as they appeared on the surface of the basal white clay. This offered a complex topography, with an interconnected net of thin, shallow runnel features (Feature Y) positioned parallel and at right angles to one another and seemingly draining into a deeper, sinuous channel feature (Feature Z), partly obscured by Features A and B; Figure LOC/2 illustrates this topography for Squares E7, F7 and F8. A sample of charcoal from the base of Feature Z in Square D5 produced the following result:

ANU-7809 LOC/b 15210 ± 370 BP
18840 (**18130**) 17340 cal BP (100%Pr.)

The lower of the two tephras seen in the section of the large light grey clay-filled Feature 3 in the wall of the LOC *gana* ditch was not identified in the initial trench or the subsequent excavation. The upper, cemented tephra, which had been visible in the centre of the Feature 3 fill, was also present in the excavation; here it appeared both in a highly disturbed and fragmentary form within the dark grey clay fills of Features A and B, largely as slump material from the adjacent light grey clay walls of these features, and as a slightly more coherent band within the light grey clay. In areas where the light grey clay was thinnest and the basal white clay unit at its highest points, the tephra formed an intact cemented pavement, positioned within the light grey clay, 0.5-1 cm above the white clay surface (Figure LOC/3). Away from these white clay crests, the tephra band dipped and fragmented over the light grey clay-filled features in the white clay surface.

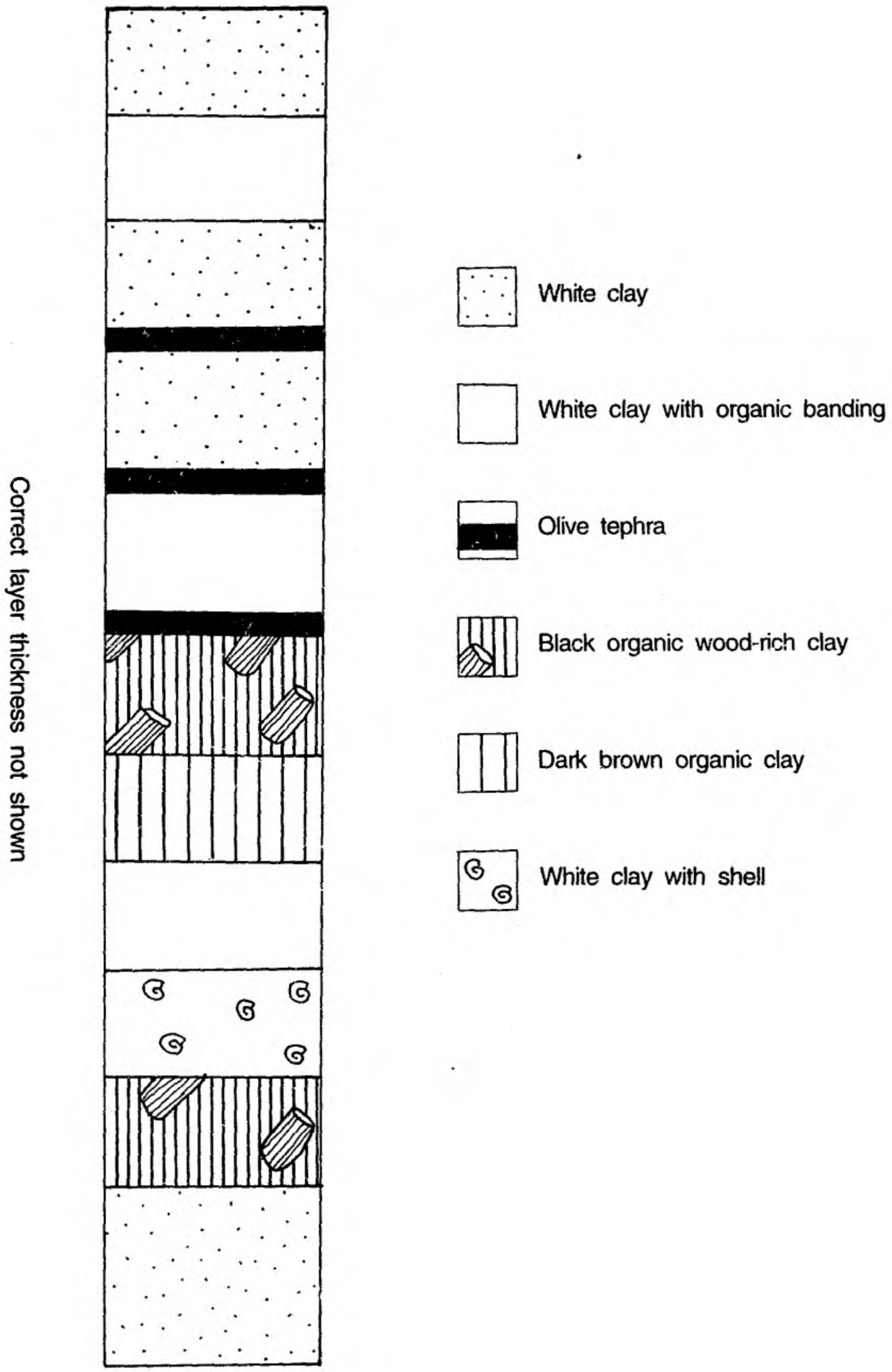


Figure LOC/1: Schematic section of white clay unit, LOC ditch.

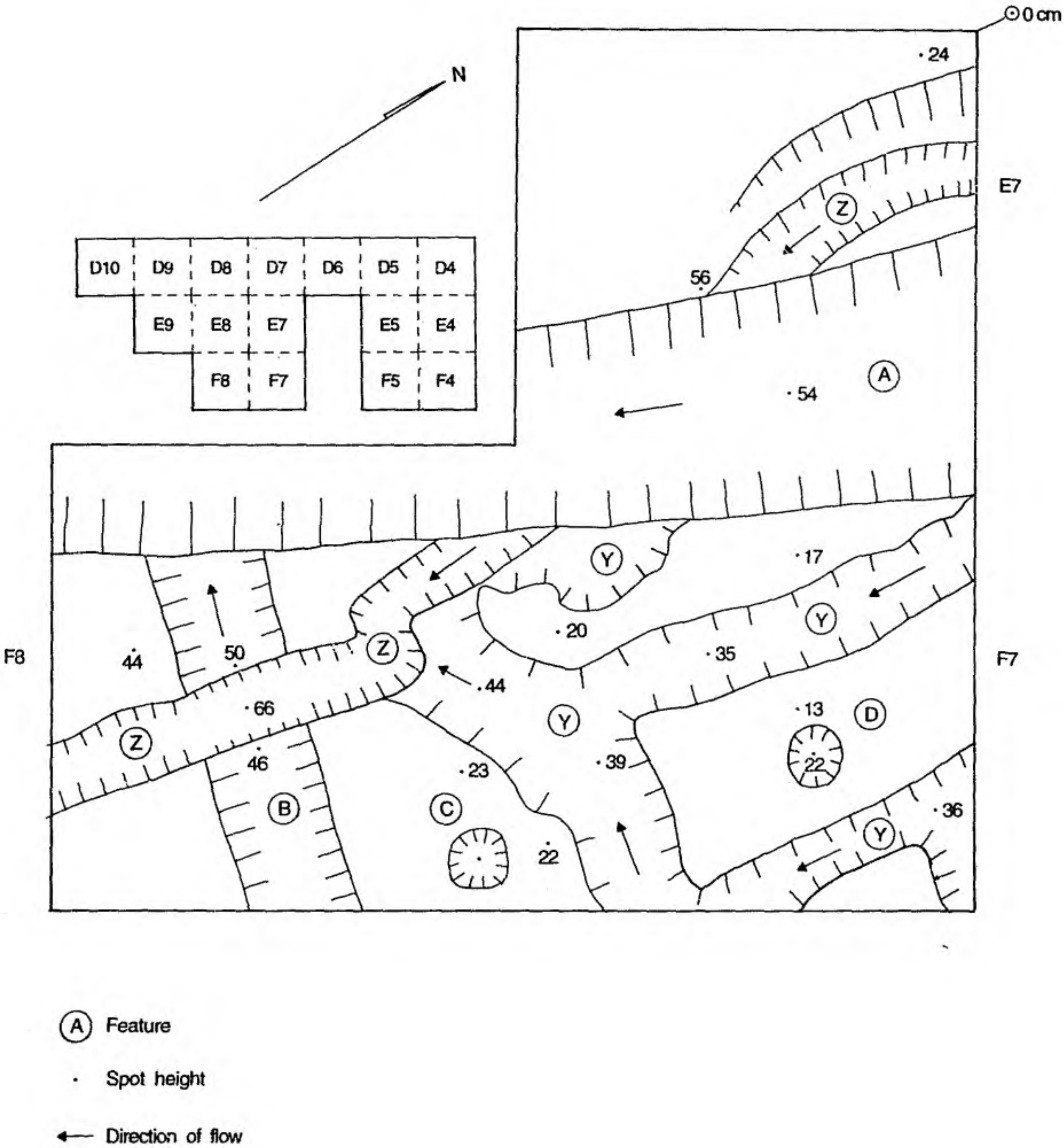


Figure LOC/2: **Plan of white clay surface, squares E7, F7 and F8, LOC excavation.**

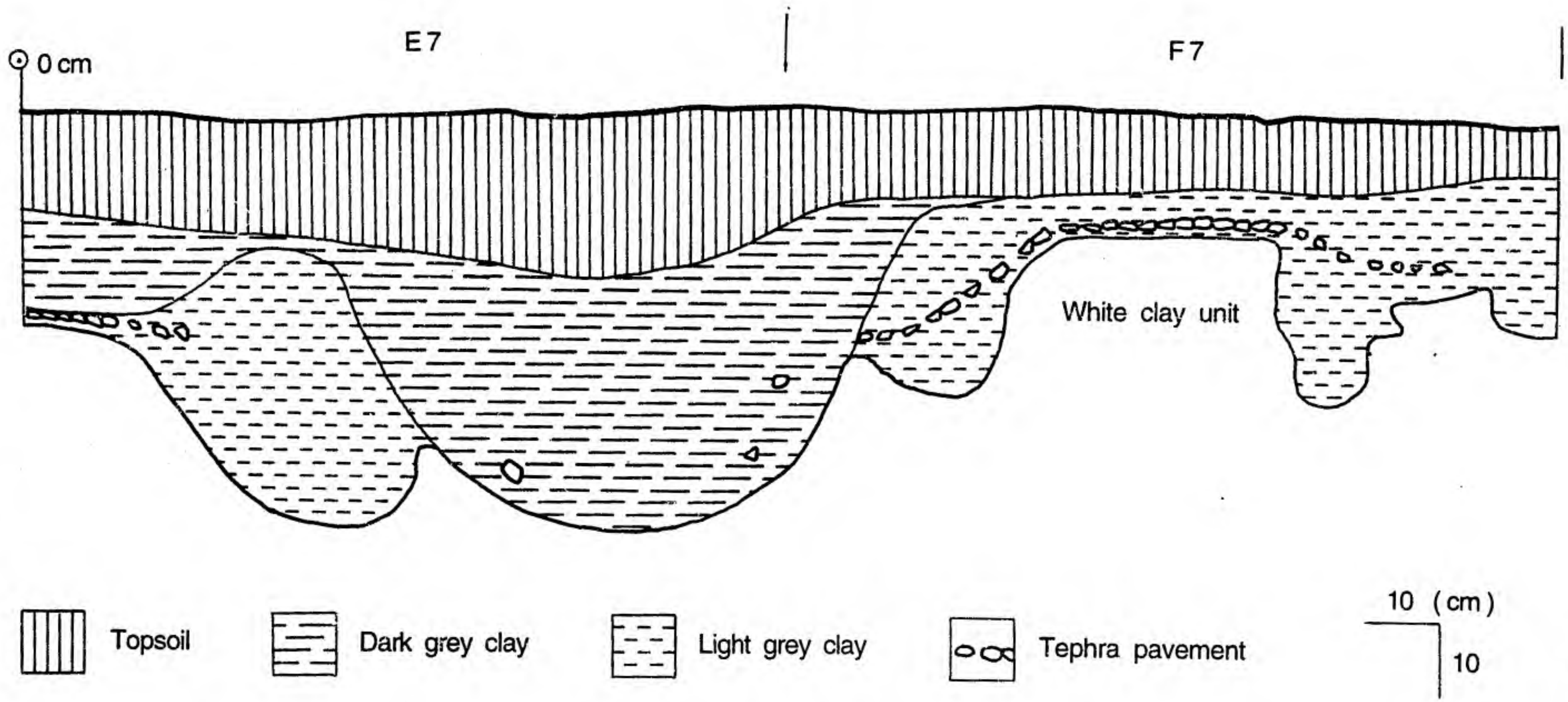


Figure LOC/3: North-east wall section, squares E7 and F7, LOC excavation.

LOD
MUNDIYA'S SITE, TELABO PARISH, HAEAPUGUA
YU054515

The LOD site consists of an extended section exposed in the wall of a newly cleaned dryland *gana* ditch on the dryland slopes of Telabo parish, approximately 8 m above the western margins of Haeapugua swamp; it is named after the owner of the garden and digger of the *gana*. A record was made of the section as the basis for a comparison with the basal white clay stratigraphy of the LOB and LOC sites on the eastern side of Haeapugua. Figure LOD/1 is a schematic illustration of the stratigraphy at LOD.

Briefly, the LOD sequence matches quite closely the sequences from LOB and LOC, with which it is compared in Figure C32: two woody organic layers at the base of the sequence, separated from one another by a plastic clay unit composed of layers that vary in colour from white to a dark brown, are in turn overlain by a sequence of alternating thick layers of white clay and thin bands of oxidised tephra. The lowest of these tephra bands immediately caps the uppermost of the woody organic layers; a thin carbonised crust along the contact surface between the organic layer and the tephra band suggests that carbonisation of the organic surface may have been a consequence of the tephra fall. No significant artificial features were noted in the section.

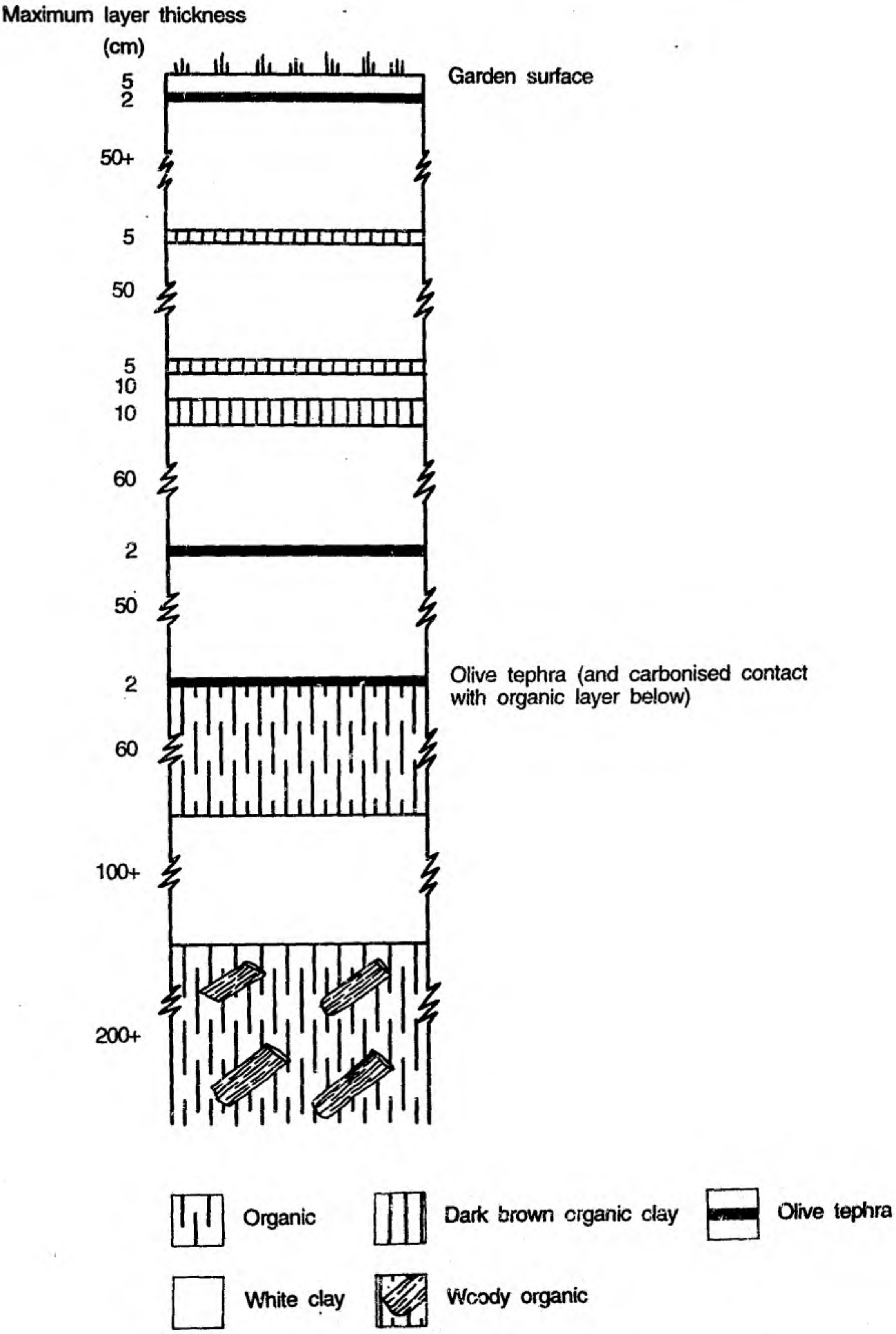


Figure LOD/1: Schematic section, LOD site.

LOE
MANGOBE'S SITE, TELABO PARISH, HAEAPUGUA
YU050515

The LOE site, named after the landowner, consisted of a testpit dug in November 1989 to trace evidence of a hearth and of sharpened posts emerging in the spoil of a recut *gana* ditch (reported rather optimistically by the landowner, as evidence for an early house). The site was located in a swampy hollow perched on the dryland slopes of Telabo parish and proved too wet, even after drainage around the planned excavation area, for anything larger than a testpit. A 1 x 1.2 m area was opened along the existing ditch wall and excavated to a depth of 1.3 m.

A single cooking stone fragment was recovered within the top 32 cm of the disturbed upcast, but no further cultural material was identified. An underlying layer of upcast white clay mixed with peat, gravel and woody fragments capped a 67 cm unit of peat, composed of a uniform finely rooted, felted light brown peat at the top, an intermediate layer of peat containing distinct banding with fewer roots, and then an increasingly sticky dense black peat at the base (Figure LOE/1). Beneath the peat unit, and presumably contributing to the sticky quality of the lowest peat layer, a basal white clay, partly gleyed, extended to the base of the testpit at 130 cm. The base of the site was augered, producing a further 85 cm of white clay, beneath which a dark brown organic layer with a massive woody content extended another 125 cm, up to and presumably beyond the full reach of the auger.

A dense band of charcoal at 94 cm, near the base of the peat unit, gave the following result:

ANU-7625	LOE/b	1400 ± 70 BP
		1420 (**1300**) 1160 cal BP (99%Pr.)

This provides a date shortly after the initial onset of peat development at this particular location; given Haberle's (1993) observations on the rarity of evidence for fire events in non-anthropogenic contexts (prior to 30 000 BP) in the Tari region, the charcoal band presumably reflects anthropogenic firing at this location at a date of about 1300 BP.

On the far side of the swampy block containing the LOE testpit, another newly recut *gana* ditch had exposed a channel feature in section, notable for the presence of what was identified in the field as a continuous band of Tibito ash within the brown peat into which the channel feature was cut, the ash thus predating the channel feature; a basal white clay unit immediately underlying the peat was observed dipping downwards in the direction of the swamp.

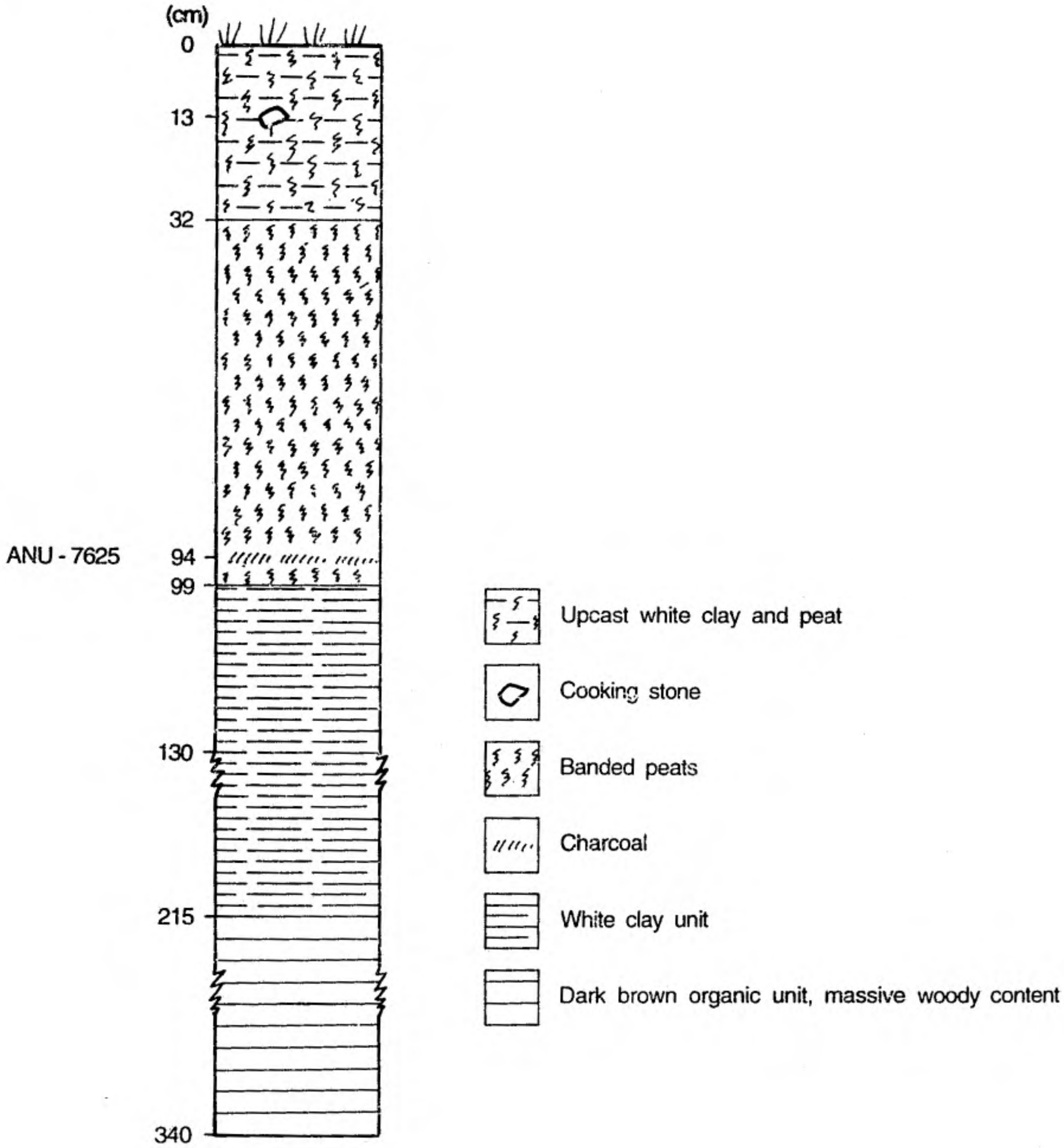


Figure LOE/1: Schematic section, LOE excavation.

LOF
MABU YANGOME, DOBANI PARISH, TARI BASIN
YU185494

Between 1989 and 1990, a new L-shaped *gana* drain was dug into Urupupugua swamp in the Tari basin, enclosing an area of Dobani clan land identified as Mabu Yangome for cattle pasture. Owners of the land are Ibale and Heba and Ibale's sons Mulungu and Agilu. Twenty men, amongst them Ginanago, a Dobani *tene* whom I met in 1989, worked on the drain and were paid between 400 and 500 kina altogether for their labour. When I returned in 1990, the drain was completed, extending through onto the dryland slopes.

Unusually, for so long and fresh an exposure, no earlier drains or other features were visible anywhere along the full extent of the drain, which was over 400 m in length. Figure LOF/1 illustrates the stratigraphy exposed in the drain walls. From the base of the drain, at a depth of about 2 m, a black organic layer, with a rich massive woody content, extends upwards to 53 cm beneath the surface. This basal black organic layer is capped by a light brown clay unit, at the base of which occasional pumaceous stones were observed. Above the light brown clay is a thin 1.5 cm-thick layer of light tan clay. At certain points along the drain, another discontinuous, light tan clay layer is positioned <u>within</u> the light brown clay. The top 46 cm of the profile, extending above the uppermost light tan clay layer, consists of a dark brown silty/clayey peat. At the base of this peat, immediately above the uppermost light tan clay layer, there is a thin but distinct band of charcoal fragments. Within the peat, at depths of between 37 cm and 40 cm, there is a discontinuous band of olive green tephra nodules. The tephra nodules and the charcoal band were both sampled, with the latter returning the following result:

ANU-7624 LOF/a 1240 ± 60 BP
1280 (**1170**) 1060 cal BP (95%Pr.)

The tephra, which was tentatively identified in the field as Tibito (on the basis of texture and colour), has not yet been characterised. The result on the charcoal band suggests that the tephra could be either Tibito or Olgaboli, though the absence of a second tephra within the peat suggests that Tibito, which is generally the thicker of the two deposits and the only one visible in the Tari region, is the more likely identification; the charcoal band, which lies very close to the date for Olgaboli tephra (Appendix A3), conceiveably represents the effects of fire initiated by hot ash.

Allen and Wood (1980:344) had previously proposed that Urupupugua had been formed (and the forest represented by the basal woody organic unit destroyed) by a massive mudflow along the Alua river, emanating from Mt Ambua. On the basis of oral accounts of a mudflow on the Alua river that occurred well within genealogical recall, they dated this event to between 1860 AD and 1880 AD. Insofar as it relates to the formation of Urupupugua, this date must now be discounted, given both the ^{14}C result reported here and the presence above the woody organic unit of a tephra that must be either Tibito or Olgaboli. But the model for the formation of Urupupugua may still hold: Allen and Wood note that the fan deposits on the western slopes of Ambua are composed of a series of overlapping mudflows, some of which are overlain by Tomba tephra which is dated to >50 000 BP. Urupupugua may well have been formed by one of these mudflow events, but it must date to before at least 1200 BP.

The absence of any evidence for drainage at Yangome is intriguing, given its location in the centre of the densely populated Tari basin and its extremely limited catchment area, factors which might both be expected to promote wetland reclamation and use. The light brown clay unit and light tan clay layers, presumably inwashed sediments from the surrounding hills, probably reflect a series of dryland clearance events dating shortly before about 1200 BP. Why a swamp that is evidently easy to drain had not apparently been drained prior to contact is problematic; certainly there is no evidence on the various aerial photographic coverages of Urupupugua for abandoned drainage networks in the swamp, comparable to those evident at most other Tari region swamps. At present, other than the possibility that the Yangome drain represents an insufficient sample and that peat development may have obscured all surface traces of earlier drains, the only explanation that comes to mind is that Urupupugua was formerly regarded in much the same way as the minor swamps at Haeapugua: as a central locus of fertility and focus for ritual and not, therefore, as potential agricultural land.

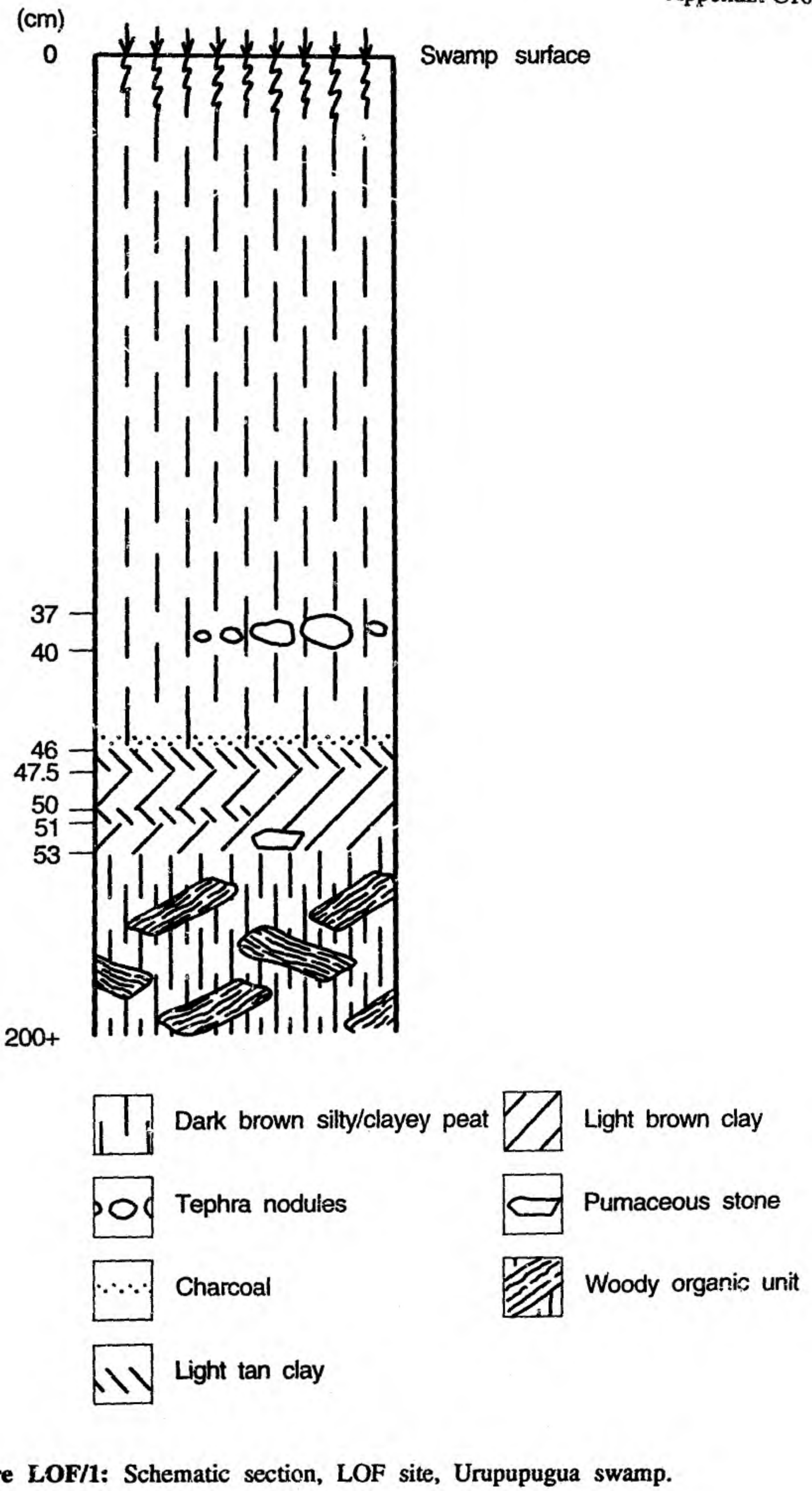


Figure LOF/1: Schematic section, LOF site, Urupupugua swamp.

LOG
MABIRA'S SITE, DOBANI PARISH, HAEAPUGUA
YU055551

The LOG excavation was undertaken primarily to retrieve fossil megafaunal remains after their discovery by local landowners and to train a team of students from the University of Papua New Guinea; observations were also made on the nature of the basal clay stratigraphy and, incidentally, on drain features within the peat overlaying the fossiliferous clays.

The LOG site is located in Kobumabu garden of Dobani parish in the Haeapugua Basin; Figures LOG/1 and LOG/2 illustrate the plan and profile of the site, the layout of the excavation and the relationships between the modern and archaeological drain features. The site was first located in the late 1920s by Walubu-Mabira (Dobani *tene*) when, as a boy of about 15 or 16, he recut a small *gana* drain (Drain A) prior to constructing his first house and pig hut. He dislodged a number of bones from the wall of the ditch, amongst which he recognised pelvis and longbone fragments; he remembers breaking a longbone with his *hewe* digging stick. At the time, he assumed them to be the remains of a Bogorali clansman, killed and thrown into the ditch during the Tani-Bogarali war of the 1890s (Appendix C4, Narratives C2 and C3). Anxious to avoid any dispute, Mabira pushed the remains back into the wall of the ditch and recut the ditch along a slightly altered angle (Drain B).

In 1989, the garden was brought back into use, the area that includes the site being gardened by Tone, a non-agnatic cognate of Dobani clan, resident in Dobani parish. In re-excavating the *gana*, Mabira and Tone deliberately altered its course before reaching the 1920s findspot so as to avoid further disturbing the bones (Drain D); nevertheless, they struck numerous other bones, some of which (bones of the hand or foot, said Mabira) they threw over into the adjacent garden (these could not subsequently be located). They kept one fragment [LOG/1] and later, in the course of constructing mounds for sweet potato in September 1990, recovered a second fragment from the surface of the fill of the 1920s *gana* [LOG/2]. Mabira retained both fragments and offered them to me in October 1990, showing me the precise location of the site.

During December 1990, a 10 m^2 area of the site was excavated, with a further 2.25 m^2 excavated in February 1991 during a visit to Tari by James Menzies. An initial metre square test pit located the 1920s *gana* and three fragments of a single vertebral bone [LOG/3] were recovered from the *gana* fill. The excavation was then extended over an area sufficient to recover the bulk of the remains, without destroying too much of an actively producing garden. Initially, some problems were experienced with drainage of the site, but an exceptional spell of fine weather and re-cutting of the 1989 *gana* and the larger *iba puni* drain into which it flowed improved conditions to the extent that rapid removal of uncovered fossils became necessary to prevent them drying out. The fill of the stretch of the 1920s *gana* exposed by the excavation was removed and sieved through a 1 cm mesh. All finds were given an individual site number, and photographed *in situ*; locations were noted in three dimensions and the finds were then removed in batches of between three and twelve and bagged in water from the site before excavation proceeded.

