UNIVERSITY OF CALIFORNIA

SCRIPPS INSTITUTION OF OCEANOGRAPHY

OPERATION NORTHERN HOLIDAY
August - September 1951
A PRELIMINARY REPORT

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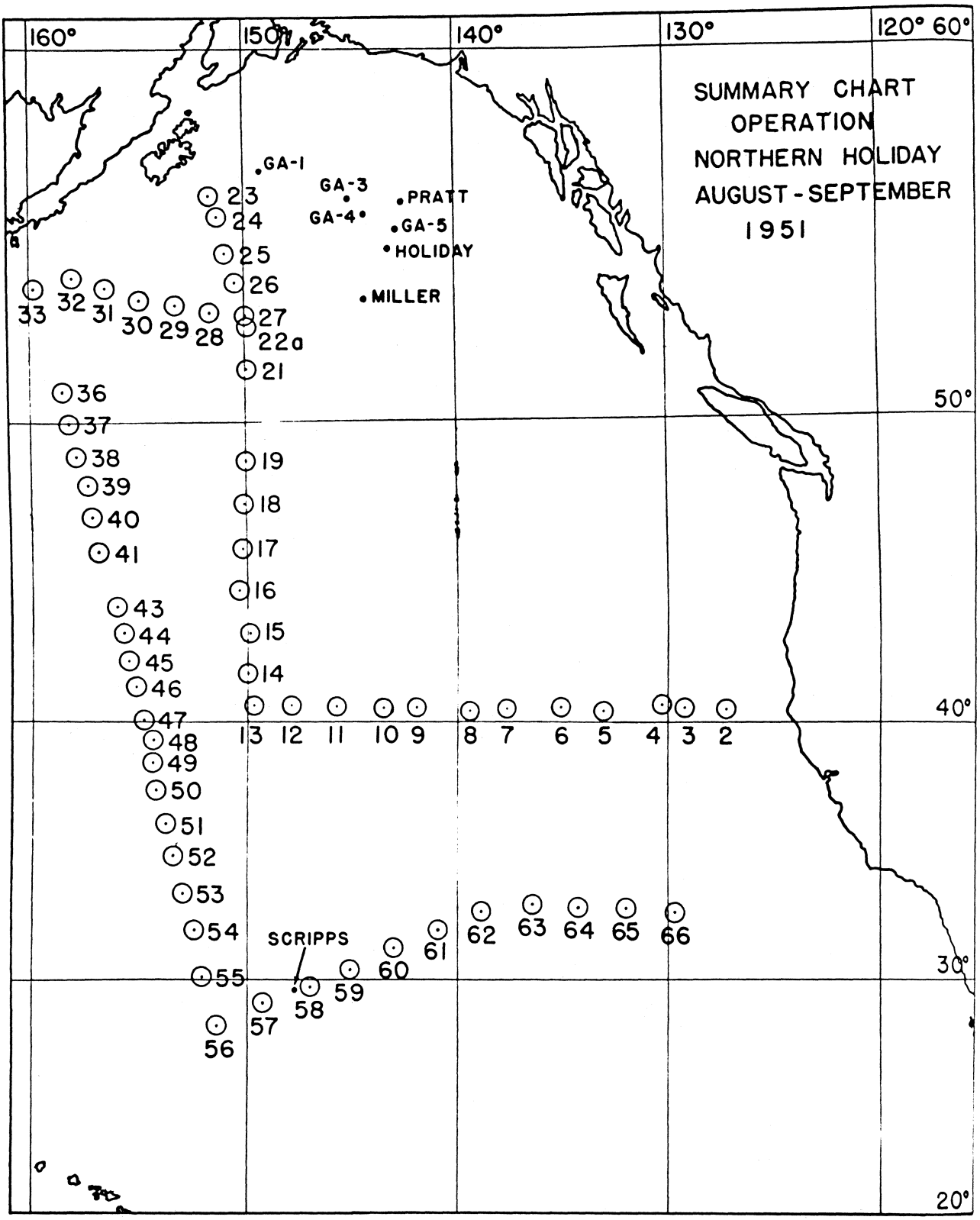

Figure 1. Summary Chart, Northern Holiday.

INTRODUCTION

Since the end of World War II a great number of oceanographic observations have been made in the eastern North Pacific. The bulk of these, however, have been within five hundred miles of the coast and there still exist large "holiday" areas in which no observations have been made. In order to make possible a description of the general oceanography of the region, to characterize its water masses and describe its current systems, it was necessary to collect further data from the deep-sea areas. For this purpose an expedition known as NORTHERN HOLIDAY was organized by the University of California's Scripps Institution of Oceanography under the sponsorship of the Office of Naval Research and the Bureau of Ships.

