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SCRIPPS INSTITUTION FOR BIOLOGICAL
RESEARCH

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LA JOLLA, CALIFORNIA, July 1, 1918.

To the President of the University,

SIR: I present herewith my report for the year July 1, 1917, to June 30, 1918.

It will be advantageous to divide the report this year into two main divisions, one dealing with the usual, or regular work of the Institution; the other with its special, or war work.

REGULAR WORK

Oceanographic.—In view of the possible significance, as indicated by last year's observations, of temperature and other data pertaining to the sea-water, for "long range" weather and other kinds of forecasting, special attention has been given this year to data-collecting, both from the pier and on the weekly and monthly boat trips. Temperatures of air as well as of water have been taken. Dr. McEwen has been ably assisted in the time-consuming work of specific gravity and other determinations by Mr. N. W. Cummings, a graduate student and voluntary assistant in physics. Mr. Cummings also has developed a shorter way of making computations and has improved the method of measuring the specific gravity of sea water.

The weekly boat work consisted of visits to a station fifteen miles west of La Jolla. The monthly cruises have been over the same course, as closely as possible, from San Pedro to a point about 50 miles west of San Nicolas Island, returning

directly to San Diego. The purpose in these series is to get information on the seasonal variation and succession of both oceanographic and biologic conditions.

The work on problems of oceanic temperatures and circulation, referred to in previous reports has been critically re-examined and extended, the results being now embodied in an extensive paper, "*Ocean Temperatures, Their Relation to Solar Radiation and Oceanic Circulation,*" by G. F. McEwen, to be published as one of the Semicentenary Publications of the University.

Plankton Work.—It was Professor Kofoid's expectation to complete this year the first of the three parts of his monograph on the *Dinoflagellates*, dealing with the *Gyannodiniumidae*. The magnitude of the task of describing adequately the seemingly infinite wealth of details presented by these microscopic organisms is indicated by the fact that this first division of the monograph will treat of more than 350 species and 45 genera. Had not Professor Kofoid entered the army to take charge of hook-worm work for the medical department, we should undoubtedly have had the satisfaction of seeing this part of his monograph in print soon. His complete severance from the work leaves it in the hands of Dr. Swezy, and it is hoped that her long service as Professor Kofoid's assistant and collaborator will enable her to bring this division to a conclusion by the end of the year. In view of the uncertainty as to when Professor Kofoid will be able to resume his regular duties, and as to the work of the Institution in the immediate future, because of the war, it seems best to let the publication of the part of the monograph now nearly completed mark a temporary interruption of this investigation. It must, however, be understood that the interruption is indeed temporary. The undertaking is too fundamental, both from a scientific and economic standpoint, and has been carried too far to permit any thought of leaving it partly done, even though the labor and expense of completing it will be great. In view of these conditions, Dr. Swezy's connection with the work and with the Institution terminates at the end of the year.

Practically all the work in marine biology, except that on the Dinoflagellates, is now subordinated, in one way and another, to fisheries problems, further general mention of which is made under the head of war work of the Institution.

Dr. Esterly's general paper, "*Field Research and Laboratory Experiment: Their Places in Ascertaining and Explaining Habits in Nature*" (Bull. No. 4, Scripps Institution) has attracted attention both from the standpoint of subject matter and that of methods employed.

Investigations on Heredity and Environmental Influence.—The investigations by Dr. Sumner, assisted by Mr. Collins, have progressed notably during the year in several ways. The rigorously scientific collecting and field studies being carried on at several strategic localities in California, where different subspecies, or races of the group of mice, the "white footed mice," occur is certainly throwing new light upon the subject, still obscure in spite of the great attention it has received, of the existence and distribution and formation of new kinds of higher animals. That groups of animals as high in the scale as mice differentiate into sub-groups in localities not isolated from one another more than are Fort Bragg, Duncan Mills, and Calistoga is certainly an important fact of organic evolution, whatever be its explanation. And it becomes all the more interesting when viewed together with the fact of local differentiation of language at least, among the Indians of California. Deserving of mention in connection with these researches is the methodological fact that without the application of the most careful measurements which can be made, and statistical methods, the group differences could not be detected, though unquestioned when these methods are employed. The preparation and measurement of 1500 skeletons in one batch indicates something of the laboriousness of such studies.

On the genetic side, interesting results continue to be reached from crossing wild races and mutants; on the appearance of mutants; and on Mendelian inheritance.

The general paper by Dr. Sumner, "*Modern Conceptions of Heredity, and Genetic Studies at the Scripps Institution*" (Bull.

Scripps Inst. No. 3) is being rather widely called for. Dr. Sumner "has entered the lists" with the medical profession in the effort to stem the current now becoming dangerously strong in California, against animal experimentation. It appears that this subject will have to be dealt with on broader principles than those of medicine and sanitation, important as these are. The address given by Dr. Sumner at the Academy of Sciences in San Francisco, and to be published soon, is in this direction.

