Graduate Program in Zoology

at the

UNIVERSITY OF HAWAII

UNIVERSITY OF HAWAII GRADUATE SCHOOL

Department of Zoology and Entomology

April 1959
The Graduate Program in Zoology at the University of Hawaii is administered through the Graduate School, and is conducted by the staff of the Department of Zoology and Entomology, College of Arts and Sciences.
Hawaii Marine Laboratory, Coconut Island


Natural Assets

The University of Hawaii is located in the city of Honolulu on the island of Oahu, Hawaii. Situated in the central Pacific Ocean at 21° N. latitude and 157° W. longitude, it is the only American university truly within the tropics. Its unique location produces not only a delightful, moderate climate and a lush tropical vegetation, but also a rich and varied fauna both on the land and in the sea.

Hawaii is a paradise for students of biology and especially for students of tropical marine zoology. Accessible all year round are varieties of habitats ranging from the sandy and rocky shores and coral reefs of inshore waters to the open sea, which descends to abyssmal depths within a few hundred yards from shore. Each habitat has its myriad life, including both the rich complex of species associated with the Indo-Pacific faunal region and indigenous forms peculiar to the islands.

With this setting, it is not surprising that marine zoology has become an outstanding specialized field of instruction and research at the University of Hawaii. With strong administrative support, an enthusiastic staff, and excellent laboratory facilities, major advances have been made in the last decade. Today, there are unsurpassed opportunities for the graduate student to receive advanced training and to conduct basic research in marine zoology at the University of Hawaii.

Fields of Specialization

The graduate program in zoology is specifically designed for students working for the Master of Science and the Doctor of Philosophy degrees in marine zoology. To this end, the faculty has been chosen to include experts with active research interests in the marine field. Although students in other fields of zoology such as mammalogy and ornithology are accepted and are given a liberal education in general zoology, usually they are not encouraged to proceed beyond the master’s degree at this University.
Within the field of marine zoology there are several areas of special development including taxonomy, ecology, comparative physiology, and developmental anatomy of marine invertebrates and fishes. Particular attention is given to instruction and research in fishery biology. Increasing emphasis is being placed on all aspects of experimental research, utilizing living specimens in aquaria, tanks or ponds, and employing the most modern experimental techniques such as radioactive tracers. Special attention is focused on behavior studies, using both captive animals and those in their natural environment.

**Faculty**

Concurrent with the development of fields of specialization and with the expansion of instructional and research facilities, the staff has been augmented to provide a well-balanced faculty for instruction and research in both fundamental and applied aspects of marine zoology. In the listing below of the Graduate Faculty in Zoology the members' fields of experience and areas of specialization are indicated.

**Banner, Albert H., Professor, Ph.D., University of Washington**
Invertebrate Zoology, Oceanography: taxonomy of crustaceans, fish toxicology

**Chu, George W., Professor, D.Sc., Johns Hopkins University**
Parasitology: schistosomiasis

**Gosline, William A., Professor, Ph.D., Stanford University**
Ichthyology: taxonomy, zoogeography, evolution and life history of fish

**Hiatt, Robert W., Senior Professor, Ph.D., University of California**
Marine Ecology, Invertebrate Zoology: ecology of coral reefs

**Hsiao, Sidney C., Professor, Ph.D., Harvard University**
Experimental Zoology, Embryology: developmental physiology, metabolism of metal ions and radionuclides

**Matthews, Donald C., Professor, Ph.D., University of Wisconsin**
Invertebrate Zoology: arthropod reproduction
TESTER, ALBERT L., Senior Professor, Ph.D., University of Toronto  
Biometry, Fishery Biology: fish behavior, fishery dynamics and management

TOWNSLEY, SIDNEY J., Assistant Professor, Ph.D., Yale University  
Invertebrate Zoology: ecology, developmental physiology, metabolism of metal ions and radionuclides

VAN WEEL, PIETER B., Professor, Ph.D., State University of Utrecht  
Comparative Physiology: smooth muscle, osmoregulation, respiration and digestion in invertebrates

Closely associated with this staff are other members of the faculty of the University who specialize in algology, radiochemistry of photosynthesis, ecology of marine plants, biochemistry, and chemical and physical oceanography.