The HORIZON, research vessel of the Scripps Institution, departed from San Diego on 28 July 1951 and arrived in Kodiak, Alaska, completing Leg A, on 26 August. She departed from Kodiak on Leg B on 29 August and returned to San Diego on 26 September 1951. The course followed and stations occupied are shown on the Summary Chart, figure 1.

Although the scientific findings of this expedition will not be available for some time, it seems advisable at this time to issue a preliminary report summarizing the work accomplished. Because the experience gained in the organization and execution of this expedition may be useful in the planning of future operations, emphasis is laid primarily on the planning aspects of the work -- time required for observations, difficulties encountered, deficiencies in planning and equipment, and recommendations for improvement -- rather than on the substantial accomplishments of the expedition. These it is hoped will be apparent in later reports and scientific papers.

At the present time it seems likely that responsibility for working up various aspects of the observations will be as follows:

Serial Observations - John Cochrane, Warren S. Wooster, Paul L. Horrer
Bathythermograph Observations - John Cochrane
Chemical Analyses - Warren S. Wooster
GEK Observations - John A. Knauss
Cores - William Riedel
Dredge Hauls - Henry W. Menard
Bathymetry - Henry W. Menard
Midwater Trawls - Carl Hubbs, Martin Johnson
Vertebrates, Net Tows and Dipnetting - Elbert Ahlstrom
Invertebrates, Net Tows and Dipnetting - Martin Johnson
Surface Temperatures and Wind Records - not assigned

SUMMARY OF RESULTS

PHYSICAL AND CHEMICAL OCEANOGRAPHY

1. Sixty-five hydrographic stations were occupied with casts ranging in depth from 200 meters to 4200 meters.

2. Water samples from 60 stations were analysed for oxygen and phosphate content; samples from 34 stations were analysed for silicate content.

3. One hundred and ten Bathythermograph observations were made.

4. Three hundred and five observations were made with the Geomagnetic Electrokinetograph.

5. During most of the trip, a continuous record of surface water temperature was made with the Thermitow. A continuous record of surface winds was made.

SUBMARINE GEOLOGY

1. Ten cores were obtained with the Phleger corer at depths from 2030 to 3000 fathoms; the longest of these was 69 inches in length. On one station a large manganese concretion weighing more than 100 pounds was obtained during the coring operation.

2. Seven successful dredge hauls from the tops of four seamounts were made.

3. Nine seamounts were surveyed, two of them previously uncharted; five small uncharted sea knolls were discovered.

4. Mendocino Escarpment was surveyed in great detail from 125°W to 150°W; 18 crossings of the scarp were made and 1500 soundings recorded.

5. Echo-soundings were made at frequent intervals during the entire expedition, some 9300 soundings being recorded.

MARINE BIOLOGY

1. Twenty-seven hauls were made with the Isaacs-Kidd trawl, reaching depths of 60 to 2400 fathoms.

2. Fifty-seven successful standard oblique net tows from 200 meters to the surface were made with a one-meter plankton net.

3. Dipnet fishing was done on 16 night stations.

4. A log was kept of miscellaneous observations, including those made of marine birds and mammals.

SCIENTIFIC PERSONNEL

The following persons participated in all or a part of the expedition:

Name	Affiliation	Leg
Barandiaran, Jose	Student (Peru), SIO	AB
Cochrane, John D.	Associate in Oceanography, SIO	B
Dinkel, Charles C.	Assistant in Marine Chemistry, SIO	B
Faughn, James L.	Technical Administrator, SIO	A
Isaacs, John D.	Assistant to the Director, SIO	A *
MacFall, John B.	Photographer, SIO	A
Menard, Henry W.	Oceanographer, NEL	A
Riedel, William	Paleontologist, So. Australia Museum	B
Simmons, Charles V.	Student, Fresno State College	AB
Smith, Alan C.	Senior Marine Technician, SIO	AB
Stewart, Harris B.	Research Assistant, SIO	AB
Wisner, Robert	Senior Laboratory Technician, SIO	B
Wooster, Warren S.	Assistant Oceanographer, SIO	AB **

*Expedition Scientist, Leg A **Expedition Scientist, Leg B

While the ship was under way a continuous laboratory watch was maintained. In general, all members of the scientific party participated in all phases of the scientific work. Certain specialized aspects of the work, however, were carried out by the following persons:

Midwater Trawling - Isaacs (A), Wisner (B)
Survey and Dredging - Menard (A), Stewart (AB)
Chemical Analysis - Wooster (AB), Dinkel (B)
Photography - MacFall (A)

The scientific party was at all times adequate in number for the work at hand. It is hoped that in the future more Scripps graduate students will find it possible to participate in such expeditions.

