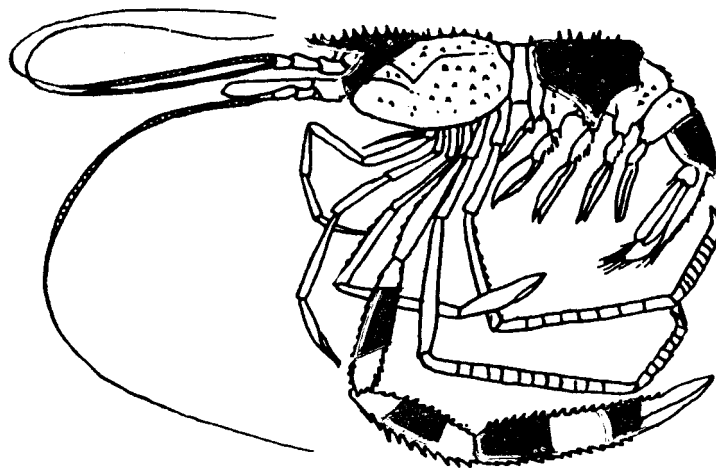


INTER-ISLAND MARINE BIOLOGICAL CONFERENCE

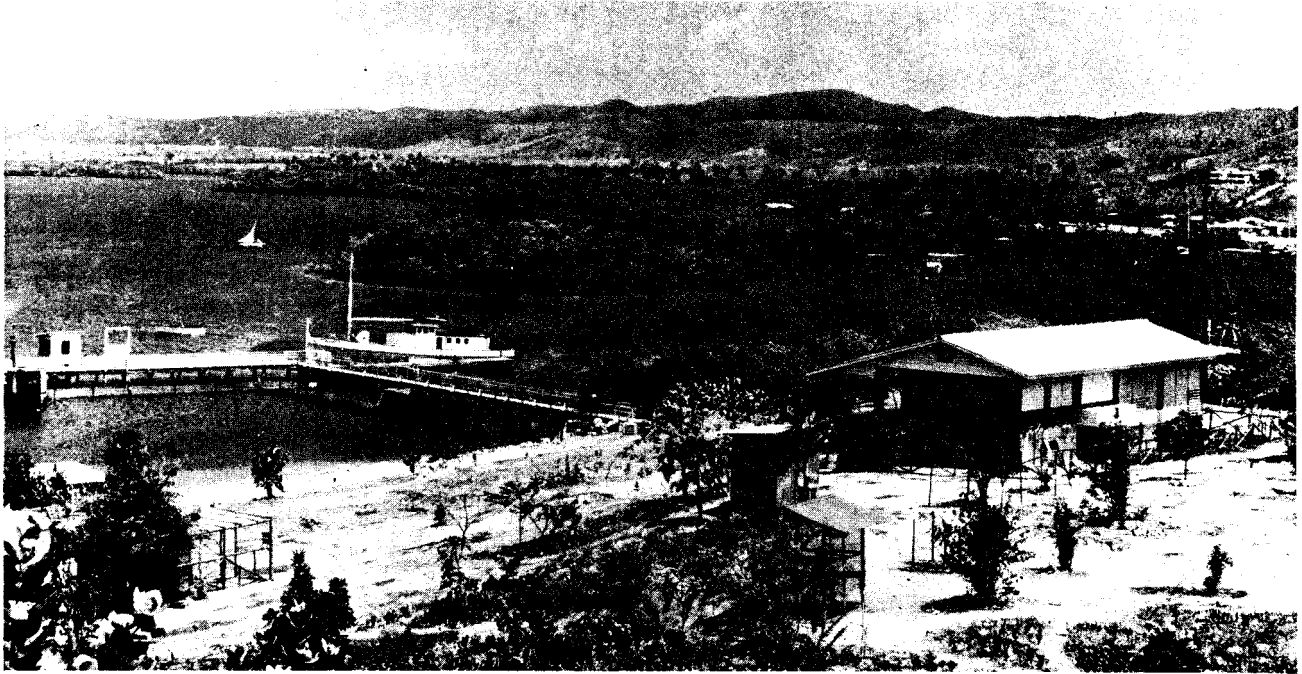
UNIVERSITY OF PUERTO RICO  
OFFICE OF NAVAL RESEARCH  
LA PARGUERA, PUERTO RICO  
MARCH 31 - APRIL 6, 1957



REPORT  
BY

INSTITUTE OF MARINE BIOLOGY  
COLLEGE OF AGRICULTURE AND MECHANIC ARTS  
UNIVERSITY OF PUERTO RICO  
MAYAGUEZ, PUERTO RICO

JULY 15, 1957



Institute of Marine Biology, University of Puerto Rico, La Parguera,  
Puerto Rico. "Carite" at dock, "Physalia" just beyond.



Caribbean Marine Biological Laboratory, Piscadera Bay, Curaçao, N. A.

**INTER-ISLAND MARINE  
BIOLOGICAL CONFERENCE**

(Held at Institute of Marine Biology, University of Puerto Rico,  
March 31 to April 6, 1957)

Representatives of marine laboratories of the Southwest North Atlantic and Caribbean Area were gathered in Puerto Rico, March 31 to April 6, inclusive, 1957, in a Conference sponsored by the University of Puerto Rico and the Office of Naval Research. The ten laboratories represented, their official representatives and accompanying participants were the following:

BELLAIRS RESEARCH INSTITUTE OF MCGILL UNIVERSITY, St. James, Barbados, B. W. I., Dr. John B. Lewis, Director.

BERMUDA BIOLOGICAL STATION, St. George's West, Bermuda, B. W. I., Dr. William H. Sutcliffe, Director; with Dr. Louis Mowbray, Vice-Chairman of the Board of the Station and Director of the Bermuda Aquarium.

CARAIBISCH MARIEN-BIOLOGISCH INSTITUUT, Willemstad, Curaçao, N. A., Dr. J. S. Zaneveld, Director.

INSTITUTE OF MARINE BIOLOGY, University of Puerto Rico, Mayaguez, Puerto Rico, Dr. Juan A. Rivero, Director; with Mrs. Germaine Warmke, Part-time Curator of Mollusks, Dr. John Weaver, Professor of Geology, and Dr. Robert E. Coker, Consultant.

LERNER MARINE BIOLOGICAL LABORATORY, Bimini (address-1112 Du Pont Building, Miami 32, Florida, or American Museum of Natural History, New York), Dr. A. E. Parr, Director, American Museum of Natural History; with Dr. Norman Newell, Curator of Invertebrate Paleontology, and Miss Francesca LaMonte, Associate Curator of Fishes and Aquatic Biology.

OFICINA HIDROGRAFICA DE LA MARINA DE GUERRA CUBANA, Habana, Cuba. Dr. Luis Howell Rivero, Director. Dr. Howell Rivero represented, also, The Universidad de la Habana and the Instituto de Pesquería, Habana.

UNIVERSITY COLLEGE OF THE WEST INDIES, Kingston, Jamaica, B. W. I., Dr. David M. Steven, Professor of Zoology and Director of the Marine Laboratory at Port Royal; with Dr. Thomas Goreau, from the Physiology Department.

UNIVERSIDAD NACIONAL JOSE MARTI, Habana, Cuba. Dr. Jorge Rodríguez Walling, Professor of Biology.

UNIVERSIDAD DE ORIENTE, Santiago de Cuba. Dr. Manuel Díaz Piferrer, Director Laboratorio Marino.

UNIVERSIDAD DE VILLANUEVA, Marianao, Habana, Cuba. Dr. José A. Suárez Caabro, Professor of Zoology.

Contributing greatly to the success of the Conference was the cooperation of members of the Department of Biology in both Río Piedras and Mayaguez, notably that of Professor Virgilio Biaggi, Sra. Graciela Candelas, Dr. Gustavo Candelas, Dr. Carlos García Benítez, Chairman of the Biology Department in Río Piedras, and Dr. José A. Ramos, Chairman of the Biology Department in Mayaguez.