The work of instruction due from the Scripps Institution to the Department of Zoology at Berkeley was given this year by Mr. E. L. Michael, the desire being to have other phases of the Institution's activities represented than those with which the Scientific Director, who alone has heretofore given the courses at the University, is professionally identified. Unfortunately Mr. Michael was not able to carry his course quite through the semester owing to illness; but the plan of wider representation of the Institution's work at Berkeley is undoubtedly sound, and it is hoped can be carried out.

The only two scientific members of the Institution subject to draft for the army, Mr. Frank Thone, Assistant and Secretary to the Director, and Mr. N. W. Cummings, Voluntary Assistant in Oceanography, have been taken from the Institution to enter the service.

During the year, the Scientific Director has brought to completion and placed in the hands of the publisher three books, "*The Higher Usefulness of Science and Other Essays*"; "*The Unity of the Organism or the Organismal Conception of Life*"; and "*The Probable Infinity of Nature and Life.*"

WAR WORK

The definitive war work of the Scripps Institution is connected with the kelp and fishing industries of the California coast.

Kelp Industry.—The Institution's function in this industry is to furnish the State Game and Fish Commission information and advice based on scientific inquiry, as to when the different kelp beds shall be declared "open" and when "closed," i.e.,

when they may and when they may not be harvested, the Commission being empowered by law to make and enforce the regulations.

The requisite information is obtained by general and special inquiry. General inquiry consists in rather frequent general examinations of the "beds" to ascertain the state of growth, abundance, health, and so on, of the plants. Special inquiry consists in botanical studies on the plants, such problems as their sporulation, embryogeny, bacterial infection, etc., receiving attention.

The work is in the immediate charge of Mr. W. C. Crandall. The botanical investigations are being performed by Dr. R. P. Brandt.

The rather elaborate scheme of dividing the entire kelp area into numbered units and securing a "gentleman's agreement" among the harvesting companies as to which shall cut in different places is largely due to Mr. Crandall. Funds for prosecuting this work are derived from a state-imposed tonnage tax on the wet kelp harvested, the proceeds being allotted jointly to the State Game and Fish Commission and the Scripps Institution.

Fishing Industry.—Work of the Institution in this field is of several kinds, which may be classified according to the agencies by which they are carried on.

(1) The Institution in coöperation with the United States Bureau of Fisheries.

During and for sometime after the fishing season of 1917, "experimental fishing" was done for the purpose of ascertaining more definitely than the industrial fishing has determined, the area over which "tuna" (the long-finned albacore) may be obtained; where these fishes go when they leave the fishing area in the fall; and other matters involving the distribution and life habits of the fish. The aim of this work was to get information which would enable the fishermen to ply their vocation more effectively and increase the output.

Also in connection with the Bureau of Fisheries, a report is being prepared on the relation of the fishing done in waters under the jurisdiction of the United States to that done in waters

of Mexican jurisdiction and influence. The aim of this study is to ascertain the relative amounts of fish taken under the two jurisdictions and from the high seas; conditions as to concessions for fishing in Mexican waters, and as to fees and other charges exacted by the Mexican government and Mexicans; and other matters affecting the industry and international relations in this quarter.

The Bureau of Fisheries furnishes the money expended directly on these inquiries, the Institution contributing certain facilities, and some labor of its scientific staff and workmen. The scientific director of the Institution has been appointed Director of Operations by the Bureau for its work in this region, and Mr. W. C. Crandall, its special agent for certain purposes.

(2) The Institution in coöperation with the United States Bureau of Chemistry and the Federal Food Administration.

The work here consists of experiments on methods of preserving fish, other than canning. Smoking, kippering, dry-salting and brine-salting are being tried, and various species of fish are utilized, special attention being given to sardines too large for canning.

The Bureau of Chemistry has assigned an expert, Mr. Horace Davi, to this work. The Institution provides laboratory and other facilities, and the fresh fish, in part, used in the experiments.

(3) In coöperation with the Council of Defense of California.

The problem undertaken in this connection is that of bringing the Institution's programme of research on the "plankton" as the fundamental food supply of commercial fishes, and on the hydrography of the fishing area, as part of the environment of the fishes, into the service of the fishing industry. The aim here has been two fold: the possible increase of productiveness of the industry; and the furnishing of information on which to base regulative and protective measures for the industry. The funds supplied by the Council of Defense for this work during the last year will not be continued next year, but the Institution plans to keep up the investigations in part, at least, on its own account.

(4) Perhaps the most important of all, is Mr. Crandall's services as Fish Administrator for southern California under the National Food Administration. This responsible position absorbs the major part of Mr. Crandall's time, and the Institution is obliged to adjust its affairs accordingly, which it does very gladly.

Respectfully submitted,

WILLIAM E. RITTER,
Director.