DISCUSSION OF RESULTS

PHYSICAL AND CHEMICAL OCEANOGRAPHY

Serial Observations

During the course of the expedition 65 hydrographic stations were occupied, including one to a depth of 4200 meters, 39 to depths of at least 3000 meters and 61 to depths of at least 1000 meters. In general the routine followed and the forms used were those of the Marine Life Research

Program of the Scripps Institution. During many of the stations the ship was under way, steaming into the wind in order to reduce the wire angle.

The following table shows stations occupied (see Summary Chart for location), time required for observations, and difficulties encountered during the station:

Station	Shallow Cast	Elapsed Time	Deep Cast	Elapsed Time	Remarks
1.	----	----	----	----	aa
2.	1200 m	1:54	----	----	a
3.	1200	1:12	2500*m	1:47	b
4.	1200	54	3000*	3:40	Btl.81 c
5.	1200	1:00	----*	----	Btl.77 cc
6.	1200	1:20	3000	2:34	
7.	1200	1:12	3000	2:40	
8.	1200	1:01	3000*	2:03	Btl.81 slip to 74
9.	1200	53	3000	2:04	
10.	1200	1:00	3000	1:56	
11.	1200	1:15	3000	2:01	
12.	1200	1:08	3000	1:58	
13.	1200*	1:17	3000	2:08	ccc
14.	1200	58	3000	2:00	
15.	1200	55	3000	2:08	
16.	1200	1:10	2750	3:00	Btl.86 d
17.	1200*	1:30	3000	2:26	ccc
18.	1200	1:14	3000	2:35	
19.	1000*	1:45	----**	----	Btl. 86D; a
20.	----	----	----	----	aa
21.	1200	58	3000	2:48	
22a.	1200	1:04	3000	2:09	Gilbert Seamount
22b.	1200	52	----	----	" "
22c.	1200	1:10	----	----	" " , Btl.80c
22d.	1200	46	----	----	" "
22e.	1200	45	----	----	" "

End of Leg A

23.	800 m*	1:03	----**	----	Btl. 85 leak, 86d; b
24.	800*	1:16	3000*	1:37	Btl.84cc; Btl.77 slip to 79
25.	1200	1:11	3000	2:11	
26.	1200	1:08	3000	2:10	
27.	1200	1:01	3000	2:10	
28.	1200	1:23	3000*	3:43	Btl.81c
29.	1200	1:02	3000	2:40	
30.	1200	55	3000	2:10	
31.	1200*	1:04	3000	2:23	Btl. 77d
32.	1200	1:14	3000	1:58	

Station	Shallow Cast	Elapsed Time	Deep Cast	Elapsed Time	Remarks
33.	1200m	1:05	3000m	1:51	
34.	----	----	----	----	aa
35.	----	----	----	----	aa
36.	1200*	1:50	3000	2:20	ccc
37.	1200	1:09	3000	2:15	
38.	1200	1:08	3000	2:30	
39.	1200*	1:17	3000	2:00	3 btls repeat (15 min+)
40.	1200	1:03	3000	2:07	
41.	200*	55	----**	----	e; a
42.	----	----	----	----	aa
43.	1200	1:09	3000	3:14	
44.	1200*	?	----**	----	Btl.70c,ccc,77-79 together; a
45.	1200	1:02	1600*	2:02	e
46.	1200*	1:40	3000	2:23	e
47.	1200	58	2500*	2:39	e
48.	1200	1:08	3000	2:22	
49.	1200	1:08	3000	2:03	
50.	1200	1:03	4200	3:23	plus samples from 5500 m
51.	600*	1:06	----**	----	Btl.83cc (wire); a
52.	1200	1:17	----*	----	a
53.	1200	1:09	3000	1:58	
54.	1200	1:03	3000	2:09	
55.	1200	55	3000	1:55	
56.	1200	50	3000*	4:14	e
57.	1200	57	----	----	No further deep casts due to insufficient wire
58.	1200	52	----	----	
59.	1200*	1:16	----	----	e
60.	1200	59	----	----	
61.	1200	54	----	----	
62.	1200	57	----	----	
63.	1200	1:06	----	----	
64.	1200	1:02	----	----	
65.	1200*	1:09	----	----	ccc
66.	1200	59	----	----	