The basic stratigraphy at LOG is illustrated in Figure LOG/3 and consists of a garden topsoil, 13 cm to 31 cm deep, developed on between 13 cm and 45 cm of friable, black peat. At the base of this peat layer, two thin bands of soft, highly plastic olive grey clay bracket a much more dense peat cap; the possibility that these bands represent the light grey and dark grey clays known from the other sites of the Dobani / Waloanda area was not considered in the field. The white, or more accurately pale yellow, clay unit that extends from directly beneath the lower olive grey clay band to the base of the site is minimally 20 cm deep and is composed of a complex series of very finely stratified bands of reworked ash, freshwater shell, and organic material. Individual bands vary in thickness from less then 0.2 cm to a maximum of approximately 5 cm. Although the topsoil and peat layers are essentially level, this white clay unit dips down towards the southwest at an angle which increases from 9 to 14 degrees (the dip is not shown in Figure LOG/3, which is schematic). Comparable dips have been recorded elsewhere along the margins of Haeapugua for this white clay unit.

pH values for the site profile range from 7 for the topsoil to 7.5 for the peats and 8.5 for the white clay, reflecting the continuous percolation of water from the adjacent limestone ridge through the site and probably accounting for the fine preservation of both bone and organic material in the site. Roots extend through the full profile and were apparently responsible for some of the post-depositional damage to a number of the larger bones.

The disposition of the fossils appears to conform to the dip in the white clay unit, as a distribution of the vertical plots for each bone reveals a dip of between 10 and 12 degrees. Though some of the larger fossils traversed a number of different bands, the vast majority lay within a single white clay band; a common observation, on removing fossils, was that a thin and discontinuous organic mat was located at a depth of 0.5 cm to 1 cm beneath the fossils. Intact leaves and a number of seeds were recovered from some of the larger organic bands and may prove identifiable.

Artificial features in the site, none of which were associated with the fossils, consisted of three drains, shown in Figure LOG/2. Though drain A apparently predates drain B, the lapse of time between the two is not likely to be great as the fills were essentially identical. It is probable that drain B represents the re-excavation of drain A within the same gardening phase, and this can readily be identified as Mabira's second 1920s *gana*. Drain C appears to be intersected by drains A and B, though it may have articulated with an earlier, thinner and shallower *gana* subsequently enlarged by these more recent drains. In size and form, drain C matches closely the shallow *de gana* ditches which serve more as boundary markers than actual drains in contemporary Haeapugua gardens. Given the abundance of carbonised organic material in both the topsoil and peat which are the sources for the ditch fill material, carbon dating of the fills was not considered worthwhile.

It is worth noting here that there was no evidence at LOG for the earliest phase of features known for Haeapugua, present at sites LOB, LOC, LOI and LOJ, which is typically infilled with a light grey clay and excavated into the basal white clay common to all of these sites.

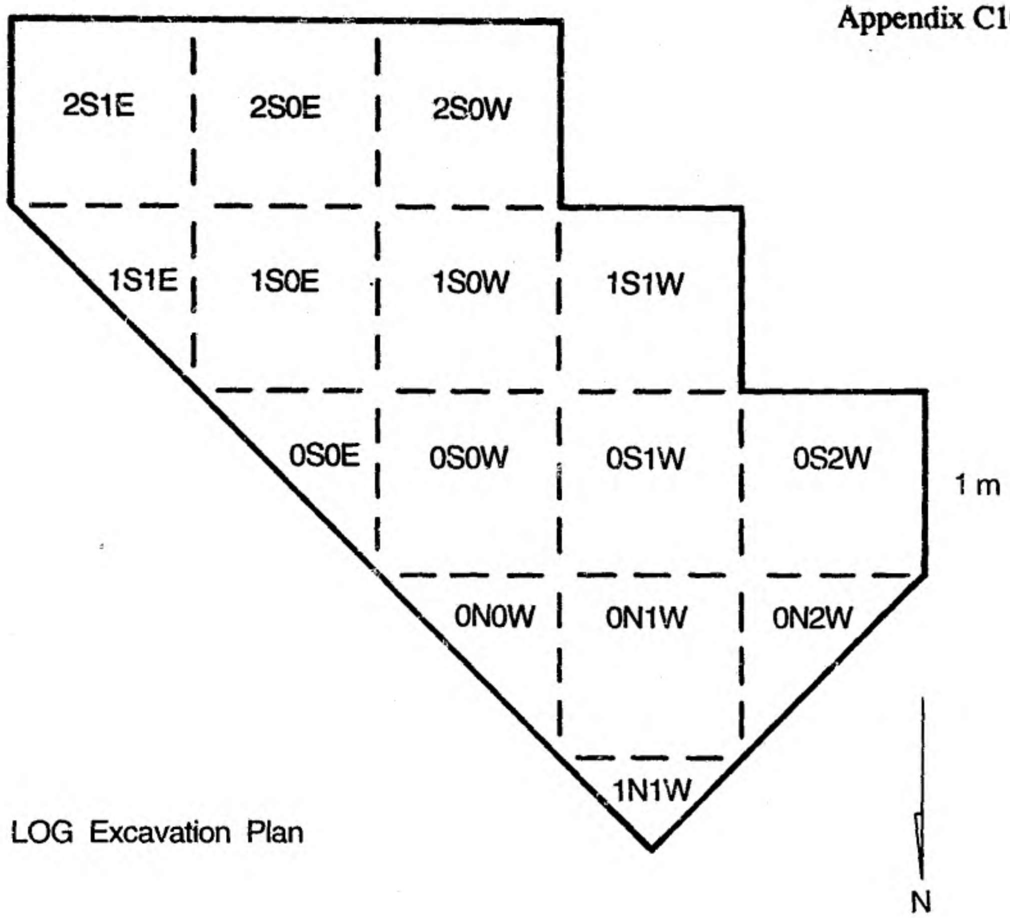
A list of the fossil finds is given in Menzies and Ballard (1994: Appendix), giving tentative identifications made by James Menzies. At present, all but three of the identifiable bones appear to derive from the same individual, currently described as a large, but primitive, extinct Protemnodon species, tentatively assigned to Protemnodon tumbuna (Menzies and Ballard 1994). Bones [5], [72] and [97] are probably bird remains.

Assuming the presence of only one individual, it would appear that the carcass is more or less *in situ*. Post-depositional disturbance has served to dismember the skeleton: only the component parts of bone [18] were found in a state of articulation. There is little pattern to the distribution of the body parts: the two mandibles ([31] and [70]) lie at opposite ends of the exposed area, and the various ribs are equally scattered. It is not yet clear why this should be the case. No obvious evidence was noted, either during excavation or in the process of initial description, for scavenging marks on the bones. The lack of uniformity, in the orientation of the long bones in particular, and the fact that the bones generally appear entirely unsorted by either size or weight suggests that although the presumed depositional environment was fluvial or lacustrine, no water current of any significance can have influenced the distribution of the body parts.

Other than the drainage features, the only artefacts identified or retrieved from

LOG were a single flake (LOG/101) found in the spoil of the topsoil from square 0S1W, and an unusual conical ground stone fragment (LOG/102), snapped at one end, from the fill of the 1920s *gana* in square 0S0W.

No samples for dating were recovered from the LOG site, but the grounds for asserting an antiquity in excess of 50 000 BP for all of the basal white clays are discussed in Chapter C3.



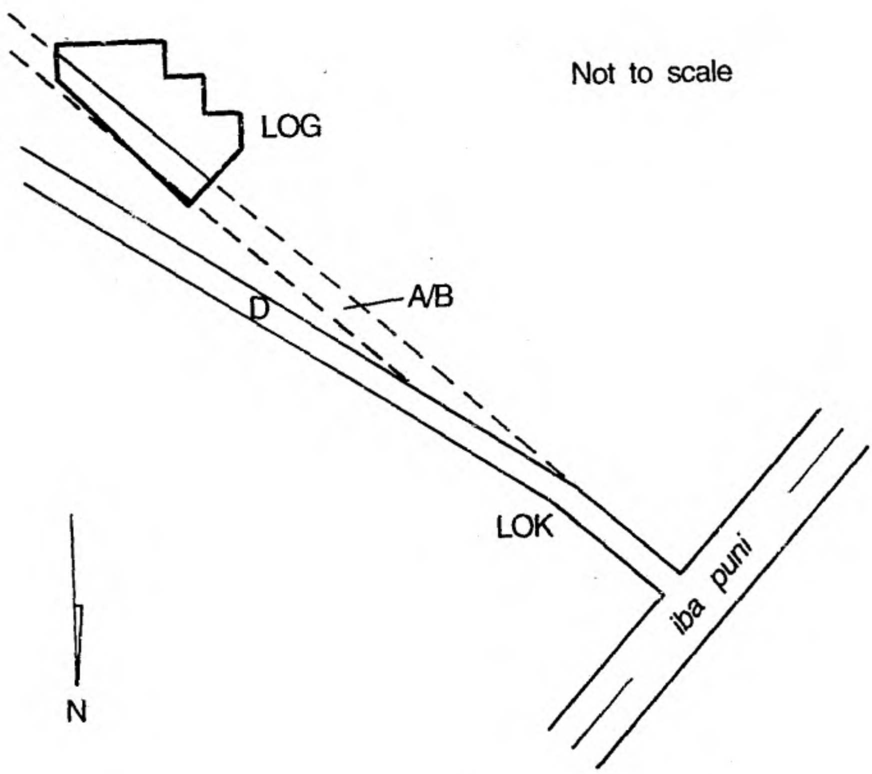
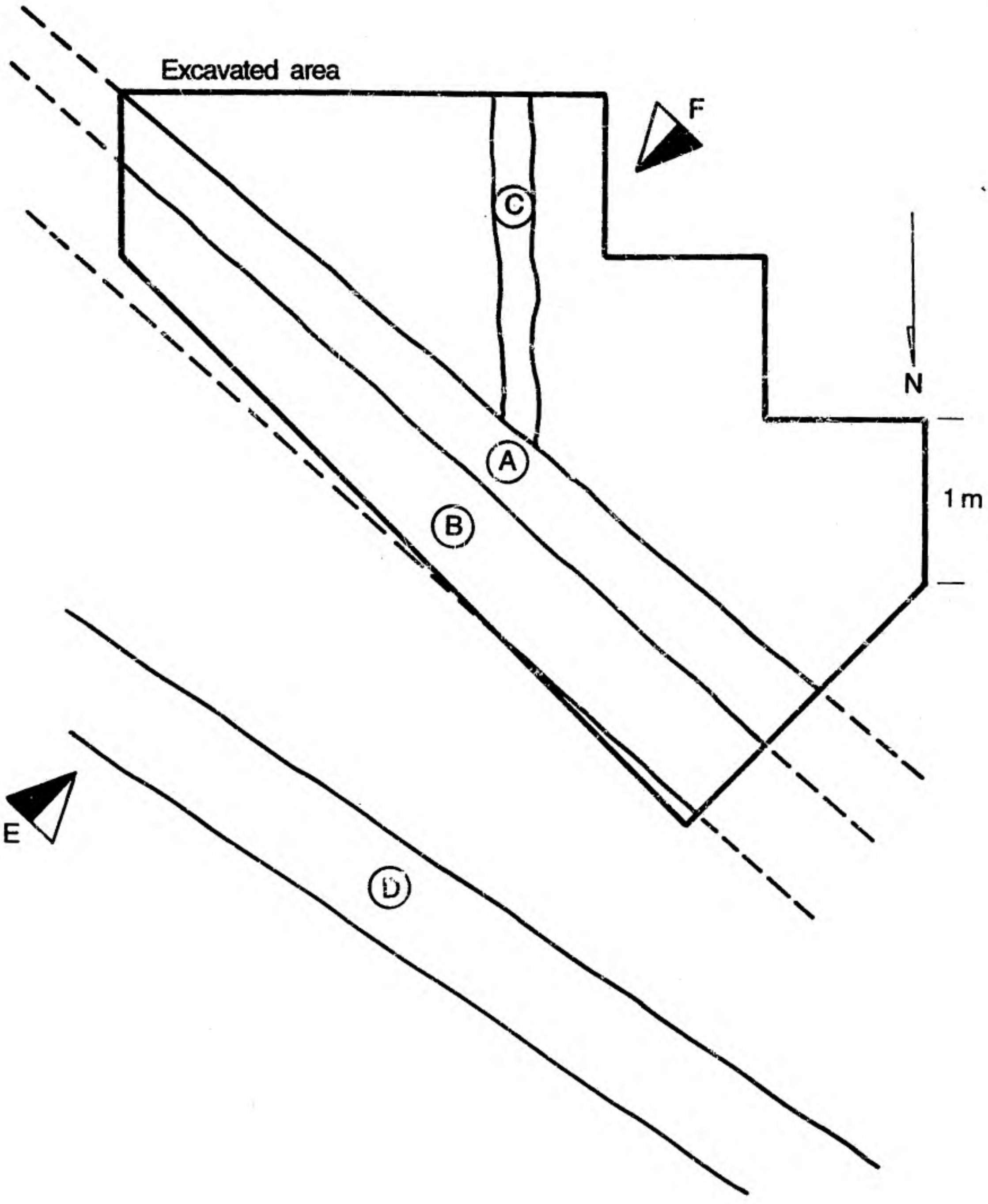


Figure LOG/1: Plan of LOG and LOK megafauna fossil sites.



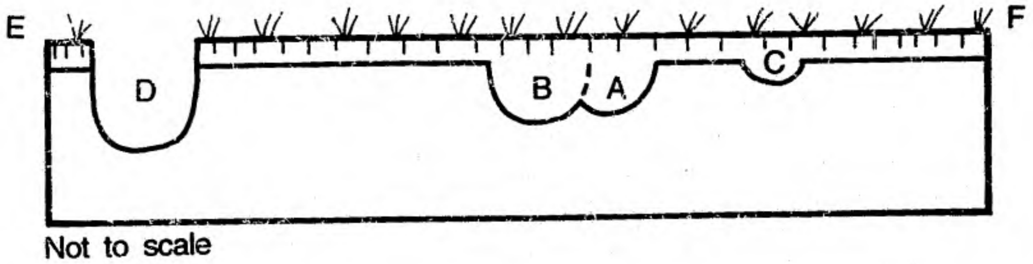


Figure LOG/2: Plan and profile of ditch features, LOG site.

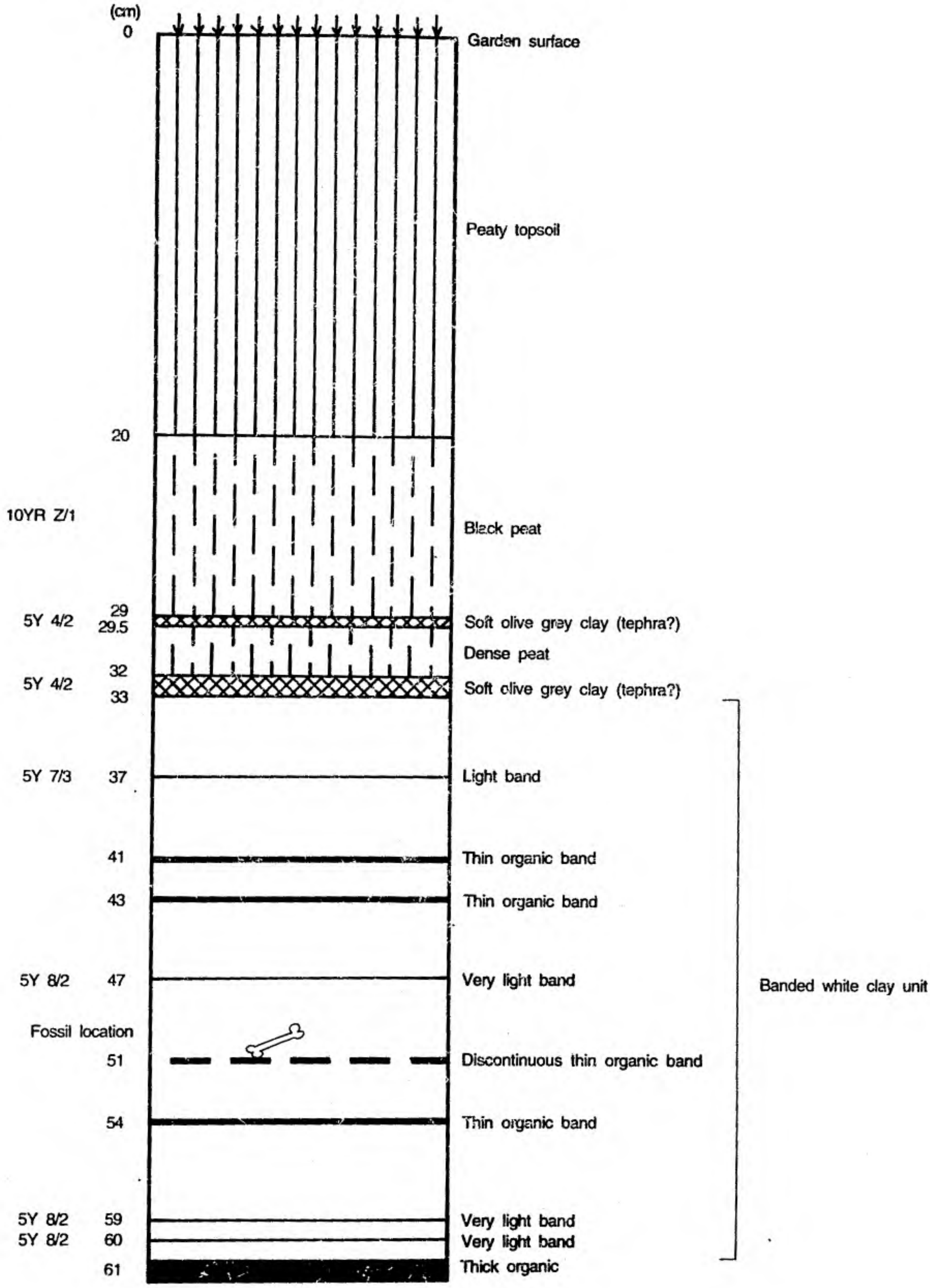


Figure LOG/3: Schematic section, LOG site. (bedding dip not shown)

LOH
BIRIMANDA, MUNIMA PARISH, HAEAPUGUA
YU032548

Birimanda is a major *gebeanda* ritual site, jointly owned by the clans of the Yari and Yami phratries (Appendix B6: Gen.1). The site is located on the highest and widest section of the levee that has developed along the Tagali river between the swamps of Haeapugua and Emepugua (Figure C1). Figure LOH/1 illustrates a plan of the extent of the site and the former disposition of some of the ritual features of the ritual centre, and a profile of the levee. The site was formerly divided into two sections, with Yari phratry performances contained between the streams Iba Ulumu and Iba Tenagua, and those of Yami phratry between Iba Tenagua and Iba Gelomi. Three huts constituted the ritual centre. These included:

i) the *liruanda*, a small, fully enclosed hut in which the sacred *liru* stones were housed between performances,

ii) the *kamianda*, a rectangular house with doors at either end, where officiants ate and discussed the identity of appropriate *dama* spirits for each performance, and

iii) the *mbaluanda*, a small *andira* shelter with a hearth upon which pork oblations were cooked.

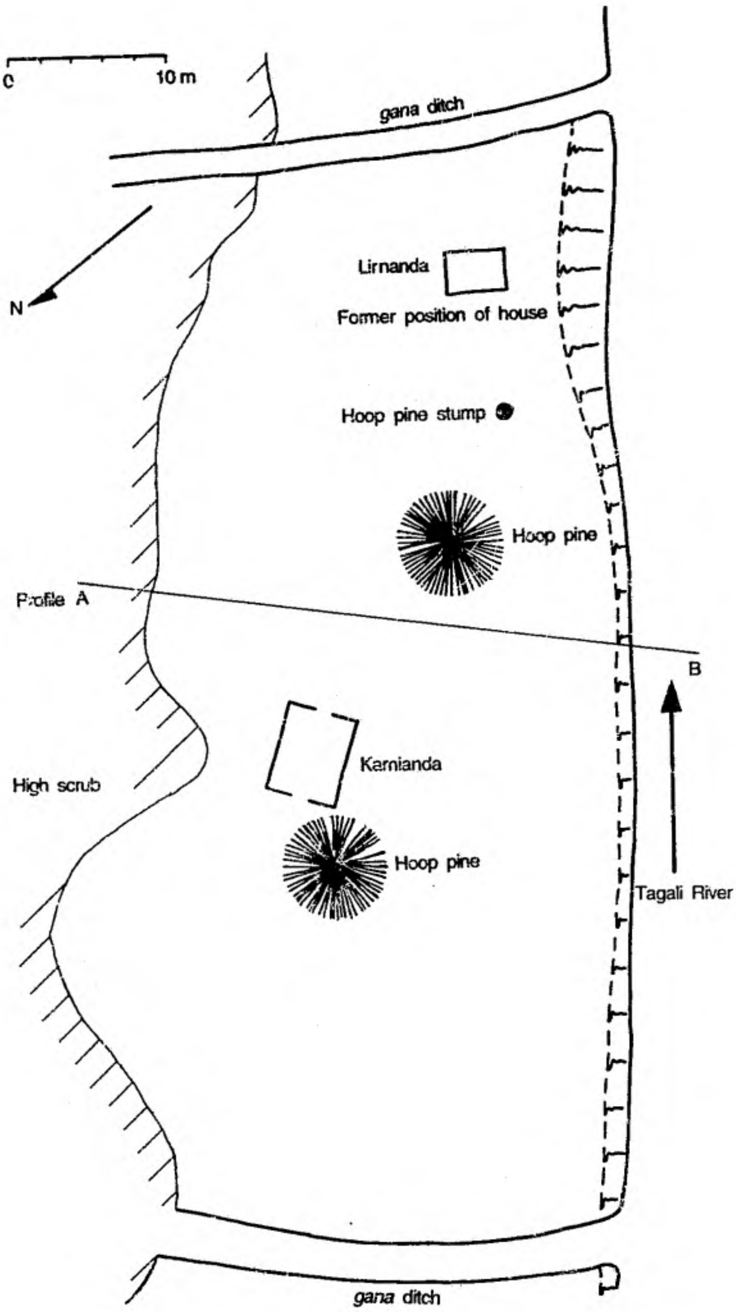
All three constructions were dismantled or allowed to disintegrate after the last ritual performance at Birimanda, which took place late in the 1950s, when ECP missionaries newly established at Walete forbade the performance of further rituals. Of the large grove of *guraya* hoop pines (Araucaria cunninghamii) that formerly covered the site, some of which are visible in a 1961 photo (Hoad 1961), only two mature trees remain, the rest having been logged.

No test pits or excavations were attempted at the site, but examination in January 1991 of a natural exposure along the banks of the Gelomi stream, which intersects the levee immediately to the north of the Birimanda ritual site, provided access to the levee stratigraphy. Figure LOH/2 illustrates this section. As might be expected of a levee section along a river which floods in most years, soil boundaries are indistinct except in the uppermost 20 cm where finely interlain layers of soil, silt and sand mark the most recent flood events. The most significant break beneath this appears at about 94 cm, where an indistinct boundary marks the transition from overlying silty sand to a silty/sandy clay.

Scattered charcoal is evident throughout the section to a depth of 125 cm, but particularly abundant in two bands between 60 and 66 cm, and 103 and 122 cm. In cleaning back the face of the section, a hearth containing several cooking stones was exposed between 23 and 39 cm; no boundary corresponding to this event was visible in the profile. The fire-blackened stones were heavily marked with traces of red ochre, suggesting to those Huli present with me that the hearth was associated with ritual performances in which ochre, mineral oil and cooked pig fat are applied to ritual stone artefacts and other stone objects. Samples of ash and charcoal were collected from the hearth and from the two dense charcoal bands and submitted for radiocarbon dating. All three samples (ANU-7803, ANU-7804, ANU-7805) returned results which extend to the modern, presumably reflecting contamination by the movement of floodwaters through the full depth of the levee profile; only one of the samples, from the uppermost charcoal band, returned a result which can be calibrated:

ANU-7804 LOH/b	190 ± 80 BP
	320 (**280, 170, 150, 10, 0**) m cal BP (96%Pr.)

Although the intercepts extend to the modern period, the result is of some value for my purposes, in that it suggests that the upper 60 cm of the Tagali levee at this point of the river have been deposited during the last 320 years.



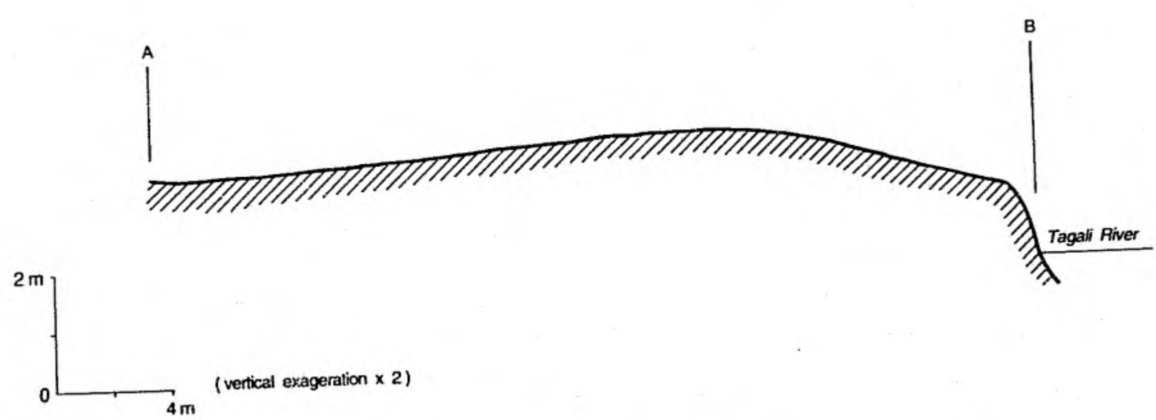


Figure LOH/1: Plan, Birimanda ritual site (LOH).

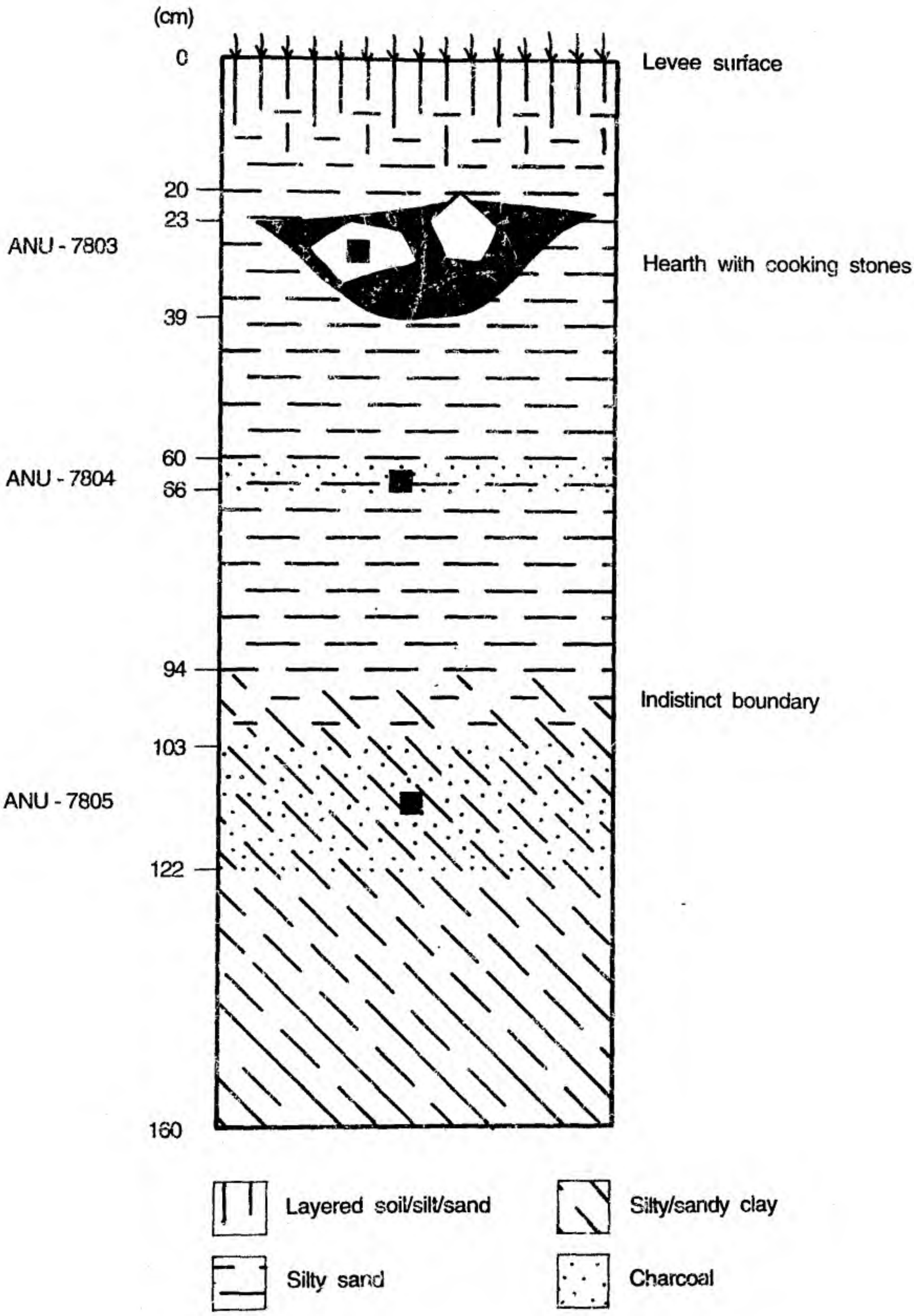


Figure LOH/2: Schematic section, Birimanda levee.

LOI
WALOBI, TANI (TAIBAANDA) PARISH, HAEAPUGUA
YU058544

The Walobi site is located in Tani (Taibaanda) parish, on ground owned by Hagu subclan. When it was excavated in January 1991, the Walobi site was in the first swamp block beyond the existing boundary between reclaimed garden blocks and the wetlands. My intention in excavating this site was to test the degree to which the stratigraphic units and the relationships between them identified in the LOB and LOC sites extended into the swamp.

A 2 x 1 m test pit was opened some 15 m into the swamp from the nearest garden block drain. After removal of a 15-20 cm topsoil, a light grey clay was immediately exposed (Figure LOI/1); the dark grey clay known from the LOB and LOC sites closer to dry land was evident here only as thin (1-2 cm), discontinuous patches in the hollows of the white clay surface topography. A sample of charcoal from one of these patches was collected, returning the following result:

ANU-7806 LOI/a	2050 ± 210 BP
	2500 (1990) 1520 cal BP (98%Pr.)

The light grey surface, which was essentially level, was broken only by a single dark grey clay-filled feature, an oval hole 9 x 12 cm in area, sloping at the base from a depth of 2 cm below the white clay surface to a maximum depth of 6 cm. Removal of the light grey clay revealed no further penetration by dark grey clay. A scattered pattern of orange staining or discoloration evident on the light grey clay surface may represent traces of a weathered tephra.

The light grey clay unit consisted of two separate layers of light grey clay intersected by an undulating 1-2 cm band of cemented tephra pavement, dipping slightly towards the swamp. The tephra was broken at six points by hole features infilled with light grey clay (Figure LOI/2). This clay fill darkened noticably towards the base of each feature, a characteristic of the light grey clay fill in features noted at both the LOB and LOC sites; this was certainly not intrusive material from the dark grey clay unit, but more probably the result of some form of organic staining or sorting of elements of the feature fill.

Removal of the tephra pavement revealed a second, thinner layer of light grey clay overlying a basal white clay unit. The surface topography of the white clay consisted of irregular, sinuous channels no longer than a metre in length, terminating in deep oval or circular pits (Figure LOI/3). None of the conformity in orientation of the white clay features witnessed at the LOB(ii) or LOC sites was evident here. There was also no correspondence between the positioning of the light grey features intersecting the tephra pavement and the white clay features below.

The relative simplicity of the LOI testpit offers an interesting perspective on the more complex problems of the LOB, LOC and LOJ sites. The dark grey clay unit associated with the clearest channel features at the other sites is largely absent at LOI, suggesting that gardening activity in the dark grey clay phase did not extend far into the swamp beyond the current limits of established reclamation. Although the limited area exposed at the LOI site does not extend sufficiently to trace the stratigraphic origins of the tephra pavement, I am inclined to identify this tephra as one of the four tephras known from the basal white clay unit, and to interpret its presence <u>within</u> the light grey clay at LOI as the result of a process of gradual replacement of white clay by light grey clay similar to that interpreted for the LOB and LOC sites.

