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MARINE BIOLOGICAL LABORATORIES

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IN spite of the war, interest in tropical marine biology has not waned. Indeed, there are a number of problems directly connected with the war effort which can only be attacked by making use of the facilities offered by a marine biological laboratory. The Bermuda Biological Station for Research is closed for various obvious reasons. The Bermuda Aquarium continues open to the public and I see no reason why that should not be a successful enterprise for a long time to come, inasmuch as our Armed Forces to-day are helping support it by their attendance, and as soon as the war is over there is every reason to believe that Bermuda will resume its importance as a tourist center. I am proud to have had a finger in closing up the Biological Station at the Dry Tortugas, where the cost per day per investigator was something the less said about the better.

It is becoming increasingly obvious that the question of economy must be given more and more consideration as funds available for research become more and more restricted. It seems to me clear, therefore, that all our resources, both intellectual and financial, should be devoted to develop that laboratory which offers the optimum biological opportunities with the greatest accessibility, since accessibility means least transportation costs for both investigators and shipments of material. The laboratory recently opened by the University of Miami at Belle Isle, near Miami Beach, answers these requirements. The premises at present occupied by the station are temporary and rather limited in scope, but opportunity for economical expansion is right there and is assured. The director of this station is Dr. F. C. Walton Smith, whose address is care of the University of Miami, Coral Gables, Florida. I know that Dr. Smith will be glad to answer inquiries regarding facilities for research,

and indeed he has prepared an excellent descriptive pamphlet outlining the extraordinary variety of environmental conditions near at hand from which I am going to quote. To all intents and purposes, the Gulf Stream is as conveniently accessible to this marine station as it was to the Dry Tortugas. Ocean beaches, mangrove swamps, wide areas of coral reefs in water sufficiently shallow so that collecting with a diver's helmet is perfectly feasible, as well as wide areas of sand flats with shallow water, are near at hand. The sea is as deep off shore as it is elsewhere and the edge of the continental shelf is not far distant.

Innumerable buses per day pass the door of the laboratory and thus metropolitan Miami may be reached in a few moments. I don't have to add that railway service and air connections link Miami with the rest of the country in a matter of hours. Thus the cost of reaching this station from any point in the United States will always be much less than reaching the station in Bermuda should it ever be reopened, and moreover, while the Bermuda fauna is tropical, nevertheless in many directions it is distinctly depauperate, as is well known. The reverse is distinctly the case with the station in Florida. Dr. David Fairchild and I visited the laboratory about two months ago. Our visit was motivated by having read "Opportunities for Subtropical Marine Investigations," issued by the university. We were astonished that right here under our very noses had been set up a laboratory which not only deserves the support of the foundations, but of all the societies associating investigators interested in this field. Besides Dr. Walton Smith, chairman of the advisory committee of the laboratory and its director, Dr. Robert H. Williams, a botanist, is assistant director. Dr. Morton Miller and Dr. Elmer Hjort are also on the staff of the station.

I quote now from the prospectus:

The laboratory is situated upon an island of the Venetian Causeway connecting the cities of Miami and Miami Beach. This is a most convenient location for several reasons. Not only may it be reached by a ten-minute automobile drive from Miami, but public transportation services have established a passenger stop at the entrance of the grounds. The grounds themselves are a portion of a large enclosed estate so that visiting investigators may be assured of privacy. Living quarters are available adjacent to the laboratory and there are excellent hotels within walking distance. The advantages of accessibility include the possibility of obtaining supplies at short notice from chemical and other houses in Miami or from the university, situated at Coral Gables, immediately outside Miami.

Although within the city limits of Miami Beach and adjacent Miami, the laboratory is conveniently located with respect to collecting grounds. On the sea-wall bordering the laboratory grounds numerous large urchins, sponges, corals, alcyonaria, oysters, and barnacles flourish and reproduce during practically every month of the year. The water in which these forms grow is pumped directly into the laboratory supply pipes without the intervention of a closed circulation system.

Accommodations in the laboratory are at present sufficient for a limited number of workers only, but are so organized as to allow for considerable expansion at short notice. Individual rooms for investigators are provided in addition to the tank room with its water table. For collection from more distant grounds a fast 22-foot launch is provided. The usual collecting equipment such as dredges and tow-nets is used and, in addition, the diving helmet has been found a convenient and valuable aid in investigating bottom-living forms such as those of the coral reefs in the warm water to a depth of forty feet.

Undergraduate classes in marine botany and zoology have been held in the summer school of the university, as well as in the regular semester for some years past, and these may be continued in curtailed form during the summer of 1943.

For those engaged in certain fields of tropical marine investigation research grants may, under approved circumstances, be available from various sources. Further information, covering laboratory and living accommodation, may be obtained by applying to the director, giving a description of the nature of the proposed investigations and approximate duration of the visit.

Within an area readily accessible to the laboratory is to be found a wide variety of habitats including shores of coral or sedimentary rock; gold and white beaches of shell and coral sand; shallow bays and inlets lined with the red mangrove, whose roots provide shelter for a varied community of plants and animals; the slimy marl or calcareous ooze, which supports the growth of commercial sponges; the outer line of reefs and the inner islands and flats, separated by the inner and outer channels from the shores; and, within a short distance from land, the deep blue waters of the Gulf Stream.