Remarks Code

a	Too rough for deep cast
aa	Too rough for shallow and deep cast
b	Too shallow for standard cast
c	Bottle No.__ failed to release messenger, portion of cast repeated
cc	Same, cast not repeated
ccc	BT failed to release messenger, portion of cast repeated
d	Bottle No.__ pre-tripped
e	Messenger hung on wire (splice or kink)

In an effort to determine the effect of a seamount on the distribution of temperature and salinity, stations 22 a, b, c, d and e were occupied in the immediate vicinity of Gilbert Seamount; station 22 a east of the seamount to a depth of 3000 meters and stations 22 b, c, d and e in the center and the other three sides of the seamount to depths of 1200 meters.

The average time required for a shallow (1200 meter) cast when no repetition was necessary was 64 minutes, times ranging from 45 to 83 minutes. The average time for a deep (3000 meters) cast with no repetition was 135 minutes, times ranging from 97 to 194 minutes.

Nansen bottles used were purchased from Kahl Scientific Company and were modified in the Scripps Institution shop. The major difficulty encountered with these bottles at sea was a tendency of certain bottles not to release their messengers, necessitating repetition of part of the hydrographic cast. After the rods which support the messengers until release were filed to a sharp point, this difficulty was alleviated.

All reversing thermometers used during the expedition were manufactured by Kahl Scientific Company. A number of these thermometers were borrowed from Chesapeake Bay Institute, Johns Hopkins University.

On 59 of the 65 stations occupied there were from one to five thermometer failures, averaging 2.5 failures per station. These failures occurred almost entirely with protected thermometers and consisted chiefly of wrong breaks and fall-throughs. It was necessary to continue use of certain unreliable thermometers because of the shortage of available spares. In every case, however, these unreliable thermometers were paired with reliable ones.

Because of an unexpected loss of wire just prior to the expedition, the only hydrographic wire available was approximately 20,000 feet of galvanized, preformed 7 x 19 plow steel 5/32 inch wire. At the beginning of the trip this wire contained three long splices and all but the outboard 5000 feet was new. During the trip the wire had very heavy use and was probably overstressed during coring. After Leg B began, the wire deteriorated rapidly, becoming seriously unlaid and kinked. Sections were cut out and spliced and some of the original splices renewed; frequently splices or kinks would not pass messengers and casts had to be repeated. After station 56 so little usable wire remained that it was no longer possible to take cores or deep casts.

If it had not been possible to steam into the wind while making hydrographic casts, additional stations would have been omitted. Under most conditions with the hydrographic wire in good condition it is possible to make shallow casts. However, if a heavy swell is running and there is little wind, it is very difficult to keep the ship from falling off and the wire from tending under the ship.

Chemical Analysis of Water Samples

During the expedition water samples from 60 stations were analysed for oxygen and phosphate content; samples from 34 stations, all on Leg B, were analysed for silicate content. On all complete stations samples from at least the following depths were analysed: 0, 10, 25, 50, 75, 100, 150, 200, 300, 400, 500, 600, 800, 1000, 1200, 1500, 2000, 2500 and 3000 meters.

Analyses were made by the following methods:

1. Oxygen - a 250-ml sample from each depth was treated with reagents and titrated with thiosulfate solution (Winkler method). Occasional duplicates were run.

2. Phosphate - duplicate 100-ml samples from each depth were treated with reagents and their transmittancy measured, using an Automatic Servo-operated Photometer (ASOP) (molybdenum blue method).

3. Silicate - a 100-ml sample from each depth, in a plastic bottle, was treated with reagents and its transmittancy measured, using a Beckman Model DU Spectrophotometer (silico-molybdate method).

A total of 1318 oxygen samples, 1193 phosphate samples and 614 silicate samples were analysed. In addition two silicate and seven phosphate standard curves were run.

On station 50 a special deep cast to 4000 meters was made to determine whether silicate reached a maximum value (in addition, water from the coring tube (at 5500 meters) was anlysed for silicate and oxygen). On this station silicate reached a maximum at 2000 meters, then decreased slightly to the bottom.

The ASOP worked very satisfactorily throughout the trip. The spectrophotometer worked well during the early part of Leg B, then developed a loose connection which could not be located. After station 63 no further silicate analyses were made.