Sra. Eneida Bordallo de Rivero, wife of the Director, was indefatigable and highly efficient in help to participants in respect to reservations and adjustment of incidental difficulties of travel and in extending the hospitalities of their home in Mayaguez. Sra. Carmén Rivera de Ayala, Secretary of the Institute, and Sr. Jorge Rivera López, Assistant to the Director, were helpful in many ways.

Most importantly, the warm hospitality of both Chancellor of the University of Puerto Rico, Don Jaime Benítez and Vice-Chancellor, in Mayaguez, Don Luis Stefani, indicated much more than cordial welcome. The official and personal interest of these educational leaders in the Conference and its individual participants was heartening to all. It was commonly remarked that the conferees derived high satisfaction and stimulus from the manifest recognition of special significance in this first assembly of marine scientists of the Antillean region.

### OBJECTIVES

Primary objectives of the Conference, as outlined, in part, by a Planning Committee, serving prior to the Conference, and composed of Drs. Breder, Lewis, Steven, Sutcliffe, Zaneveld and Coker, Chairman, were essentially as follows:

It was considered most desirable: (1) To establish personal, as well as official, relations between chief staff members of island laboratories, which have, to a great extent, common problems of administration, support and procedures; (2) To explore potentialities and opportunities for cooperation among island laboratories and between island and continental laboratories; (3) To consider together the most practicable needs and techniques for research in tropical marine biology adapted for small laboratories in the warmer areas; and (4) To discuss plans for stimulation of interest in studies of the sea among high school and college students and for a program of public education respecting the importance of biological and oceanographic studies.

## GENERAL PROGRAM

Most of the participants arrived in San Juan, Saturday, March 30, and were met at the airport by members of a Reception and Entertainment Committee comprised of Sras. Graciela Candelas, Pura Quiñones, Eneida Rivero, Germaine Warmke, Dr. Carlos García Benítez, and Dr. Virgilio Biaggi, Chairman, assisted, as needed, by Drs. Rivero and Coker.

Temporary headquarters were in the Normandie Hotel. Following registration in the hotel Sunday morning, March 31, and a guided tour of San Felipe de El Morro, the church of San José, the Governor's Mansion and other points of interest in Old San Juan, the group was entertained for luncheon at the Faculty Club in Río Piedras by Chancellor of the University of Puerto Rico, Don Jaime Benítez. Luncheon was concluded with coffee in the garden of the home of the Chancellor, where Chancellor Benítez spoke informally of the University, its activities, accomplishments and ideals. He commented in a stimulating way, also, on the purposes and potentialities of the Conference, emphasizing the interest of the University and its administration in the anticipated outcome.

The group then proceeded by car to the rain forest of El Yunque National Park, an area of special interest to all biologists, marine as well as terrestrial. At 11:00 A. M. on the following day, Monday, April 1, the party was taken to the Isla Verde Airport for travel by plane to Mayaguez. After an informal luncheon given by the Institute of Marine Biology in its offices on the College campus in Mayaguez, there was a brief tour of the campus of the College of Agriculture and Mechanic Arts. The special tour of De Celis, the "Science Building", was guided by Dr. José A. Ramos, Chairman of the Biology Department.

About 6:00 P. M., the conferees arrived by car at the Hotel La Parguera ("Guest House"), which served as base of residence during the remainder of the week. The evening was given to a visit by boat to La Bahía Fosforescente. The stage of the lunar cycle being just right (about "dark of the moon"), the display of luminescence was at its best, arousing enthusiastic comments and inquiries.

Immediately after breakfast on the following morning, Tuesday, April 2, participants in the Conference and members of the Advisory Committee for Hydrobiology, American Institute of Biological Sciences, assembled in the future dining room of the new part of the hotel for an informal and brief "get-acquainted" gathering. Drs. Hiatt and Galler told something of functions and operations of the Committee. After this, Committee and Conference each went its own way until the joint meeting on Thursday.

At all times, the conferees were in close association. Personal conversations, here and there, and informal discussions in smaller or

larger groups, as circumstances ordered, were among the most fruitful features of the Conference. Eight schedule sessions constituted the set Program, which will be outlined in a following section, with a note on the plan of organization followed.

The first three scheduled assemblies were held, morning, afternoon and evening of Tuesday, April 2. During the morning of Wednesday, April 3, most of the conferees left the hotel early by boat for observations on the coral reefs. After lunch on Isla La Gata, where conferees were joined by members of the Committee on Hydrobiology, a short tour of mangrove-bordered shores concluded the field tour. The program for the day included a short late afternoon meeting (fourth) in the laboratory and an evening meeting (fifth) for presentation of illustrated papers.

In the morning of Thursday, April 4, all went by car to Mayaguez for an open meeting (sixth) of conferees, members of the Hydrobiology Committee and others in the auditorium of Piñero Hall. Illustrated talks were given on the laboratories at Bimini, Bermuda, Willemstad (Curacao), Port Royal (Jamaica), and St. James (Barbados). After a subscription lunch in the College cafeteria, the afternoon was free for individual visits, as desired, to places of interest about the College and the City of Mayaguez. In the evening a generous complimentary dinner was given by Vice-Chancellor, Don Luis Stefani, in the garden of his home on the campus, for conferees, committee members, biologists of Río Piedras and Mayaguez and others. Late in the evening, the conferees returned by car to La Parguera.

Because the proposed trip by boat to Mona Island became impracticable, the previously prepared "alternate program" for Friday and Saturday was followed, except as it was voted to have the business session Friday afternoon, instead of Saturday evening, and to leave Saturday entirely free for personal conferences and observations as individuals might desire. Friday, April 5, then, comprised morning and afternoon sessions (seventh and eight), with a special evening session for films postponed from an earlier occasion. Most of the participants spent Saturday in Mayaguez, taking leave Sunday morning, April 7.

## PROGRAM OF MEETINGS

### AND ABSTRACTS OF PROCEEDINGS

Sessions for discussion were organized according to the following plan. The Chairman, different for each meeting, first called in succession upon previously prepared members of a panel of three members, who expressed their personal views upon the designated topic. Since, invariably, the panelists spoke briefly, the greater part of the session was available for general discussion, which was always open and lively. A most important officer was the Recorder, assigned for the particular session; the recorder not only shared with the Chairman

the responsibility for leading to clear conclusions regarding the principal suggestions offered by anyone, but also prepared and submitted soon after the meeting, a summary account of proceedings.

There were eight regular meetings, all of which, with two exceptions, were held in the laboratory of the Institute on Magueyes Island; one of the exceptions was an outdoor evening meeting on Magueyes Island; the other was the public meeting, with the Advisory Committee on Hydrobiology of the American Institute of Biological Sciences; this was in the auditorium of Piñero Hall on the campus of the College in Mayaguez.

First Meeting. April 2, 10:15 A.M. - 12:30 P.M.

Chairman: Dr. J. S. Zaneveld

Recorder: Dr. Manuel Díaz Piferrer

Panel: Drs. A. E. Parr, Thomas Goreau, D. M. Steven

Special Topic: Opportunities for cooperation among island laboratories and between island laboratories and continental institutions, with consideration of desirabilities and practicabilities in distribution of efforts.

Suggestions offered or questions raised and discussed included chiefly the following:

1. Possibilities of cooperation through: (a) Joint attacks upon major problems; (b) Collection and supply of material needed by investigators in other laboratories; (c) Arrangements for visits of investigators to more than one laboratory; (d) Occasional interchange of personnel, with, perhaps special rates (where charges must be made) for members of the staffs of other laboratories of the area; (e) Joint use and support of a larger vessel, which might otherwise be too heavy a burden upon a single laboratory.