Situated on the campus or near to it are several research institutions whose senior staff members are members of the University's Affiliate Graduate Faculty. They serve on thesis committees and participate in seminars and advanced courses. Chief among these affiliate institutions, insofar as graduate study in marine zoology is concerned, is the Bureau of Commercial Fisheries Biological Laboratory of the U.S. Fish and Wildlife Service, located on the campus. Several leading oceanographers, ecologists, ichthyologists, planktologists and fishery biologists are members of its scientific staff. The Affiliate Graduate Faculty also includes senior scientists of the Pineapple Research Institute, the Hawaiian Sugar Planters' Association Experiment Station, and the Bernice P. Bishop Museum. Affiliates directly concerned with marine zoology are:

AUSTIN, THOMAS S., Associate Professor, Oceanographer, Bureau of Commercial Fisheries Biological Laboratory, M.A., University of Buffalo; M.S., Yale University  
Oceanography, Marine Ecology

BROCK, VERNON E., Director, Bureau of Commercial Fisheries Biological Laboratory, M.A., Stanford University  
Ichthyology, Fishery Biology
KING, JOSEPH E., Fishery Research Biologist, Bureau of Commercial Fisheries Biological Laboratory, M.S., University of Cincinnati
Marine Biology

KONDO, YOSHIO, Malacologist, Bishop Museum, Ph.D., Harvard University
Malacology, Biogeography

STRASBURG, DONALD W., Fishery Research Biologist, Bureau of Commercial Fisheries Biological Laboratory, Ph.D., University of Hawaii
Ichthyology, Fishery Biology

The visiting marine biologists who are in residence at the University's Hawaii Marine Laboratory for several months each year are important to the graduate program. Frequently they are available to give seminars and to discuss biological research problems with the graduate students.

Under a grant from the Carnegie Foundation outstanding visiting professors are invited from time to time to offer courses and give lectures in certain important aspects of zoology, particularly in areas not covered by the permanent staff. They are a source of intellectual stimulation to both the faculty and graduate students.

Facilities

Laboratories

On campus, laboratory and classroom facilities are located in Gartley Hall. The Department of Zoology and Entomology is well supplied with the usual equipment for instruction such as microscopes, microtomes, kymographs, etc., and with special equipment for research. Instruments are available for instruction in the techniques of radiology. Graduate students are given office or desk space in Gartley Hall or near-by annexes.

The Department maintains a close association with the University's Hawaii Marine Laboratory. Research facilities of the Coconut Island Branch, located in Kaneohe Bay some 15 miles from the campus, are available to graduate students.
Transportation is provided. Extensive tidal ponds provide unparalleled opportunities to hold captive marine species under approximately natural conditions. Tanks and aquaria, supplied with running sea water, are available for maintaining smaller specimens. The sea water systems are built of non-toxic materials so that the water is suitable for the most exacting experimental research. The laboratory includes research rooms for general zoology and physiology, a dark room, and a machine shop. Facilities are available for storing, chemical manipulation, detecting, counting and final disposal of radioactive materials. The laboratory maintains a reference collection of biological specimens.

The Waikiki Branch of the Hawaii Marine Laboratory, some three miles from the campus, has laboratory rooms for both teaching and research, and some of the courses in marine zoology are taught there. A sea water system and aquaria enable living specimens to be held for instruction and research. A radiological laboratory is available.

Also, the Department maintains a close association with the Bureau of Commercial Fisheries Biological Laboratory where advanced seminars in oceanography and fisheries are held. Often the collections and facilities of this laboratory are available to graduate students who are working on problems involving offshore waters.

The Bernice P. Bishop Museum maintains extensive collections of Hawaiian and central Pacific marine species which are available to qualified graduate students of the University.