Bathythermograph Observations

At the beginning of the expedition only 3 Bathythermographs were available, a 450-foot and a 900-foot instrument, and a 450-foot hydrographic instrument converted for use during serial observations. The standard 450-foot instrument never functioned properly and was not used after the first few days. After 38 lowerings the 900-foot instrument could no longer be used, the pressure element having been broken, apparently by overpressure. Additional instruments shipped to Kodiak did not arrive before departure of the HORIZON.

In all 110 lowerings were made. The hydrographic bathythermograph was used for the bulk of the observations on Leg A and for all observations on Leg B.

GEK and Thermitow Observations

During the course of the expedition 305 observations were made with the Geomagnetic Electrokinetograph. As a rule observations were taken every two hours while under way; an attempt was made to make observations just before and after hydrographic stations. In certain regions observations were made at 60- or 90-minute intervals. A series of 26 jogs were made on two intersecting lines across the top of Miller Seamount in the Gulf of Alaska; this series lasted for 10 hours.

An electric winch was used for streaming and retrieving the GEK cable and electrodes. These were customarily retrieved just prior to arrival on station, the ship being slowed to 3 knots for this purpose. It was found inadvisable to wrap the outboard electrode and drogue on the reel; eventually the conductor leading to the electrode was broken because of the bending encountered in this process. On three occasions the winch was started before the lead to the recorder was unplugged, and it was necessary to rewire the plug.

On one occasion the inboard electrode was struck by a shark. Several long gashes were found in the formica electrode case, one conductor was completely severed, and the other conductor partially severed in two places. A new set of electrodes was then streamed. This set exhibited a serious drift in zero point and it was necessary to use zero point control on several occasions to keep the record on scale. During the last week of the expedition both sets of cables and electrodes developed open circuits which could not be located and the GEK program was discontinued.

A continuous record of surface temperature was made with the Thermitow during most of the trip. The sensitive element was streamed from a boom rigged on the starboard side and was retrieved and stowed in a bucket of water while the ship was on station. Early in Leg B it was noticed that the bucket temperatures were 3 to 5 degrees higher than indicated by the Thermitow record, and it is likely that little can be done with these later records.

SUBMARINE GEOLOGY

Coring Operations

All cores were obtained with a modified Phleger Corer lowered by means of the hydrographic wire and winch. Two corer bodies were furnished, one weighing about 50 pounds, the other about 150 pounds; core barrels ranged from 1 to 6 feet in length. During the first part of the cruise the corer was suspended from the ball-breaker and lowered until some indication of bottom was received. Later, when this device was no longer operable, the corer was lowered to an estimated amount of wire out.

The following coring operations were carried out:

No.	Location	Depth	Bot.Det.	Elapsed Time	Sample
1-a	Station 13	2550 f	x	3^h30^m	none
1-b	" "	"	xx	3^h10^m	45"
2.	Station 21	2450	xx	2^h17^m	60"
3.	Between Gilbert & Miller Smnt.	2220	xx	2^h	16"
4.	On Miller Seamount	560	xx	33^m	few pebbles
5.	Between Holiday & Pratt Smnt.	2030	x	2^h33^m	50"
6.	Near GA-4 Seamount	2100	xx	2^h18^m	none
7.	Near GA-1 Seamount	2650	xx	2^h27^m	16"
8.	Between Stations 38 and 39	2750	xx	4^h36^m	22"
9.	Between Stations 46 and 47	2920	x	3^h10^m	69"
10.	Station 47	2750	x	5^h19^m	44",nodule*
11.	Station 49	2800	x	3^h50^m	41"
12.	Station 50	3000	-	4^h10^m	16"
13.	Station 54	2880	-	2^h30^m	none

*See note 4 below
x = Ball-breaker used, no signal
xx = Ball-breaker used, good return

Of 14 attempted cores, 10 were successful. Of the four unsuccessful cores, one was on hard bottom (no.4), one penetrated but lost its core (no.6) and the other two apparently did not reach bottom.

Most of the core liners on board were lost soon after leaving San Francisco and replacements did not arrive before departure from Kodiak. In order to conserve the available liners for areas of greater interest, coring was not attempted during the early part of Leg B.

The following points of interest are noted:

1. Use of Hydrographic Wire for Coring: No spare hydrographic (5/32-inch) wire was avilable and all cores and hydrographic casts were made with the same wire. This wire contained three splices at the beginning of the trip and included a 5000-foot section of used wire. The greatest stresses to which this wire was subjected occurred during coring, the weight of the wire and corer approaching half the breaking strength of the wire and great additional stress being applied while breaking the core out of the bottom.