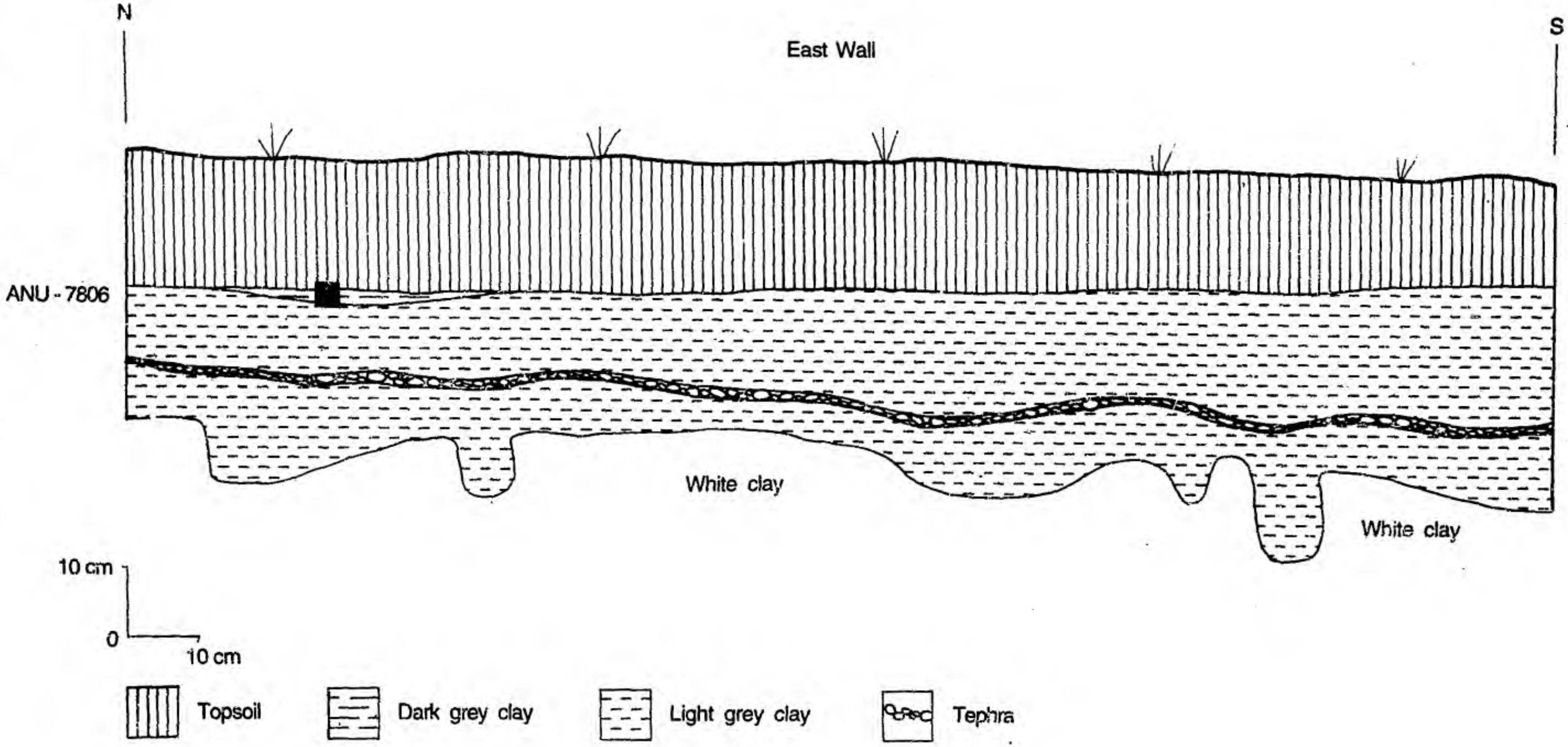
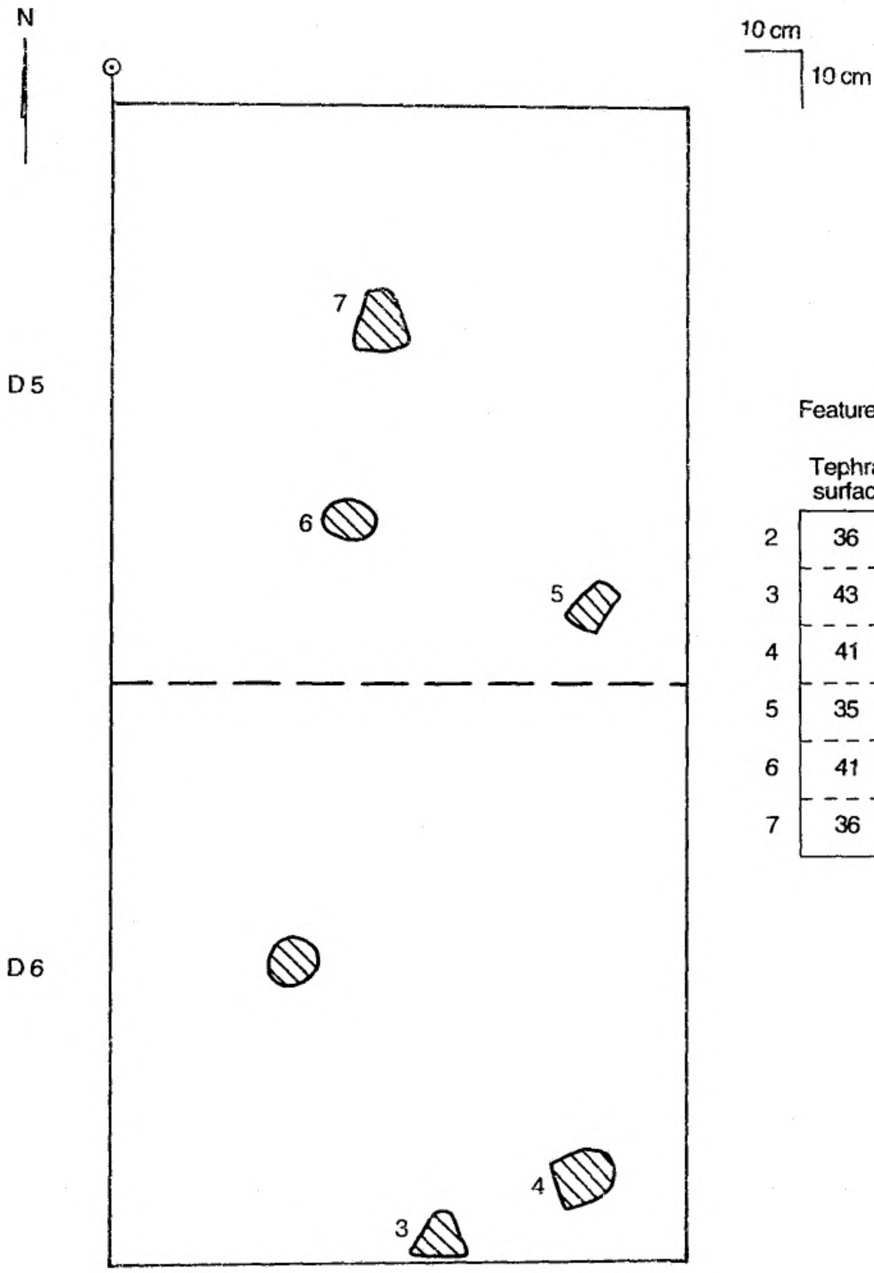


Figure LOI/1: East wall section, LOI site.



Feature depth at: (cm)

	Tephra surface	Base	Length	Width
2	36	43	6	6
3	43	49	9	7
4	41	47	10	9
5	35	44	8	6
6	41	49	10	7
7	36	48	15	14

Figure LOI/2: Plan of tephra pavement surface, LOI site.

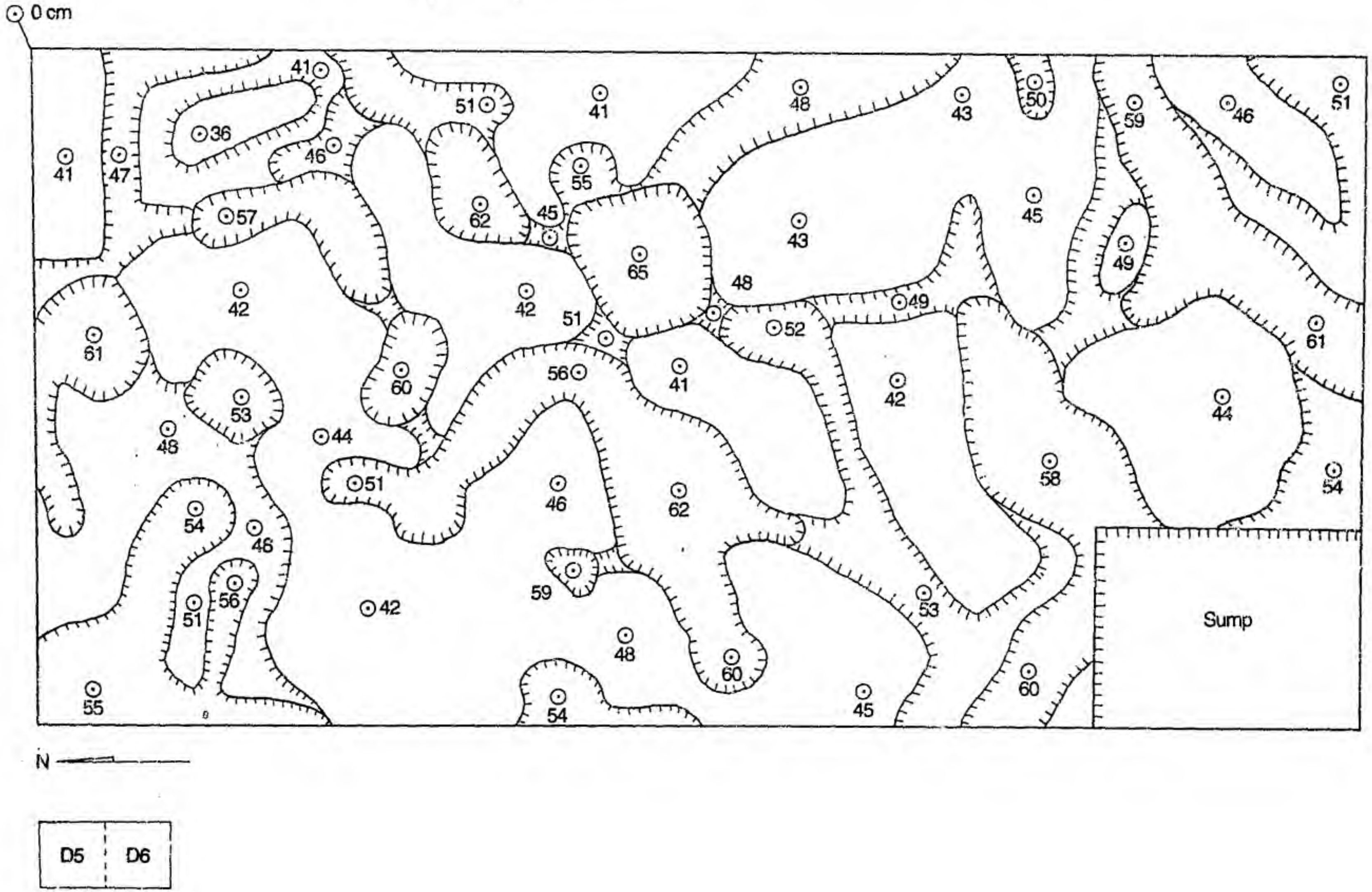


Figure LOI/3: Surface of white clay unit, LOI site.

LOJ
HIRIBITE, TANI (TAIBAANDA) PARISH, HAEAPUGUA
YU059543

The LOJ site in the Hiribite locale is situated on a former pig droveway (*nogo dugudugu*) in Hagu subclan land in Tani (Taibaanda) parish; the block which constituted the droveway is currently the location of a pig-hut (*nogoanda*) but no longer serves its former function of moving pigs from dryland houses to wetland forage areas. A 2 x 1 m^2 area was opened near the centre of the droveway in January 1991 in an attempt to determine the maximum possible age of the use of the area as a droveway (presumed to post-date the most recent use of the block as a garden), and as a means of further exploring the sequence of dark and light grey clay fills identified at the LOB and LOC sites.

A thin topsoil, 2 cm to 14 cm in depth contained a single piece of flaked stone. The transition from the topsoil layer to the dark grey clay unit was gradational, moving with increasing depth from a more friable dark soil to an increasingly plastic dark grey clay. No internal differentiation in the dark grey clay was noted during excavation, but the surface of the underlying light grey clay revealed the presence of two intersecting channel features (Figure LOJ/1: Features A and J); the shallow angle of intersection and the difference in depth of the channel bases suggested that these two features were not contemporary with one another but, even subsequently in section, the fills of the two features were very hard to tell apart. Eight hole or pit features were also identified in the surface of the light grey clay. A patch of charcoal lying at the base of Feature A was sampled and submitted for dating, producing the following result:

ANU-7800 LOJ/a 2390 ± 230 BP
2940 (**2350**) 1880 cal BP (100%Pr.)

At the southwestern end of the site, fragments of cemented tephra were found both settled on the surface of the light grey clay and dispersed across a depth range of 24 cm <u>within</u> the dark grey clay.

Excavation of the light grey clay unit revealed the presence, midway within it, of an incomplete cemented tephra pavement dipping lightly downwards in an ENE direction, presumably the source of the cemented tephra fragments found within the dark grey clay (Figure LOJ/2). The pavement was noticeably most intact where it was positioned immediately above the underlying basal white clay unit, and dipped markedly above the deeper light grey clay-filled features in the white clay surface.

The base of the light grey clay unit revealed three distinct blocks of what was interpreted initially as white clay, lying above a layer of very dark carbonised organic clay covering much of the remaining extent of the site. This thin 2-7 cm organic layer was removed, exposing a surface topography of basal white clay broadly similar to that uncovered at the LOB and LOC sites, consisting largely of connected pit and shallow runnel features (Figure LOJ/3). A more unusual element of the white clay surface was the much deeper and, by comparison with other light grey features, straighter channel feature (Feature Z) running from northeast to southwest across the site. The fill of Feature Z consisted of light grey clay, grading significantly in colour towards a darker grey at the base of the feature, but without any evident change in texture; this colour gradation was presumed to reflect a higher organic content settled at the base of the fill. Feature Z was quite unlike any of the light grey clay-filled features seen at other sites, with its straight side walls and level base resembling more closely the characteristics of some of the dark grey clay-filled features (e.g. Feature A at site LOB(i)).

The other unusual element of the white clay surface was the presence of the three blocks of apparently disturbed white clay, each of which capped the thin band of carbonised organic clay. These three white clay blocks contained none of the fine banding evident in all of the basal white clay units at this and other Haeapugua sites and were interpreted on site as upcast from the channel and runnel features, capping a buried organic soil which was thus presumably the contemporary soil surface. At one point along the length of Feature Z, one of the "upcast" white clay blocks appeared to have slumped subsequently over part of Feature Z; the dark carbonised organic clay band also extended at several points, from beneath the capping "upcast" white clay blocks on either side of Feature Z, into the light grey clay fill of the feature (Figures LOJ/2 and LOJ/3). The observation that the light grey clay extended beneath the dark organic layer in places suggest, in retrospect, that the dark organic layer behaves similarly to the "transgressive tephras" at this and other Dobani / Waloanda sites (see Section C3.2).

The presence of the largely intact if dipping tephra pavement immediately above Feature Z at its northeastern end was inexplicable in terms of my 1991 field model of local stratigraphy, a situation rendered even less clear by its absence at the other end of the same feature.

When samples of the organic band beneath one of the upcast white clay blocks, from its upper 2 cm (LOJ/b) and lower 2 cm (LOJ/c), were submitted for dating, the following results were returned:

ANU-7801 LOJ/b	15820 ± 140 BP 19040 (**18710**) 18400 cal BP (100%Pr.)
ANU-7802 LOJ/c	17660 ± 150 BP 21550 (**21040**) 20490 cal BP (100%Pr.)

Concern during the 1990/91 excavation season about the status of the light grey clay-filled features in the white clay surface, given their troubled relationship with the "transgressive tephras", was considerably amplified on receipt of these ^{14}C results. Tentative conclusions on this matter are contained in Chapter C5.

In November 1992, an attempt was made to extend the 1991 excavation in order to consider more closely the junction of the two dark grey clay-filled channels, Features A and J. ^{14}C results from the previous year's excavations had suggested that at least two distinct phases of use were represented within the dark grey clay unit, and further excavation of the LOJ site was proposed as a means of examining the possibility of distinguishing the different phases of use at one site on the basis of fill characteristics. A 2 x 1 m area extension along the southwestern and southeastern borders of the 1991 excavation was opened and excavated with the assistance of Jack Golson. Excavation by trowel proceeded from the topsoil surface to the base of the dark grey clay, with close attention paid to variation in colour and texture. Successive surfaces within the topsoil and dark grey clay were almost impossible to identify except where scattered lenses of charcoal formed a perceptible level; a sample from one of these charcoal lenses at a depth of 6 cm beneath the designated dark grey clay surface produced the following result:

ANU-8754 LOJ/d	440 ± 200 BP 690 (**500**) 50 cal BP (95%Pr.)

The two channels, Features A and J, were quickly recognised and their walls and bases easily defined. Less easy was the task of distinguishing between the fills of the two features along the plane of their intersection, the only difference noted in the field being that the fill of Feature J was slightly darker than that of Feature A which it intersected and presumably post-dated (Figure LOJ/4). Two further samples of scattered charcoal, one (LOJ/e) from the surface of the light grey clay at the base of the dark grey clay, 6 cm lower than and directly beneath the LOJ/d sample and 20 cm northeast of Feature A, and the other (LOJ/f) from the base of Feature J but partly embedded within the surface of the light grey clay, returned the following results:

ANU-8755 LOJ/e 1210 ± 90 BP
1280 (**1130, 1110, 1090**) 960 cal BP (100%Pr.)

ANU-8756 LOJ/f 1210 ± 310 BP
1710 (**1130, 1110, 1090**) 630 cal BP (99%Pr.)

Taken together with the results of the LOJ/a and LOJ/d samples above, this suggests at least three phases of dark grey clay deposition at LOJ: the first from about 2350 BP, represented by the fill of the channel Feature A, the second from between about 1300-1000 BP, represented by the fill of the channel Feature J and the base of the dark grey clay at the eastern corner of the 1992 extension, and the third from about 500 BP or later, represented by the upper half of the dark grey clay in the 1992 extension.

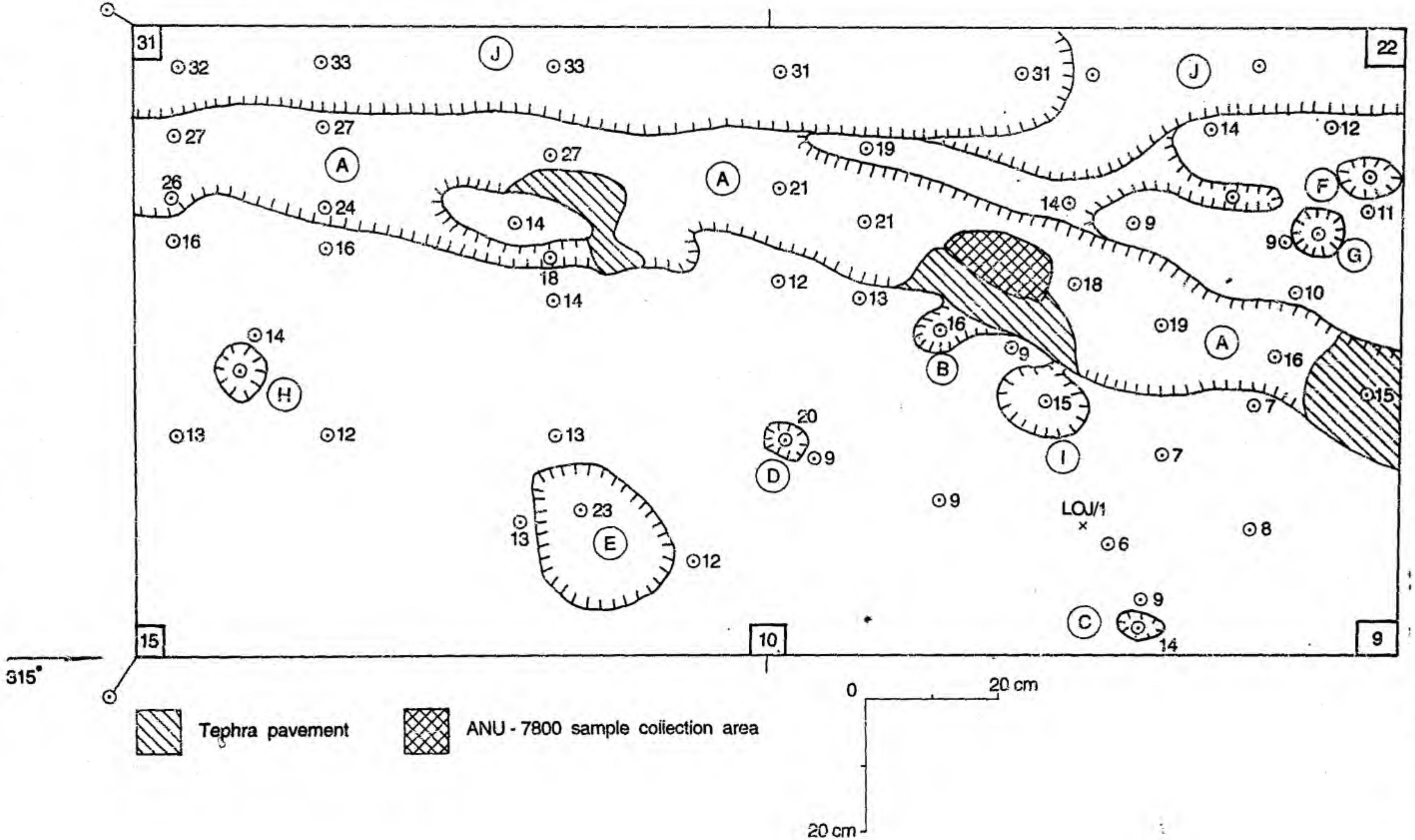
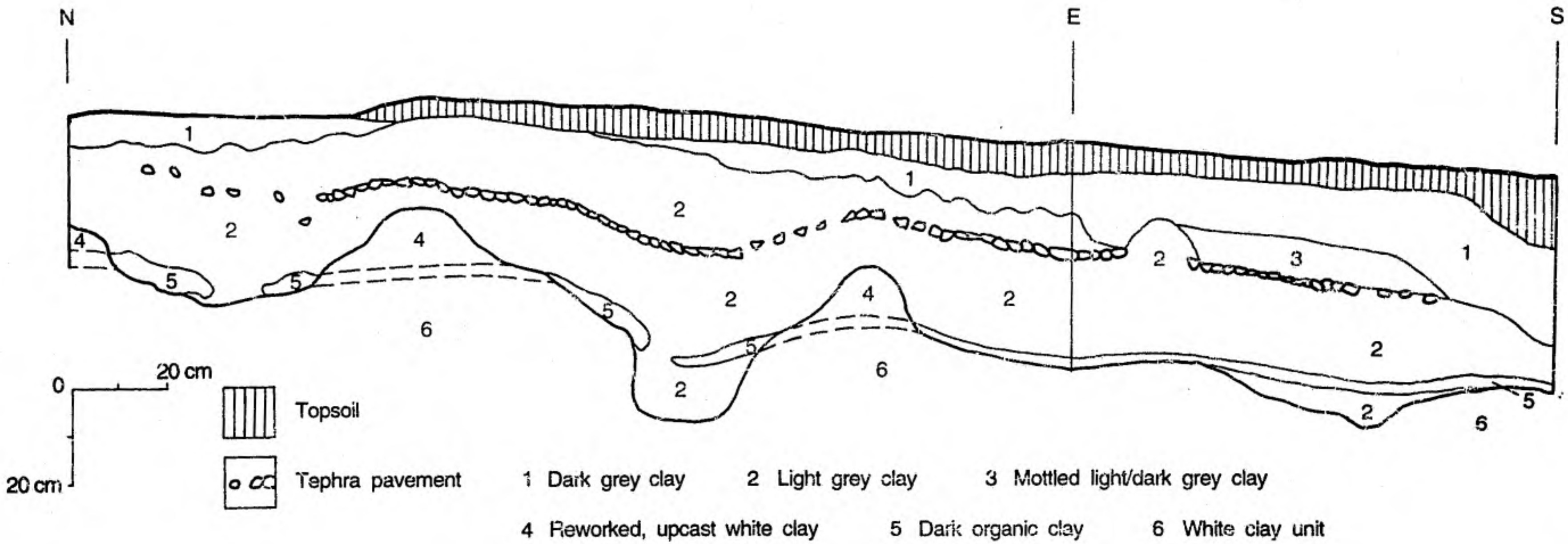


Figure LOJ/1: Plan of light grey clay surface, LOJ site.

Figure LOJ/2: North-east and south-east wall sections, LOJ site.



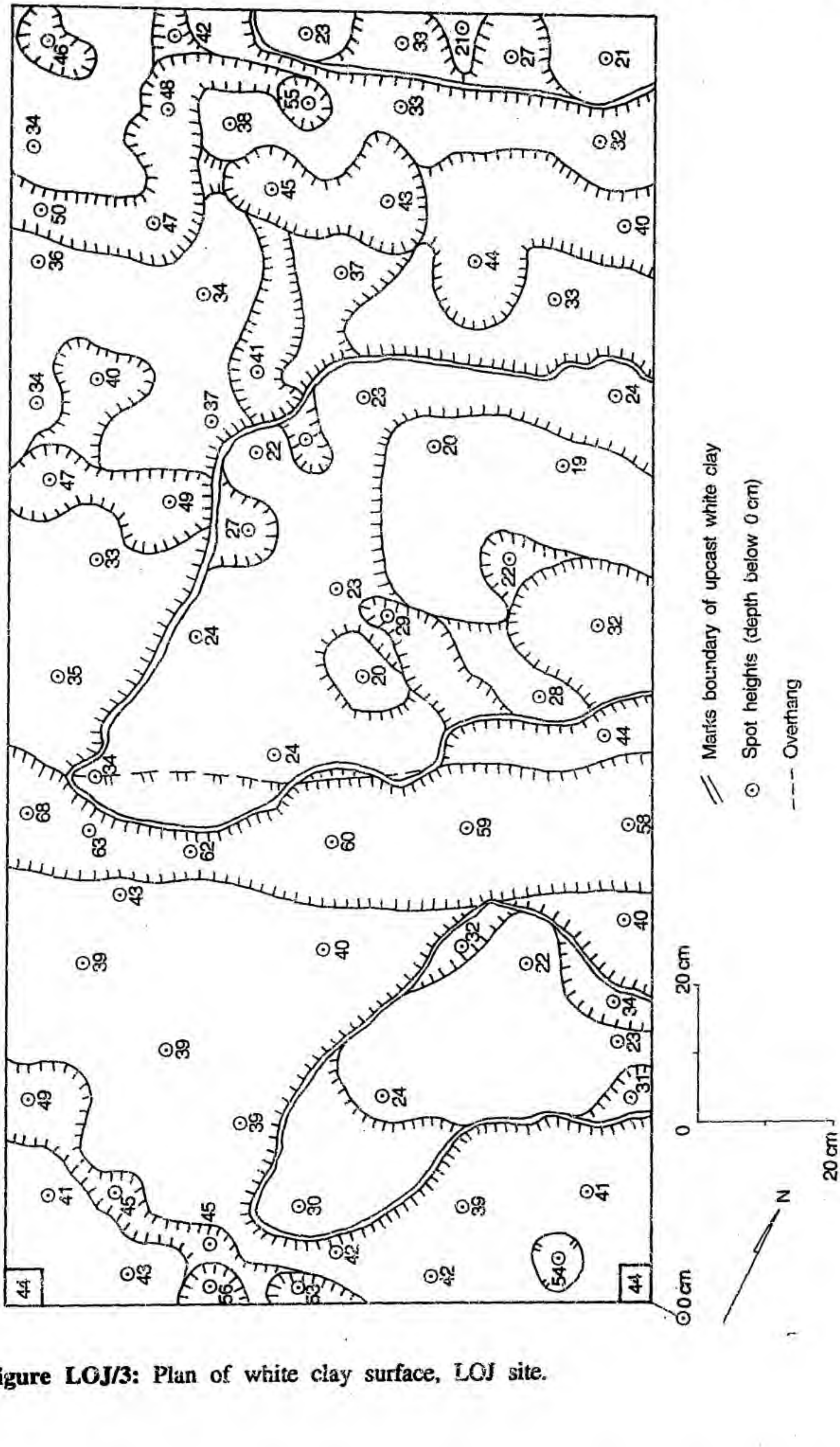


Figure LOJ/3: Plan of white clay surface, LOJ site.

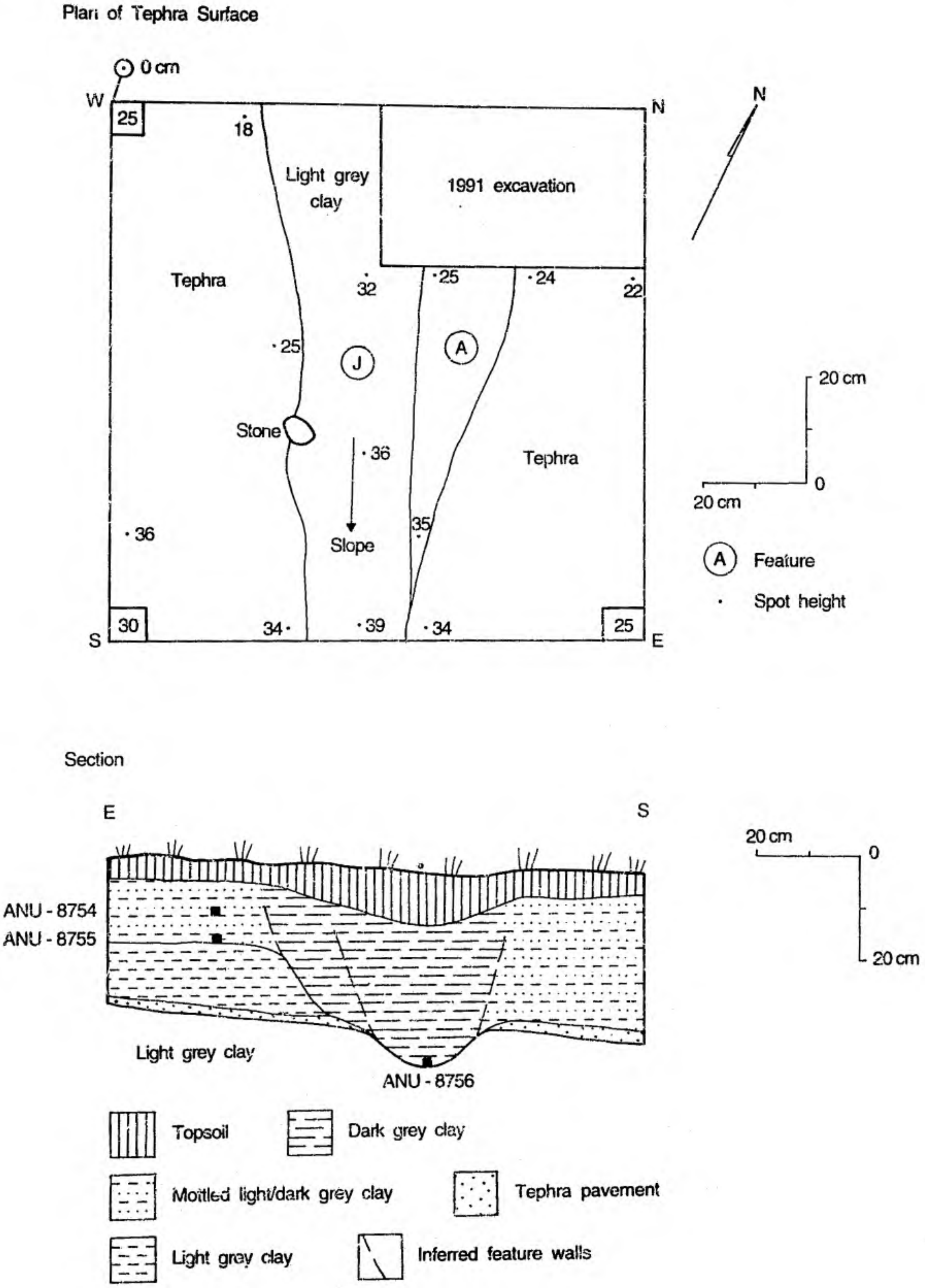


Figure LOJ/4: Plan and section, 1992 extension, LOJ site.

LOK
TONE'S FOSSIL SITE, DOBANI PARISH, HAEAPUGUA
YU055551

In the process of re-excavating the 1989 *gana* to drain surface water from the LOG excavation, further fossil fragments were located at a site designated as LOK and named after Tone (Dobani *yamuwini*, Pibe *tene*), who was then gardening the area; the location of these finds, relative to the LOG site, is shown in Figure LOG/2. The discovery here of a third mandible, also idenitifed by Menzies as Protemnodon tumbuna (Menzies and Ballard 1994), indicates the presence of at least a second individual in close proximity to the LOG find. Fragments of longbone and pelvis may prove to derive from the LOG individual, though the presence of most of the diagnostic bones at LOG within a relatively limited area might suggest otherwise. No attempt was made to retrieve material other than that thrown up in the course of clearing the *gana*. Though located at a depth of about 1 m below the surface, the fossil-bearing layer at LOK appears to be in an identical stratigraphic position to that at LOG, in the upper 20 cm of a white clay unit capped by peat.

LOL
EMBO EGEANDA, TANI (TAIBAANDA) PARISH, HAEAPUGUA
YU067540

The Embo or Berabu Nali Egeanda rock-shelter site lies in Tani Wangane land in Tani (Taibaanda) parish, at an altitude of 1690 m on the mid-slopes of the steep Lagale Mandi limestone ridgeline. The limestone bluff that forms the shelter is visible from the Highlands Highway below. The shelter floor consists of a level area 7 m in length and 2 m at its maximum width, from which larger rocks have been removed and placed at the rear of the shelter (Figure LOL/1). A steep talus slope on a 28 degree angle extends downwards from the edge of the floor area. Hearth ash and fire-blackened cooking-stone were present on the current floor surface, together with two human crania and an assortment of post-cranial material at the northern end of the shelter. A further six crania and other post-cranial material were distributed in crevices along the bluff on either side of the shelter; the identities of the individuals are well known to current residents of the area. The site owners suggested that the site had been used more recently for shelter while gardening and as an ossuary over the full duration of traditional recall.