2. Need for a regular means of exchange of information among the several laboratories -- information regarding studies in progress, visitors, changes in staff, significant additions to facilities, unusual happenings or observations.

3. Possible need for a journal. (It was held by some that there were important areas of research in tropical waters, for which papers of high quality met special difficulty in finding avenues of publication.)

4. Difficulties in securing identification of plants and animals from tropical waters. The great need for more taxonomists of modern type was stressed.

5. Possibilities of cooperation with established continental or island museums, or of effecting visits, by invitation, of specialists from museums.

6. Possible solicitation of aid from UNESCO in respect to equipment, vessels, scholarships for students, participation by graduate students in UNESCO's Training Courses (offered in San Paulo last year, in Habana this year), fellowships for study abroad by trained scientists, publication of results of research in a journal sponsored by UNESCO and published in Chile. (Suggestion offered by Dr. Howell Rivero, a member of UNESCO.)

7. Desirability of more uniformity among laboratories in conditions upon which temporary investigators are received.

It was voted: (1) That an information bulletin should be established, with regular circulation among island laboratories, and perhaps elsewhere; and (2) That study be given to the need and practicability of a journal for publication of the results of original research. (Referred to Resolutions Committee.)

Second Meeting. April 2, 2:30 - 5:00 P.M.

Chairman: Dr. J. A. Suárez Caabro

Recorder: Miss Francesca LaMonte

Panel: Drs. W. H. Sutcliffe, J. B. Lewis, Luis Howell Rivero

Special Topic: Types of research and techniques adapted for small island laboratories in tropical regions and need for standardization in instrumentation.

Conferees agreed that, since the sizes of available research vessels must generally limit activities to the littoral zone, our emphasis should be principally on hydrographic work, plankton and other floral and faunal studies to depths of some 100 fathoms and on fundamental marine biology rather than on fisheries technology.

In our tropical environment, we have opportunity to study seasonal changes and to compare productivity of tropical waters the year round as compared with productivity in temperate waters. We have excellent opportunity for underwater observations with aqualung to depths from 30 to 200 feet. It is an advantage that so much can be done in our waters with the use of small "day boats".

Limitations inherent in a small resident staff may be reduced by arrangements for visiting scientists and, perhaps, by securing special funds for additions to regular personnel.

Except as we are engaged in joint programs, the need is for calibration of methods used in the several laboratories, rather than in standardization of methods or equipment, other than for fundamental physical measurements.



Manuals of methods and equipment should be available to students; but it would be kept in mind that too much standardization may exclude newer and more efficient techniques. An example of newer technique cited was the use of aerial photography for base-mapping shallow waters and bottom communities; this has proved highly efficient in waters about Bimini; results should, of course, be checked by running a few selected traverses; deeper penetration of light in tropical waters favors this method of survey.

Dangers are greater with standardization than with nonstandardization, provided always that workers consider reliability limits in methods, calibrate their methods with those used by others, and make their techniques fully known in subsequent publications.

It was mentioned that marine stations connected with Universities have the added advantage of opportunity and responsibility for direct educational functions.

Discussion then reverted to the subject of organization, which had been broached at the first meeting. A first question was whether the organization of laboratories should be an "official" one, involving agreements by governments, or "unofficial". It was generally agreed that unofficial organization, with essentially the present membership, was preferable, but that there should be further discussion after a later meeting in which the several laboratories would be described.

A second question regarding the proposed organization was whether it should have a fixed center or should meet in rotation at the several laboratories. Where rotation is practiced it is customary to change officers for each meeting. It was suggested, however, that there should be a permanent place for records, continued for a period of years.

Various names were proposed for the association contemplated, as follows: Caribbean Council for the Study of the Sea; Association of Island Marine Biological Stations, Island Research Association for Study of the Sea; Association of Island Marine Biological Stations of the Western Atlantic; Island Research and Educational Council for the Study of the Sea; Association of Island Marine Laboratories of the Western Atlantic; Association of Island Marine Institutes of the Western Atlantic. The last-mentioned title was approved by the meeting. (In the eighth meeting, as reported below, this title was abbreviated.)

It was voted: (1) That the Resolutions Committee be asked to prepare a resolution recording the desire of the group to maintain present contacts through future meetings and through regular exchange of information; and (2) That the Resolutions Committee be authorized and directed to appoint a Nominating Committee to nominate officers for the next period.

Third Meeting. April 2, 8:00 - 10:00 P.M.

Chairman: Dr. José A. Ramos

Recorder: Dr. J. S. Zaneveld

Speakers: Dr. Louis Mowbray and Dr. Thomas Goreau

Illustrated Talks.

Dr. Mowbray spoke on "Migratory Routes of the Bluefin Tuna", with the use of a chart.

Dr. Goreau presented some results of his studies on "Calcification in Reef-building Corals". He showed also a number of excellent slides illustrating the zonation of corals.

(Abstracts of these papers will be found in Appendix A.)

Fourth Meeting. April 3, 4:30 - 5:30 P.M.

Chairman: Dr. R. E. Coker

Recorder: Dr. Thomas Goreau

Panel: Drs. José A. Suárez Caabro, Louis Mowbray,  
D. M. Steven

Special Topic: Need for stimulation of interest among high school and college students for careers of research in marine biology.

After a brief account of the teaching of biology in Universities in Cuba, with no special courses in marine biology, mention was made of two organizations that promote interest in the sea and in marine biology: one is called Amigos del Mar, the other is the Academia Nacional de la Marina de Guerra. (Suárez Caabro)

In Jamaica, with no seafaring tradition, interest in the sea is small. The poverty and low social standing of fishermen adds to the difficulty of attracting interest. Aquaria may be important in stimulating general interest among the public in marine sciences. (Steven)

Interest of the young could be stimulated through a prospectus indicating available opportunities of financial aid and, possibly, of salaries attainable. (Mowbray)

In endeavors to attract interest, the aim should be for quality of candidates rather than for quantity; the field should not be oversold; stock must be taken of available opportunities and positions. (Parr)

The importance of lectures and films over radio and TV was stressed. (Díaz Piferrer)

The help of natural history societies in the creation of Nature preserves, including submarine national parks, could be an important adjunct for stimulation of interest in the marine bio-sciences. (Goreau)

The importance of developing interest among parents, as well as children, was mentioned. The example given was a natural history society with meetings, lectures and films. (Howell Rivero)

The usefulness of guided tours and of demonstrations and talks in schools and over radio and TV in Puerto Rico was mentioned. (Rivero)

Relations between marine bio-sciences and geology are becoming of great importance. Columbia University and the American Museum of Natural History offer in conjunction a program for training professional paleontologists. The output of trained people is much smaller than the number of available positions in colleges and industry. Increasingly, geologists are utilizing the facilities of marine stations for studies of the conditions under which sedimentation and fossilization occur in modern times and of the relations between organism and environment. (Newell)

Training courses for teachers in primary and secondary schools are needed. (Zaneveld)

Increasing use of the facilities of the press for popular articles may have important results in stimulating interest in marine bio-sciences and in recruiting potential future scientists. (Goreau)

The problem is to attract the right people. Adequate grounding in mathematics and physics must be stressed as an essential part of the training of future marine biologists. (Steven)

A resolution was proposed committing members of the Conference to greater activity in efforts to stimulate public interest. (Howell Rivero) The resolution was referred, with instruction, to the Resolutions Committee.

Fifth Meeting. April 3, 8:00 - 10:00 P.M.  
(Concluded, April 5, 8:30 - 11:00 P.M.)

Chairman: Dr. Luis Howell Rivero

Recorder: Dr. John B. Lewis

Speakers: Drs. M. Díaz Piferrer, J. S. Zaneveld, J. A. Rivero

Illustrated Talks.