**Vessels and Collecting Equipment**

The "Salpa" is owned and operated by the University and serves as the station vessel of the Hawaii Marine Laboratory. A diesel-powered, 46-foot boat, the "Salpa" is outfitted for inshore and short offshore work around Oahu. A feature of great utility is a 500-gallon livewell which serves to transport living specimens to the laboratory. Also available is a winch for operating nets and dredges to medium depths, gear for several types of fishing operations and self-contained diving apparatus. Several skiffs with outboard motors are available for collecting specimens from the rich coral reefs and
productive shorelines of Kaneohe Bay. A skiff which may be hauled by trailer gives access to other inshore waters around Oahu.

Occasionally, and with special arrangements, use may be made of the "Makua," a 65-foot research vessel operated by the State Division of Fish and Game, and the "Charles H. Gilbert," a 105-foot research vessel operated by the Bureau of Commercial Fisheries Biological Laboratory. The "Makua," capable of cruising to the other islands of Hawaii, is equipped for inshore hydrographic and fishery research. The "Gilbert," which operates for the most part on the high seas, is substantially equipped with modern gear and instruments for offshore exploratory fishing and oceanography.

Library

The University of Hawaii library is superior to the libraries of many universities of comparable size. Special emphasis is placed on reference material in the field of marine zoology. Special effort has been made to obtain all materials pertinent to research in the Pacific. Microfilm and microcard readers are available. An additional microfilm reader in the Department provides an extra convenience to the zoology student.

The library of the Bernice P. Bishop Museum is very extensive in the zoology fields, especially with regard to early literature of historical importance in the tropical Pacific. Excellent libraries complementing those of the University and the Museum are maintained by the Hawaiian Sugar Planters' Association Experiment Station, the Pineapple Research Institute, and the Bureau of Commercial Fisheries Biological Laboratory. Reference material from these libraries is freely available to qualified graduate students.

Advanced Degrees Requirements

General

The general requirements for advanced degrees are included in detail in the Graduate School Bulletin and only major points of interest to the prospective graduate student in zoology are summarized here.
Students with the bachelor's degree from accredited colleges and universities are admitted to the Graduate School and are permitted to register for graduate courses.

The student working toward an advanced degree in zoology must notify the office of the Graduate School at the time of registration. He will then meet with a qualifying committee consisting of the staff of the Department of Zoology and Entomology who will examine his background. For admission to candidacy, a student should have an average grade of B or better in all undergraduate courses in zoology, or in all courses taken in the last two years of undergraduate work. Also, he must have a minimum of 18 semester hours of undergraduate preparation in zoology, including courses in comparative vertebrate anatomy, embryology, and general physiology. In addition he must have completed two years of chemistry (inorganic and organic), one year of physics, and courses in algebra and botany.

If the applicant fails to meet the grade average requirement, his candidacy will be deferred pending demonstration of his ability to obtain grades of B or better in his graduate course work. If his undergraduate preparation is deficient, his candidacy will be deferred until he has completed prescribed undergraduate courses for which he will not receive graduate credit. In the meantime he will be assigned an interim advisor. If the applicant is deficient in both undergraduate grade average and in course requirements his application may be rejected.

On admittance to candidacy, the graduate student is assigned a thesis committee which not only supervises thesis work but also prescribes course work leading to the master's or doctor's degree. Courses offered for graduate credit are listed in the Graduate School Bulletin and also in the University's General Catalogue. Certain courses are required of all students working toward an advanced degree.

**Master of Science Degree**

For the master's degree, the minimum residence requirement is two semesters of full-time work or four 6-week summer sessions. The minimum credit requirement is 30 credit
hours, 24 in course work and 6 in thesis research.

The thesis committee, particularly the chairman, has the responsibility of advising the candidate on his thesis research and on preparation of his thesis dissertation. However, candidates are encouraged to work independently under general direction rather than under close supervision. The student will find not only his thesis committee but all members of the staff willing and eager to discuss his research topic and to advise him on problems which may arise.

After the master's candidate has completed 9 to 12 credit hours of graduate work, he must pass a comprehensive oral examination which covers the fundamentals of zoology. In a final oral examination, the candidate presents and defends his thesis before his thesis committee and other members of the University faculty who attend.