As a result of both coring and deep hydrographic casts, the wire deteriorated progressively and during Leg B of the trip became seriously unlaid and developed numerous kinks. Since the wire had to be used for casts and hence must pass messengers, sections where kinks were cut out had to be rejoined with long rather than short splices. Five long splices were made during Leg B. Finally the wire was in such poor shape that further attempts at coring were abandoned and no more deep hydrographic casts could be made.

It is recommended that:

a. Coring not be carried out with the same wire or winch that is required for hydrographic casts.

b. Stronger wire than 7 x 19, 5/32-inch wire be used for coring.

2. The Phleger Corer: The Phleger Corer is a very simple and reliable coring device. The 50-pound corer is probably too light for deep-sea work and is not sufficiently heavy to make the winch free-spool. The longest core of the trip, no. 9, is 69 inches in length and was obtained with the heavy corer and a 6-foot barrel.

3. The Ball-breaker: Previous expeditions have shown the ball-breaker to be a valuable device. With certain knowledge of the arrival of equipment on the bottom, time is saved in coring, and piling up of wire and loss of equipment are reduced to a minimum.

The modified ball-breaker used on this expedition was not a very reliable device. On both units the eye from which the corer was suspended broke off on deck, the welds supporting the end plate which carried the eye came loose and the striking points frequently sheared off. Out of 13 lowerings, seven satisfactory indications of striking bottom were received.

It is recommended that the modified ball-breaker be redesigned to increase its strength and reliability.

4. The Manganese Concretion: During the coring operation on station 47, in 2750 fathoms of water and with a large wire angle, the ball-breaker failed to operate and the full amount of wire available (6300 meters) was let out. The core pulled out with 6159 meters of wire out. When only 112 meters were still out, a large manganese concretion broke the surface, securely wrapped in 5 or 6 turns of wire. A 44-inch red clay core was also obtained.

The concretion has many manganese nodules pyramided on top, some as large as 5 inches in diameter. It weighs more than 100 pounds and measures approximately 25 x 21 x 13 inches. Indications are that four or five inches of the base were buried in red clay, the rest being above the surface of the bottom.

Dredging Operations

During Leg A, seven successful dredge hauls were made. These hauls were made with a chain dredge from which trailed two small pipe dredges. The dredge was handled from the A-frame on the fantail and lowered by means of the $\frac{1}{2}$-inch wire and winch. One unsuccessful lowering of the Emery-Dietz snapper was made on station 40.

The following table summarizes results of the dredging program:

No.	Location	Depth	Time	Contents
1.	Gilbert Seamount	830 fm	3^h5^m	large no. pebbles, cobbles, boulders
2.	Miller Seamount	554	2^h55^m	1 bone, sponge, Mn nodule
3.	" "	600	3^h49^m	volcanic rocks, Mn pieces, sponges, pebbles, cobbles
4.	Pratt Seamount	400	2^h44^m	rocks, pebbles, sand, crinoids, etc.
5.	" "	510	2^h	rocks, bone, flatfish
6a.	GA-3 Seamount	---	4^h51^m	empty
6b.	" "	510	1^h27^m	pebbles, sand
7.	" "	850	3^h13^m	autocthonous rocks with Mn coating, pebbles, sponges

The canvas bags of the pipe dredges were torn completely off during the early hauls. After they had been covered with burlap and surrounded by heavy wire they proved more effective (hauls 4, 5 and 6b). The dredging winch worked quite satisfactorily during this work.

Bathymetry

Throughout the expedition while the ship was under way, soundings were recorded in the sounding log at frequent intervals; every 10 minutes while steaming at cruising speeds, every 20 minutes while trawling and at 5-minute or less intervals in regions of particular interest. This procedure had been planned before it became evident that the fathometer would not record properly.

The fathometer (Model NMC-1) required continual attention and adjustment and never recorded properly in deep water. It became apparent that all sound heads were in poor condition, and during most of the trip it was necessary to use the hull-mounted head rather than the one mounted in the dome. The fathometer was operated from a constant-frequency source which functioned properly until the last week of the cruise.

Because the fathometer was not recording properly, it was not possible to make a continuous record of the deep-scattering layer. When this layer was apparent in the audible soundings, a notation of its depth and intensity was made in the sounding log. During much of Leg B an apparent scattering layer was evident most of the time, day or night, always at approximately the same depth. It seems likely that this "scattering layer" was an artifact created by a malfunctioning fathometer.