At this session, held out of doors on Magueyes Island, the showing of pictures was interrupted near the beginning by failure of electric current. Modified talks were given by the several speakers; pictures,

with talks, were shown at a continuation session in the laboratory during the evening of April 5.

Dr. Díaz Piferrer described the coast of eastern Cuba, illustrating with beautiful pictures. His films showed, not only the character of the coast, but also the work of the algal survey conducted by him for the Cuban Government, and close-ups of algal communities. The films pictured also work in the technical laboratories in preparation of agar, alginic acid and fertilizer from seaweed. (See Appendix A)

Dr. Zaneveld displayed excellent pictures of the coast of Curaçao, with special views of coral formations. (See Appendix A)

Dr. Rivero discussed the "Red Tide" situation that occurred off the western section of the south coast of Puerto Rico in September, 1954, showing moving pictures taken from a helicopter touring over the coast from La Parguera to the region of Guánica. "Fish kills" seemed to occur only where fish were confined within enclosures, as at the Institute, and were attributed to suffocation from accumulation of dinoflagellates on the gills, rather than to any toxic substance. (See Appendix A)

Sixth Meeting. April 4, 9:30 A.M. - 12:00 P.M.

Chairman: Dr. Norman D. Newell

Recorder: Dr. W. H. Sutcliffe

Speakers: Drs. A. E. Parr, W. H. Sutcliffe,  
J. S. Zaneveld, D. M. Steven and J. B. Lewis

Brief talks about laboratories.

Accounts of the laboratories will be found in Appendix B.

Seventh Meeting. April 5, 9:00 - 11:30 A.M.

Chairman: Mrs. Germaine Warmke

Recorder: Dr. W. H. Sutcliffe

Speakers: Drs. J. Suárez Caabro, M. Díaz Piferrer,  
J. Rodríguez Walling and L. Howell Rivero

Brief talks about laboratories, continued. Accounts included in Appendix B.

Eighth Meeting. April 5, 2:30 - 5:30 P.M.

Chairman: Dr. J. A. Rivero

Recorder: Dr. John D. Weaver

Resolutions Committee: Drs. J. S. Zaneveld, D. M. Steven,  
R. E. Coker, Chairman

Nominating Committee: Drs. L. Mowbray, J. Suárez Caabro,  
N. D. Newell, Chairman

The following resolutions were presented by the Resolutions Committee:

1. The participants in this first Inter-Island Marine Biological Conference wish to express warm gratitude to those institutions and persons who have played leading parts in sponsoring and guiding so significant and enjoyable a gathering. We refer particularly to the University of Puerto Rico and its division, the College of Agriculture and Mechanic Arts. We deeply appreciate the special courtesies of Chancellor Benítez, Vice-Chancellor Stefani and Dr. Rivero, Director of the Institute of Marine Biology, and those of others connected with the University and College. It is our strong conviction that the Office of Naval Research has rendered a real service to the advancement of marine biology and other studies of the sea in making possible this highly stimulating and educative gathering of marine biologists and geologists from island laboratories of the southwest Atlantic and Caribbean area; our most cordial thanks are recorded.

This resolution was moved, seconded and adopted by unanimous vote.

2. It is resolved that all present, by their personal effort and that of their institutions, should work actively to increase public interest in marine sciences.

The resolution was moved, seconded and adopted unanimously.

3. We, the participants in this first meeting of island marine laboratories are resolved to establish an association of island marine laboratories of the tropical west Atlantic for the purpose of advancing our common interest in marine sciences.

The resolution was moved, seconded and adopted unanimously.

4. Resolved: That it is desirable to establish a regular publication to serve as a medium for exchange of information between the island marine laboratories of the tropical western Atlantic. [As originally presented, the resolution included the following: (and that the journal be so designed as to serve for publication of the results of original research - to the extent that funds may permit.)]

The resolution, as read, was moved by Dr. Zaneveld and seconded by Dr. Goreau. Dr. Steven and others expressed opposition. After some discussion the resolution was divided into two parts; the first part, not within brackets above, was adopted without opposition.

Dr. Steven moved, as substitute for the part in parenthesis above:

That a committee be appointed to explore the possibility of establishing a scientific journal, having regard both to financial aspects and to the probable availability of suitable papers, and that the committee report back to the Association as early as possible.

This motion, seconded by Dr. Newell, was passed without opposing vote.

Discussion then followed as to a name for the Association. Suggestions were finally reduced to two: (a) The Caribbean Council for the Study of the Sea; (b) Association of Island Marine Laboratories. After further discussion the latter name was adopted by a vote of twelve to four.

It was stressed in the discussion that membership of the Association should be clearly defined in the bylaws when formulated.

The Nominating Committee presented the following nominations and recommendation:

President -- Dr. David M. Steven  
Secretary -- Dr. Juan A. Rivero

It was recommended that a Council advisory to the officers be formed, the Council to be composed of directors of the participating laboratories or their designated representatives. With Dr. Zaneveld temporarily in the chair, no nominations were received from the floor. After adoption of a motion changing the title "Secretary" to that of "Secretary-treasurer", Dr. Steven and Dr. Rivero were duly elected as President and Secretary-treasurer, respectively. The recommendation regarding the Council was approved.

Dr. Newell proposed the election of Vice-Presidents. After approval of the proposal and nominations, Dr. Robert E. Coker and Dr. Luis Howell Rivero were elected by acclamation as first and second Vice-President, respectively.

Discussion followed as to membership in the Association, voting powers and subscriptions. It was agreed that, until bylaws should be adopted, all present participants should have membership in the Council and voting power for the time. It was then voted that the officers of the Association should constitute the Committee on Bylaws, and that their recommendations should be circulated by mail to all present participants and be subject to approval or dissent by mail vote of the pro-tem Council as now constituted.

Dr. Rivero yielded the chair to Dr. Steven. Discussion followed as to date and place of next meeting. Definite plans could not be made, but it was generally considered desirable that the next meeting should be in 1958 and, probably, at Bermuda and that a meeting in 1959 might be held in Jamaica. The chair requested that any laboratory inviting

the Association should at the same time indicate what facilities and financial aid it could provide. Hope was expressed that future meetings might be concerned chiefly with presentation of scientific papers and that, possibly, there could be sessions in the nature of symposia on topics in the field of tropical biology.

So far as business was concerned, the Conference adjourned, sine die, at 5:00 P.M. (An evening meeting on this day was a continuation of the Fifth Meeting, which had been interrupted.)

## APPENDIX A

(ABSTRACTS OF SOME PAPERS PRESENTED)

### SOME NOTES ON THE KNOWN ROUTES OF MIGRATION OF THE BLUEFIN TUNA, Thunnus thynnus

by

Louis S. Mowbray, Curator  
Bermuda Government Aquarium

The Bluefin tuna enter the Caribbean Sea through many of the passages between the islands of both the Windward and Leeward group, usually during late February, March, and April. Some may even winter there. They leave the Caribbean on their northern migration through Mona Passage, the Windward Passage, and around the west end of Cuba. The fish in these groups pass through the Florida Straits from mid-May to mid-June. There appears to be a very considerable fluctuation in numbers during certain years. There is probably a direct relationship between this and the variation in the speed of the Gulf Stream and the so-called Antilles Current. In normal years, when the prevailing winds are strong, the Gulf Stream retains its full flow through the Caribbean, etc., while on other occasions the usually prevailing winds are lacking or weaker, and the Antilles Current is the stronger. It is my belief that further research will disclose that, in the years that are marked by a sparsity of bluefin tuna passing to the west of the Bahamas, the Antillean Current will contain the bulk of the migration, and will pass close to Bermuda, few having entered the Caribbean at all.