An attempt was made to test the deposit at LOL as it appeared the most promising of the shelter sites along Lagale Mandi ridge, in close proximity to and overlooking the swamp. A trench, 50 cm wide and extending 135 cm in length from a point 40 cm from the rear wall of the shelter, was excavated. Figure LOL/2 illustrates the excavation stratigraphy. Much of the soil matrix through the full depth of the excavation was poorly consolidated and appeared extensively disturbed and reworked. Cultural deposit appeared to terminate at a maximum depth of only 26 cm from the surface, beneath which there extended a poorly consolidated limestone rubble set within a very loose, soil matrix of degraded limestone. No features were identified in the course of the excavation, the individual layers consisting instead of what appeared to be a reworked combination of in situ hearth material and inwashed soil from either end of the shelter.

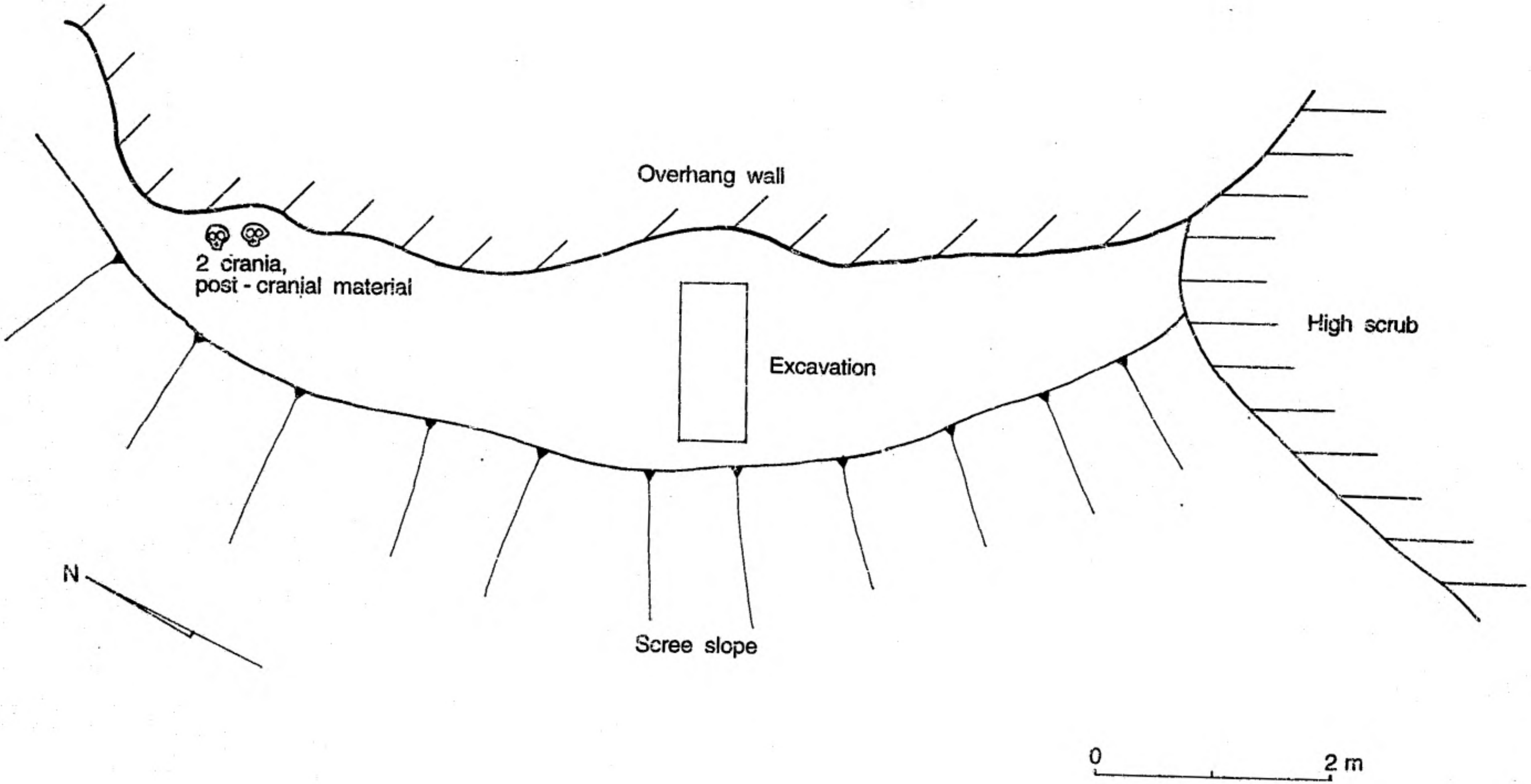
All of the excavated deposit was put through 20 mm and 10 mm sieves, but the amount of cultural material identified in excavation or on the sieves was remarkably slight: 6 flaked stone pieces, 14 human bone fragments, a single pelvic fragment from an unidentified possum species, 3 perforated cowrie shells and an assortment of red ochre fragments constituted the total assemblage from the site. The human remains, which consisted of 6 teeth, 1 distal phalange, 4 cranial fragments and 3 unidentified fragments, were reinterred when the site was backfilled. Two radiocarbon results on charcoal from units 3A and 5A at the LOL site are available, as follows:

ANU-8307 LOL/3a	610 ± 130 BP 780 (**630, 610, 560**) 420 cal BP (95%Pr.)
ANU-8308 LOL/5a	190 ± 70 BP 320 (**280, 170, 150, 10, 0**) m cal BP (99%Pr.)

The apparent inversion of these results is unaccountable but may reflect the generally disturbed character of the site stratigraphy.

If any confidence in the stratigraphic integrity of the site can be maintained, the presence of human remains, cowries and red ochre fragments both above and below the ANU-8307 sample suggests a not inconsiderable antiquity for use of the site as an ossuary and for some continuity in the form of local mortuary ceremony. This may also account for the minimal presence of evidence for other forms of activity at the site: the paucity of flaked stone material and non-human bone suggests that the ceremonial function of the site may largely have excluded use of the site for more mundane activites, at least until the period since contact.

Figure LOL/1: Plan, Embo Egeanda (LOL) site.



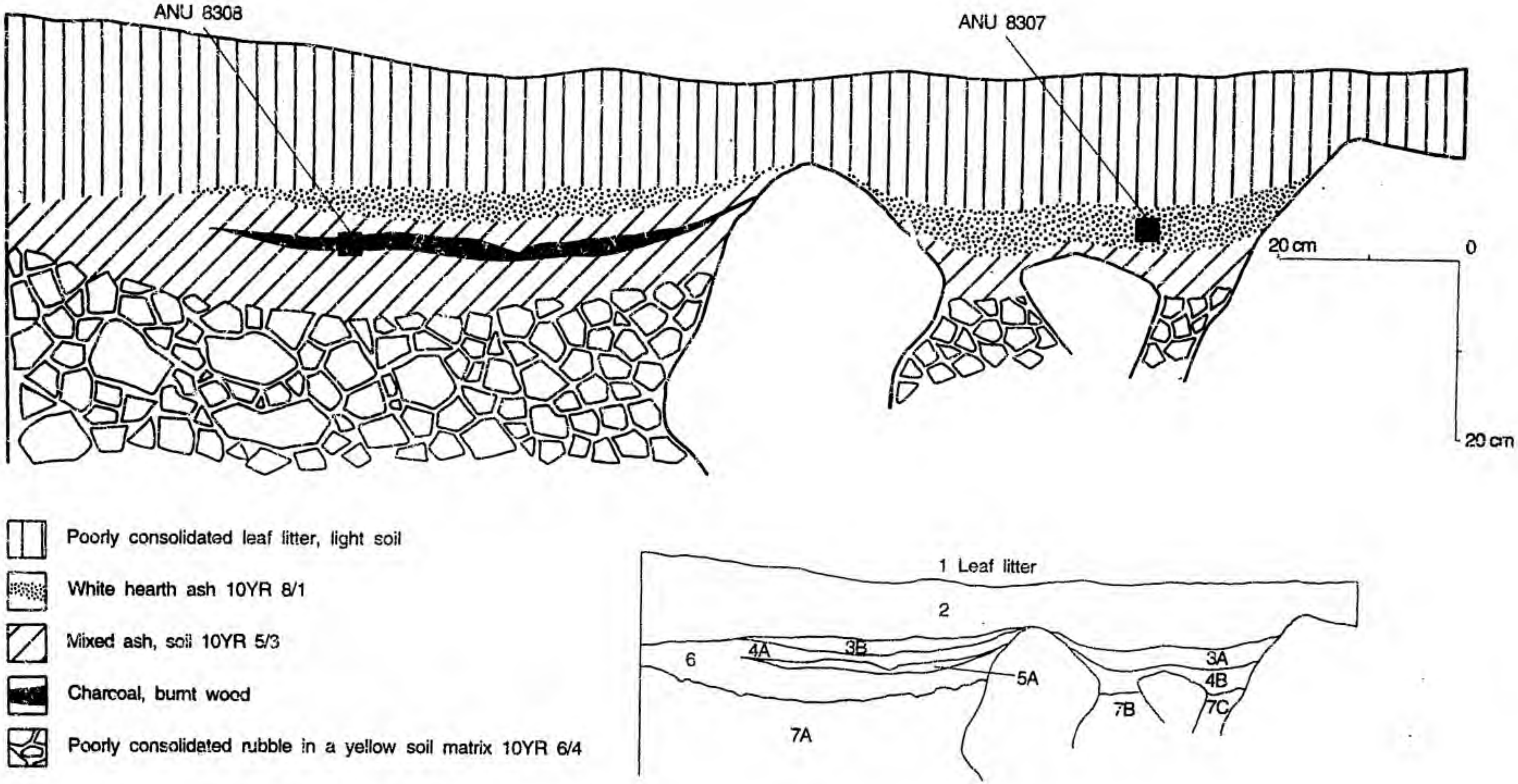


Figure LOL/2: West wall section, LOL excavation.

LOM
ALUYA'S SITE I, DOBANI PARISH, HAEAPUGUA
YU058549

The LOM site was tested as part of a general attempt to identify the history of pig droveway development along the margins of the Haeapugua wetlands; it is named after the block owner, Walubu-Aluya (Dobani *tene*). A 2 x 1 m test pit was opened on a former droveway block, then under long grass fallow and in use as a forage area for pigs. The excavation was terminated abruptly during the first day due to an attack of typhoid and hepatitis which prevented a return visit until 1992, by which time pigs had thoroughly ravaged the site; there is thus no full record of the plan or stratigraphy of the site.

After the grass cover and topsoil had been removed, a layer of dark grey clay was exposed. No internal features could be identified within this layer, which lay directly upon and infilled the surface topography of the basal white clay. Two post or crop holes, infilled with dark grey clay, were distinguished in the surface of the white clay, from one of which the remains of a wooden post were recovered. The absence of a light grey clay at LOM was particularly interesting as it confounded my initial theory that the distinction between the light grey and dark grey clays was largely a function of the difference in their relative proximity to the basal white clay and the extent of admixture between this white clay and the contemporary topsoil. The absence of a light grey clay at LOM thus raised the possibility that the light grey and dark grey clays represented formative processes that were qualitatively, and not simply stratigraphically or temporally, distinct.

LON
ALUYA'S SITE II, DOBANI PARISH, HAEAPUGUA
YU057549

The LON site was tested in an attempt to identify the antiquity of use of swamp margin land for pig droveways (*nogo dugudugu*). The block consisted of a strip of land nominated by the owner as a former pig droveway and currently used as a location for pig huts (*nogo anda*).

Topsoil was stripped back from a 2 x 3 m area, one metre from the *gana* ditch defining the south-eastern side of the block. Test pits in the northern, western and southern corners yielded only gradational changes in the peat stratigraphy, showing an increase in clay with depth. A trench, 30 cm in width, was excavated along the SW and NW sides of the excavation area in order to confirm the stratigraphy identified in the corner test pits. The water table was reached at 40 cm in the northern and western corners and at 28 cm in the southern corner. No features were identified either during excavation or in any of the exposed sections. The excavation was abandoned at this point.

The limited value of this testpit lies in its demonstration of the rapid decline with distance from the current dryland margin in the density of buried ditch or other garden features.

LOO
Tari Gap 1
YU368404

This site consisted of a test pit located in the grasslands of the Tari Gap, 40 m to the southwest of the Highlands Highway, just below the crest of a ridge. A trench was excavated by spade through a small crescentic feature, 160 cm in length, 40 cm wide and partly filled with water but probably drier than usual owing to recent dry conditions. Figure LOO/1 illustrates the section exposed by the trench. A 40 cm peat topsoil contained an olive green tephra at a depth of 10 cm, consisting of a series of small dispersed patches of tephra distributed along a broadly level, but visually indistinct horizon. Beneath this peat was a dark brown carbonised organic layer, 10 cm in thickness; this capped a sequence of clayey volcanic ash bands, varying in colour from white to dark brown and similar to the basal white clay sequence recorded in many of the Haeapugua basin sites, which extended to the base of the profile at a depth of 100 cm, and included, between 80 and 85 cm, a 5 cm layer of tephra. Four samples were taken from the section; of these one sample (LOO/a), from the centre of the dark brown carbonised organic layer, was submitted for radiocarbon dating, yielding the following result:

ANU-8758	LOO/a	8290 ± 90 BP
		9400 (**9260**) 9140 cal BP (69%Pr.)

This date, which marks the initiation of local peat formation, is taken to represent the onset of anthropogenic fire disturbance in the immediate area of the site.

LOP
Tari Gap 2
YU371404

A section from a second sunken feature in the Tari Gap, immediately opposite site LOO on the north-eastern side of the Highlands Highway, is located in grassland approximately 130 m from the road and 100 m from the forest margin. Figure LOP/1 illustrates the section, showing a similar sequence to that of site LOO. The LOP section reveals a deeper peat topsoil of 46 cm, containing a thin band of olive green tephra between 13 cm and 16 cm, and capping a sequence of banded white and brown clays. The green tephra was sampled, but no samples for dating were taken.

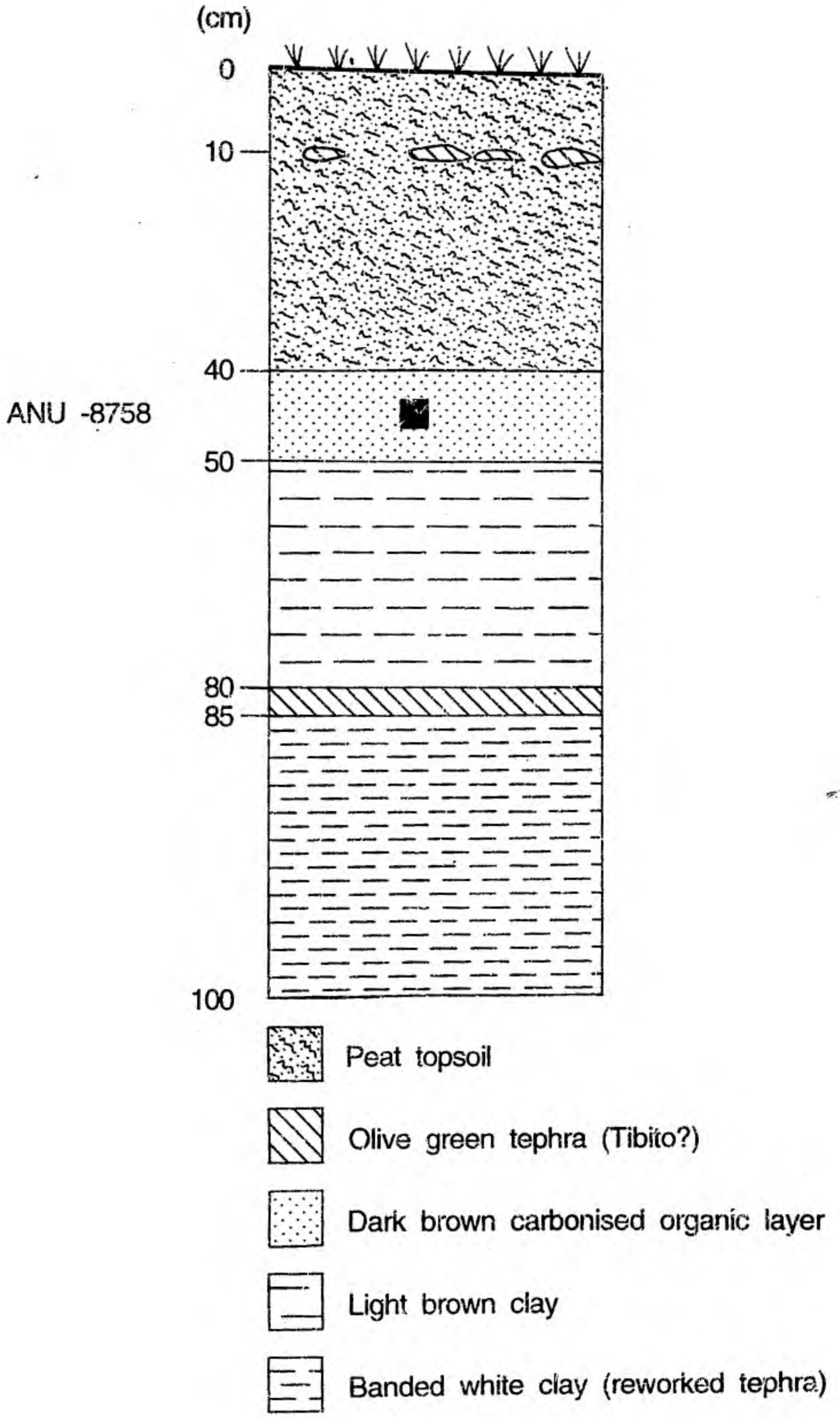


Figure LOO/1: LOO site section.

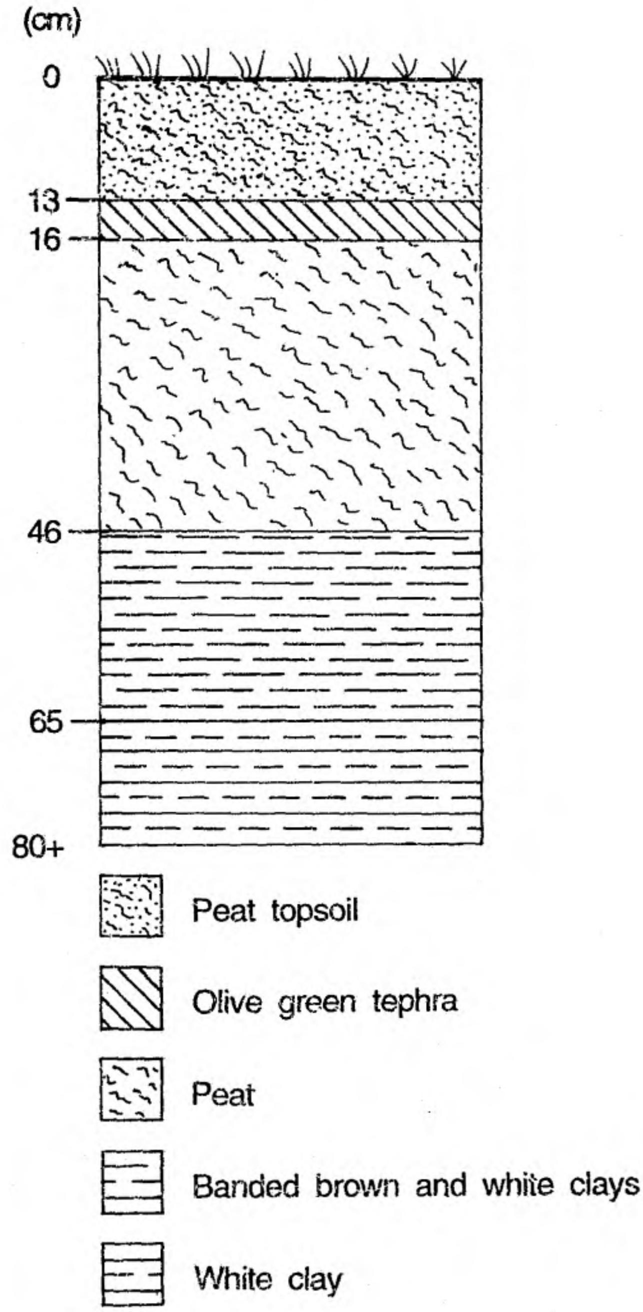


Figure LOP/1: LOP site section.

LOQ
WAYA EGEANDA, LEBANI
XU794655

The cave site of Waya Egeanda consists of a single chamber, some 60 m in length. The entrance to the cave, 3 m in width and 9 m in height and at an altitude of 2360 m, is perched at the head of a small talus slope in one of the numerous side-valleys along the eastern margins of the Lebani basin. From a 2 m-high raised lip at the cave mouth, a dry and fairly level floor extends back towards a small pool in the rear of the cave.

A small test pit, 30 cm x 30cm in area, was dug 120 cm from the cave entrance, on the entrance side of the raised lip. This exposed deposit to a depth of 40 cm, from which three samples were collected for dating. No artefacts were identified within or recovered from the test pit. The stratigraphy, illustrated in Figure LOQ/1, consisted of a 20 cm cover of light brown friable soil, presumed to be a mixture of soil and bat guano, overlying a thin layer of soil, similar in texture but darker in colour and impregnated with charcoal. Beneath this, a further layer of lighter brown soil capped a second layer of dark, charcoal-rich soil. Intruding into this second darker soil layer was a tapering lens of white ash. Beneath 34 cm, the deposit consisted of an apparently sterile yellow soil, composed of degraded limestone; no effort was made to explore the depth of this yellow soil, which may cap further cultural deposits. Plans to return to the Lebani valley and to excavate the site late in 1991 were abandoned after illness.

Two samples were submitted for radiocarbon dating, yielding the following results:

ANU-8808 LOQ/b   1230 ± 180 BP
1420 (**1160**) 770 cal BP (98%Pr.)

ANU-8809 LOQ/c   300 ± 210 BP
560 (**310**) m cal BP (98%Pr.)

Within so narrow a test pit, the scope for interpretation is obviously limited, though apparent continuity in the charcoal-impregnated soil from which ANU-8808 is derived suggests that the white ash source of the ANU-8809 sample may be intrusive, with slumping of the soil subsequent to the deposition of the white ash. Nevertheless, ANU-8808 provides a minimum date for exploration and occupation of the high-altitude Lebani valley.

Immediately above the raised lip, 7.6 m from the entrance of the cave, there is a small panel of rock art on the northern wall of the cave. The panel, which is positioned 1.15 m directly above the floor of the raised lip, is 55 cm in width and 80 cm in height. The wall material is a soft calcareous deposit covered in a film of mould. The art consists of a number of parallel series of finger-flutings, broadly similar to those recorded at the Kalate Egeanda (LOT) site, though less distinct. An attempt at a photographic record of the art without the benefit of flash proved unsuccessful; a sketch of the art is reproduced here as Figure LOQ/2.

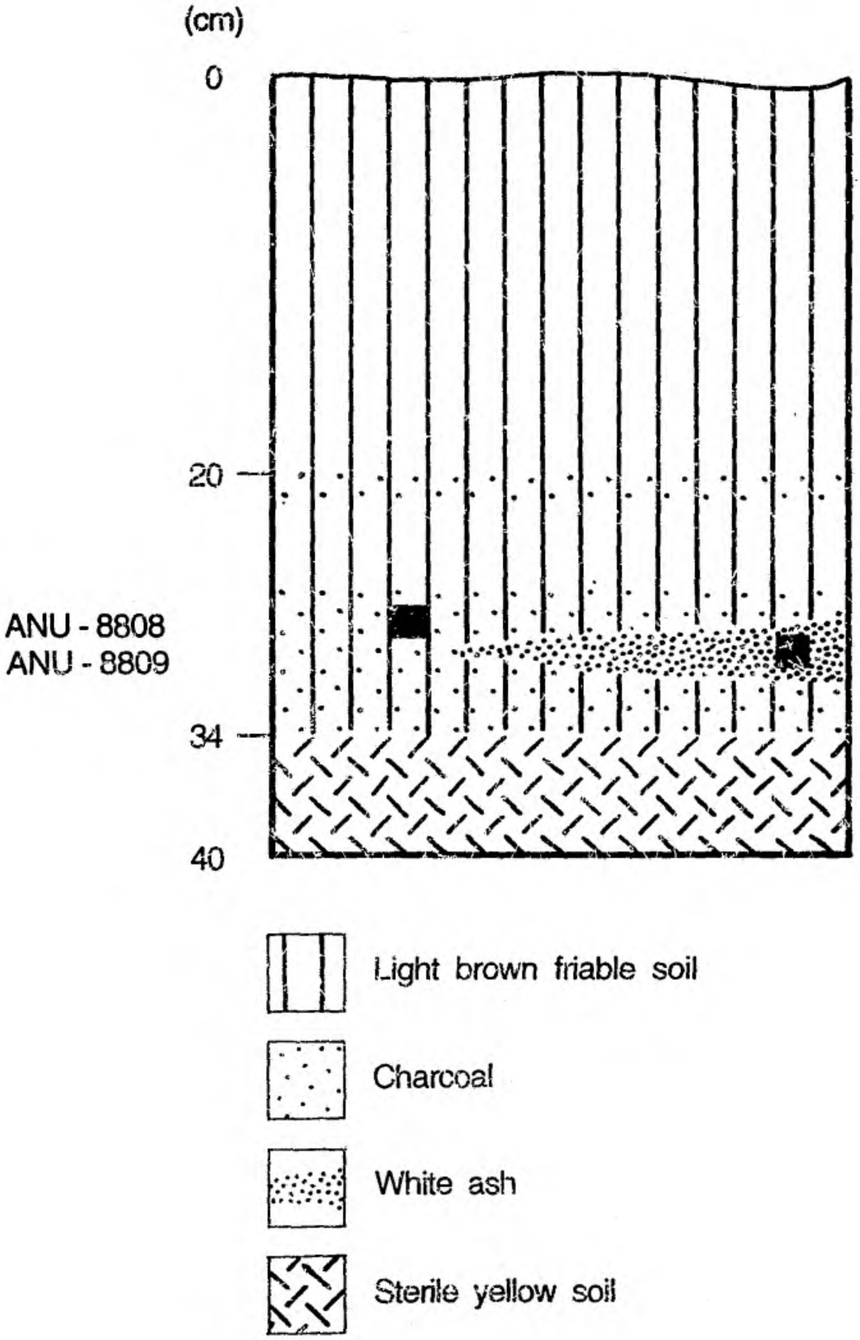


Figure LOQ/1: Test pit section, Waya Egeanda cave.

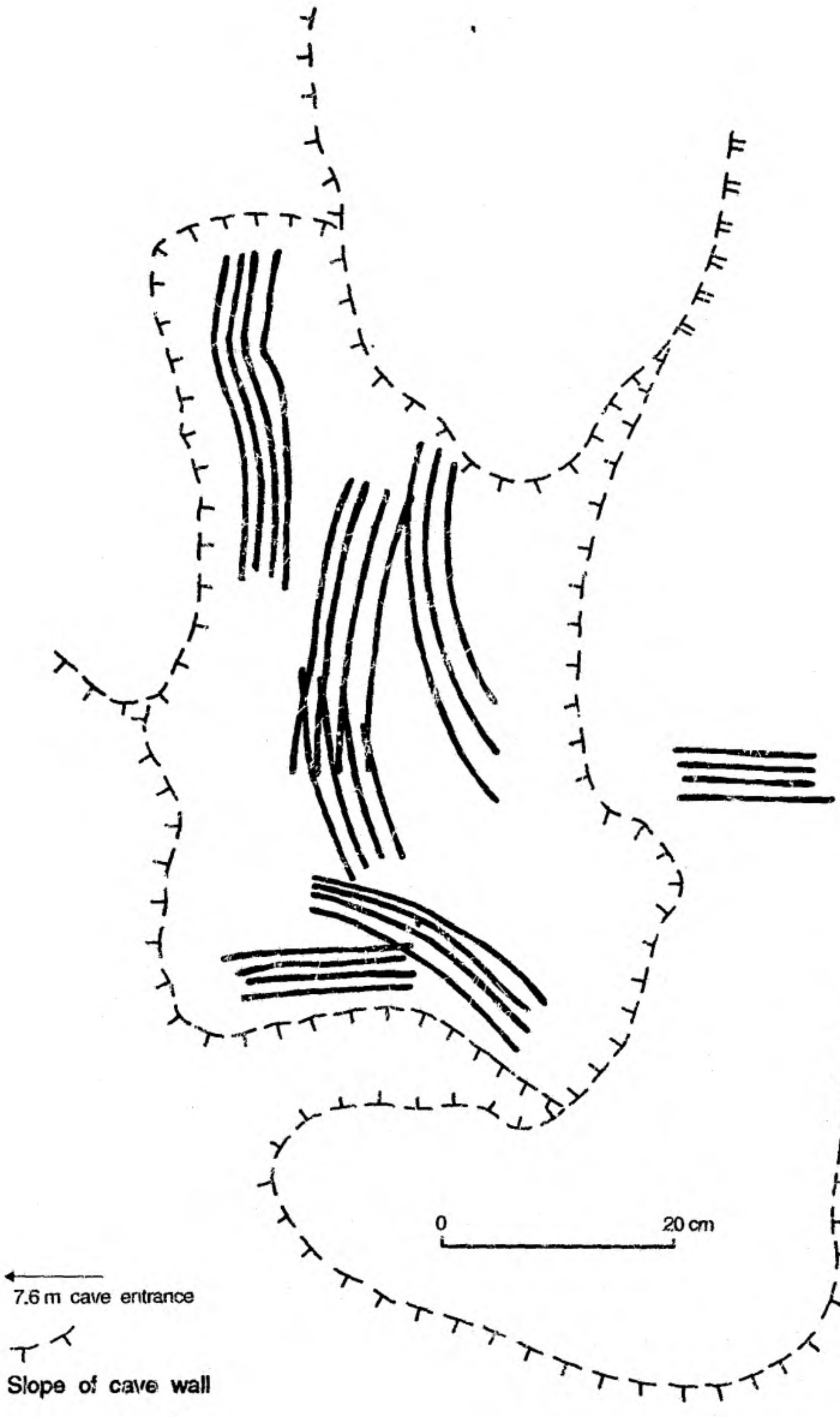


Figure LOQ/2: Digital fluting cave art, Waya Egeanda cave.

LOT
KALATE EGEANDA, ARUA PARISH, HAEAPUGUA
YU025576

[Text adapted from Ballard 1992a]

Kalate Egeanda is a large chamber cave located in Arua parish, in the Munima hills along the northern margin of Haeapugua swamp. Possibly the chamber represents a former channel for the Tagali river, before it assumed its current course. Kalate is the focus of a number of local tales, the most popular being that it runs beneath the Tagali river, appearing at an undisclosed location on the north bank. Clans on the south bank of the Tagali have long suspected individuals from the north bank of using the cave to steal pigs and drive them back, unseen, beneath the river. A relatively modern myth, this tale is more an indication of the grudging respect for the courage and wiliness of thieves, than an account of familiarity with the cave. Few, if any, older Huli could claim any knowledge of the interior of Kalate Egeanda.

The entrance to the cave is a large dry walk-in rift, 20 m from the Tagali river. There has been no mapping of the cave, but successive visits have established that it consists of a single, largely dry, main passage, which runs parallel to the Tagali river for about 400 m. Numerous side chambers have been inspected, but have all proved to be blocked at short distances from the main chamber. The main chamber, which forks and reforms at several points, finally terminates in a maze of small passages, one of which leads to the surface via a tight chimney, 4 m in height (Dyke n.d.). Minor streams are found in some of the lower passages, and light inflows of water from the ceiling at several locations, presumably the inspiration for the stories about the cave passing beneath the Tagali river, have formed a number of small pools.

A panel of rock art, first recognised during a visit to the cave in October 1989 but recorded later, in November 1990, is located approximately 200 m from the entrance, on the wall of a dry, stranded fork. The floor directly beneath the art is in the process of collapsing into a lower chamber with an active stream, and no floor deposit could be found in the immediate vicinity of the art. A small 100 cm-wide area of soft calcite deposit or *montmilch*, deposited in solution from a now-dry dripline along the ceiling, appears to have been selected deliberately for the art.

The art consists largely of a single panel, 85 cm high and 45 cm wide (Figure LOT/1), the base of which stands approximately 110 cm from the former floor surface and approximately 350 cm above the floor of the lower chamber. A further single set of three short digital flutes running parallel to the floor beneath the main panel is not depicted in Figure LOT/1. Linear gouges, in parallel sets of three or four, converge towards the base of the panel. Marked indentations at the top of each parallel set of gouges suggest that the fluting was performed with a downwards motion. Some superposition is evident, particularly in the centre of the panel, and variation in the weathering of these cross-cutting sets suggests that the gouges were not produced in the course of a single event.

The gouges are well-preserved, the only defacement of the panel known in 1990 being two small sets of trial impressions, in softer deposits on either side of the panel, made in 1989 (one of these is shown in the lower left corner of Figure LOT/1). Although the deposit around the panel is fairly soft, the interline ridges created by the gouges have undergone dessication, leading to a considerable hardening of the entire gouged area. Shrinkage in the width of the original gouges is presumed to reflect the subsequent reprecipitation of carbonates over the panel's surface which has infilled the gouges with precipitate.