The fauna consists of sub-tropical forms extending north from Miami, together with numerous tropical species which overlap and find their northern limit in this latitude. Conspicuous among the latter are the massive reef building corals and the smaller inshore forms, many of which, like *Isophyllia, Oculina* and *Meandrina,* may be kept alive in the laboratory for considerable periods, and which are therefore well adapted for experimental work. No less interesting are the massive brain corals such as *Diploria, Montastrea* and *Dichocoenia.* Not only are these corals interesting in themselves, but they provide a shelter for calcareous tube-worms, boring molluscs and crustacea, and house in their crevices many brittle stars and occasional burrowing holothurians. One of the interesting inhabitants is the Atlantic palolo-worm, *Eunice fucata,* which liberates its reproductive segments in swarms to the surface of the ocean in an annual rhythm, the climax of which occurs at the corresponding tide and season each year.

A large and important group are the alcyonaria. Large groves or underwater shrubberies of these fans and whips are found in shallow water, and are associated with

sponges, holothurians, six-rayed stars, basket stars and various tropical mollusca.

The echinoids are plentiful and include *Lytechinus variegatus,* which litters the offshore flats, and *Centrechinus,* whose egg should interest embryologists. Sand-dollars, heart-urchins and the beautiful golden *Moira atropos* from muddy bottoms are also common. The stars range from the large *Oreaster* to the small red *Echinaster.* Below the surface of sand lives the handsome *Luidia.* All three are very plentiful.

Some of the larger crustacea live in holes or burrows, as in the case of the stone-crab and the "sand-lobster," *Scyllarides equinoctalis.* The Florida crayfish, *Panulirus,* is plentiful and is remarkable for its unusual breeding habits. There are numerous species of the smaller crustacea.

Clumps of *Sargassum* wood which drift inshore in quantity afford startling illustrations of protective mimicry in their associated nudibranchs, crabs and fish.

A particularly rich habitat is that of the piling and wharf. Coelenterates, sponges, bryozoa, tunicates and barnacles are easily collected without leaving the laboratory grounds, by means of devices developed by recent investigators, and they afford a splendid opportunity for the study of the previously rather neglected field of the biology of sedentary and fouling organisms.

The large loggerhead sponge forms a habitat in itself, supporting the growth of an enormous variety of commensals including annelids, crustacea, gastropods, coelenterates, tunicates and even barnacles.

Fishes of southern Florida exist in enormous variety and range from the marlin and sailfish down to the delicate blue-heads and multicolored inhabitants of the reef, which are equally numerous in variety and quantity. Among the mammals are porpoises and the vegetarian sea-cows.

The great variety of animals is equalled by the abundance of algae which, together with some marine seed-plants, flourish in this region. Among the latter are *Thalassia, Cymodocea* and *Halodule* which replace the familiar eel-grass of northern waters.

Blue-greens are abundant in the brackish water along the canals draining the Everglades area, and in the tidal pools filled with decaying vegetation.

Green algae show more coenocytic forms than are found in more temperate zones. The delicately beautiful *Acetabularia* and the bushy *Batophora* are among the most common of the littoral greens. The Valoniaceae are well represented by the beautiful *Anadyomene* and *Dictyosphaeria* and by several species of *Valonia,* which lends itself so well to physiological studies. The Codiaceae are very abundant, especially the lime-encrusted *Halimedas, Penicillus,* and others which almost cover some areas of shallow water. The Caulerpaceae include eleven or more species of the fascinating fern-like Caulerpas.

Although no massive browns of the Laminariales occur here, there are several attached and floating species of *Sargassum* and other Fucaceae, along with the well-known Dictyotas, *Zonaria* and *Padina.*

The red algae are amazing in their numbers, variety and beauty, becoming a delight to the collector and a challenge to the taxonomist. From the delicate Bangiales, to the lime-encrusted *Corallinas* and the tiny *Ceramiums,* every order is well represented. There are at least twenty-three genera of Rhodomelaceae, ten of Ceramiaceae. Many are easily collected at low tide, some are dredged, and many more are washed near or on shore in the drift. The delicate *Dasya* flourishes near the spiny *Acanthophoras* and *Digenia.* Many square miles of the shallow bays are covered with species of reds, some of which may prove commercial sources of agar.

The algologist will find in South Florida the materials, habitats, and equipment for a wide variety of physiological, taxonomic and ecological investigations.

I do not think that anything more need be said to prove my point. Not long since I had the pleasure of making a little address, presenting the Alexander Agassiz Medal of the National Academy of Sciences to Columbus O'D. Iselin. To my delight, I found, conversing with him, that he had visited this station very recently and was as completely convinced of the excellence of the opportunities presented as I was. I feel quite sure that he would endorse all the statements which I have made. Many persons forget that some years ago a most excellent marine aquarium was opened at Miami, not far from where the station is located. Were it open to-day it would be self-supporting. It would have still been open to-day except for the fact that the property on which it was situated became so extremely valuable that the institution simply could not continue operations. Those boom days are past and the area has shaken down now, so that there is little reason to believe that financial convulsions causing sudden fluctuations in land values will be likely to occur in the future. Rebuilding and reopening the aquarium with the idea of its being supported by admission fees to be paid by the public would be a useful adjunct to the station and a great addition to the educational and entertainment resources of the area. I believe that this is certain to come in the future. In the meantime, to all American biologists interested in opportunities to conduct investigations in marine zoology or physiology and assorted disciplines, here is the answer to prayer.

I hope that Dr. Walton Smith will not object to my interjecting myself into his affair in this way. The sooner, however, that this matter begins to be talked about and the sooner these opportunities are appreciated, the sooner will adequate financial support come forward to aid this project. There is no reason to reopen the Bermuda station and certainly no object in opening another tropical station for North American biologists.