These huge fish go northward annually to glut on the herring off the New England and Nova Scotia shores, leaving those waters in late October for the return southward, keeping clear of strong head currents. Spawning probably takes place anywhere along the line of migration between April and late May. They feed little during the ripe gonad period due to the fact that a packed stomach would release eggs or milt prematurely.

An interesting point of fact is that few of these tunas are seen on the surface in the Caribbean or Florida Straits. The probable reason is that they are remaining deeper, at the first or second thermocline, the temperatures which more closely approximate those further northward in the feeding grounds. Comparative data for the two areas should reveal much of interest to the marine biologist and oceanographer.



# CALCIFICATION IN REEF CORALS

by

Thomas Goreau

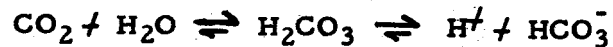
Department of Physiology

University College of the West Indies

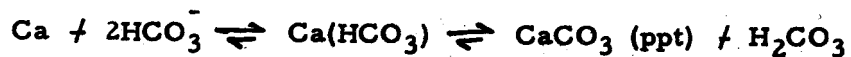
and

The New York Zoological Society

The scleractinian corals secrete a skeleton of pure aragonitic calcium carbonate. A method has been developed by the writer for determining calcification rates in corals under controlled conditions, using  $\text{Ca}^{45}$ . Preliminary investigations have been carried out to determine calcification rates in coral under different conditions. In four species of tropical shallow water corals, calcification was between 30% and 60% higher in light than in darkness. Removing the zooxanthellae from the coral caused the calcification rate to decrease by over 50% and become independent of the light intensity. Treatment of the coral with  $10^{-3}\text{M}$  Diamox (2-acetyl-amino-1, 3, 4-thiadiazole-5-sulfonamide), a powerful carbonic anhydrase inhibitor, caused the calcification rate to fall by over 50% regardless of the light intensity. The action of carbonic anhydrase and the zooxanthellae appear to be physiologically equivalent in that both can catalyze the reaction system



If calcification involves the reaction



then the removal of carbonic acid by zooxanthellae and/or carbonic anhydrase would shift the reaction to the right and increase the rate at which calcium carbonate is deposited into the skeleton. This would explain the facts that (1) the zooxanthellae produced twofold increase in calcification rate provided the coral is exposed to light, and that the absence of these algae from the coral causes a decrease in calcification and makes it independent of the light intensity; and (2) that inhibition of carbonic anhydrase causes a similar decrease in calcification rates.

## STUDIES OF MARINE ALGAE IN CUBA

by

M. Díaz-Piferrer, Director

Laboratory of Marine Biology, University of Oriente  
Santiago de Cuba, Cuba

Dr. Díaz-Piferrer discussed recent efforts in Cuba, and mainly in the University of Oriente, to reconstitute collegiate curricula for greater emphasis on studies directed at better understanding and exploitation of the nation's natural resources. In the first three years of the new program, the student acquires basic knowledge in the fields of the natural sciences; the fourth and fifth years allow specialization in Geology, Zoology or Botany, or, for the first time in Cuba, in Marine Biology. The University of Oriente offers specialization in Marine Phycology.

In May, 1955, there was held in the University of Oriente a "Mesa Redonda sobre la Industrialización de los Recursos Marinos Cubanos", participated in by representatives of fisheries, economics, workers, press and radio, and by others interested in potential industries based on resources of the sea. The proceedings were published by the University of Oriente. An outgrowth of this Round Table was the establishment, in September, 1956, of the Laboratory of Marine Biology of the University of Oriente, the first institution for the study of Cuban Marine Flora.

Much effort, through newspapers, radio and television, has been made to awaken interest among the public, private organizations and governmental agencies both for support of research in marine biology and for inclusion of study of the sea in education at primary, secondary and university levels.

The Instituto Cubano de Investigaciones Tecnológicas, an autonomous organization dedicated to the industrial development of Cuba, has given \$5,000.00 to defray costs of investigations by the Laboratory with respect to the utilization of marine algae in preparation of balanced feeds for animals. This organization is also interested in establishing in Habana a laboratory for studies in Marine Biology.

At present, the laboratory of the University of Oriente is devoted to investigations dealing with the marine flora of Cuba. The studies relate to geographic distribution in Cuba, abundance and ecology. Both formalin-preserved and dry specimens of classified algae are kept in the Ficoteca Cubana that is being developed. Duplicates are preserved for exchange with other marine laboratories interested in marine algae. An archive of photographs of algae in color is maintained, and a color films has been made to illustrate the ecology of Cuban marine algae.

All species of brown seaweed (Phaeophyceae) and red algae (Rhodophyceae) are processed for yields of agar and algin, by species, locality, season, and types of habitat. Some species of browns, reds and several green algae (Chlorophyceae) are tested for their nutritive values to animals and man. Other series of experiments with marine algae have to do with transplantation, with culturing and with possible uses as ingredients of commercial fertilizers.

Investigations of algae as sources of antibiotics will begin in September, 1957.

A LITHOTHAMNION BANK NEAR BONAIRE  
(NETHERLANDS ANTILLES)

by

Jacques S. Zaneveld, Director  
Caribbean Marine Biological Institution  
Piscadera Bay, Curacao, N. A.

Before the close of the last century banks covered by lime-secreting red algae were known to occur in the Arctic Sea, along the northern coast of Norway and off the shores of Spitsbergen, and in Nova Zembla (Kjellman, 1883; Foslie, 1903).

In the subtropics, a Lithothamnion bank in the Bay of Naples, about 30 meters below the surface of the sea, had been detected by J. Walther, quoted by Seward (1894).

During the expedition of the "Siboga" in the tropical Netherlands East Indian waters (1889-1900), Mrs. Weber-Van Bosse detected a Lithothamnion bank near the coast of Haingsisi, an island near the S. W. point of Timor. The species being named Lithothamnion erubescens f. haingsisiana Fosl. Again, near the Kei Islands such an enormous number of Lithothamnion australi f. tualensis Fosl. occurred that this again was to be named a Lithothamnion bank.

In the West Indies Murray (1880) was the first who mentioned Lithothamnion banks, e. g. from Bermuda. Alex. Agassiz (1880) dredged incrusting "nullipores" in a living condition from Pourtales Plateau off the south coast of Florida at depths from 250 to 350 fathoms.

Bigelow (1905) states that he dredged a number of "calcareous pebbles", on the Challenger Bank about 9 miles from Bermuda. The pebbles were growing at a depth of 30.5 fathoms and they proved to be a species of Lithothamnion.

A new Lithothamnion bank in the West Indies was detected in 1955 by the present author in the entrance to a large inland bay (4 x 3 km), called "Lac", situated at the southeast side of the island of Bonaire, one of the Leeward Islands of the Netherlands Antilles.

Beyond a broad bar a limestone plateau about half a square kilometer in extent lies at a depth of 30-60 cm under the surface of the water. The whole plateau appeared to be covered by globulous (2-7 cm in diameter) and more or less sausage-shaped calcareous red-coloured seaweeds, the species most probably being Lithothamnion erubescens.

Streaming from ebb and flood causes the calcareous balls to be rolled to and fro on the platform. This must be the reason that the Lithothamnion balls are alike on every side and that they do not show uncoloured spots on their surface.

In the course of time the platform becomes gradually enlarged at both ends as the balls are rolled by the movements of the tides at either side of the bank from the surface to the surrounding deeper water. So Lithothamnion knolls play a role in the formation of land.

## MICRO-ATOLLS IN THE NETHERLANDS ANTILLES

by

Jacques S. Zaneveld, Director  
Caribbean Marine Biological Institution  
Piscadera Bay, Curacao, N. A.

So called brain-corals, belonging to the general Siderastrea, Porites, Diploria and Meandrina often show muddy sand spots, especially in the centre, but also on other parts of the surface. On these spots species of the genus Chaetomorpha may grow, and, when the mud cover is 2 cm or more thick, Halimeda tridens, Dictyota dichotoma and Lau-  
rencia papillosa occur also.