The form, length, and variation in number of the gouges correspond strongly with similar marks ascribed to human agency at southern Australian cave art sites (Bednarik 1986). Bednarik's (1991) critical distinctions between natural and human cave markings are acknowledged but no obvious non-human explanation for marks of this nature, within a limited area on the wall of a large chamber, can be found at Kalate Egeanda. Some broad conclusions about the possible antiquity of the art and further comparison with similar art at Australian sites are provided in Ballard (1992a).

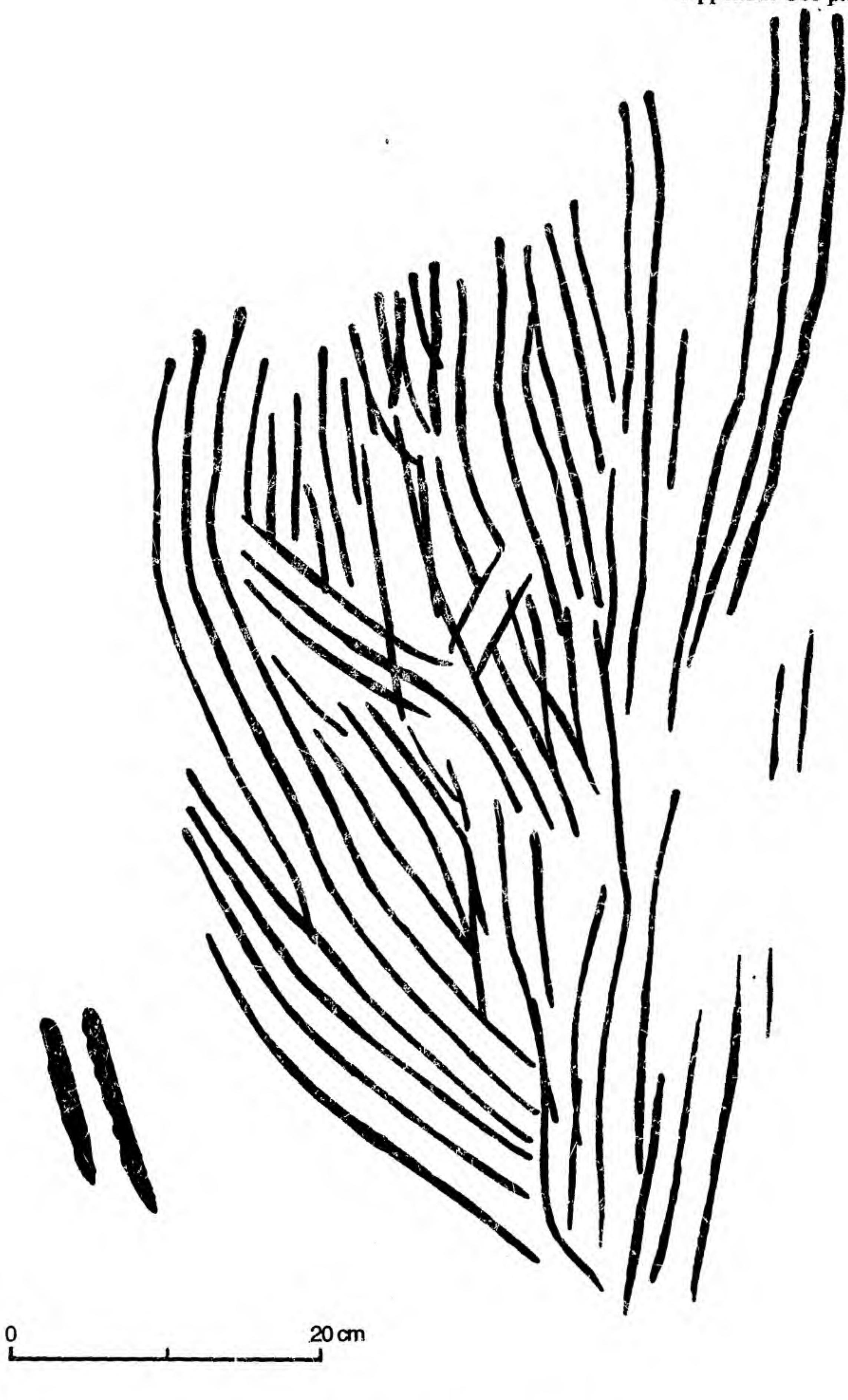


Figure LOT/1: Digital fluting cave art, Kalate Egeanda cave.

LOU
MBUGUA'S SITF, TANI (TAIBAANDA) PARISH, HAEAPUGUA
YU062533

This site is located in a reclaimed wetland garden along the Tereba river levee in Haeapugua swamp, on land owned by Ngoari-Mbugua (Tani Wangane *tene*). The intention in excavating at this location was to obtain a date for the development of the Tereba levee and thus for the channelling of the Tereba river through the wetland centre. Poor visibility due to vegetation regrowth and the closeness of the water-table to the surface prevented any systematic survey for earlier features along the faces of existing drains. Enquiries amongst the owners of garden blocks on the Tereba levee revealed that no-one had seen evidence for early ditches exposed during recutting of the current drain network, though all were aware of such features along the wetland margins. Within an area indicated by the landowner, approximately 40 m from the Tereba river channel, a 2 x 1 m testpit was excavated in July 1991. Although the testpit was located within the driest part of the garden, the water-table was reached at a depth of only 45 cm, at which point the landowner declined permission to proceed further.

No clear breaks were discerned in the stratigraphy of the testpit, nor were any features identified. The stratigraphy consisted of a light cover of topsoil developed upon a light brown silty clay loam, slightly sticky with weakly developed peds, which extended to the base of the pit where it was increasingly subjected to oxidation and gleying (Figure LOU/1). The silty clay loam, identified by Mbugua as *mu* ("sand, silt"), is regarded as an exceptionally rich soil for most crops. The oxidised soils are described as *hagua dindi*, or *hagua* where fully gleyed. Soil pH at 10 cm was 5.

A lens of dispersed charcoal between 40 cm and 45 cm was sampled and submitted for ^{14}C dating, yielding the following result:

ANU-8310 LOU(i)/b	410 ± 270 BP 770 (**490**) m cal BP (100%Pr.)

While the result is broadly suggestive of the general recency of the sample, the extension to the modern period of the range at two standard deviations renders the date unusable for any more precise determination.

A second visit was made to the LOU site in October 1992 in the (unfounded) hope that the general water-table might have lowered sufficiently to extend the depth of the 1991 test-pit. Instead, a much deeper profile (designated as the LOU(ii) site) was examined; this was exposed at the end of a freshly recut "blind" drain, forming the eastern side of the same garden block and abutting directly onto the banks of the Tereba channel. The form of the drain is itself significant, suggesting that the Tereba actually contributes little to local drainage within the swamp, landowners preferring to drain water from their levee blocks <u>away</u> from the Tereba to other *iba puni* drains running parallel to the Tereba channel and articulating with the Tereba along its lower reaches.

The stratigraphy exposed at LOU(ii) is illustrated in Figure LOU/2. The profile consists of three units: an upper silty clay loam (Unit 1) divided from an increasingly plastic basal silty clay (Unit 3) by a distinct 80 cm layer of sandy silt (Unit 2). A sharp, even break separates Units 1 and 2, while the boundary between Units 2 and 3 is distinct but wavy. Evidence for oxidation increases with depth through the profile, which extends approximately 30 cm below the current watertable. The intermediate sandy silt I interpreted in the field as marking the base of the Tereba levee, with the basal silty clay indicating the presence of an inwash fan extending from the former mouth of the Tereba channel on the swamp margins. Unit 1 is taken to represent the formation of the levee along the channelled course of the Tereba.

Three charcoal samples were extracted from the freshly cleaned face of the LOU(ii) drain at the points indicated on Figure LOU/2. Samples LOU(ii)/b and

LOU(ii)/c were submitted for radiocarbon dating; the carbon content of LOU(ii)/c proved too small for dating, but LOU(ii)/b was re-submitted for an AMS resolution for which the following result was obtained:

ANU-8757 LOU(ii)/b	410 ± 90 BP
(AMS 442)	560 (490) 280 cal BP (99%Pr.)

If the interpretation of the profile given above is correct, the channelling of the Tereba river and the development of the levee at this point along the channel must post-date this result.

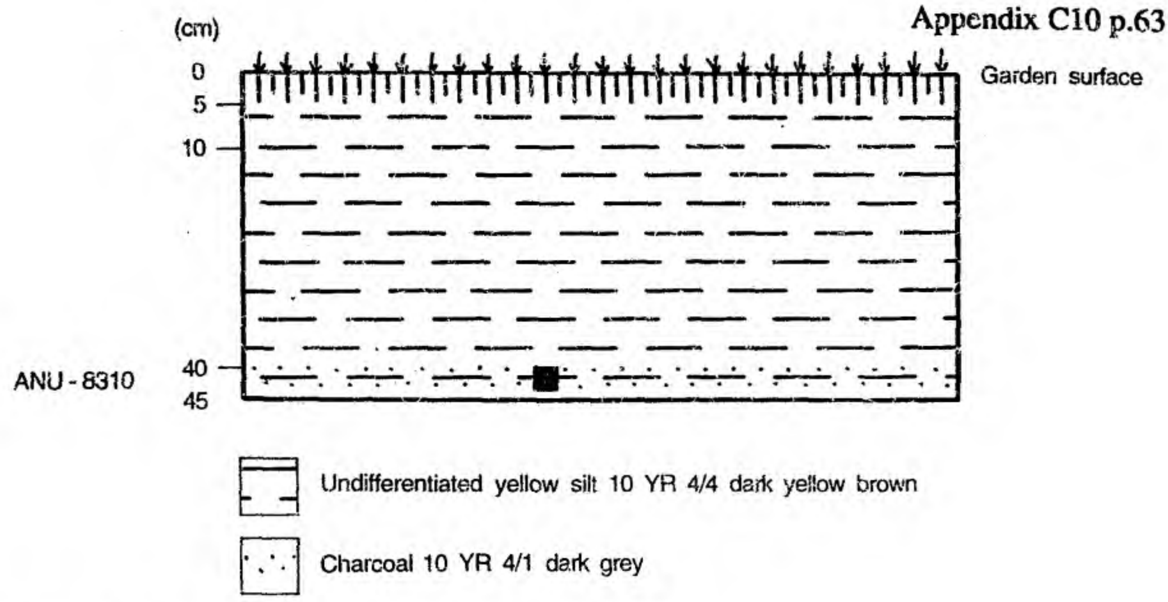


Figure LOU/1: Schematic section of excavation.

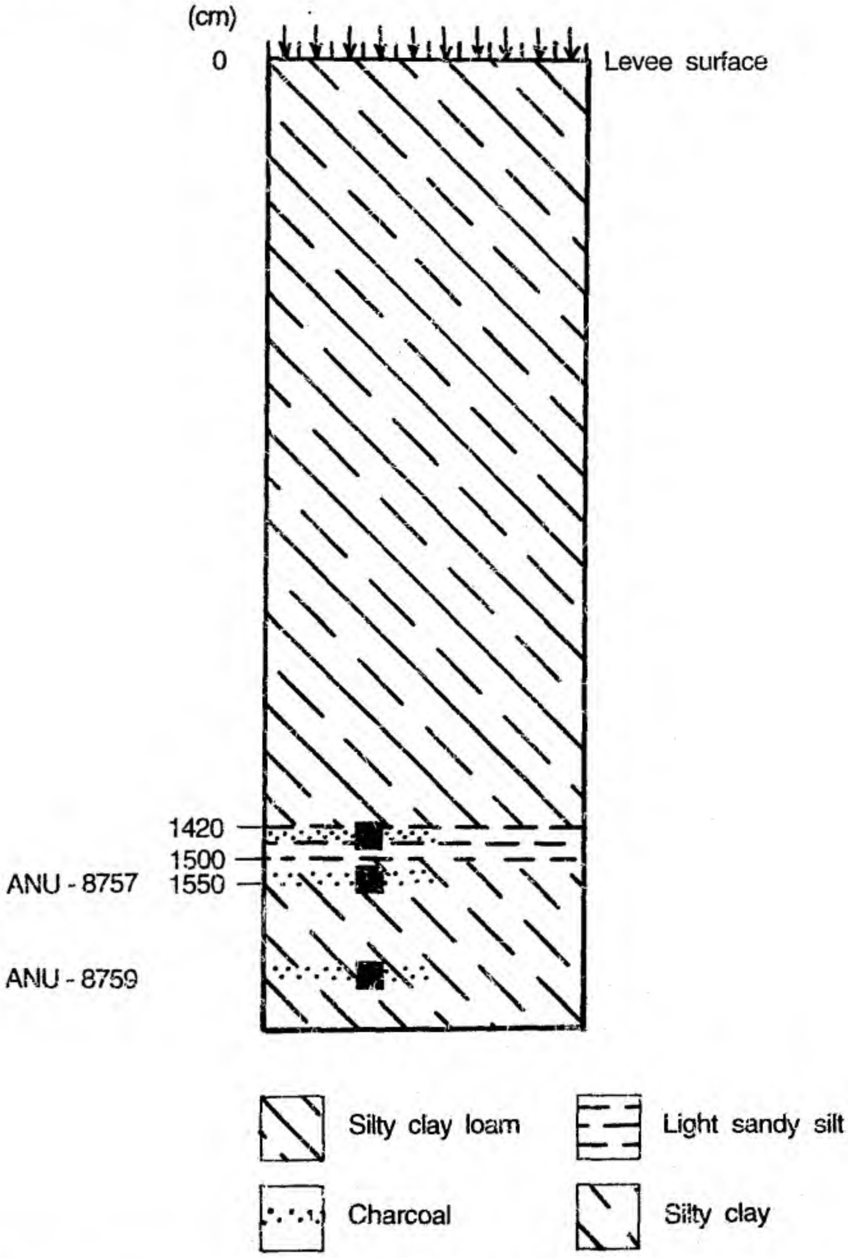


Figure LOU/2: Schematic section of ditch, LOU site.

LOW
SITE 1, ABIMA-YOKONA TRACK, STRICKLAND VALLEY
XV476175

A small panel of painted rock art located on a vertical bluff of unconsolidated material, facing the Strickland river at 330 degrees, at an altitude of exactly 1000 m. The site lies directly along the current foot track leading between the Abima valley to the north and the Yokona valley to the south. Fourteen separate designs, all painted in red ochre, were identified, though most were too poorly preserved for their form to be distinguished. Figure LOW/1 illustrates those designs clear enough to be recorded.

LOX
SITE 2, ABIMA-YOKONA TRACK, STRICKLAND VALLEY
XV475184

This rock art site was reported to me as similar in content to LOW, but was not visited. Apparently it lies on the route of the former track between Ambi and Yokona, lower down on the slope than the current track and the LOW site.

LOY
SITE 3, ABIMA-YOKONA TRACK, STRICKLAND VALLEY
XV474169

Also located above the Strickland river on the Ambi-Yokona track, at an altitude of 1070 m, this site consists of two large adjacent limestone outcrops, 3 m apart at the closest point. Both offer large sheltered areas facing the valley; both floor areas appeared to contain at least some deposit and bore traces of recent use in the form of hearths. The northernmost of the two outcrops has at least nine separate designs painted in red ochre on the back wall of the overhang. All were very weathered, but it was possible to differentiate between two distinct shades of red, one lighter and the other darker. Figure LOY/1 illustrates the clearest of the designs; Design (i), like Design (ii) at the LOW site, appeared to exploit the full length of a smooth area of surface.

Not drawn to scale.

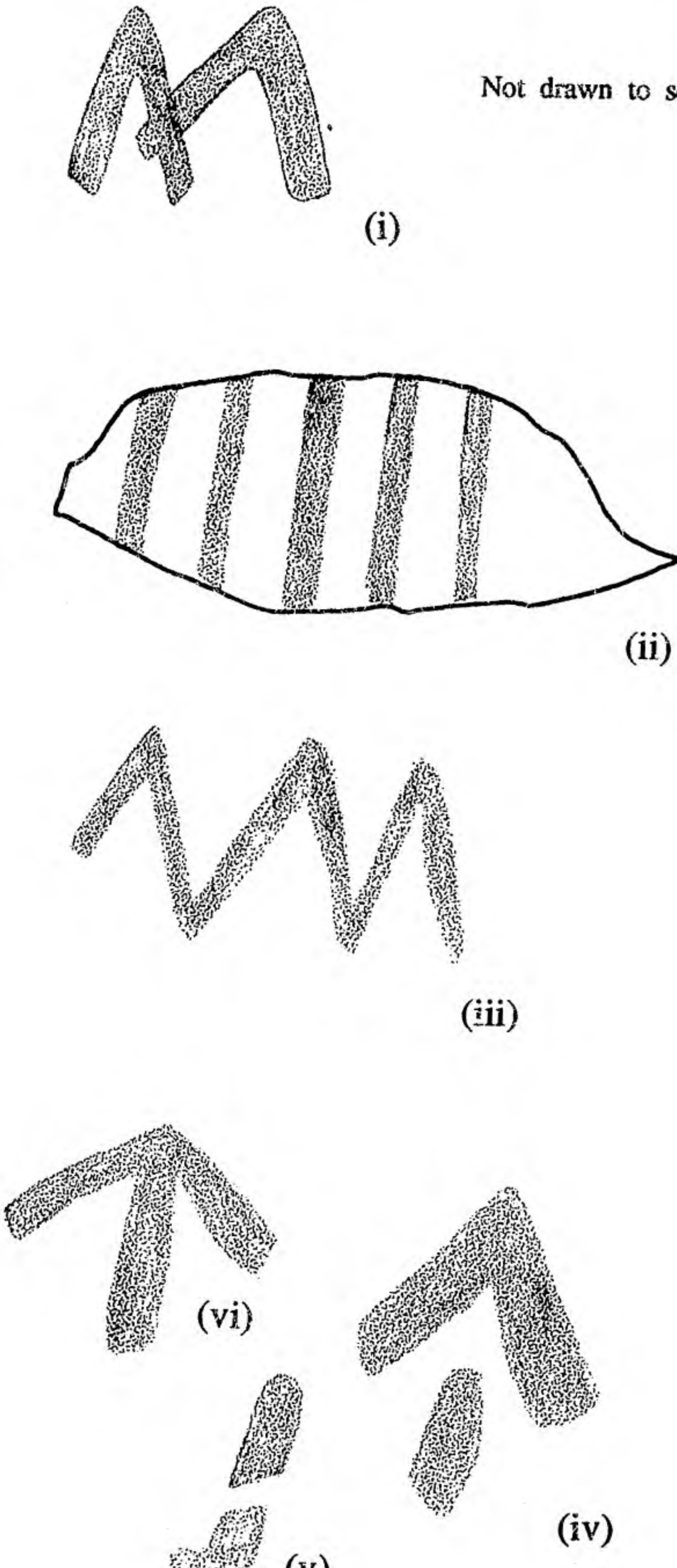


Figure LOW/1: Rock art designs, Strickland site 1.

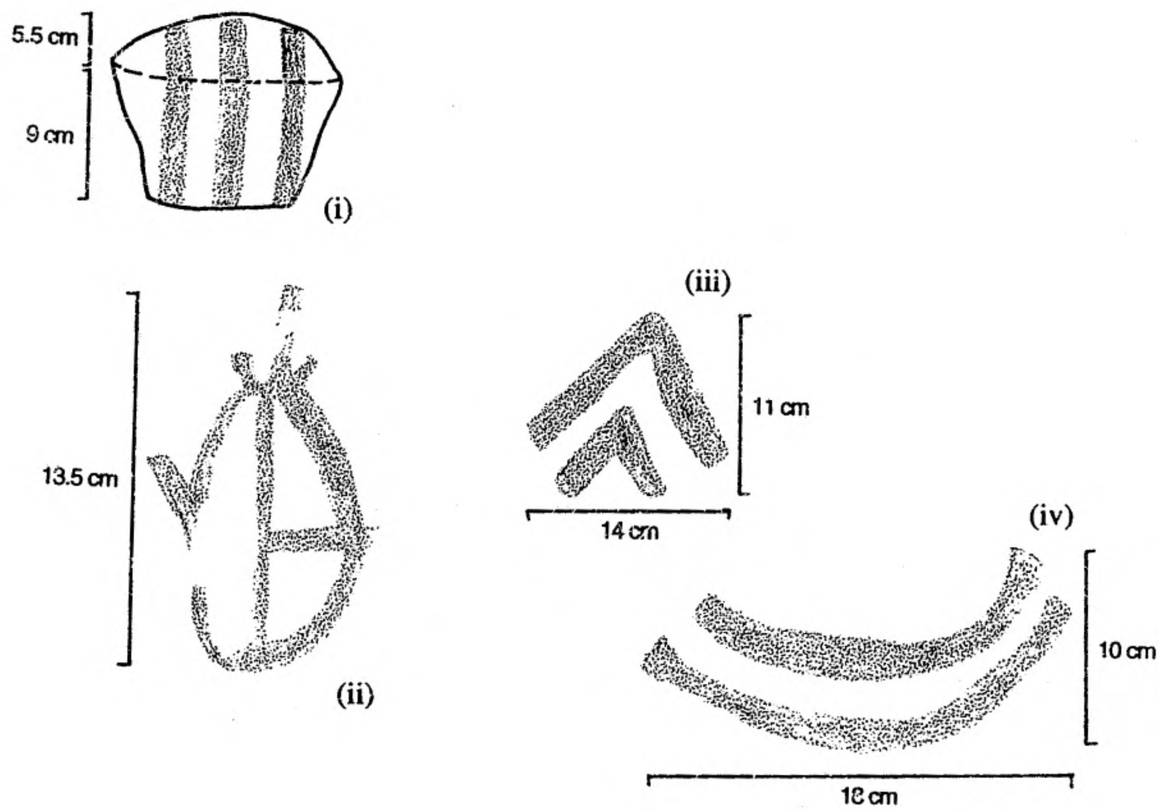


Figure LOY/1: Rock art designs, Strickland site 3.

LSH
GARDEN 10, WALOANDA, TANI (TAIBAANDA) PARISH, HAEAPUGUA
YU061546

In the course of surface surveys in the Waloanda area of Haeapugua (C3.2), an unusual flaked tool formally resembling an axe blade was collected; the tool is illustrated in Figure LSH/1. The heavy degree of patination over the full surface of the tool (with the exception of a single, fresher scar) is suggestive of an antiquity for its production considerably in excess of that of most of the other artefacts collected in the Haeapugua basin. On the basis of a hand inspection, the material of the artefact appears to be a vesicular rhyolite (J.Chappell pers.comm.). A brief microscopic inspection of the tool by Tom Loy of the Australian National University revealed heavy traces of black residue, possibly resin, along the central spine of the tool. Starch grains between 3 and 7 microns in width were identified, both imbedded in the black residue and in great quantity along the working edge of the tool. Heavy crushing along the longer sides of the tool suggests deliberate blunting to improve the grip of a haft. The narrow width of the exposed blade inferred from the extent of the haft blunting, combined with the presence of a large single flake scar along the face of the working edge, imply that the tool had approached the end of its use life in terms of its original intended function. Wholly flaked axe blades are highly unusual in contexts from New Guinea post-dating 6000 BP, after which point the working edges, if not the entire blade, are almost universally ground. A late Pleistocene / early Holocene date is tentatively proposed for this artefact, though its find context may not match the original act of deposition, given the propensity of Huli and other Highlanders for re-employing unusually formed stones in ritual contexts.

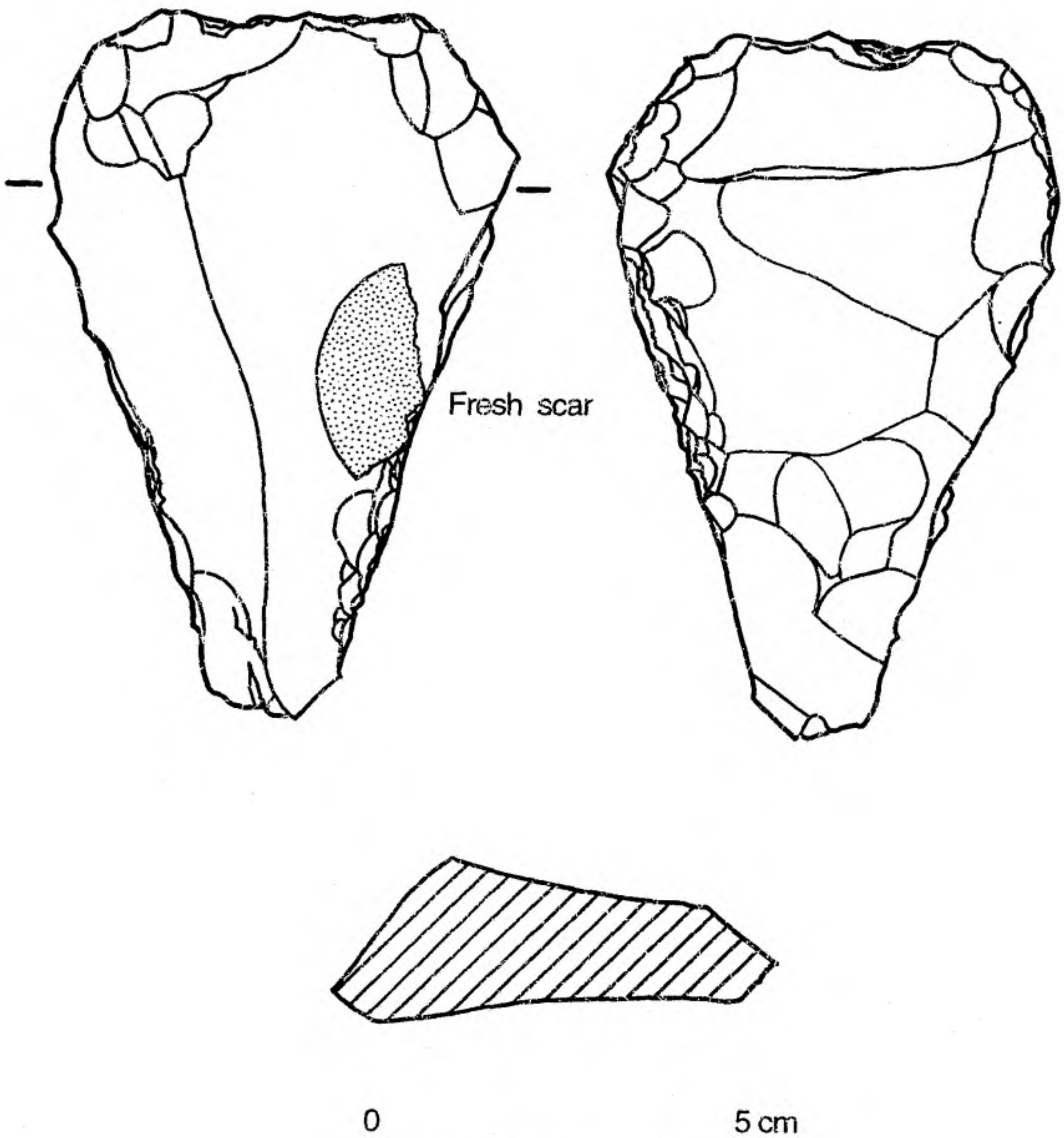


Figure LSH/1: Tanged blade, Waloanda Garden 10 (LSH site).

APPENDIX C11

RADIOCARBON RESULTS FROM THE TARI AND LAKE KOPIAGO REGIONS

This list provides details of most of the known ^{14}C determinations from the Taro and Lake Kopiago regions. The results from my own field research are all the ANU dates beginning with ANU-7623, except for ANU-8270 to ANU-8272; sources for all other results, which have been calibrated for this list, are given in the list. Calibrated dates (cal BP) are provided, using the CALIB rev.3.0.3 program, with none of the special options applied (Stuiver and Reimer 1993a, 1993b); a note on this procedure is attached below the results.

Lab. code	Sample code	^{14}C age BP	Cal age BP (2 S.D.)	%Pr	Material	Location and source
Gak (Gakushuin):						
2826	TE/5	32,700±900	-	-	Peat	Telabo palaeoecological site (Williams et al. 1972).
NSW (University of New South Wales):						
100	Kami 1	430±110	650 (**500**) 280	99	Charcoal	Ditch fill, Lake Kopiago (White 1974).
SUA (Sydney University):						
697	-	780±95	910 (**670**) 630	90	Wood	Blong (1979).
1275	AM/1/b	840±80	920 (**730**) 660	100	Wood	Urupupugua (B.Allen pers.comm.).
1276	AM/1/a	715±80	780 (**660**) 540	100	Wood	Urupupugua (B.Allen pers.comm.).
1279	PE/1/a	6655±105	7650 (**7520, 7500 7480**) 7330	98	Wood	Urupupugua (B.Allen pers.comm.).
1280	PE/1/b	10,025±130	12,070 (**11,330, 11,300, 11,220, 11,170, 11,130**) 10,990	100	Tree seeds	Urupupugua (B.Allen pers.comm.).
1280x	PE/1/b	9685±130	11,100 (**10,940**) 10,360	99	Tree seeds	Urupupugua (B.Allen pers.comm.).

Lab. code	Sample code	^{14}C age BP	Cal age BP (2 S.D.)	%Pr	Material	Location and source
ANU (Australian National University):						
231	PUR/2	38,600+2500-1900	-	-	Wood	Pureni megafauna site (Williams et al. 1972).
1347	H2/1	4730±80	5620 (**5560, 5460, 5340**) 5290	99	Organic mud	Powell core (Haberle 1993:168).
1348	H2/2	8930±110	10,080 (**9930**) 9570	100	Organic mud	Powell core (Haberle 1993:168).
7194	-	16,640±250	20,370 (**19,600**) 19,000	100	Organic	Haeapugua 6 (Haberle 1993:179).
7195	-	12,860±250	15,960 (**15,210**) 14,440	100	Organic mud	Tugupugua (Haberle 1993:222).
7235	-	630±60	670 (**640, 600, 570**) 530	100	Peat	Haeapugua 5 (Haberle 1993:179).
7237	-	1700±210	2080 (**1570**) 1230	99	Peat	Tugupugua (Haberle 1993:222).
7238	-	5750±80	6740 (**6530**) 6400	99	Organic mud	Tugupugua (Haberle 1993:222).
7239	-	9290±190	10,900 (**10,290, 10,250, 10,220**) 9950	100	Organic mud	Tugupugua (Haberle 1993:222).
7240	-	1080±160	1280 (**970**) 700	100	Peat	Aluaipugua (Haberle 1993:244).
7370	-	16,990±180	20,720 (**20,090**) 19,530	100	Organic mud	Haeapugua 6 (Haberle 1993:179).
7371	-	890±80	930 (**780**) 670	100	Organic mud	Haeapugua 6 (Haberle 1993:179).
7372	-	2860±100	3220 (**2950**) 2770	99	Peat	Haeapugua 6 (Haberle 1993:179).
7373	-	8340±150	9600 (**9370**) 8950	98	Peat	Haeapugua 6 (Haberle 1993:179).
7368	-	7970±160	9240 (**8940, 8900, 8890, 8880, 8820, 8790, 8730**) 8410	100	Peat	Haeapugua 6 (Haberle 1993:179).
7369	-	11,270±100	13,430 (**13,180**) 12,960	100	Peat	Haeapugua 6 (Haberle 1993:179).
7623	LOA/c	10,980±590	14,250 (**12,900**) 10,980	100	Charcoal	cf. Appendix C10.
7624	LOF/a	1240±60	1280 (**1170**) 1060	95	Charcoal	cf. Appendix C10.
7625	LOE/a	1400±70	1420 (**1300**) 1160	99	Charcoal	cf. Appendix C10.
7800	LOJ/a	2390±230	2940 (**2350**) 1880	100	Organic	cf. Appendix C10.
7801	LOJ/b	15,820±140	19,040 (**18,710**) 18,400	100	Organic	cf. Appendix C10.
7802	LOJ/c	17,660±150	21,550 (**21,040**) 20,490	100	Organic	cf. Appendix C10.
7803	LOH/a	m	-	-	Charcoal	cf. Appendix C10.
7804	LOH/b	190±80	320 (**280, 170, 150 10, 0**) m	96	Charcoal	cf. Appendix C10.

Lab. code	Sample code	^{14}C age BP	Cal age BP (2 S.D.)	%Pr	Material	Location and source
7805	LOH/c	m	-	-	Charcoal	cf. Appendix C10.
7806	LOI/a	2050±210	2500 (**1990**) 1520	98	Charcoal	cf. Appendix C10.
7807	LOB(ii)/a	410±170	660 (**490**) 240	83	Charcoal	cf. Appendix C10.
7808	LOC/a	540±90	670 (**540**) 430	95	Charcoal	cf. Appendix C10.
7809	LOC/b	15,210±370	18,840 (**18,130**) 17,340	100	Charcoal	cf. Appendix C10.
8270	-	4380±80	5090 (**4960, 4950, 4880**) 4830	78	Peat	Haeapugua 6 (Haberle 1993:179).
8271	-	880±70	920 (**770**) 680	100	Peat	Tugupugua (Haberle 1993:222).
8272	-	16,970±130	20,590 (**20,060**) 19,590	100	Organic mud	Aluaipugua (Haberle 1993:244).
8307	LOL/3a	610±130	780 (**630, 610, 560**) 420	95	Charcoal	cf. Appendix C10.
8308	LOL/5a	190±70	320 (**280, 170, 150 10, 0**) m	99	Charcoal	cf. Appendix C10.
8310	LOU(i)/b	410±270	770 (**490**) m	100	Charcoal	cf. Appendix C10.
8754	LOJ/d	440±200	690 (**500**) 50	95	Charcoal	cf. Appendix C10.
8755	LOJ/e	1210±90	1280 (**1130, 1110, 1090**) 960	100	Charcoal	cf. Appendix C10.
8756	LOJ/f	1210±310	1710 (**1130, 1110, 1090**) 630	99	Charcoal	cf. Appendix C10.
8757	LOU(ii)/b	410±90[a]	560 (**490**) 280	99	Charcoal	cf. Appendix C10.
8758	LOO/a	8290±90	9400 (**9260**) 9140	69	Organic	cf. Appendix C10.
8808	LOQ/b	1230±180	1420 (**1160**) 770	98	Charcoal	cf. Appendix C10.
8809	LOQ/c	300±210	560 (**310**) m	98	Charcoal	cf. Appendix C10.

a AMS date
m Modern result (1955 or later)
%Pr. Relative contribution to probability at two standard deviations.