The bathymetric studies can best be described in the following two categories:

I. SURVEY OF MENDOCINO ESCARPMENT

During the summer of 1950 the joint University of California - Navy Electronics Laboratory MIDPAC Expedition discovered and made 4 crossings

of the Mendocino Escarpment between 146°W and 125°W, extending east-west in about 40° of latitude. The track of NORTHERN HOLIDAY was laid out to allow further study of this escarpment; 18 crossings were made between 125°W and 150°W and about 1500 soundings recorded. From these data a much more detailed picture of the escarpment can be prepared. In addition on Leg B the latitude of the escarpment was crossed at about 155°W. There was no evidence of the scarp here but 70 miles further south a similar feature was surveyed which is undoubtedly related to the Mendocino Escarpment.

II. SEAMOUNT SURVEYS

The following seamounts and sea knolls (less than 6000' high) were surveyed or crossed during the expedition:

Name	Date	Depth (fathoms) Shoal	Bottom	Height (ft)	Soundings	Remarks
Gilbert	8/16-17	620	2300	10,080	550	survey, 5 sta, dredge trawl
Miller	8/18-19	520	2200	10,080	925	survey, 2 dredge, 26 jogs trawl
(Holiday)	8/21	1080	2100	6,120	150	survey (uncharted)
GA-5	8/21	420	2000	9,480	250	survey
Pratt	8/22	390	2000	9,660	475	survey, 2 dredges
GA-4	8/23	238	2000	10,572	175	survey
GA-3	8/24	410	2100	10,140	250	survey, 2 dredges 2 trawls
GA-1	8/25	1130	2600	8,820	325	survey
——	9/5	2080	2700	3,720	100	survey (uncharted)
——	9/7	2450	2800	2,100	20	uncharted
——	9/8	2250	2800	3,780	7	uncharted
——	9/8	2590	2800	1,260	23	uncharted
——	9/13	2470	3000	3,180	15	uncharted
(Scripps)	9/18-19	900	2800	11,400	350	survey (uncharted)

The first eight seamounts are located in the Gulf of Alaska. Holiday and Scripps are the names proposed for uncharted seamounts discovered and surveyed.

The following recommendations are made for future operations:

1. The NMC-1 echosounder should be checked out in deep water before the expedition sails. Our instrument recorded satisfactorily in less than 1000 fathoms of water (the deepest water readily accessible to San Diego) but it did not record in deeper water.

2. All available soundings for the whole area should be plotted prior to the expedition. Such plots were prepared for areas of special interest, such as the Mendocino Escarpment and the Gulf of Alaska. During much of the entire course of the expedition, however, interesting bottom features were observed; without detailed plots of all available soundings, it was often not possible to determine the best course for study of these features.

MARINE BIOLOGY

Trawling Operations

During the course of the expedition 27 hauls were made with the Isaacs-Kidd Trawl. This gear was handled from the A-frame on the fantail and was lowered by means of the ½-inch wire and winch. One net, used for study of the deep scattering layer, was scrim-lined the entire length; other nets were lined only in the throat.

The following table gives a summary of trawling operations.

Trawl No.	Location	Depth Zone	Time	Remarks
1.	Sta. 3	E	3:15	
2.	Sta. 4-5	E	3:00	
3.	Sta. 5-6	D	2:25	
4.	Sta. 7	D	3:00	
5.	Sta. 8	F	9:25	3400 out, net fouled and torn
6.	Sta. 9	C	2:48	
7.	Sta. 9-10	F	7 ca	5577m out
8.	Sta. 12	D	3:10	
9.	Sta. 14	E	2:38	
10.	Sta. 15	B	2:00	
11.	Sta. 21	E	5:13	
12.	Sta. 22	D	4:05	
13.	Gilbert to Miller	C	3:10	
14.	Miller Seamount	D	2:35	net tangled and torn
15.	Pratt Seamount	C	2:50	
16.	GA-3 Seamount	F	7 ca	5000m cut
17.	GA-3 Seamount	D	1:40	
18.	No. of Trench	A	1:30	Last trawl, Leg A
19.	Sta. 30	B	2:45	
20.	Sta. 33	F	10:40	5700m out, full-lined net lost and beam collapsed
21.	Sta. 38	F	11:05	5700m out
22.	Sta. 41	C	1:55	beam collapsed
23.	Sta. 46	F	10:45	2800m out
24.	Sta. 50	D	6:45	
25.	Sta. 54	F	11:35	5700m out
26.	Sta. 59	B	5:20	
27.	After sta.66	F	18:00	4780m out