The shape of these coral boulders immediately call to mind the well-known atolls which abound in the Pacific and Indian Oceans, hence the name "micro-atolls".

Semper (1863), after having studied the Palau reefs in the Pacific, was the first author to mention these peculiar coral growths. This author, and after him Murray (1880) and Alexander Agassiz (1894), thought that the shape of these corals was due to the fact that the centre of the original coral boulders became uncovered by sea water at low tide. Therefore the coral polyps at that spot die through desiccation and the underlying part of the coral colony is subsequently eroded by the

action of boring animals, carbondioxide in the water, power of the streams, etc.

On account of his coral studies in the Chinese Sea, Krempf remarked already in 1905 that the origin of all micro-atolls cannot be explained in this way. This author observed micro-atolls to a depth of 12 meters, and consequently these must have originated without the influence of the tides. Therefore, Krempf thinks that the accumulation of sediment on the horizontal centre is the reason for the death of the polyps. Moreover, this author stated that the accumulation of sediment takes place on all horizontal parts of a coral boulder and not only in the centre.

Kuenen (1933), in his report of the Snellius expedition, gave as his opinion that "both explanations must be used, either separately or combined, if we wish to explain all micro-atolls".

On account of the observations made in Indonesia in the years 1954-'57, the present author is of the same conception.

The polyps of the micro-atolls which occur in the littoral zone, are killed as soon as they rest too long above low tide level.

In the micro-atolls of the sub-littoral zone, however, the polyps are principally killed by sedimentation. The more sand and mud is accumulated on the surface, the better algae can get a holdfast. As this process proceeds, more and more coral polyps die, so that the diameter of the circle of dead polyps becomes gradually larger.

Moreover, marine borers and other calcium carbonate attacking animals take shelter in the accumulated sand and start their destructive work. Therefore the sand-covered parts of the brain coral become more and more excavated, which may go so far that only a rim of living polyps is left.

A close study of the micro-atolls occurring in Indonesia and in the Netherlands Antilles, shows the subsequent stages step by step. And the same is to be observed in the micro-atolls of the reefs off the coast of Parguera, Puerto Rico, as I can state from observations made on an excursion during the Inter-Island Marine Biological Conference in 1957.

## HAEMATOTHALASSIA IN PUERTO RICO

by

Juan A. Rivero, Director  
Institute of Marine Biology  
University of Puerto Rico  
Mayaguez, Puerto Rico.

On September 10th, 1954, there was at La Parguera, an outbreak of haematotholassia, or red tide, that extended for 30 or 40 feet beyond the fish pens and docks of the Institute of Marine Biology at Magueyes Island. Four days later, the red water extended three or four hundred yards out from the dock and all the water in the pens was of a reddish tea color. A distinct sweet smell was noticeable.

Ninety five percent of the enclosed fish were killed by the red water. Parrotfishes, snappers, sharks and rays were easy victims; groupers and porcupine fishes were more resistant; Humboldt penguins and a manatee were not apparently affected. No ill effects were noticed in humans during or after submersion.

The organism was tentatively determined as Polykrikos, but subsequent red areas have been found to contain Glenodinium. Almost immediately after collection the reddish dinoflagelates settled in a muscilaginous scum having a definite, mango paste (pectin ?) odor. Fishes placed in aerated aquaria containing a good concentration of the dinoflagelated died in about 4 hours. Filtered, the same water, however, could keep fish indefinitely, showing the absence of free toxins capable of causing direct damage. Death was attributed to asphyxia caused by deposition of the muscilaginous dinoflagelates on the gills of fishes.

Still photographs and moving films were taken from a helicopter over the affected area. No free dead fishes were noticed anywhere. The red areas were almost always found on the leeward side of mangrove islets or fringing the mangrove covered shores.

Burkholder has found that scrapings from mangrove roots assay very high in vitamin B12. In bottom deposits obtained at the Luminescent Bay, the B12 activity ranges from 60 to 940 millimicrograms per gram of dry sediment. Scrapings from mangrove roots assayed highest of all bottom deposits, giving 740 to 940 millimicrograms per gram of dry matter.

Since vitamin B12 compounds apparently are limiting factors for the growth of planktonic organisms, the apparent relationship between haematotholassia spots and mangrove areas in Puerto Rico invite further studies along these lines.

## APPENDIX B

### ACCOUNTS OF LABORATORIES (In Order of Establishment)

#### BERMUDA BIOLOGICAL STATION St. George's, Bermuda

Dr. William H. Sutcliffe, Director  
(Address as above)

The station was established in 1903 and incorporated in 1926. Its chief sources of support are an endowment (from the Rockefeller Foundation and the Bermuda Government) and annual income from the Bermuda Government and from rents, fees and contracts. It is not connected with a university.

Its buildings are: a Main Laboratory of four storeys, including laboratories, offices, rooms for investigators and apartments; the Lower Laboratory, with four laboratories and a shop; a two storey Library, with apartment above; five cottages; two apartment buildings with total of six apartments, and a boathouse.

Vessels include: the "Panulirus", a converted fisherman, equipped with light and heavy winches, radio telephone, deep-scale fathometer, radio direction-finder, Ekman reversing bottles, reversing thermometers, bathythermographs, 110 volt A. C., the "Abudefduf", a 26-foot launch, equipped with radiotelephone, fathometer and live well; a 14-foot runabout, with inboard Briggs-Stratton engine; two 12-foot row boats.

Principal items of equipment, other than ordinary laboratory apparatus and supplies, are: Cold room, dry room, deep-freezes, Warburg apparatus, autoclave, dark rooms, colorimeters, running sea water, four indoor concrete tanks and machine shop.

Regular members of the staff for research, besides the Director, are Lieut. Colonel W. E. Stevens, Dr. David W. Menzel. Available are laboratory and living accommodations for 25 visiting scientists.

Environment conditions favorable for marine research include coral reefs, rocky and sandy beaches, mangrove swamps, shallow bays and close proximity to deep sea.

THE LERNER MARINE LABORATORY  
Bimini, Bahama Islands

Mailing address:  
DuPont Building, Miami 32, Florida

(Submitted by Miss Francesca LaMonte, Associate Curator of Fishes, American Museum of Natural History. Appointment of a new resident Director is in progress)

The Lerner Marine Laboratory, owned and operated by the American Museum of Natural History, New York, was established in 1947. Buildings and two and a half acres of land running from harbor to ocean were given by Mr. Michael Lerner, who also started the Laboratory's endowment fund, since added to by many other contributors.

Buildings are: the Residence, with five double air-cooled bedrooms, three baths, kitchen, bathroom and screened porch; a similar Cottage for the maintenance man; the Power House, a tool house, and the Laboratory building. Visiting scientists are housed and fed in the Residence. The laboratory building contains a study, four laboratories, two combined aquarium and laboratory rooms, an animal room, refrigerator room, constant-temperature room, desiccation room, photographic dark room, lavatory and shower, and storage closets. It is equipped with running sea water, well water, hot and cold rain water, 110 volt, 60 cycle alternating and 110 direct current, bottled gas outlets, 64 aquariums with running sea water and four water tables. There are exterior concrete pools and dock cages, and five large ocean pools.

Other than the Director and a maintenance man, permanent employees of the Lerner Marine Laboratory consist of service employees for house, laboratory and boats, and a secretary at the Miami office.

Our boats are the "Research", a 29' twin engine, Egg Harbor Jersey Sea Skiff, and the "Wild Goose", a twin screw, 41'9" Hall Scott (Camden Shipbuilding) vessel with two-berth deckhouse, double stateroom and bath, and two berths and head for crew. A captain and mate are employed when this boat is used. In addition we have several power boats and a glass-bottomed boat.