Notes on radiocarbon dating and calibration

All samples with radiocarbon ages younger than 18,360 BP have been calibrated using the CALIB rev.3.0.3 program (Stuiver and Reimer 1993a, 1993b). Calibrated ages are given BP, with age ranges at two standard deviations obtained using the probability distribution method (Method B) of the CALIB program. For each sample, the median intercept calibrated age is given in bracketed **boldface**. Following the procedure suggested by Stuiver and Reimer (1993a:12), calibrated ages have been rounded to the nearest ten years (all of the samples listed having standard deviations greater than 50 years); ages that end in a 5 have been rounded "up" to 10. An age of 695 cal BP is thus given as 700 cal BP. No correction factor for Southern Hemisphere atmospheric samples has been applied (Stuiver and Reimer 1993a:20; Option K).

LIST OF NARRATIVES

NARRATIVE B1 - Ni and Hana (The Sun and the Moon)

Bari-Wayama (Yumu), 13.9.89, 89/1A:49-119

Agali mbira iba Tagali o piyago ni iba unu pumaro bidagoria iba dadabu balu hene.
There was a man at the Tagali river, draining the water down to its base.
Iba dadabu balu hearia tia irini mbira yalu ibiyaria hendene.
As he drained the water, he saw possum fur floating on it.
Obagoni ibu mo nene mo nalu berearia dendebiyagola hendene.
He took this and ate it and found it tasty.
Dendebiyagola hondowa udu iba tigida handama iraga halu berearia udu ibatigida yalu ibuabo hayagola monama nama ibuabo hene.
It was tasty, so he followed the river upstream and found more fur, which he took and ate as he went.
Nama iba tigida ibuabo halu berearia udu Tagali nai ore Hewai pugu layago howa udu handa daga halu berearia udu mane nayalu ibi.
Taking and eating thus, he came up the Tagali to Hewai falls, and looking up from beneath the falls, he saw that there was no fur coming down them.
Nayalu ibiyaria hendene agua be toba howa hearia irini mbira udu ira maneni paga hearia hendene.
He was confused [*toba ha*] - where was this fur coming from? He looked up and saw some fur hanging in the crown of a tree.
Ira yunini. O ibu narugoni udugoha howa ibira heneda lowa li pagua pare baowa iraga hene.
On the tree leaves. He thought that the stuff he had been eating was up there, so he climbed up.
Monama iraga halu berearia wali mbira li berearia iraga hene.
When he took it and ate it and climbed up, he saw a woman sitting there and went inside.
Wali mbira li berearia iraga howa.
He went into where she was sitting.
O tia irini biago li wali beragoria dugu paya biaria hendene waligo ibu ira nadele bame egeandaha.
Where the woman was sitting inside the cave he saw much fur, and he saw that she was sitting on top of the possum, but that there was no fire.
Wali biru paliaga berearia.
She sat and slept without a fire.
Tia irini dugu paya biago i naru ale ogoda lowa monene ogoni naya ale nagago.
When he saw the fur, he said 'That is what I was eating,' so he took it and ate some.
Tia dawa ngogo nalowa tia dawa wini bago mo pe hene.
She said 'I have cooked some possum, take it and eat it' and she gave it to him.
Dawene bago mo pe hayagola howa, handalu berearia ege hirini uli nawi. Dawene uli nawi.
When she gave him this cooked food, he saw that there were no cooking stones.
Ira nadeleyagola tia hungu dawa wiagola hondowa.
She had not made a fire, yet she had cooked the possum.
O ndo ibu mbira wiagua dawaliya ngi lene. Bo wi yagua.
'No, if you kill a fresh one give it to me and I'll do lookwise [i.e. cook it, from *bo wia* - to copy].'
O ibu dawaro lowa o bo wiyago iri heba bowiniyago miyagola howa. [...]
'I'll cook it' he said, and she gave him an unskinned possum.
Ege hirule ira hibu nowa. Ege hiruwa uli godowa ibu dawene.
He made a fire with wood, heated stones, dug a hole and made a mumu.
Ibu dawayagola ai wali i nde ebere dawareda dagua ibu hondoliya dawa lene agali biago ibu dawaho biruwa. [...]
When he had cooked, he sat and said to the woman, 'Now let me see how you cook'.
Wali bago dawa layagola wali biago ibugua howa.
He told her to cook and she did.
Yu tugua angi bia.

She took ferns and cut banana leaves.
Ma hai uruni buwa angi tebera howa bame li daliga bagoria bira dambi hene.
At the base she put taro, banana, then on top the meat and banana leaves and then she sat on top.
Bira dambi hayagola pobo hagua urume tilitula lowa.
When she sat thus, her heat [*pobo*] and steam [*hagua*] burst forth with a noise.
Tomo dawayagola darali dagua pobo haguala timbuni bini.
It was like when water is poured over cooked food and heat and steam rises.
Dowa heagola wali biago ibu pogo ia amu hayagola ma biaru do dagabu wiaria.
When it was all cooked, she came off it and everything was cooked and deboned.
Tia biaru kuni do piagolo wiaria duguni.
The possum was cooked through and the bones were all stripped [of meat].
Ai dawarayago o dawaraganida lene.
'Ai, this is how you cook', he said.
Ai mbiraga paliaba lowa anda ibuwa.
'Ai, it's night, let's sleep', they said and they went inside.
Agali biago ibu ira delowa eganda ira delowa paliyagola wali biago ibu tambeneha palene.
He made a fire in the cave and slept by it, but she didn't make a fire and slept in a cold area.
Ibu andaga paliaga dagoria, anda andobe uru do wiaria hendene.
Where she slept, the house was thoroughly blackened [as if from fire, in reference to her "heat"].
Aguani buwa ibu tambeneha palipe hene.
Thus it was done, and he slept.
Mbiraga paliyago paluwa wali biago ibu mbiraga agali biago palia hondo heaha,
When they slept at night, while the man slept,
wali biago ibu tia bo piyiya. Tia bo puwa.
the woman went out to hunt possum.
Ogoria bo payabu wiaria hendene agali biagome.
She carried the possum back and the man saw that she had brought many.
Ai egerabagi tia dawabiya ogoni be.
'Ai, I'll cook it in the morning', [he] said.
Au lowa ai ibu nde talebu miya.
When this was said, she divided them and gave some to him.
Ibu nde ibu dawaga, bia dagua dawale.
She would cook as she did.
Agali biago ibu talebu ngi lene.
The man said, 'Give me my share'.
Ibu tale bu miyagola ibu tia mbira biago mo do hene.
Of his share, he took one possum and hid it.
Mo do howa. Ai ibu tia dawale ira bo porogo lowa, ayu yalu puwa.
When he had hidden it, he said, 'I'm going to cook my possum, so I'll go and get some wood', took his axe and went.
Tia biago o howa mo yalu yalu puwa.
He took this possum and carried it with him.
O ira mbaria amu Tagali ore pugulu pe hayagoha.
A tree stood leaning over the Tagali river.
O ira ore podalu unu ibani agua podape holobada lowa manda buwa.
He saw this tree and thought, 'If this tree breaks she will fall into the water'.
O ira biago ayume dibu gua bini.
He cut this tree with his axe.
Dibu gua buwa tia biago [..], ira hengebaneha gedo lalu, ibuwa ayume, ira biago dibu gua bini.
When he cut it... [first] he placed the possum in a forked branch, then came down and cut the base of the tree.
Aguani bialu ibu dai bini.
This done, he returned.
Dai buwa wali o inaga tia mbaria amu beda handala eberago.

When he came back, he said, 'Woman, I saw a possum sitting over there so I came back.'
Ina bo ngule mba lene.
'Come and kill it to give to me'.
Mba layagola howa o libu haru pene, ibugua bole berogo mba lowa libu haru pene.
'Come,' he said, so the two went for her to kill and give it to him.
Puwa [..] tia biago amu bedagoni lalu walia hene.
They came to where the possum sat and he showed her.
Wali biago ibugua ira biagoria gerai irini.
The woman climbed the tree.
Iruwa tia biago miniyu hea ore unu iba biagoha,
She climbed up, grabbed the possum, and when she did this,
o ira biago heba wali biago heba podo pe hene.
when she held it [the possum], the tree broke while she was in it.
Podo pe hayagola, Tagalini, hagua hungume iba biago do gabu ki bini.
When she fell into the Tagali, steam rose together with fire.
Wali biago poboneme.
This was the woman's heat.
Do gabu ki biyagola agali biago ibu handaya ho hene delo.
The man watched this steam from above.
Handaya heagola howa tambe ore hayagola howa.
He watched for some time till she had cooled down.
Tambe hayagola howa o dalini.
When she was cold, he went down.
Daluwa wali biago dugu gilili mini.
When he came to the water's edge, he dragged her out of the river.
Au yalu uyu hari biagoha iraga hene hari bare biagoria irini.
He put her on his back and carried her up the hill.
Ani buwa uyu egeanda biagoria anda pene.
He carried her up to the cave and went inside.
Anda puwa ede iragoria tede/tedo wu amu howa nge lene ira delene.
When he came into the cave, he put her by the fire.
Ira nendebu nendebu nendebu gabu delene.
He stoked the fire up.
Wali biago ede biagoria beregede hinaga, beregede hinaga, beregede hinaga bu ngelowa.
She turned round in her sleep next to the fire.
O ede birayago bi hongo howa hiyu bere lene ira biagome.
The fire dried her and she got up and sat.
Hiyu birayagola howa ai wali o i nde tia dawa lene ibunde dawarogo ai.
When she got up, he said, 'Woman, cook your possum and I'll cook mine.'
Ai gibu gle mbira biyago bi layago.
'Are you afraid to do what you did before?'
Dawa lowa o wali biago ibu nde amu dawarali dagua dawene, agali biago ibu nde ege hiruwa dawarali dagua dawene.
He said to cook, and she cooked in her way and he in his.
Au biyagola howa wali biagome dawayago.
She cooked as she was accustomed to.
Kange wiaria hendene.
But she saw that it wasn't cooked.
Agali biagome dawayago nai do wiaria hendene.
The food cooked the way the man cooked it was cooked.
O agali biagome dawayago libu haru dugualu naribi.
The two went and dug up the man's mumu and ate it.
Ai wali biagome dawayago kange hene.
The food cooked the way the woman cooked it was uncooked.
Aguani biyagola libu obagoriani hene.
So the two lived together.
Libu obagoriani howa, o agali biagome wali biagoni o ibu one howa o libu waneigini

honowini.
They lived together, married and bore children.
Honowiyagola hawa, o igiri mbira honowini.
When they bore, the first was a boy.
Igiri honowu howa ndonellone wandari mende honowini.
When this son was born, the second was a girl.
Aguani buwa ai wandari biago ibugua egerabagi mbiraga tagira puwa.
The girl would go out in the morning before dawn.
O alendo anda ibugu biyagola howa o poragani agoha porabe handama pu lene.
She would not return till late in the afternoon, so he said [to his son], 'Follow her and see [what she does].'
Handama pu layagola o wali angibuni agali taribuni biago labo libugua igiri ogoni ina wandari ogoni goriama pu lene.
The parents agreed and told their son to follow his sister and find out [*goriama*] what she did.
Goriama piyagola li Yumu Nene ngaragua bolangua howa, amu Dagia amu domade howa.
He followed her to find out, up there to Yumu Nene, and then across [*domade*] the Dagia river over there.
Ede Bebenite gebeanda anda pu hearia hendene.
Over there to Bebenite *gebeanda* where he saw her.
Aguani puwa ede hearia hondowa, o libu haru ede biagoniha'howa.
He found her where she sat and the two had intercourse.
Wali biagoni ibini hene. Igiri biago ibu one hene.
Brother and sister slept together.
Ibu one howa ai agua lole dai biba.
When they had slept together, they said, 'Ai, what shall we say when we return?'
Dai bialu kabaria ai taga biaruago.
'When we go back we shall be shamed [*taga*].'
Au lowa, o li iraga howa Hari Ambua wene. Hari Doma wene.
Hari Geloba wene.
They said thus, so they placed the mountains Ambua, Doma and Gereba.
Iba Piwa duguni. Iba Alua duguni. Iba Doma duguni.
They dug [the channels of] the Piwa, Alua and Doma rivers.
Here libi iba wini. Digi hare iba wini.
They placed the salt sources [*here libi iba*] and the red ochre sources [*digi hare iba*].
Ani bialu ibu dai bini.
This done, they returned.
Ibu dai bialu, ainya abala berearia nai iraga hene agi biribibe laya.
When they returned, their parents asked, 'What have you been doing?'
Hari wedeba lene, iba dugudeba lene, here libi iba ngaba lene.
'Placing these mountains, digging these rivers, placing these salt sources,' [they replied].
Ai agua berebibe lene, ndo Duna poroba lene. O Duna pene.
'Now what will you do?' 'Oh, we'll go to Duna.' So they went to Duna.
Duna puwa amu pu howa [o amu pu amu hayagola Here Libi, iba wini, ai], iba Gora Awa bere lene.
When they came over there to Duna they [...] sat together at the Strickland river.
Ega Gabiago bere lene. Dombobuli irane helene.
They placed Lake Kopiago. They planted the *dombobuli* [Nassa shell] tree [popular Huli belief has it that Nassa shells grow on a tree].
Duna hari nai wiaru wene. Ani bialu ibu dai bini.
They placed all of the Duna mountains and then returned.
Ai agi bialu haribibe laya, Duna hari wedeba, ega Gabiago bere ledeba.
'What have you done?' 'Placed the Duna mountains and Lake Kopiago.'
Ani lene. O Gora Awa bere ledeba lene.
It was said thus. That they placed the Strickland river.
Duna hari wedeba lene, here libi iba ngaba lene.
That they placed the Duna mountains and the salt sources.
Ani lalu dai bialu berearia duria nai bagoria hono payabu wiaria iraga hene.

When the two came back, their parents had borne five children.
O hono payabu ngemiruni mini aibe lene igiri biago ibugua.
'What are the names of all these children?' said the boy.
Amugu o Heyolabe lene. Amugu Parindali lene. Amugu o Giraboli lene. Amugu Duna Wali Bolome lene. Unugu Yuguale Dabualela lene.
'That one is Heyolabe, that on is Parindali, that on is Giraboli, that on is Yuguale and that on is Dabuale,' they replied.
Ai bayaie honowini dago libu ai kababe lene.
'You have borne well, but what are our two names?'
I Hona Ni lene. Igirigo i.
'You, the boy, are Hona Ni [the sun].'
Wandarigo aibe lene. Hona Hana Wali lene.
'Who is the girl?' 'She is Hona Hana Wali [the moon].'
O libu agoria ho̱le̱ porobabe lene.
'Where shall we go?' the two said.
Libu li hari ogoria ho̱le̱ pudaba lene. Lo maro biruguni.
The two were told to go up into the sky. That is all.

An interview version of Narrative B1:

There was a woman living at Maberi [near Hewai falls]. A man standing on the banks of the Tagali river saw possum fur on the water and walked upstream eating it to find the source. Before he got to Hewai falls, he found fur falling from a tree. Then he found a woman plucking a possum. The man was still eating the fur and the woman said, 'The fur isn't meant to be eaten, the edible bits are in the mumu'. But he couldn't see a mumu and didn't want meat, so the woman gave him fur first, and then meat. The man made a fire with cane, heated stones and mumued the meat. 'Show me how you mumu,' he said to the woman. She made a pit, covered the possum with earth and banana leaves and sat down on top of the mumu. Smoke soon emerged from where she was sitting and then she dug up the mumu and the possum was cooked and de-boned - with the bones laid to one side. The woman went into a cave (the man could see smoke but no fire). The man slept in a separate part of the cave, made his own fire and while he was asleep, the woman went hunting possum and brought plenty back to the cave. The man said, 'I'll get firewood,' and stole one of her possums and went down to the Tagali where he found a tree on the bank with a fork in it in which he placed the possum. He then cut the tree at the base so that it was almost felled. The man went back to the woman and said he'd seen a possum in the bush and that she should come and get it. The woman climbed up the tree which broke and she fell into the Tagali. Steam and smoke rose up from the river. The man pulled her from the river, half-dead, and put her legs around his neck and carried her back to the cave. He brought dry firewood, made a fire and put the woman close to it. She dried out and recovered, asking, 'What happened?' The man told her she had fallen into the river and asked her to cook some possum. She mumued as before, but when she took the ground out, she found the possum uncooked - she had lost her power of heat. The man and the woman slept together and they bore a boy and a girl who grew very quickly. The girl walked along the ridgeline of Mt Yumu. The parents told the boy to find his sister. The girl crossed the Dagia river and the boy returned. On the next day the girl walked to Bebenite and the boy returned. The boy then went back to Bebenite, had sex with his sister and the two returned to their parents but said nothing. The following morning, the two left for Bebenite and went up to Iba Alua etc and finally up to Ambua, where they put the ochre and salt sources in place, so they could tell their parents they had been doing something (while having sex instead). Next day, they left home for Duna, where they put the salt and ochre sources and lakes in place. On their return, they found five other children: *dama* Heyolabe, *dama* Parindali, *dama* Wali, *dama* Wali Polome and *dama* Yuguale and Dabuale. The boy asked his parents what his name was, and was told Hona Ni. He asked what his sister's name was and was told: Hona Hana Wali. 'Where are we to go?' The parents replied, 'To the sky', so Ni became the sun and Hana became the moon. If the man hadn't made the woman fall in the water, women would eat men and destroy them entirely. This is why we kill pigs for the sun and the moon.

NARRATIVE B2 - The Cut Vagina

Ngoari-Mandiga (Tani), 1.8.91, 91/14A:381-465, excerpt

Wali hamba ho hearia daga nabi haabo hayagola,
A woman had a vagina but it had no opening;
agua to ho wiabo hayagola, agua durubu tono biyagola,
it was swollen up so she used to scratch it.
Are yogona edebagoria bo, edebagoria kambu lowa,
A man found some stone flakes [*are yogona*],
ira kambu lowa, are yogona agua bo wini, are yogona bo wiagago ka. Agali. [..]
and he set them in the tree where she scratched herself.
Are yogona agua bo wini, bo wiaria, wali hamba agua to howa,
When he had set the flakes, the woman with the vagina,
hamba to howa, o tola nale wiabo hayagola,
the swollen vagina without an opening;
tola nale wiabo hayagola, are bowa, are Luya Talela,
this swollen vagina without an opening, the flakes broke it, the flakes called Luya and Tale,
tale [=hale] timbu ede heagoria are yogona agua kala pe ho wini.
which were placed in a big *hale* [Elmerillia sp.] tree.
Agua kala pe ho wiari o ede duru bu toro biraligoria.
He broke these flakes and put them where she scratched herself.
Agua duru biarua, pobo biyagola.
When she scratched herself, she became hot [excited sexually].
Duru biyagola ede dagabu pe hayua, dagabu pe hayagola.
She felt thus, so she scratched more and broke.
O ibiame nene e ibiame nalu o ibia ibu unu ibaha ibira hene.
When she was broken, the centre part fell into the water and became an eel.
Guru ibiame nene guru ibiame nalu o ibia ibu unu ibaha ibira hene, wali pugua / buga ibira hayago.
The eel [*guru ibia*] came up from the menstrual blood [*pugua*] dripping from the cut,
Guru ibia ibu ega kamia hanga haga...
The eel is for the performance of the *ega kamia hanga haga* rite [in which dams are constructed to trap eels]...
O ede dindi baholo bu ede ngagoni Bebenite edegoriani o ani biagane wini.
These flakes were set over there at Bebenite.

NARRATIVE B3 - *Hela tene te* (The Origins of Hela)

Daii-Urulu (Gobiya), 27.3.91, 91/3A:76-142, excerpt

O wali dago ibu ogoriani biruwa nira honowia hayagoni,
The woman [Tia Nangume] sitting down there bore all of these things:
o gambe, o yagua, o dangi, o iba ibu pela.
the grasses *gambe* (Miscanthus floridulus), *yagua* (Pteridium aquilinum) and *dangi* (Imperata cyclindrica) and then water which came out.
E hari hari ogoriani dage howa, o hari wene.
She placed the sky and the mountains.
Ani buwa o hari ibini, irabu hari, ogobi ibugua dage wene.
First she placed the sky, then the forests and mountains.
Ogoriani biruwa, o dagani damene ogoni ibugua biai halu ngelame halu biaiu.
Sitting over there she completed these things.
O wali dago ibu, o hariga ibu puabo henego.
This woman came here along the track.
O hariga puabo halu, o nai amuna Goloba amuna mbira palene,
She went along the track and slept once over there at Koroba,
udu Kiaburege mende palene, o pialu amu o Hewari Gambeni anda pene...
then a second time at Kiaburege and then she went over there to Hewari Gambeni...
Hewari Gambeni howa, o Gelote amu nga. Dindi Gelote.
She came to Hewari Gambeni, from Gelote over there. The place Gelote.
Duna o ogoriani anda penego, ani binigo Hewari Gambeni howa.
She went to Duna, to Hewari Gambeni.
O ogoriani biruwa, o, o ogoriani biruwa Hela honowini.
Seated there, she bore Hela.
Agali Hela. Hela ogoriani honowuwa.
The man Hela. Hela was born there.
O ogoriani howa ti Hela ibugua, Hela ibugua o Hela Huli mbira honowini.
The first born to Hela was Hela Huli.
O ndo, Hela Duna wahene honowini. Hela Duna.
No, the eldest was Hela Duna.
Ani buwa ngelowa, o Hela Duguba honowini.
When he had been born, Hela Duguba was born.
Ani buwa ngelowa, Hela Obena honowini.
When he had been born, Hela Obena was born.
E ani buwa, o Hela Hewa honowini.
Then Hela Hewa was born.
Ani buwa wali Gogonabe honowini.
Then the woman Gogonabe was born.
Ani buwa o Hela Huli heyogone honowini. Hela Huli.
Then Hela Huli was born last.
Aguani binigo, aguani binigo, o ibugua ogoriani howa, o ti anda bialu hene.
There they made a house and sat.
Guabala anda, anda daiga [= daliga], anda bialu hene.
A long house, going up, they built.
Ani biyagola, o anda bago bialu ai pu mo ngi.
When they were building the house, they called out, 'Bring some rope.'
Ai anda ogo bima, au layagola howa o ndo Hewa ibu, o nina hama ibago.
They said, 'Let us build a house,' but Hewa stood about doing nothing.
Nira ibu mangaha. Au bialu hearia obiago, o kangome minu bene.
He was lazy down there. When he did thus, they beat him with a stick.
Tibume, ani bu mini baya handale, ndo,
When he had been beaten, he said, 'No';
o ibu Wana bu hinalu, poro lalu, ibu o ibu mbalini Gogonabe dagola,
when Wana [Hewa] had been beaten, he said, 'I am going off with my sister Gogonabe,'
libu libu pu tara henego unu unu palu mabu bidagoni. Au lene.
and these two went off and slept over there.

O unura pali mabu bidalene.
Over there, down below [in the lowlands around Lake Kutubu].
Ani lene, ai ani bialu, ai Duna ibu.
When they had gone, Duna,
O ogoriani biruwa anda bago bialu howa, ibu o Dunabi layagola howa, o ibu Duna. Au lene, o ibu Mirila.
Duna took Duna speech and they said, 'You are Duna, you are Mirila'.
Au lene hago dulu paya, bindi baro, ega malungu,
It was said thus, fur of the *dulu paya* possum, rope [*bindi baro*], feathers worn in the hair [*ega malungu*],
dambale autaba uru, mbagua yole uru momialu. Ibu Duna ogoni.
string apron [*dambale autaba*] and mineral oil [*mbagua yole*] were given to Duna.
Ai Duguba, ibu Duguba bi bi lene,
Duguba took Duguba speech
obagoria biruwa ai ani biyagola ndo i Dugu Yawini da,
and sat over there and they said, 'You are Dugu Yawini,'
Mi Gilini da, wai hegene, tabage luni uru abiyane, ai gewa hagone au lalu.
'You are Mi Gilini, with feathers [*wai hegane*] of the *abu hege* bird, the long drum [*tabage luni*], the cane belt [*gewa hagone*],' it was said.
I Dugu Labane au lalu ibu ibu pene.
'You are Dugu Labane,' it was said, and he went off.
E Hela Obena ibu ogoni biruwa, Hela Obena bi bi laya.
Hela Obena was seated there, with Obena speech.
O Hela Obena i, o hagi dambale uru, iba donge uru,
'Hela Obena, with the long sporran [*hagi dambale*], the wide bark belt [*iba donge*],
pagabua mane uru, gulu wambia uru, ai ayu,
the pigs tails [*pagabua mane*], the bird of paradise feathers [*gulu wambia*], axes [*ayu*],
o Hela Obena manda wagowago uru, i nde i pu lene.
and your wig style, go now.'
E aguani bini, Hela Huli ibu, o obagoriani howa....
This done, Hela Huli stayed here....
Au bini o Hela Huli ibu, o ani binigo howa, o Huli ibu, ina ina kamagoni.
Hela Huli is us, we people here.

NARRATIVE B4 - *Hela purerodmo* (*Hela* Adage)

Maiya-Alua (Munima), 27.9.89, 89/3A:349-384

Hela Obēna ibugua gulu wambia uru.
The Enga, with their *gulu wambia* [Lesser Bird of Paradise] feathers,
Polene tangi uru wi, pobogale dolene ege[r/l]uhe.
with their hair nets, the axes that come from there
Here libi uru, hirulene ibi iba uru wi.
Their salt, the salt that they get from the water sources.
Ogoni pene, ai timbi uru payabu uru.
They wear cordyline,
Manda wagowago uru, lai yandare yula. Hela Obena pene.
round wigs, carry spears of *lai* [Dodonaea viscosa] wood.
Ani lene, i hame handa lea dago lalu howa.
This was said, this is how my father said it.
Mirila ibugua penego, pombo puli tolene,
The Duna, with headbands
pindi baro bulene, anda tawa anda bulene,
with bamboo pinned across their foreheads, living in pandanus houses
ega malungu bulene, dada tegabe uru honolene.
cassowary(?) plumes in their hair, laces of red seed across their chests
Duna bi lole pene lene.
They speak the Duna language
I hame ibugua lea dago lalu howa.
This is how my father said it.
Hela Obena ibugua ani bini lene.
Hela Obena say thus too.
Dugu Yawini penego unuguha pu ka lene.
Duguba, they say, went down below.
Ibugua nde nulu hiwa dibulene, nangama dibulene,
They cut sago trees, they cut *nangama* [unidentified woody species] bow staves,
hoga yolu hambulene, aminami[aminemo?] hambulene.
fill up with tree oil,
Ai, dange uru dolene, unuguha pu ka lene.
carry shells; those who got these things went to live down there.
O Dugu Yawini lene. Hela Huli ina ogoria kogo lene.
Duguba said thus. Hela Huli said, 'We will stay here.
Ina nde manda hare uru holene,
We wear the red wig,
danda timu uru yulene.
hold the bow and arrow.
Gulu beberaya payabu uru bulene.
Wear the *gulu beberaya* cordyline.
Nu emene uru honolene, dambale pongone uru bi,
Carry the small net bag, wear the woven sporran
manda hare uru holene.
and the red wig.'
Ina nde dombeni ogoria haro lene.
We said, 'We will stay here in the centre.'

NARRATIVE B5 - Digiwa of Digima Clan and the Origins of Sweet Potato

Digi-Malingi (Digima), 13.6.91, 91/9A:382-end, excerpt

Digiwa ibini hangu edebagoria hearia.
Digiwa [the man] was the only one here.
Ai ore, gana godo mabu mabu mabu bu ngelo biraya.
Once he dug a ditch around his garden and sat there.
Unuguria godo ngela, amuguria godo ngela, naiguria godo ngela buwa, biraya.
He dug it down there, over there, over there, and set it out thus.
Berearia libagoria mbira godo wiyagoria,
Seated there, he dug one garden,
o digi hina muguba hina doai lene,
and the *digi* or *muguba* variety of sweet potato (*hina*) came up there,
mende o bamu paboro mbaguali uru doai lene.
in the other, bean and gourd came up poorly.
Ogoni doai lai hene.
These came up there.
Doai lai hayagola, digi hina biago yu lo gimbu gimbu gimbu biyagola.
When these things came up, *digi hina* spread all over the place.
Nandi paboro mbaguali pini miai haya.
The yam, bean and gourd were trailed up sticks.
Pini miai hayaria, hina biago pini miyaria,
When sticks were made for these, they were made for the sweet potato too.
nde girigere layagola, a ai hina biago ko, yolahe.
But when they did thus, the sweet potato grew poorly; it just hung there and he could see that it was poor.
Ko haya handala, dindi dugu dambi haya.
Because it grew poorly, he covered it with soil instead.
Dindi dugu dambi hayagola, ba timbuni, digi hina, digi hina lenego.
When it was covered with soil, it grew large and it was said that this was [really] *digi hina*.
O hina yulame ho ayu kagoni.
This sweet potato which grew then is [still] here now.

NARRATIVE B6 - *Hina tene te* (The Origins of Sweet Potato)

Maiya-Alua (Munima), 5.1.91, Tape 90/2A:90-154

Hina digi hina. Hina alu muguba. Ma hubi gaea.
Sweet potato is [given the praise terms] *digi hina* or *alu muguba.* Taro is [given the praise term] *hubi gaea.*
Ma yarali ho ngelaro. Bamba nandi. Bamba ira goba.
I'll leave taro till later. Before there was yam and there was rotten wood.
Bamba homa bawila. Bamba nano ogoni no haraya.
Before there was pueraria. Before there was the *nano* mushroom.
O, Heyolabe ibugua. Heyolabe ibugua honowini dama ti ogoni nalu haga.
These things that Heyolabe bore, the *dama* ate these things.
Au biagola howa, dama ibugua howa wali damu purogolaga bini.
The *dama* went and found a woman and brought her back.
Wali damu purogolaga bini dagua,
When the *dama* got this woman,
o wali damu purogolaga wali hono wiya dagua,
she bore him children;
waliha howa Digima andaga digimu amuraha nga, Dunaha.
she bore them at the place Digima, on the Duna side [of the Tagali river].
Ogoniha howa. Digi hina ibini.
The *digi* sweet potato cultivar came from over there.
Digi hina Habono-Pebo ainya, o, wali Buria handa yalu ibini.
Digi hina was brought by Habono-Pebo's mother, the woman Buria brought it.
Habono-Pebo ainya handa. [..] Digima anda howa.
Habono-Pebo's mother brought it from the Digima area.
O hina Habono-Pebo ainya handa yalu ibini.
Habono-Pebo's mother brought sweet potato.
Habono-Pebo, Habono-Pubali, Habono-Liruaya uru hene.
Habono-Pebo, Habono-Pubali and Habono-Liruaya [her sons] were there.
Iba Tagali na ibu pea ha.
The Tagali river wasn't there then.
Ogoni wali mbira hora hayagola,
Once, they had buried a woman
wali ogoni duguanda bereria.
and they were sitting in her mourning hut.
Bambolini mbaria dea dagua, mbaguali uru dea dagua, yuni o baragua doai lowa anda hene.
Vines like those of the cucumber and bottle gourd came up.
Doai lowa anda hayagola howa, o, wali biagome ira kanogo wa howa pini mini.
When they came up, the woman planted a stick and trailed the vines up the stick.
Pini miyagola howa obagoria bamboli dara dagua mbaguali dara dagua lini do girigere lene.
When they trailed up the stick, they looked like cucumber and bottle gourd, but they bore nothing.
Ani biyagola unu pinigo ha dindi godo homa bini wali biagome.
Then she put some ground over the roots.
Habono-Pebo ainya handa.
Habono-Pebo's mother.
Dindi godo homa biyagola Pebo Pubali Liruaya ima ainya, Miniba wali, Buria-Abuna handa.
She placed the soil thus, this woman, mother to Pebo, Pubali and Liruaya, a Miniba woman, Buria-Abuna.
Godo homa biyagola howa o lini deagola howa.
When she placed the soil thus, the fruit [*lini*] came up.
Ai lini ore do ti tau layagola howa,
When it fruited and it was almost ripe,

o nde abidabe hondole lowa, wali mbira [..],
when this was done, this woman,
o lini biago dowa hiri nene.
she tasted one of the fruit.
Hiri nayagola howa, o, ai dendebi ngabi.
When she tasted it, she said 'Ah, it is tasty.'
O, unu dindi ha peago nde kango yuwa wene.
The others, deeper down, she also dug up with her stick.
Wayagola [..] o pini beago pu amu hearia dendebi ngabi dage.
These ones from deeper down were tasty too.
Ani lowa, obaganime egane yu lowa horo yu ibaga buwa hangalu.
She carried these around and planted them.
O hina nanaga henego hina pigane ogoni angi nene dagoni.
Before they didn't eat sweet potato, this was the first time.
Nowa iba Tagali ni biago na ibu pea hago.
When they first ate it, the Tagali river didn't flow where it now does...
Ani binigo hina tene Miniba Habono-Pebo ainya handa
The source of sweet potato is Miniba Habono-Pebo's mother;
mo wini Digimu andaga Digima howa mo hono ibini.
it was brought by her after it was given to her by Digimu at the place Digima.
O hinanaga tene ogoni.
This is the source of sweet potato.
O Digima andaga howa ibini dago lowa, digi hina, ani laga.
Because it came from Digima *andaga*, it is called *Digi hina*.
Muguba, alu muguba ani laga.
It is also called *muguba* or *alu muguba* [praise terms].
Ani laga hina mini mogia uru... heme uru,
There is a sweet potato cultivar called *mogia*... and another *heme*,
gabutuguya uru, gawa uru, dabero uru, aliga uru,
also the *gabutuguya*, *gawa*, *dabero* and *aliga* cultivars,
tianobi uru, tugulu uru, hina ani haga mandiyame uru,
the *tianobi*, *tugulu* and *mandiyame* cultivars,
mole uru, kuli uru, haga, giambu hina uru, aroguai uru,
the *mole*, *kuli*, *giambu* and *aroguai* cultivars,
tebolopaia uru, haga, hina mini, ani bialu, biliraya uru, bagaya hina uru...
the *tebolopaia*, *biliraya*, and *bagaya* cultivars...
Ani buwa a bialu hemagola ayu howa,
These were here before the present time,
o ayu ore howa, o ayu ore o paluni nalu hemagola howa honebi tagira ibiyagola howa,
those [cultivars] that have come only recently... these others [from before] were buried [literally "grave goods for" (*paluni*), i.e. abandoned] with the old men when they died, when the whites came,
o magaya hina uru, tagira ibiya, ani buwa obago nalu hemagola howa,
then *magaya hina* came out,
o bo hina, dambera hina uru, tagira ibiya,
the *bo* and *dambera* cultivars came out,
dambera hina o lira o Malibu ha howa, o Malibu.
dambera came from Malibu.
Bo dindi mugua howa, bo hina ogoni ha tagira ibini.
Bo came from the place Mugua, *bo* came out from there.
O gaea mbaria timbuni binigome.
A great drought happened.
O wali agali hina garime homa pu hema ha.
Everyone went hungry and many died.
Gaea dago buwa tagira ibiyagola bo hina ogo tagira ibini.
It was when this drought happened that *bo hina* came out.
Bo hinago tagira ibuwa habia hina, dama hina, tagira ibini...
After *bo* came out, *habia* and *dama* came out...
Gondoma hina tagira ibini. Ani buwa po hina tagira ibini.