Doctor of Philosophy Degree

For the doctor's degree, the candidate must complete a minimum of 6 full semesters of graduate study, at least 3 of which must be in residence at the University of Hawaii. A minimum of 72 credit hours is required, of which 24 are allowed for thesis research. However, doctoral candidates must attain high standards; the thesis committee may require additional course work for the student with inadequate general background. Of the 48 credit hours devoted to course work, 12 credit hours must be in a field or fields other than zoology. Students entering the Graduate School with the master's degree from an accredited institution are allowed to transfer a maximum of 24 credit hours towards the doctor's degree.

A reading knowledge of German and one other foreign language is required. At the University of Hawaii, the following foreign languages are taught: German, French, Russian, Spanish, Chinese, and Japanese.

The study program is intended to give the student a well-balanced training in zoology. However, it stresses marine zoology giving particular attention to the one area, such as physiology, in which he is conducting thesis research. It is not intended to prescribe a rigid program of study for each student. Rather, the student is given a considerable latitude
of choice in course work both within the Department of Zoology and Entomology and in other departments of the University. His choice is restricted with respect to certain courses which are required of all graduate students and other courses which may be required by his thesis committee to provide a well-balanced background of knowledge.

With the guidance of his major professor, the candidate selects a thesis topic and prepares an outline of proposed research which must be approved by his thesis committee, by a University committee on research and graduate study and by the Dean of the Graduate School. Although working under the general guidance of his major professor, the student is expected to show initiative and enterprise in designing the research program, in accumulating research data, and in analyzing and interpreting the results. His doctoral dissertation must be a scholarly presentation of an original contribution to knowledge based on independent research. The dissertation should be suitable for publication in whole or in part.

After the candidate has satisfied the foreign language requirement, he must pass a comprehensive oral examination both in his major field and in related fields. He must demonstrate a rich background of general knowledge and a firm grasp of fundamental principles. Upon completion of his program of study and research, the student must present and defend his doctoral dissertation in a final oral examination by his thesis committee and by other members of the faculty of the University who may choose to attend.

**Part-Time Employment**

**Graduate Teaching Assistantships**

Several graduate teaching assistantships are available in the Department of Zoology and Entomology. Although some of these are held by degree candidates for more than one year, usually two or three become vacant each year. They carry a stipend starting at about $1800 per year with annual increments in the second and third years. The salary is paid on a 12 months basis for 9 months of service. In addition, tui-
tion, registration and laboratory fees are waived. Graduate assistants are expected to spend half time (20 hours per week) working for the Department in laboratory instruction (12 hours a week) and associated duties (8 hours).

Graduate assistants may carry a course load of eight or nine credits. Under these arrangements it is usually not possible to complete the requirements for a master's degree in less than two years and for the doctor's degree in less than five years.

It is understood that a graduate assistant will not engage in work other than the above duties, which would interfere with giving his remaining time entirely to advanced studies.

Application blanks may be obtained by writing to the Dean of Faculties, University of Hawaii.

Graduate Research Assistantships

Occasionally research assistantships are available to qualified graduate students in connection with contract research work undertaken by the staff. The stipend and working conditions are similar to those of graduate teaching assistants. Very often the graduate assistant may undertake his thesis problem within the field of research of the professor he assists.

Other Aid

Part-time positions as "Biological Aide" are occasionally available in the Bureau of Commercial Fisheries Biological Laboratory. Work hours are arranged so that the incumbents can continue their academic studies. The salaries are prorated on the basis of government civil service rating of GS-3 to 5 (plus 20 per cent cost of living allowance), bringing them in line with the compensation received by graduate teaching and research assistants. Applicants should submit their dossiers (including Form 57) to the Director, Bureau of Commercial Fisheries Biological Laboratory, Box 3830, Honolulu, Hawaii.

Occasionally funds are available from contract research projects to provide part-time employment on an hourly basis. During summer and winter recesses short term employment may be available at the Hawaii Marine Laboratory.