Bimini lies sixty miles due east of Miami, Florida. The Florida shore marks the western edge of the Gulf Stream and the Great Bahama Bank the eastern. Bimini is situated on the edge of this bank adjacent to the Gulf Stream. Its eastern side forms a shallow harbor on the Great Bahama Bank. There is a good tidal flow but the normal rise and fall is slight. Most of the shore line is composed of coral sand beach with outcroppings of aeolian limestone. On the eastern side are mangrove stands and a variety of partially enclosed waters with sandy or grassy bottom. There are also various living coral and sea fan environments.



# INSTITUTE OF MARINE BIOLOGY

University of Puerto Rico  
Mayaguez and La Parguera, Puerto Rico

Dr. Juan A. Rivero, Director  
College of Agriculture and Mechanic Arts  
University of Puerto Rico  
Mayaguez, Puerto Rico

Established, February 8, 1954, with business office in Mayaguez and seaside station near La Parguera, 22 miles south and slightly eastward of Mayaguez, the Institute is supported almost exclusively by the College and University.

Base office and four small laboratories for research are in a building on the campus in Mayaguez, which is on the shore of Mona Passage.

The seaside station is on an islet of 18 acres, Magueyes, occupied exclusively by the Institute and associated Zoological Garden. It is just east of the village of La Parguera and about 100 yards off shore. The principal building, 52 x 26 feet, comprises one large room, usable as research laboratory or assembly room, an office, storeroom and bathroom. In process of construction is a building, 60 x 25 feet, containing a laboratory for summer students, storeroom, kitchen, refrigeration room (for the Garden), and shop. An aquarium arcade adjoins the central laboratory building. A U-shaped pier extending into the bay embraces about an acre of sea, divided into nine enclosures for fishes and other animals for research or display.

Vessels are: a 65-foot diesel-powered boat, the "Carite", an 18 foot outboard-powered launch, the "Physalia", a smaller launch and several row-boats. The "Carite" has light and heavy-duty winches with oceanographic cable, swinging davit at the stern and swinging boom amidship; it has ship-to-shore radio, 32 volt electric system, a laboratory, and living accommodations for eight or ten persons.

Laboratory equipment, besides microscopes and accessories, ordinary glassware and thermometers, includes plankton nets (12", 1/2-meter, and Clarke-Bumpus), Nansen bottles, reversing thermometers, centrifuge, millipore filter, small aerating pumps, titration equipment, circulating sea water and electric current, 110 and 220-volt, 60 cycle, A. C.

Besides the Director, the scientific staff includes Mrs. Germaine Warmke, Honorary Curator of Mollusks, Dr. Ruth Turner, Honorary Research Associate, Mrs. Eneida B. Rivero, Honorary Associate for Mollusks, and Dr. R. E. Coker, Consultant and Investigator. Dr. John Weaver and Mr. W. A. Gordon, Geologists, work closely with the Institute.

Close by are luxuriant coral reefs, mangrove swamps and great depths of the sea. Permanently luminescent bays are within 15 minutes by boat. Accessible by station wagon are, within an hour, estuaries, lagoons, salinas, mud-flats and rocky shores, and, within two hours, the Atlantic with semi-diurnal tide and other conditions different from the Caribbean.

## THE BELLAIRS RESEARCH INSTITUTE OF

McGILL UNIVERSITY  
St. James, Barbados, B. W. I.

Dr. John B. Lewis, Director  
(Address as above)

The Bellairs Research Institute was founded in 1954 in Barbados, B. W. I., as a marine biological field station of McGill University. It was endowed for the purpose by the late Commander C. Bellairs, R. N.

The Institute is situated by the sea, on the leeward coast of Barbados. A wide variety of tropical marine environments are available for study at short distances from the Institute. There are fringing coral reefs along the leeward coast of the island and barrier reefs on the windward. There are also numerous rocky shores, sand beaches and shallow water flats. There is a rich tropical plankton fauna and a well-developed pelagic fishery.

At present the Institute consists of two laboratories with running sea water throughout. There are large and small aquaria and water tables for experimental work. There is a moderate amount of glassware and chemicals, nets, dredges and other collecting gear. There is a photographic room, underwater camera and two Aqualungs. The Institute possesses two small boats with an outboard motor and a 30 foot power research vessel. This will shortly be fitted with a winch and light trawling gear.

Furnished rooms for a limited number of investigators are available for a small charge. Kitchen facilities will shortly be available; or meals can be obtained at a nearby hotel.

The Island is served by three airlines; BOAC (BWIA) from the West Indies. TCA from Canada and PAA from the United States.

Investigations in progress at the Institute include a study of the biology of the tropical sea urchin Tripneustes, the ecology of rocky shores, the ecology of local coral reefs and a survey of the local plankton. A study of the biology of the local flying fish, Hirundichthys will shortly be initiated.

CARIBBEAN MARINE BIOLOGICAL INSTITUTION  
Piscadera Bay, Curacao, Netherlands Antilles

Dr. Jacques S. Zaneveld, Director  
Berg Carmelweg 7  
Willemstad, Curacao

The Institution was established in 1955 by the Insular Government of Curacao, the Foundation for the Development of Science in Surinam and the Netherlands Antilles (W. O. S. U. N. A. ), the Curacao Petroleum Industry Maatschappij (C. P. I. M. ) and the Technical Economic Council of the Netherlands Antilles (T. E. R. N. A. ). Sponsor of the Institution is the Insular Government of Curacao, Lt. Governor M. P. Gorsira being President of the Board of Trustees. It operates in close cooperation with the Netherlands Universities of Leiden, Utrecht, Amsterdam among Groningen.

The Laboratory Building, only 25 meters from the sea, has floor space of 1,596 square feet, and is adequate for 6 visiting scientists and 10 students at one time. The ground floor has an octagonal aquarium room, laboratory, chemical-physical work room, balance cabinet serving also as constant-temperature room, workshop and general service rooms. On the first floor are: air-conditioned library, Director's laboratory, three laboratories for visiting scientists, combined auditorium and laboratory, and air-conditioned photographic darkroom. A residence building, adjacent to the Institution, offers at moderate prices two one-bedroom units and four two-bedroom units. Meals are obtainable nearby.

A 25-foot motor vessel serves for research work.

Equipment includes running sea water circulating through ducts of polyvinylchlorid, running fresh water, electricity (110 and 220 volt, 60 cycle, A. C. ), bottled gas and air, electric semi-automatic microbalance and electric refrigerator. Outside, are four hatching jars and enclosures at the end of the 63-meter jetty.

Visiting investigators are accommodated at nominal cost and under conditions ascertainable on application to the Director. For transportation a jeep and a station wagon are available at nominal cost. Laboratory and residence are open all the year.

Special features of the tropical environment of interest to scientists are: abundance and diversity of species of fishes; wide variety of biotopes, including ocean beaches, coral reefs, flats, lagoons, rocky shores, tide pools, caves, mangrove swamps, salinjas and the deep sea (with depth of over 500 meters at a distance of only about 400 meters offshore). The location at 12°2' N. Lat., 68°50' W. Long. is just south of the most southerly trace of hurricanes. Average annual temperature is just below 80 F. Constant north-easterly trade winds with mean velocity of 5m/sec. make midsummer days seen cooler than is indicated by the thermometer. Average rainfall is about 600mm annually, with greater part of the precipitation from November to February.

Curacao is accessible by four airlines and a number of steamship lines.

UNIVERSITY COLLEGE OF THE WEST INDIES  
Marine Laboratory at Port Royal, near Kingston)

Dr. David M. Steven, Director  
Department of Zoology  
University College of the West Indies  
Mona, St. Andrew, Jamaica, B. W. I.