Gondoma hina came out, then *po hina.*
Ogoni honebi tagira ibiya angi, tagira ibinigo ogoni.
When the whites came, these came out.
Ala tagira ibini, o hina unu laruguni, o hina digi hina, hina alu muguba, ani laga biaga.
The first [*ala*] to "come out" of the cultivars we have talked about was *digi hina, alu muguba hina.*
Du hiwa tege, ani laga biaga.
Sugarcane we call *hiwa tege* [praise term].
Hai habo waya ani laga biaga.
Banana we call *habo waya* [praise term].
Ma hubi gaea ani laga biaga. Ogoni.
Taro we call *hubi gaea* [praise term].
Ina hame malu wini ogoni honebi naibia angi.
Before the whites came, our fathers laid down this *malu* [literally "genealogy"].

NARRATIVE B7 - *Nogo tene te* (The Origins of Pigs)

Abu-Ganabi (Wenani), 9.11.90, 90/1A:73-89

Nogo mindi Wara-Yuguale nogo, Wara-Dabuale nogo, ai Nogoli Paiaba nogo, Giginawini Gula nogo, Giginawini Mbirili nogo.
The black pigs came from Wara-Yuguale and Wara-Dabuale, from Nogoli Paiaba and Giginawini Gula, from Giginawini Mbirili [all clans and places in "Duguba", the Papuan plateau to the south of the Huli].
O nogo mindi niguha howa tagira ibini. O ni Duguba anda howa.
The black pigs came from down there. From down there in Duguba.
Ai li Duna, Au Boda nogo, Higida nogo, Hagani nogo, Yagura nogo, o nogo tambugua ibini.
From up there in Duna, from Au Boda, Higida, Hagani and Yagura [these clans], there came the brown-skinned pigs.
Ai nogo hone, o li Gerene Gauba nogo, Undu Liya nogo, Wagala Waiba nogo, Bagaya Dabiranalo nogo, o li Aruanda howa tagira ibini.
The red-skinned pigs came from up over there, from Gerene Gauba, Undu Liya, Wagali Waiba, Bagaya Dabiranalo [these clans], from the direction of Arua.
Nogo pagabua o li Hela Obena nogo, dambale lu nogo,
The mottled white pigs are from Obena [Enga/Ipili], the pigs of the men with the long sporrans,
manda wagowago nogo, o ligo howa tagira ibini, o Hela Obenanaga.
the pigs of the men with wigs, the Hela Obena, they came from up there.
Ani bialu nogo ogonime yulene ngama.
These pigs we brought from these places to here.
Yu lalu ogonime hinini, o agali ayu yu heangi, dandayu heangi,
When these pigs were brought here, men were already here, holding bows,
wali biraya angi, gana waya angi, ai anda biya angi, nogo hina angi.
women were here, ditches were dug at this time, houses were made at this time, pigs were given fodder [i.e. reared] at this time.
Nogo hinini dagoni ogoni angi, agali gana walu, agali danda yalu,
We looked after pigs at this time, when men dug ditches and carried bows,
wali hura bialu, nu hanalu,
[when] women made skirts and carried pigs,
ai au laya angi tagira ibini.
at this time they [the pig breeds] came out.
O nogo ogoni angi tagira ibini dagani, hinu yu lene ngama.
When the pigs came out, we tended them and we spread out [*yu lene*].
Hinu yu lalu, o daga tege bima daru, wali dabu bima daru,
When we spread out, we performed the *tege* ritual, paid brideprice for women,
nogo barama daru, bi larama daru, nogo ni hana howa.
and killed pigs; pigs are the base of our talk.
O agali ogoni bialu hema angi tagira ibini, nogo.
When men did these things, it was because of pigs.
Ani binigo o ayu hiniyu lenego ayu kamagani.
Now we have tended them and spread out and are as we are.

NARRATIVE B8 - *Mbingi* (The Time of Darkness)

Walubu-Mabira (Dobani), 14.11.89, 89/5B:31-71

Hari uyugu kilikulu larua.
Up there in the skies there was great thunder and lightning.
Kilikulu, tigitugu, lalu kagola anda, dindi hombene wiyagoria biama piarua.
When it thundered, they used to build houses on high ground [*hombene*].
Dindi hombene biagoria. Hombene biagoria biama piyagola howa, o nga aleni hombeneni anda bima piaruagoni.
On the high ground, at places like this [gestures around us] they built their houses.
Au biyagola tigitugu lalu.
They did thus as it thundered.
Lalu helowa dege anda bia howa anda biyagoha hina uyu hayago mo banda halu.
While it thundered, they finished the houses and gathered sweet potato and put it inside.
Hina biago mo banda howa, o, hina biago unu mabuha mo banda harua tamu biagoha.
When they gathered the sweet potato, they threw it inside the houses.
Anda bia hayagoha. Au buwa hobaki howa, wali hangu agali hangu lowa.
When the houses were built, they divided them in two, one side for men and one side for women.
Ogoniha mo banda haruagoni.
They did thus inside.
Mo banda haruagola howa hina biago nalu bedeaya.
When all were gathered inside, they ate the sweet potato there.
Ani biyagola mbabuni hina wala hayagoria, ira nai weda dagua warua.
When all were inside, they placed sticks in the gardens where the sweet potato was planted.
Ira o weda dagua warua.
They placed the sticks thus.
O mbingi hina mulene mbiyaore, honowinigo ibugua tagira ibuwa hina bago mialu.
When they wanted to get the "*mbingi* sweet potato", those who were ¬ly-children would go out and get this *mbingi* sweet potato.
Hina o ngago mialu. Miama manga biyagola hina bago mo hanalu.
They would give this sweet potato [to those inside]. When they were tired of gathering it, they would carry it inside.
Mo hanalu piyagoria howa, o nalu birule obago wigiwigi bialu, ogoni ibu tamu wiyadagua.
When they carried it inside, they would give it and divide it to each and eat.
Ani buwa nogo ogoni yu anda ibu birarua.
Pigs too they brought inside to stay.
Haru anda ibuwa. Maru bo banda halu tini nole.
They carried them inside.
Ani buwa hina mo banda hayago narua.
Then they ate the sweet potato they had thrown inside.
Nogo angibunibi ogoniha haru birarua. Anda puwa.
Sows too they brought in.
Tau angibunila haru haruagoni.
Boars and sows together they brought in.
Wali, agali, wane, igini, o, bihende ogoni ha anda ibu birarua ogoni.
Men, women, daughters, sons, all came inside and sat together.
Au buwa igiri emene, o, wi heago mini yalu, o, ibalu uyu balamandani hangu palu haruagoni.
Small boys, those with testicles, would be carried over there to the men's house.
Mebia habe hedagola.
So that no rules [*mebia*] were broken.
Ai, o, balamanda bagoria he lowa, paliyagola howa wali ibu nde wandiaha paliaruagoni.
Let them sleep in the men's houses, and the women would sleep in the women's houses.
Hobaki howa, tu wuwa. Wali agali bimaga nahole.

They divided the houses in half, placed borders. Men and women could not mix.
Ani biragola mbiyaore ore honowinigome,
Those that bore only one child,
mbiyaore ore ibu hamene mende bi nahegome.
single children, without brothers,
o ibu mbiru birayagoni biruwa tagira pialu o ibunaga wa he horombe wiragoni.
this one child would stay inside for only one day and then would go out on the next day and it would be daylight outside.
Ti uyu mbi lowa mbilogimbu bu wiragoni.
For all the others, it would be night.
Obagoni hina miaruagoni. Hina miama [manga] *buwa ibugua mo banda haruagoni.*
He would get sweet potato. He would go around and get sweet potato and carry it back inside.
Kirali, wali agalila, kirali heledaria, o mebia hole biragoni lowa.
If a man and woman were together, this would break the rules.
Agalime miaruagoni. Hangu hangu.
Only men gave [i.e. only men were allowed outside to gather sweet potato]. Singly.
Ani biyagola hina obagoni mo banda haruagoni.
These people would get sweet potato and throw it inside.
Mo banda howa nalu biraruagoni.
When it was thrown inside it would be eaten.
O [haliru..] kira honowinigo ibu, o kiru biruwa mendeangi tagira polebira.
Of those who slept inside, if they were born with another, they would come out on the second day.
Tebira honowinigo ibu tebiru biruwa.
Those from three-sibling sets would stay for three days.
O mane angi tagira polebira.
On the fourth day they would come out.
Maria honowinigo ibu malu biruwa, dauni angi tagira polebira.
Those from four-sibling sets would sit for four days and come out on the fifth day.
Duria honowinigo ibu, waragaria biruwa, kane angi tagira polebira.
Those from five-sibling sets would sit for six days and come out on the seventh day [the narrator starts to confuse his count here].
Ai, karia honowinigo ibu, o karu biruwa, halini angi tagira pole.
Those from seven-sibling sets would sit for seven days and come out on the eighth day.
Halira honowinigo ibu, o, halira biruwa dini angi tagira pole.
Those from eight-sibling sets would sit for eight days and come out on the ninth day.
Ibuha yagi aruma haragola emene biru dai bigi biaruagoni.
If they came out and it got dark again, they would go back in again.
Au binigo o biagoni ai, gaea biyagola howa haliniangi,
ai wa laruagoni.
So, when they had sat for eight days, dry weather would come and it would clear.
Hina biago mo banda hayago nalu biruwa.
They would eat the sweet potato thrown inside.
Haliniangi, o wa laruagoni.
On the eighth day it would clear.
Wa laragola howa, ibu dai biragola hari biago ibu beraliba ibira hayago ibu uyu haruagoni.
When it cleared, the clouds would go back on top and it would become dry.
Hari podo pe hayago ibu haya dagua gimbu biaruagoni.
The sky [or mountains] that had broken and come down would join together and go back up.
Mbirale puya, nogombi, daria, gau, anda ibiyago ibu,
unu tamuha birayago ibu polene hayago ibu tagira ibiragoni.
All the snakes and lizards, when it grew light, would go out.
Dindi biago ibu ndibu laruagoni.
The ground too would be firm again.
Au bialu iba biago ibu, unu iba pene biagoha iba yolo miaruagoni.
The rivers would return to their courses.

Gimbubu wiyago ibu, hari biago ibu yu dai biaruagoni.
The mountains and the land would be separate again.
Ani biyagola dindi ogo mo gimbu bini laya.
Then the land would be whole again.
O, mbingi penego lalu. Mbingi penego ogoni.
It is said that this is how *mbingi* came.

NARRATIVE B9 - The Water of Life

"The Great Flood", C.E.T.Terrell, Lake Kutubu PR 3-53/54, pp.17-18

In the beginning everyone lived in the country as they do now. One day, while the women were sitting around the fire in their house, water started to come up through the fireplace. They were very frightened and ran outside and told their men. The men came and saw it, and found the water pouring out of the ground like a river. They were very frightened because quickly the water joined other rivers, and they began to rise and rise, and as they rose they covered all the low ground and then the mountains too, and everyone was drowned. Quite often nowadays when women are digging in the ground they find old ashes and stone axes. These belonged to the people who perished in the flood.

When everyone was dead, the floods went down again, and one day the sun came down to the earth, and saw that it was a good place, and wondered why there weren't any people. He made a little clay figure and left it on the ground and went away. The next morning he came back and found a man there and he said "Who are you and where do you come from?" The man replied that he had always been there because it was his place, and that he [w]as the only one. The sun said "You weren't here when I came yesterday" and the man answered that this was his place. As they were talking the sun made a model of a woman out of clay and put it on the ground. Then he went away and came back in the morning, and found a woman with the man. When he asked where she came from, the man replied that she had always been there, so the sun asked why he hadn't seen her yesterday. The man replied, "She has always been here". When the sun found that they did not have a house or a garden he told them to make one, and to have children. He said, "I will go away now, but later when I come back and call you must answer me."

In time the woman had a baby, and the same day the sun came again. Four times he called "HAPANJA" (Meaning "Live person's mother") [*habe ainya*: mother of life], but they did not answer him. He got angry and threw the gourd he was carrying onto the ground and it broke. Then he called "HOMAPENJA" (meaning "Dead person's mother") [*homabe ainya*: mother of death] and the woman answered. The sun then asked "Why didn't you answer before?" The woman did not reply, so the sun went on, "In that broken gourd was water which if you had given it to the child meant you would never have died. However you did not do as I told you, so now give the child milk from your breast, and in time you and the child will die." Then the sun went away and did not come from the sky again.

NARRATIVE B10 - Decline of the Earth

Timothy Meria (Homa), 17.4.91, 91/6A:376-420

Ina ayu bamba ala hama ibimadago.
How we were from before till now.
Ibu ibu bialu, o Hela Obena o ibalu,
Coming thus Hela Obena came,
o ina andagani dage momogo bialu, Hulu Gumaiyani dage ibalu,
we met them at our place, within Huli land,
Mi Duna momogo bialu, Hulu Gumaiya dage ibalu.
Duna too we met in Huli.
Dugu Yawini ibalu momogo bialu.
Duguba too came and we met here.
Aguani bialu, o bamba dindi o ngamagani piningi pili pialu.
After the tenth generation, the land fell.
Piningi pili mialu, ibame napenego. Ibame nalu no wa henego.
On the tenth time, the water drowned them. The water drowned and finished them.
Ayu o mani haragola, piningi pilarangi haragola howa.
Now, afterwards, on the tenth generation it will fall again.
O iba Ngaruni togo wuwa, iba emene uru, Iba Gabia uru, Iba Girabo uru, Iba Gumugu uru, ogoni olo paluwa togo wuale beremi.
At all these small rivers you will call out and gather and bridge them,
O lo paluwa togo wialu kemi angi haragola howa,
When the time for calling out, gathering and bridging comes,
o Hari Ambuani howa, o Giginawini ge dagima biragola howa,
at the mountains Ambua and Giginawini, one leg will be placed at Giginawini,
Hari Ambuani ge mendego paga haragola howa, Urunawinini
another leg at Ambua, and the head at Urunawini [Bari Yumu]
o manda tene edegoriani paga haragola howa.
where the wig [head] will fall.
O ogoni angi haragola howa ibulebira o dindi ogoni angi ko holebira.
At this time, it will come, the ground will go bad.
Ko haragola howa, o bereba holebira, ogoni angi pili pialu bereba holebira aguani lenego, uruni tagira pialu.
When it falls everything will be finished.
Haeapuni o haeala paya bulebira.
At Haeapugua, we will spread.
Mogorowadapunini momogo bulebira.
At Mogoropugua, we will gather.
Daliwaliapunini dai lolebira.
At Dalipugua we will turn back.
Bira angi howa ge dagima biragola uruni angi bereba holebira aguani lenego.
When a leg is placed at each place, at this time, all will be finished.
O ayu bereba hole manda manda biya.
Now the end is nigh.
Haeapuni o dangi ibulebira, dagi ibulebira.
At Haeapugua *dangi* [Imperata cylindrica] and *dagi* [Gleichenia milnei] will come up.
Urupuninaga, Haeapuninaga, Tolowarapuni, Daliwaliapuni, Mogorowadapuni,
At Urupupugua and Haeapugua, on the "coast" [*Tolowarapuni*: "the salt water river"], at Dalipugua and Mogoropugua,
uruni angi yagua ibulebira, dangi ibulebira, balimu ibulebira, gambe ibluebira.
yagua [Pteridium aquilinum], *dangi* [Imperata cylindrica], *balimu* [Melastoma affine], and *gambe* [Miscanthus floridulus] will grow.
Uruni ibiyagua howa, o bereba hayada lowa manda bibe.
If you see these you will know that everything is going to end, it was said.
Ai Iba Uria u u lolebira, ogoni u nale bereba holebira.
The rapids at Iba Uria [on the Tagali river] will no longer call out *u u* [i.e. they will dry up].

Aguani bulebira laga binigo. Uruni u nale bereba hayagoni.
They said this would come about. Now the sound is gone.
Bereba hai hayagua homa polebere.
If it ends completely you will die.
O biba ogoni angi holebira. Piningi bamba pili penego.
All will end at this time. Before it fell on the tenth time.
Ayu angi bi pili polebirago.
Now it will fall again.
Pili polebira aguani lo hemaria, o ndo.
But will it fall as was said on the tenth time? No.
Ogoni angi emene bolangua holebere halene daba ogoria nahale holene holebira waneigini honowerego.
This time, at the thirteenth generation, the children will not listen.
O wandari honowerego emene bida ore, andu ibulebira.
The small daughters that you marry will grow breasts.
Igiri emenego wi iri angari ibulebira, hambu iri ibulebira.
The small sons will grow pubic and facial hair.
Wali ai dagedage ala dabu bigi bulebira.
Women will marry young.
Ini ke ore, dagua ala ibugu bulebira, ge lagoli ko holebira, ne polebira.
You will be here, white hair will come, knees will break, teeth will break.
Uruni angi haragola howa, ainya lara ore, mbalini lara ore, aba lara ore, hamene lara ore,
At this time, 'Mother' will not be said, 'Sister' will not be said, 'Father' will not be said, 'Brother' will not be said,
yagayaga bibe, bagabaga bibe, naganaga bibe,
but [instead] all will be raped, killed and consumed.
Ai aguani bialu, [..] ka ore howa o ge dagima bulene ibulebirago.
When this happens, the two legs will come.
Ogoni angi haealo waholebirago.
This time they will carry and pour away everything.
Haealo wahalu bereba holebira aguani lenego ogoni haealo waholene, ayu tagira inu nga.
This pouring that will come is happening now.
Ai bagabaga bulene ayu tagira ibu nga.
The killing is happening now.
Naganaga, bigibigi, wandagimene gali damene ogoni ka ore, wene hamburi angarila nai bida ore.
The eating and fighting, the children with hair,
Wali ala dabu bigi. Ala honowigi.
Women marry early, bear children early,
Daga ala laga bigibigi bialu, ogoni ke ore bereba holebira lenego.
Count swiftly, all will end.
Henene ayu tagira ibiragani, nahale holene, ayu tagira ibu kagoni.
Truly [*henene*] it is now, the time of not listening is now.
Ayu homa pole. I abanaga mana winidagola,
Now all will die. This is my father's *mana*
tuguli manala ogo bi labolabo tagira ibu ngaru, udu mana ayu tagira poragola.
and it has come out as one together with the *mana* of the church.
I aba manala ngola haya. O biba. Ayu biba harabagani. Ogoni hangu.
My father's *mana* as well. All of us. Now we will all be finished. This is one [talk].

NARRATIVE C1 - The Origins of Hewai Falls

Piwa-Gomengi (Honomani), 28.8.91, 91/19A:22-31

Iba Tagali peneyago, o Haeapugua birime halu,
The river Tagali which flows, once it filled Haeapugua
wali agalinaga dindi anda uru naya.
and ate the land and houses of men and women.
Iba Gobe uru, Iba Gugubalu uru, Iba Darama uru, Iba Tereba uru,
The rivers Gobe, Gugubalu, Darama and Tereba too,
ogoni birime howa, momogo biyagola gibi berene Iba Garai uru.
they all sat there and, when gathered with the Garai river too, they became enormous.
Gibi birayagola, dungume hayagola,
Having swelled up to a great size and spread out [*dungua ha*: to flatten out],
ai burugu lalu wali agalinaga dindi anda uru nayagola.
it [the water] covered all the houses and land of the men and women and ate them.
Ai agiha pe loabe toba howa, mini burugu lo wiaria.
Ai, how could they drain this water, they were at a loss.
O wane labo bamba ganage, wane labo mbira bereneyagome.
Before there were female water spirits [*wane labo*] and one of them sat there,
Emene ore henge ngerogo, pole ibu lowa, ge dagi dale biyagola.
'Now I shall make a little space for you, so you can come through', she said and she spread her legs a bit.
Doni pe henego. O ayu ngagoni.
It drained away. Then it was as it is now.

NARRATIVE C2 - The Tani-Bogorali War: a Tani Version

Darama-Pudaya (Pi *tene*, Tani Lebe *yamuwini*), 20.10.89, 89/1B: 0-28

Bogoraiila Tanila wai binigo.
Bogorali and Tani fought a war.
O nogo unu Birimanda bopene.
A pig was killed at Birimanda.
Birimanda bopuwa o nogo biago Bogorali nogo homa pene
After this pig was killed at Birimanda all of the Bogorali pigs died.
Birimanda puwa nogo homa piyagola
After he [Ngoari-Bualu] went to Birimanda and the pigs had died,
o nogo yani tauwa ibiya dago lowa
after the pig sickness [*yani*] had come,
i nogo homa piya lowa nogo darama hongoni.
it was said that they had died of the blood [poison] of his [Ngoari-Bualu's] pig.
Nogo hongo pulupaga la Gaịla nogo nai Haeawi ange ogoria hina ibira hearia.
Over there beside the Haeawi river at the place where Ngoari-Gai [Tani Tuguni *tene*] threw food for his pigs they blew on to the pigs' fodder [*nogo hongo*: Job's tears].
Obagoria o nogo darama biago hambu yu ibira hayagola nogo yani bini.
The poisoned blood was brought to this place to make the pigs sick.
Ani biyagola wai bini. Bogorali Tanila.
This having been done, war started between Bogorali and Tani.
Wai buwa o nogo palibago dawa lowa ede Waloanda ni mandagi dawalu hene.
When the war had been fought, they cooked truce pigs [*nogo paliago*] together over there at Waloanda.
Dawalu hearia Bogorali ge hamua bi kiralime.
When these [pigs] were being cooked, two Bogorali lepers spoke.
Wandari wariabu uru, igiri abinalu uru, nogo bodawalu uru
'When brideprice is given, when compensation for the slain is eaten, when pigs are killed,
puguni namiaga kira hene gome,
they are not given to the two of us.
I aba o Baru-Mbiyago uru, Hulu-Tabugu uru, Maiya-Golia Domalia uru, Goloba-Habe uru, Gambe-Aluya uru, hahandanda bi gume,
Your *aba* kin: Baru-Mbiyago, Hulu-Tabugu, Maiya-Golia and Maiya-Domalia, Goloba-Habe, Gambe-Aluya [all Tani Hebaria *yamuwini*], these [lineages] gathered,
Dabura-Pago Gurubu uru, Aya-Obara uru, Dali-Hira uru,
Dabura-Pago and Dabura-Gurubu [Tambaruma *tene*, Tani Doromo *yamuwini*], Aya-Obara [Tani Agiabu *yamuwini*], Dali-Hira [Tani Agiabu *yamuwini*],
Balimu-Nebara uru, Hundia-Pangobi uru, Dabu-Pilabe uru, hahandanda bi gume,
Balimu-Nebara [Tani Dindiago/Angarere *yamuwini*], Hundia-Pangobi [Mabiali *tene*, Tani *yamuwini*], Dabu-Piliabe [Tani Doromo *yamuwini*], these lineages all gathered,
Maiya-Toneya uru, Darama-Ayu uru, Abu-Payabu uru, Uguma-Guriyaba uru, hahandanda bi gume,
Maiya-Toneya [Hubi *tene*], Darama-Ayu [Pi *tene*], Abu-Payabu, Uguma-Guriyaba, these men [all Tani Lebe *yamuwini*] gathered.
Egerebagi, ibuwa bari dago, i Yuna Lai haru,
In the morning, you came to kill, I was at Yuna Lai,
Aguma Lai haru, Uludima Tawate diba harugo.
at Aguma Lai, at Uludima Tawate [in Peda, Karida areas]/
Wai emene ebero lowa ge hamuabi gilame, wai gelepe hayane.
I [we] have come to make this little war,' said the lepers, 'I have run here to fight.'
Au biyagola wai biyagola.
This said, the war was started [again].
Mendego Iba Galowa iraga halu, mendego Iba Tagali doma ade hayagola
One climbed Mount [not river] Galowa, and the other crossed the Tagali river.
Bogorali Tanilame wai mobia hene nogo nahambua haga urume, hina nahambua haga igiri abi nalu nahambua hagame.

'Let Bogorali and Tani fight, for when they ate pork or good sweet potato as compensation [*igiri abi*], they gave nothing to us.'
Wai mo bia henego. Mo bia hayagola.
These two started the war. Thus it was started.
O Ngoari-Egaya uru, Ngoari-Begaya uru, Ngoari Ninimali uru, Ngoari Gebo uru,
Ngoari-Egaya, Ngoari-Begaya, Ngoari-Ninimali, Ngoari-Gebo [all Bogorali *tene* sub-clans]
Hono-Libi uru, Tabeda-Bara uru, Maiya-Mogia uru, Kuari-Debule uru, hangu pugu pilalu,
Hono-Libi [Honomani *tene*], Tabeda-Bara, Maiya-Mogia (Munima *tene*], Kuari-Debule [Dolo *tene*], each of these [all Bogorali *yamuwini*] fled,
Tanime podalu Iba Tagali ange ede yagi, ubade helene, ubade hayagola,
Tani broke them and chased them over there to the banks of the Tagali river,
o ede heagome Bai Mole uru, Bai Dagabua uru, Bai Yalo uru
over there, with [Bai Mole: unidentified clan], Dagabua, Bairama
Mo Gedani uru, Tagga uru, Aulungu uru, ede heagome lalu.
with [unidentified clans at Pureni] over there.
Iba ange ede yagi heagome lalu.
Over there on the banks of the river.
I Hubi Ngoari ni hagua dela abo hare dago.
[The Pureni clans said] 'You [Bogorali] were always making smoke up there at Hubi Ngoari mountain.
Hari ebere ngogoria, hagua deloleni lene.
You made smoke at this mountain over there.'
Hagua deloleni layagola o biru nde iba gendo uru nalu hagua tabu larida layagua
When this was said about the smoke, [the Bogorali refugees replied] 'If you [their Pureni hosts] say once that the water here has turned bad because we drink it
wandari yango igiri wabe uru hari weda layagua biru
or if you remark that the kin of our brothers and sisters are like the mountains [i.e. too numerous],
Hagia tigida, Haea tigida, Hiribi tigida, Wayabi tigida, Gono tigida, Mogono tigida, Lai tigida, Lagu tigida,
then we will follow [i.e. return to] the Hagia, Haea, Hiribi, Wayabi, Gono, Mogono, Lai and Lagu [all rivers],
handa daidai biaguago.
we will look back to them [i.e. return].'
Piru yagua nde biaguago lalu Yale Togo,
'If I go [from Bogorali ground], I will go completely', said Bogorali [Yale Togo]
piyagola dindi aribia halu.
and when they left we [Tani] took over this land.
Hengenego Ngoari-Hewago handa, Ngoari-Doromo handa, Ngoari-Dabo handa, Ngoari-Egago handa,
This land was taken by [literally: "seen by"] Hewago, Doromo, Dabo and Egago [the Tani clans]
Ngoari-Eli handa, Ngoari-Agiabu handa, Ngoari-Angarere handa, Ngoari-Dindiago handa, Ngoari-Abiya handa, Ngoari-Boroba handa, Ngoari-Yanga handa, Ngoari-Tabayia handa, Ngoari-Tuguni handa, Ngoari-Wangane handa, Ngoari-Hara handa, Ngoari-Endeli handa, karu lalu hangalu,
by Eli, Agiabu, Angarere, Dindiago, Abiya, Boroba, Yanga, Tabayia, Tuguni, Wangane, Hara and Endeli [Tani sub-clans]
Yale Togo, Gu Tagali togo gandula pehenego dindi ina mini nai wimagoni.
We cut the Tagali bridge to mark the border with Bogorali [Yale Togo] and took their land.

A Synopsis of Narrative C2:

At the same time that Ngoari-Bualu (Tani *tene*) killed some of his own pigs, some Bogorali pigs died of illness. Bogorali thought that Bualu's pigs had also died of sickness and were the source of the epidemic that had killed their pigs. They took some of the pigs' blood and rubbed it on a bush of Job's tears (Coix lachryma-jobi; favoured pig fodder) near the Haeawi river outlet, where Ngoari-Gai (Tani Tuguni *tene*) looked after his pigs. Tani saw them doing this and a fight lasting two days ensued. On the third day, a truce was called, and pigs were exchanged and eaten at Waloanda (Tani Hagu land). Then two Bogorali lepers turned up and complained that they never received their share of any pork distributions. They successfully got the fight going again before fleeing, one across the Tagali, the other over Mt Galowa. Bogorali were routed and fled across the Tagali to seek refuge with Bairama, Dagabua and others of their *aba* kin on the Pureni side. The Pureni people told Bogorali that there had always been cloud over Mt Hubi Ngoari when Bogorali were there (cloud here as a metaphor for smoke, which stings and reddens the eyes, itself a metaphor for being permanently enraged and at war). Bogorali said to Tani that if their welcome at Pureni wore thin, if their Pureni hosts said that they drank all their water, or if the Pureni people persisted in reminding Bogorali that the pandanus was theirs, Bogorali would follow the Hagia, Haea, Hiribi, Padiabi, Gono, Mogono rivers, come back to Lai, Lagu (near the Garai), that they would return to claim their land. The Tani sub-clans split up the Bogorali ground amongst them and felled the bridge over the Tagali river to signify the finality of Bogorali's flight.