The depth zones used above signify the following:

Zone	Wire out (m)	Depth (fm)
A.	0-350	0-100
B.	350-700	100-200
C.	700-1200	200-360
D.	1200-1700	360-510
E.	1700-2500	510-750
F.	more than 2500	more than 750

Standard Net Tows, Dipnetting and Other Observations

On 57 hydrographic stations standard oblique net-tows were made with a one-meter plankton net. Three hundred meters of wire was let out in about six minutes, the net reaching a depth of approximately 200 meters. It was then brought in at a rate of 20 meters per minute. The amount of water passing through the net was measured with an Atlas flow meter.

Such tows were made on all stations occupied except as follows:

Sta. 2 - bridle parted during tow but net was recovered
Sta. 10 - bridle fouled and sample lost
Sta. 22b-22e - tows were omitted because of weather
Sta. 41 - tow omitted because of weather
Sta. 51 - net torn, qualitative sample only
Sta. 52 - tow omitted because of weather

On the following 16 night stations, dipnetting was successfully carried on: 6, 8, 9, 10, 11, 15, 21, 22, 26, 27, 40, 47, 49, 55, 56, 64. Catches consisted largely of squid, sauries and myctophids.

A count of albatross was recorded on each station and records were kept of such other marine birds and mammals as were observed.

Floating kelp was encountered to 500 miles offshore in the Gulf of Alaska, some bearing a sufficient number of mussels to be of significance in survival.

TENTATIVE STATION POSITIONS

OPERATION NORTHERN HOLIDAY
August-September 1951

Sta. No.	Date	Latitude N	Longitude W
2	Aug. 1	40° 23'	127° 04'
3	1	40° 28'	129° 05'
4	2	40° 30'	131° 08'
5	3	40° 22'	133° 06'
6	4	40° 29'	134° 58'
7	5	40° 28'	137° 38'
8	5	40° 21.5'	139° 24.5'
9	6	40° 28'	141° 57'
10	7	40° 30'	143° 35'
11	8	40° 32'	145° 47'
12	10	40° 34'	147° 54.5'
13	10	40° 34'	149° 43'
14	11	41° 42'	150° 00'
15	11	43° 8.5'	149° 50'
16	12	44° 35'	150° 21'
17	12	45° 58.5'	150° 11.5'
18	13	47° 25.5'	150° 4.5'
19	14	48° 48'	150° 00'
21	15	51° 35'	149° 52'
22a	16	52° 50'	149 52'
b	16	52° 50.5'	150° 36'
c	16	52° 41	150° 06'
d	17	53° 5.5'	150° 3.5'
e	17	52° 48'	150° 13'
23	29	56° 28.5'	151° 39'
24	29	55° 50'	151° 18'
25	30	54° 52'	150° 53.5'
26	30	54° 08'	150° 23'
27	31	53° 13'	149° 56'
28	31	53° 13'	151° 36'
29	September 1	53° 24.5'	153° 18'
30	1	53° 34.5'	155° 00'
31	2	54° 00'	156° 32'
32	2	54° 18'	157° 58'
33	2	53° 58'	159° 47'
36	4	51° 00'	158° 33'
37	5	50° 01'	158° 16'
38	5	49° 01'	157° 55'
39	6	48° 06.5'	157° 27'
40	6	47° 05.5'	157° 16'
41	7	46° 01'	157° 01'
43	8	44° 08'	156° 11'
44	8	43° 14'	155° 55.5'
45	9	42° 15'	155° 36'

Sta. No.	Date	Latitude N	Longitude W
46	September 9	41° 20'	155° 20'
47	10	40° 09'	155° 03'
48	11	39° 18'	154° 38'
49	11	38° 30'	154° 25'
50	12	37° 28'	154° 12'
51	13	36° 12.5'	153° 56'
52	13	35° 00'	153° 32'
53	14	33° 30'	153° 05'
54	16	31° 58'	152° 25'
55	16	30° 03'	152° 00'
56	16	28° 06.5'	151° 25'
57	17	29° 03'	149° 17'
58	18	29° 45'	147° 05'
59	18	30° 25'	145° 08'
60	19	31° 19'	143° 02'
61	20	32° 02'	140° 55'
62	20	32° 46'	138° 50'
63	21	33° 03'	136° 22.5'
64	21	32° 53'	134° 13'
65	22	32° 52'	131° 58'
66	23	32° 39'	129° 41'