The marine laboratory was established at Port Royal in 1956 as an extension of the Zoology Department of the College and is under the direction of the professor of Zoology. Communications should be addressed to the Department of Zoology, U.C.W.I., Mona, St. Andrew, Jamaica, B. W. I. It is an integral part of the University College of the West Indies from which it receives its principal financial support. The laboratory is housed temporarily in a single large room in rented premises, but a site including a stretch of waterfront has been acquired recently on which a permanent laboratory will be erected. It is hoped to have this completed during 1958. The present temporary laboratory is equipped with mains supplies of electric power and fresh water, and has a circulating sea water system feeding a number of aquaria.

The laboratory has two open boats of 16 ft. and 12 ft. length powered by outboard motors. A 26 ft. launch equipped with power driven winch will be available by the end of 1957. A set of plankton nets, dredges and other collecting gear are available.

The laboratory is used by all members of the staff of the Zoology Department and there are no special appointments to it. Principal users other than the Director are Dr. I. M. Goodbody and Dr. Thomas Goreau.

There are no residential facilities for visiting scientists at the present temporary laboratory, but it is hoped to include a residential apartment in the permanent one.

The sea around Port Royal offers a large number of different environments within easy reach of the laboratory and this is reflected in the richness and variety of the fauna and flora. Kingston Harbour to the north consists of several square miles of enclosed waters, so far little affected by industrial activities, with extensive shallow areas of sandy and muddy bottoms, and beds of turtle grass. There are also mangrove swamps, lagoons, salinas and the estuaries of two small rivers. Outside the harbour there is a continental shelf area, several square miles in extent, with a complex system of active coral reefs and sandy cays separated by channels with depth up to 20 fathoms. Beyond the outer barrier reef the sea floor descends precipitously to oceanic depths.

LABORATORY OF MARINE BIOLOGY  
University of Oriente  
Santiago de Cuba, Cuba

Dr. M. Díaz-Piferrer, Director  
(Address as above)

The laboratory was established in September, 1956. Its Director is Professor M. Díaz Piferrer, who has now a graduate aid in chemistry and undergraduate aid for routine work in the laboratory.

Presently, attention is concentrated on studies of Cuban marine flora, their systematics, distribution, abundance, ecology, and potentialities as sources of agar, algin, vitamins, and other useful products and for use in preparation of animal feed and in fertilizers for agricultural crops.

In September, of this year, it is contemplated to initiate investigations of antibiotics, employing marine algae. The studies will be conducted by the Director of the Laboratory of Marine Biology and Dr. Eusbio Viciado Perdomo of the Department of Microbiology in the University of Oriente.

Financial support of the laboratory and its work is derived from the University and from the Instituto Cubano de Investigaciones Tecnológicas, which is based in Vedado, Habana, Cuba, and is directed by Dr. Emiliano Ramos Rodríguez, a leading Cuban chemist.

The laboratory receives visiting scientists and may extend aid for transportation and subsistence for visitors invited with approval of the University Council on recommendation of the Director of the Laboratory. Facilities are available for transportation to all stations on the north and south coasts of the Province, or any other locality on the island.

LABORATORY OF MARINE BIOLOGY  
University of Villanueva  
Marianao, Habana, Cuba

Dr. José A. Suárez Caabro, Director  
(Address as above)

The Marine Laboratory, established in January, 1957, is under the general direction of R. P. Ing. Gerrit E. Hamerlinck, O. S. A., Universidad de Villanueva, Apartado número 6, Marianao, Habana, Cuba. It is supported by the University through the Institute of Scientific and Technological Research.

Its home is in the University building, "Tarafa", situated some 200 meters from the sea on the north coast of Cuba. At present, it employs a rented boat, about 40 feet in length, propelled by sail and motor.

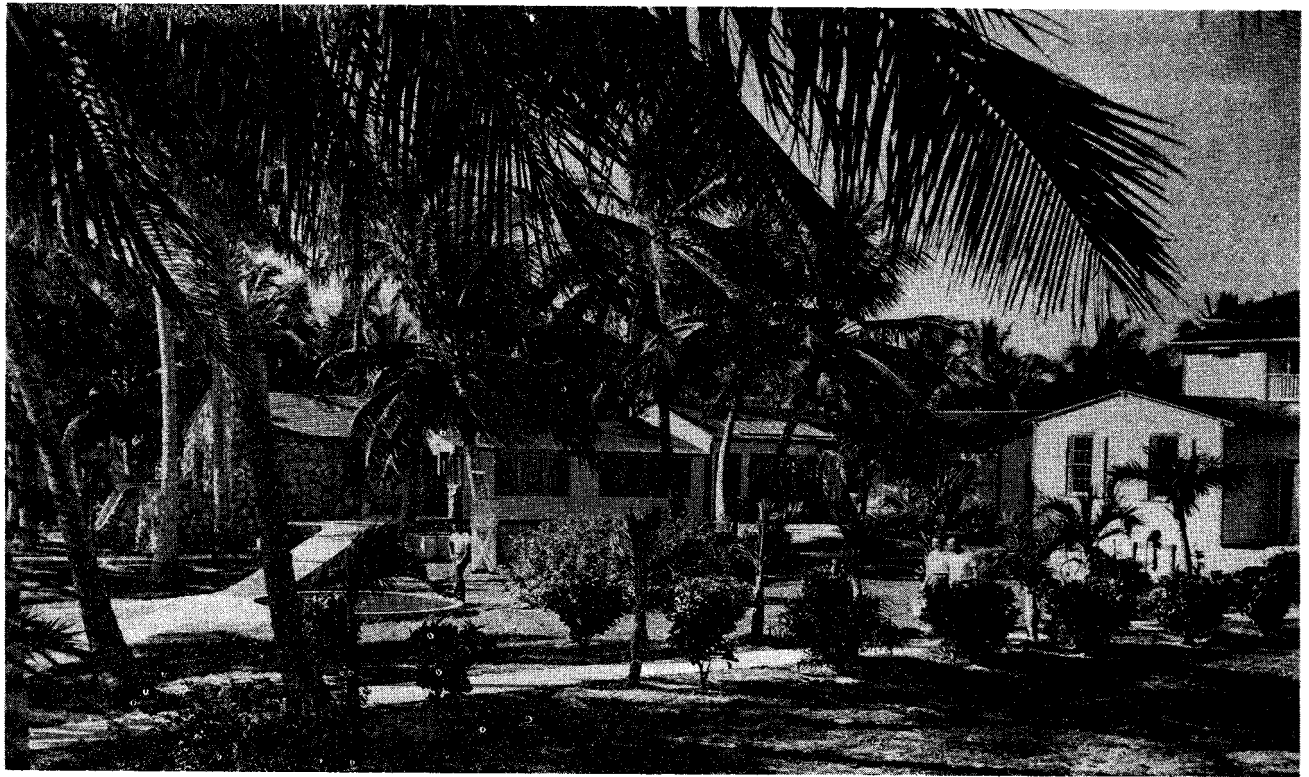
Equipment, besides microscopes and accessories, ordinary glassware and supplies, includes: plankton nets (regular and closing), Nansen bottles, reversing thermometers, Clarke and Bumpus plankton sampler, winch, hydrographic cable and equipment for chemical analyses.

At this time, Dr. Suárez Caabro has as assistants: Mr. Warden Johnson, B. A., and Dr. Georgina Morales de Vega. There are no special facilities for visitors, but nearby hotels offer substantial discount to visiting scientists.

Shores nearby are rocky; eastward beyond the City of Habana, are sandy beaches. Some work is now being done near the Isle of Pines, 25 minutes by air from Habana, on the broad shelf off the south coast of Cuba, and in the Caribbean. The Straits of Florida and Yucatán, the Caribbean and the Gulf of Mexico are readily accessible from this place.



Bermuda Biological Station, Bermuda, B. W. I.



Lerner Marine Laboratory, Bimini, Bahama Islands