NARRATIVE C3 - The Tani-Bogorali War: a Bogorali Version

Ngoari-Hebe (Bogorali Egaya), 8.2.91, 91/1A: 150-250

Tani Bogoralila wai binigo.
Tani and Bogorali fought one another.
O hambuni ndo bii, tomiani ndo bini, purini ndo bini.
We [Bogorali] didn't use *hambu*, or *tomia*, or *puri* [all poisons].
Tani Bogoralila wai bini dago Bogorali ibu nogo bo yalu.
This war between Tani and Bogorali happened because Bogorali killed and took a pig.
Baibuali pene. Baibuali penego dai bialu hearia.
[Some Bogorali men] went to Baibuali and then came back.
Tani Ngoari Doarigonaga, ira Bogoralime pelo wearia galogalo hariga pelo wearia mo yalu ibini.
The Bogorali men took some firewood cut and left by the roadside by a Tani man, Ngoari-Doarigo, and carried it.
Yalu ibuwa wandari dege taribuyagola dindi Waloanda ogoria wa ho hene.
He had no sons, only daughters, and they carried the wood and placed it at Waloanda [for him].
Mo dindini mo ngelene anda bi lo.
They planted the wood in the ground as if to build a house.
Mo ngeleria agali mbirame ogoriani howa.
When they planted it there, a man was there.
Ira biago, Bogoralime dindi tu wialu denge hanganda halu piyadago lene.
'Bogorali are using this wood as a boundary marker [*denge*]', he said.
Ani layagola, Tani hondole nguai hene.
When this was said, all Tani gathered to see it.
Bogoralime yobage bialu biyada lene.
It was said that Bogorali were making an allusion [*yobage*: "veiled talk/action"].
Ani layagola yobage biyada layagola nguai hayagola. Denge hanganda halu piyayagola hendene.
It was said thus when they all gathered and saw this *denge* border mark.
O ibuwa kẹ hene. Kẹ halu, o biagoria howa, kẹ halu. Lalu hene.
There was talk to find out who had done this and they talked and talked.
Obagoria howa lalu howa horo mbiru kẹ halu hene, horo mende angi obagoria howa kẹ halu howa, kẹ howa.
A first time they talked [ie held a moot] and did not find out who had done this, and then a second time they talked and did not find out who had done it.
O Tani Bogoralila tigi tege lo, wai bini.
Then Tani and Bogorali started to quarrel [*tigi tege*] and a fight started.
Wai bialu o wai bini dagoni. Wai bialu howa o walu purogo lene.
The fight started and they fought. After they had fought, it was said, 'Leave it, I'm going' [i.e. let's call a truce].
Wai bialu howa o walu purogo lowa nogo nigi uru dawalu libu hene.
The fight ended and compensation pigs [*nogo nigi*] were killed to stop the fight.
Dawalu hearia ayu dalu ibira dagua ore ibiyagola aiendo hole ibiya yagi agali mbira ibini.
They were cooking [the pigs] in the afternoon, as the rain came, when a man came up.
Ibuwa Baru-Yabule ibuwa lalu. O biyada agibe lene.
Baru-Yabule came up and said, 'What are you doing?'
O ibu aba Mai-Mogia ha andanda bia, Mai-Toneya ha andanda biagome, Embo Hini ha andanda biagome, Abu-Aluwai ha andanda biagome, Mai-Yoromo ha andanda biagome, Bari-Ambu ha andanda biagome, Aya-Obara ha andanda biagome.
'His [Tani's] kin, Mai-Mogia [Munima *tene*], Mai-Toneya [Hubi *tene*], Embo Hini [?], Abu-Aluwai [Wenani *tene*?], Mai-Yoromo [?], Bari-Ambu [?] and Aya-Obara [?] all live close by [ie Tani had the numbers at hand during the fight].'
Abale ha anda halu biyada lene ibu damba bi lalu.
He gave a *damba bi* speech and said that these lineages had come and stopped the fight.
I Ulutima Yagua haruya, Pedaro Gabua haruya, Yuna Lai haruya, Aguane Togo

haruya, Biala Togo haruya, Nale Togo haruya, Handala Togo haruya, Bala Togo layadago, Gambe Ele wiridarunaga,
'While I was at Ulutima Yagua, Pedaro Gabua, Yuna Lai, Aguane Togo, Biala Togo, Nale Togo, Handala Togo, Bala Togo and Gambe Ele [i.e. all distant locations],
i hondo poliya lalu yandare ngulau\ lalu ba ai\ hene.
you did thus so I have come to see where you were fighting', and he threw his spear down and it made a noise [*ngulau*].
Nogo nigi dawalu hearia. Ani laya.
They were cooking the compensation pigs and he said thus.
Bogorali aba ge hamua hamuabi mbirame au lene.
This Bogorali kinsman, who was a leper, said thus.
Au layagoia howa, bialui wa haribago, nogo nigi dawaraba layagola, danda bai hayagola.
When he said thus, they replied that they had killed and cooked the compensation pigs and thrown aside their bows.
Piaruago layagola dau tiri heneyago, kulukulu layagola amu wiagoniha.
Five rows of men had come [with the leper] and over where they were the ground shook [*kulukulu*].
Tani andaga gele wia haya.
They went straight into [i.e. invaded] Tani ground.
Gele wia hayagola, Tani nde manda mandabu beragoria ndobe biribu auwalanda hayagola agali labo nai biagoria de ni hene kuni laribigoni wai obagoria lere le pe haribigoni.
When they went in, Tani were ready and pushed out and there was a great fight; when arrows pierced them in the eyes they ignored them and kept on fighting.
Bogorali a aguabere i nogo nigi dawalu henego layago.
[Tani said] 'Bogorali, what are you doing? We have already cooked the compensation pigs.'
Ngoari-Aguma handa, o danda ba ai\ halu.
Ngoari-Aguma [Bogorali *tene*] threw his bow aside.
Amu nogo, wai biago wa halu ya lalu i amu poro lalu i boga lalu amu bagoria pidiri pedere bini.
'Leave the fight aside; if you want to fight then just shoot me' he said, and he rolled down to where they fought.
Bogorali Ngoari Aguma handa.
The Bogorali man Ngoari-Aguma did thus.
Au biyagola bai ai\ halu hearia Ngoari Luni abale tegelepe heneyago mbirame ge pau\ ini dugua bene.
But soon someone shot Ngoari-Luni [Tani Hebaria *tene*] in his calf [*ge pau*].
Dugua bayagola bamo dago hondo ha yamo dago lowa dabamia dage lalu nogo biago gibu payapayabu dawa payabu ngelowa, dabamia dage bamogo hondo ha laya tirigi tigitega lene bolangua bolangua haga bini timuha abale.
Some sat and said, 'This is no great thing, it is just small, let us talk and kill pigs.' 'Let us divide our pigs'; but others kept shooting, and the arrows flew swiftly in both directions [*bolangua bolangua*].
Bolangua haga biyagola o Tani ibu Bogorali horombe pelole lowa.
When the arrows had been shot, Tani swore [*horombe pelole*] as they had before that they would oust Bogorali.
Maiya-Dimbu, Maiya-Toneya handa toro\ halaga biangonga.
Maiya-Toneya [Hubi *tene*; Tani *yamuwini*] had performed divination rites [*toro, halaga, biangonga*] for Maiya-Dimbu.
Bu yu heagome.
He already held it [the result of the divination].
O Bogorali ogoni angi, Luni bara angi, polene lowa, wai Pela Pagola waini.
At this time, when Bogorali shot Luni, Pela and Pago [two Pureni clans] were fighting together.
Dimbunaga, Toneya ibu toro\ uru halaga uru biangonga uru bu yu henego.
Toneya performed *toro, halaga* and *biangonga* [forms of sorcery and divination] for Dimbu and held it.

Bu yu howa, ai Bogorali polene angi dago.
When it [the result of the divination] was held, then it was time for Bogorali to go.
Polebira, Ngoari Luni balu, polene lalu ala toro\ halaga biangonga uru bu yu hene emaga uru hondo yu hene.
This that he held would kill Ngoari-Luni with *toro*, *halaga* and *biangonga* and then they would rout them [Tani].
Ai Luni bo ibira hayadago, Tani hilimia lene.
They said now we have killed Luni and we shall rout Tani.
Au biyagola Tani hilimiyagola.
When this was done, Tani fled and then regrouped.
Bogorali laibelabe lo hayagome. Luni bogoni. Bogayagola, Tani Bogoralila wai kulu laribigoni, Luni bogayagola.
Bogorali shot Luni and then the war between Tani and Bogorali grew huge.
Luni bogalu Bogorali polene, lene bagoria.
When Luni was shot, Bogorali would go, it was said.
Ani biyagola, Toneya handa, lo wiyagoria, piyagola, Maiya-Toneya handa, ai pelaro lene.
When this happened, Toneya said now Bogorali must go.
Hubi, Tani aba, Maiya-Toneya ogoni.
This Hubi man, Maiya-Toneya, was an *aba* kinsman of Tani.
Tanila wai emene dago hangu bidibale iya hinimagaho / bimagaho? holene wini.
If we had fought a small war only with Tani, we could have stopped it and stayed.
Hubi Toneya handa pelene. Ibu hame Dimbunaga.
It was Hubi Toneya who made us go, in revenge for his father Dimbu.
Pela Pagola waiguria pelene dagoni.
They were routed when Pela and Pago fought.
Ani biyagola howa wai Bogoralila balu, amu yagi Ngoari-Luni bamu hea dagoni.
When they fought, Bogorali shot Ngoari-Luni over on that [Tani] side.
O Ngoari-Ayaga bamu hene. Ngoari-Gai bamu hene.
Ngoari-Ayaga [Bogorali] was shot. Ngoari-Gai was shot.
O yagi nde Baru-Langini ima, Dali-Dabugo ima.
On that side Baru-Langini and Dali-Dabugo were shot.
Ora bawa ka agali. Deria labolabo haleria balu togo lene.
Thirteen or fourteen on each side were killed.
Balu ogoni angi, balu, ai Bogorali pe la.
When they were killed, it was said that now Bogorali would be evicted.
Bogorali udu Hari Ngoariba biago piniha heremiai hene.
Bogorali were camped up there at the base of Mt.Ngoariba [behind Walete mission].
Miai hayagola, Tani Ngoari-Luni handa, uyura, puwa, nogo bo yu iraga hene huliha.
Before, Ngoari-Luni had killed a pig and taken it up to *huli* [the Tari basin].
Uyura huliha pialu hearia. Igiri emene kira Ngoda Hadala.Iba payalu beraria hendene.
When he came up to *huli*, he met two small boys, Ngoda and Hada, who were damming water.
Ai gene dege haga berogoni.
Now I'm giving a branch of this story.
Puwa, igiri emene kira ogobila ogobila iba payalu yago gara mbira bo mu howa dugu bialu hearia iraga hene.
When he went, he saw that the two little boys had been playing like this and like this [*ogobila ogobila*] at damming water and that they had killed a frog [*yago gara*; unidentified sp.] and built a mourning hut for it.
Luni handa bamba Luni nahome howa.
This was before, when Luni was alive.
Madaba andaga Ngoari-Luni halu Tani nogo bo yu pene ibalu hearia.
At Madaba parish, Ngoari-Luni had killed a pig and he was returning.
Yago mbola biago mu ho ngelowa Ngoda Hadala.
Ngoda and Hada had put this frog thus.
Mu howa. Dugu bialu hearia iraga hene.
The two were mourning when he came.
A agua berebe iene.

'What are you doing', he said.

Waru biago domo wa howa pai dandabuni kira, payani ogoria hahalu.

He cleaned the mud from them and put two roasted pork strips [*dandabuni*] on their shoulders.

Puguni biarume, abene biarume, hai howa halenego, igiri emene biago labo.

He gave the two some meat and some fat which he put on their bodies and left them.

Ai o biago labo ore, manda ho, Ngoari-Luni mbira bara layagua igiri emene biago labo ibabe, hale halibu lenego.

When he did thus, he said, 'If, when you are older, you hear that someone is beating Ngoari-Luni, you must come.'

Manda ho hearia, Luni benego.

When the two had grown full heads of hair, Luni was killed.

Bogorali balu, Luni balu ede Ngoariba biagoha here muwa agua bialu hearia.

When Bogorali killed Luni they were camped at Ngoariba.

Ngoda Hadala biagome, Luni bo mu ka layagola hale howa igibu udu Madaba anda hari udu wiagoria howa Hari Ambuani howa, gili lene.

When Ngoda and Hada heard that Luni had been killed, they mourned him at Madaba and then they went over there to Mt.Ambua and brought [cane] from there.

Yalu ibuwa hari udu Ngoariba udu mbaria udu ira udu mbaria udu heagoria andiba hene.

They brought this cane to Mt.Ngoariba and tied it [*andiba*] to a tree at the top.

Andiba howa irabu ede, ege tene biagoria pu gililape hene.

They tied it and rolled the other end of the cane down the limestone cliffs.

Hale tiri udu bagoria yu kululupe hene.

When they had done this, they leapt down from above.

Bogorali udu herene heago helepe howa unu, Birimanda guriya he dagoria Tagalini helepe halu, Bogorali ogoni angi biniyi o biba hene.

They routed Bogorali, chasing them over there to Birimanda where the hoop pines are, to the Tagali river, and chased Bogorali off entirely.

Biba hayagola howa, Bogorali ibinigo ogoria o kogoni amugoria penego ka edegoria penego ka udugoria penego ka.

When they were finished there, Bogorali came here, to where I am now [in the Koroba basin], to over there, down below where they are now.

Iya wai walere emene bialu hebaria.

It was only a small war that the two of us fought.

Toneya ibu hada daga howa podene.

Toneya [Hubi] started this fight and evicted us.

Bogorali puabo holeni lene.

Some Tani said, 'Bogorali should not leave altogether.'

Wai bini dago. O Pomiala binigo. Pomia igini Giwa, Giwa igini Madabi ka, i hamene.

This fight we fought with Pomia [a Tani fight-leader]. Pomia's son Giwa had a son Madabi, my kinsman, who is alive now.

Bogorali pu abo holeni dai bilo abale dege dai biaboha lalu birabo henego. Beda.

'Bogorali, do not go entirely, come back before too long,' they said, and stayed. They [Tani] stayed [on Bogorali ground].

Luni dago anduane ogoni, Gunini ka. Gunini igini Agilo ka.

The leader of Luni's line is Gunini. Gunini's son is Agilo who is alive.

Agilo handa ibu lalu i hamene ibu lalu birabo ka.

Agilo has said, 'Brother, come back'.

Giwa handa ibu lalu birabo henego biralu homayagoni. Igini ayu beda.

Giwa said 'Come back' but he is dead now and his sons are there now.

Ogoni angi Bogorali biba henego ayu ibinigo o kamagoni.

When Bogorali left we came here where we are now.

Ina aba wandari laruru bihendeme o dindi Ngoariba wuwa, Walete beda.

The daughters of our *aba* [i.e. our *yamuwini*, the descendants of our mother's brother's daughters] are at Ngoariba and Walete.

O iya ogoni hambume mbira nabi, purime nabi, tomiame nabi.

We didn't fight with *hambu* or *puri* or *tomia* poisons.

Dandame daliga biba dagoni.

We fought openly [literally: "on top": *daliga*] with bows.
Ba i hene oba hole kaba mbiru haba layagua Walete dai bu harabada angi, Lunila mbiru nogo mololа howa agubule kaba.
If we went back to Walete we would pay compensation for Luni.
Ibu nogo noaba layagua. Mangaba layagua yamo dindi uru hole kabagoni.
If he wanted pigs [ie would accept compensation]. If he said 'No' [*mangaba*], we would stay as nothing [*yamo*] on this ground.
Au lalu ibugua mi tangiba layagua bulebereba, nalayadagua iya.
If it is said [by Tani], 'We are still remembering' [Luni's death], then we will pay, if not we will stay here.
Ayu horo uru biba halu agali timbuni dai birago hamene lowa.
Now the days are almost over and the Big Man [God] will come back, so we will say, 'Brother'.
Gi tigali bu hole keba.
We will shake hands and stay together.
Noaba layagua nde, Bogoralime mbira ago buwa hamene o "muni" dagabi mbira tagu ngero lolebira.
If they say they want compensation, Bogorali will give them money ["muni" (Tok Pisin)] compensation.
Ndo, mangaba layagua mandagi palue bereba, bu migi buwa.
If they say, 'No', we will sleep together anyway, sleeping face to face.
Hariha kagome ani bilibu leda, wa howa palue kabagoni. Ngode handa au bilibu leda.
God says 'Live in peace together', so we will throw away these old ways. God has said thus.

NARRATIVE C4 - A Bogorali Lament

Ngoari-Hebe (Bogorali Egaya), 8.2.91, 91/1A: 117-134

Bogorali ibu aba, Bogorali Yale Togo ibu aba
The *aba* kin [ie *yamuwini*] of Bogorali, of Yale Togo, [including:]
o ibu aba Mai-Mogia uru, Kuari-Dolo, Baru-Yabule uru,
Mai-Mogia [Munima], Kuari-Dolo [Dolo], Baru-Yabule [Yobiya],
Haro-Mamage uru, Dali-Ngawe -Halumala uru, Yaliduma-Loria -Waberala uru,
Haro-Mamage [Haro], Dali-Ngawe [Gaiyalu] and Yaliduma-Loria [Dagabua],
Ibara-Agabu -Yabala uru, Dali-Nai -Domabela uru, Bibi-Handabe uru, edera helai kogo.
Ibara-Agabu and Ibara-Yaba [Haliali], Dali-Nai and Dali-Domabe [Gobiya] and Bibi-Handabe [Munima *yamuwini*], I left them all there.
Iba Hagia ange, Abago angeange, Hiribi angeange, Gendo angeange, Bara angeange edera haledogo.
On the banks of the Hagia, Abago, Hiribi, Gendo and Bara rivers [in the former Bogorali parish] I left them there.
I ini maane pene kogo parane uruni iba uruni angeha o kogo lalu heledogo.
Myself, I departed, but I left small roots along the banks of these rivers.
Uruni ha kago. Yale Togo uruniha hai kago. I ini o kogo.
They are there, [and thus] Yale Togo [Bogorali] is [still] there. Myself I am here [at Dalipugua].
Hari ogo piniruha kogo [igiri yango ibinigo], nogo nabalole ibinigo, wandari payalole ibinigo, igiri yango lole ibinigo uruniha kogo.
At the base of this mountain, I came to eat pork with them, to befriend [literally: "shoulder"] their daughters, to befriend their sons, those who are here.
Mane edere yagi wia, parane edere yagi wiaiha, dai bule kago.
Some of the root [*ma*] I left there, some of the branches I left there, for I will go back.
Aba uruni uru ede wiai kogo.
All these kin, I left them there.
Hubi Ngoari inagago, inaga ngogo.
Hubi Ngoari mountain is mine.
Iba Padabi, i hamenaga bulini duginogo.
Padabi river springs up from the heart of my father.
Iba Dere / Deriaanda inaga bedogo tindule lalu koria ge hamua bulene uru burayu holene uru, amali holene uru, ti tu bulenego, iba Dereanda ale, dere bulenego.
Where the Dere river runs is mine and if I am lying [*tindule la*] may I get leprosy, may I get tuberculosis [*bura*: breath; *yu*: short], may I get chronic bronchitis [*amali*], may my nose run [*ti tu*], may I get sores [*dere*] like [i.e. the size of] the Dere river itself.
Ogoriani bereledo Yale Gai\ Hubila ngo, Hubi Ngoari Dane inaga udu ngogo, ogoni panigi ore ngogo.
Here I leave the mountains Yale Gai\ and Yale Hubi and Hubi Ngoari Dane, this is quite clear [*panigi*] [ie open knowledge].
Iba Hagia angeni, iba ameya mialu haabo holebira, i aba o larorume.
On the banks of the Hagia river, my kin used to fish for tadpoles [*iba ameya*].
Iba Bara angeni, iba ameya mialu haabo holebira.
On the banks of the Bara river, they used to fish for tadpoles.
Iba Gendo angeni, iba ameya mialu haabo holebira.
On the banks of the Gendo river, they used to fish for tadpoles.
Dindi uruni Yale Togo inaga ngo.
These places belong to Yale Togo.
Ai i aba uruni ha hele dogo
I left my kin there
Mai-Mogia handa, molomolo birabo ka.
Munima still stays there [literally: "is seated there continuously" (*molomolo*)].
Baru-Yubale handa, yabuyabulo haabo ka.
Yobiya is there to divide out [*yabuyabulo*] the pork [ie when they do this we will come].

Kuari-Dolo handa, didolo haabo ka.
Dolo is there, restless [*didolo*].
Habono Miaro handa, miamiaho birabo ka.
Miniba is clearing [*miamiaho*] the way.
Iba Gindira handa, gundigundibu hundi yabunga.
Iba Gindira looks back wistfully [*gundigundibu*] towards us.
Haro Mamaga handa, mamagaho nga.
Haro clan keeps watch [*mamagaho*] for us.
Dindi Hubi Ngoari inaga, Iba Hagia inaga.
The land, the mountain Hubi Ngoari is mine. The river Iba Hagia is mine.
Au ngo ogoni ngo.
These are mine.
Au lalu ini, uruniha howa bi agali adogeha howa ladabero.
Now I am beneath the arm of another man [i.e. I am *yamuwini* here] and only my words go back to there.

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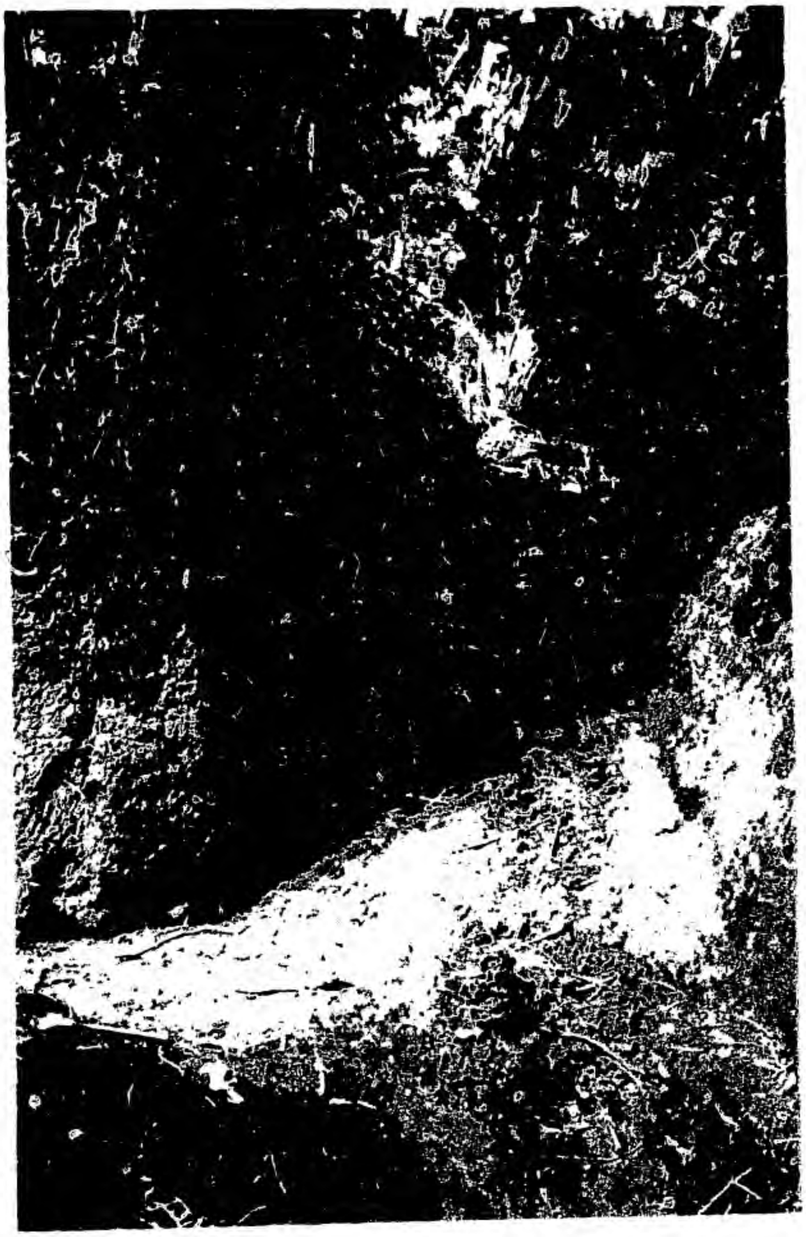

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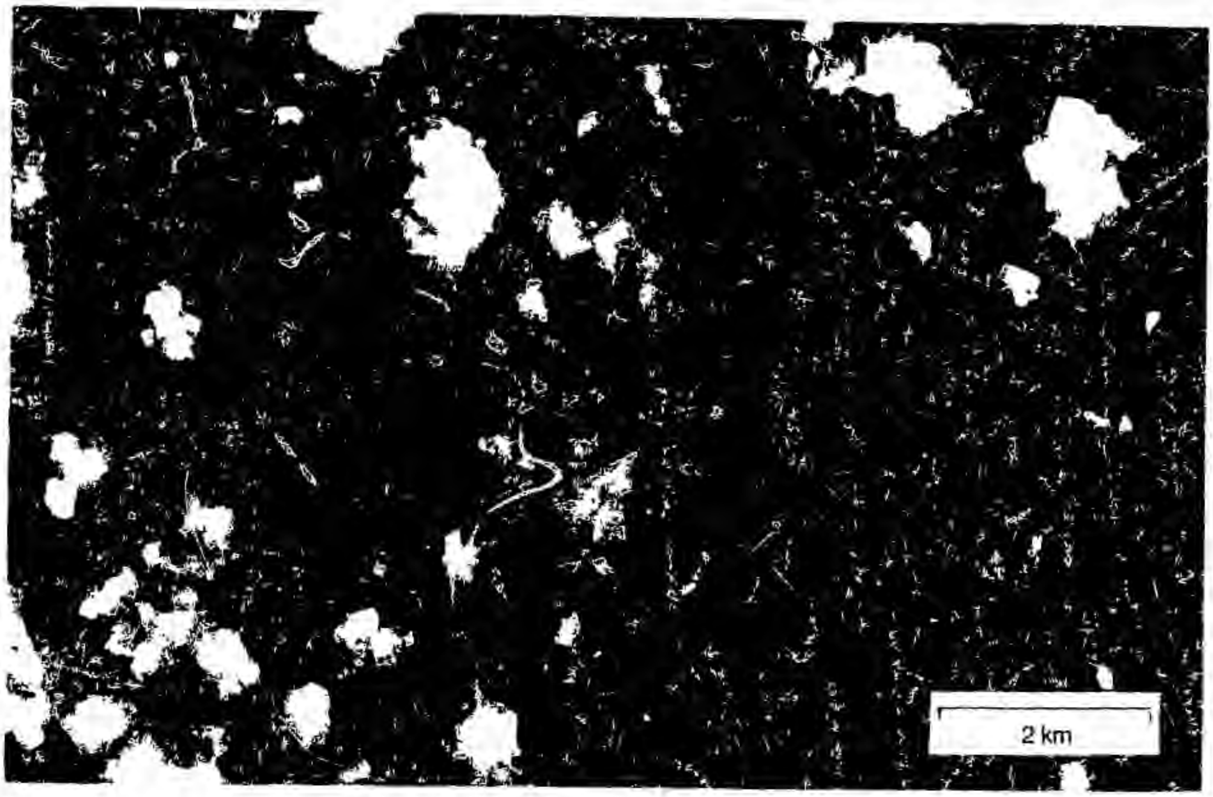

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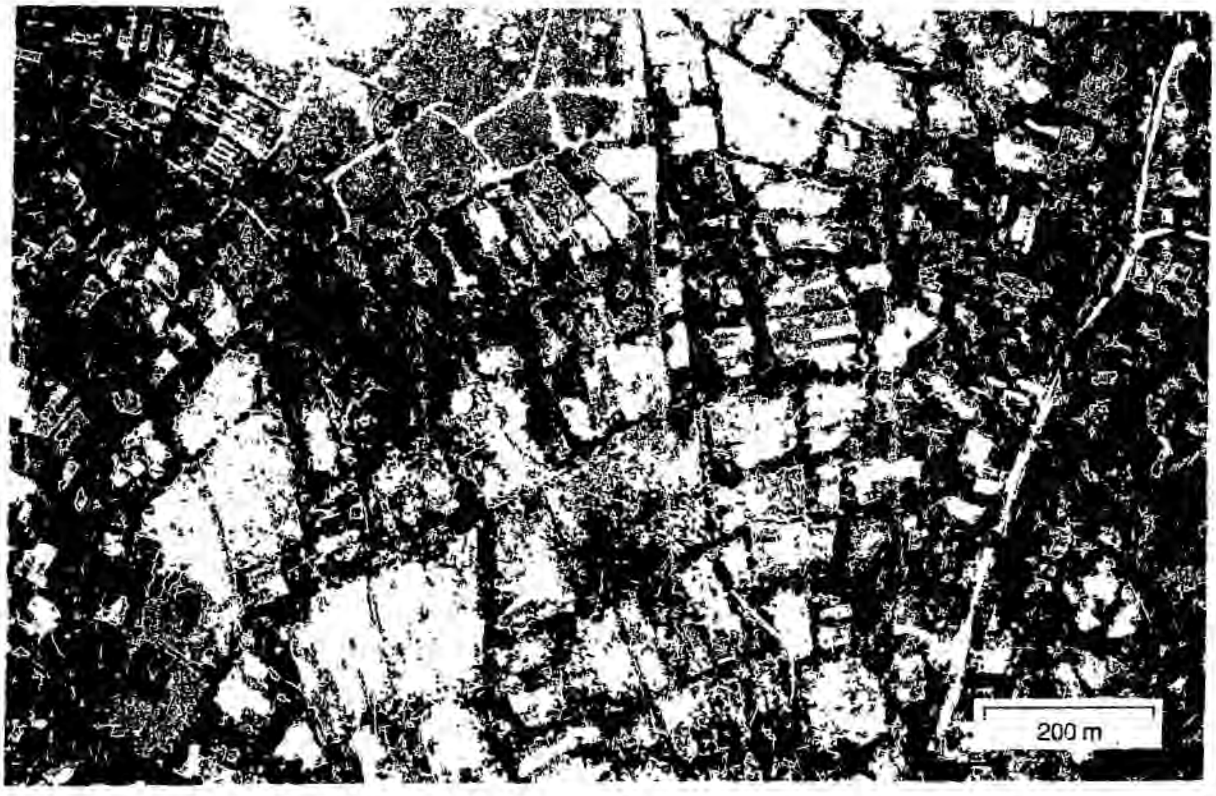

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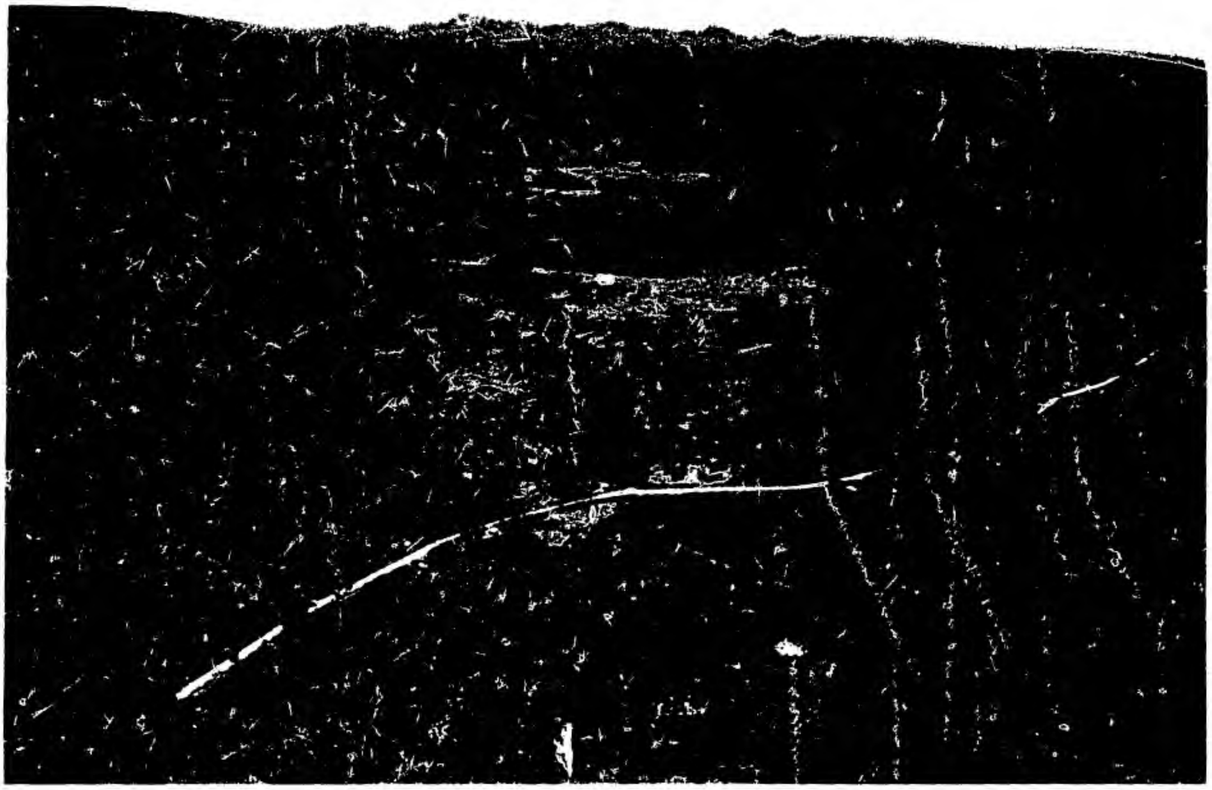

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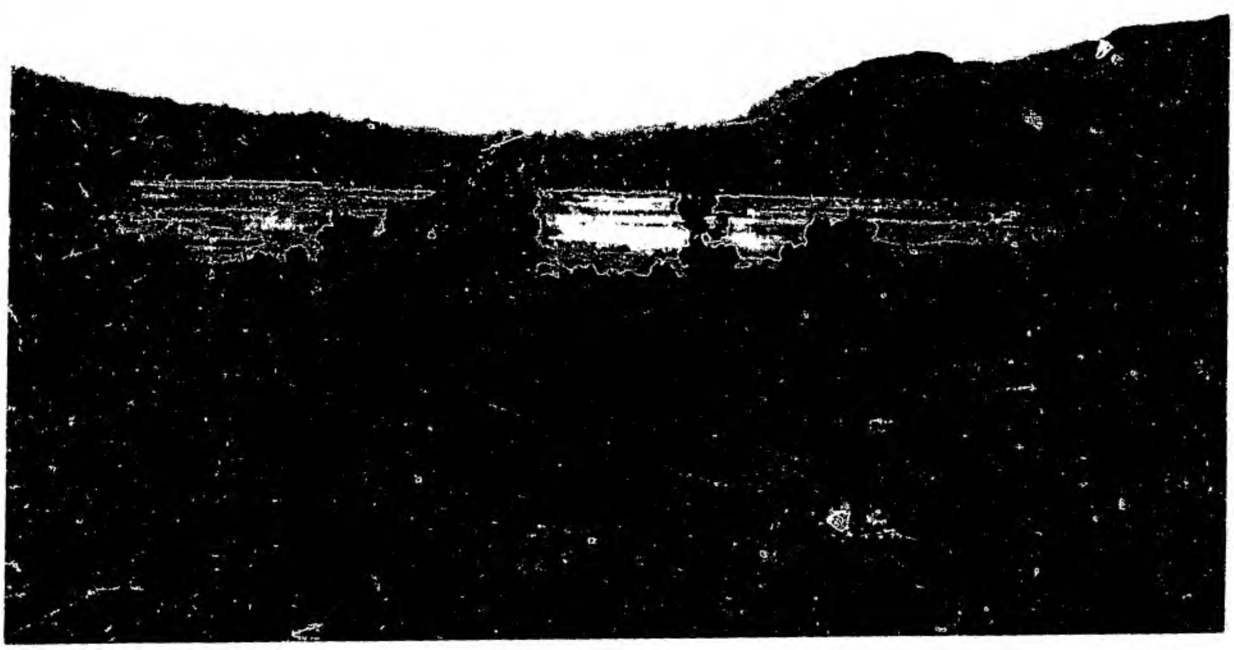

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