

Office of the Dean

MANOA CHANCELLOR'S
OFFICE
May 11, 2010

Memo To: Reed Dasenbrock, VCAA
From: Brian Taylor, SOEST *Brian Taylor*
Alan Teramura, CNS *AT*
Re: Marine Biology Joint Graduate Program ATP

Attached please find a request from the College of Natural Sciences and the School of Ocean and Earth Science and Technology for Authorization to Plan a joint graduate degree program in Marine Biology. Your favorable attention would be appreciated.

Cc: Gary Ostrander, VCRGE
Patricia Copper, SOEST ADAA
Jo-Ann Leong, HIMB

ATP Approved/ Not approved

Reed Dasenbrock

Date



REQUEST FOR AUTHORIZATION TO PLAN (ATP) AN ACADEMIC PROGRAM

1. **School/College and Department/Unit:** School of Ocean & Earth Science & Technology (SOEST)/ College of Natural Sciences (CNS) Departments of Zoology, Botany, Oceanography, and Microbiology and the Hawai'i Institute of Marine Biology
2. **Chair/Convener of Planning Committee:** Jo-Ann Leong and Christopher Womersley
3. **Program Category:** X__ New ___Modified X___ Interdisciplinary
- 4a. **Degree or Certificate Proposed:** M.S. and Ph.D. Degree (with M.S. *en route*) in Marine Biology
- 4b. **List similar degrees or certificates offered in UH System:** There is an interdisciplinary graduate specialization in Marine Biology at UH-Mānoa supported by faculty in the following MS/PhD programs: Botany, Microbiology, Oceanography and Zoology. We are proposing to take the current program from a graduate *specialization* to a *degree-granting* program with doctoral and master's degrees in Marine Biology.

5. Planning

- a. **Planning period (not to exceed one year or reapplication is necessary)**
October 2010 through September 2011
- b. **Activities to be undertaken during the planning phase:**

The planning committee will focus on three areas during the planning phase, as detailed below. The committee will seek to maximize the available instructional resources for the Educational component. The committee will develop an Administrative component to identify critical features and processes necessary to insure a healthy and competitive degree program. We will also coordinate Organizational needs and functions to streamline the process among the many existing University units that currently engage in marine biology teaching and research.

Education

- a. Define the critical academic requirements needed to create a new and competitive educational program for Masters and PhD students;
- b. Identify existing courses that can be used and those that need to be developed;
- c. Identify a graduate core course curriculum;
- d. Define admission requirements;
- e. Define degree completion requirements;
- f. Identify intramural and extramural resources for student support in research;
- g. Document future needs and challenges;
- h. Define requirements for broadcast of distance education components;
- i. Identify UH Marine Biology faculty and requirements for participation in the program;

Administration

- a. Formalize the program's administrative structure;
- b. Solicit interest in creation of the Advisory Council from non-academic partners;
- c. Identify marketing and recruitment requirements and budgets;
- d. Identify program needs with respect to administrative support;
- e. Identify extramural fund sources to support operational needs during the provisional period and beyond.

Organization

- a. Work with existing graduate departments (e.g. Oceanography, Zoology, Botany, Microbiology) and programs (e.g. Ecology, Evolution and Conservation Biology) to avoid undesired overlap and conflicts in courses and research.

- b. Develop timetable for implementation;
- c. Survey stakeholders (students from targeted programs at Hawai'i and other U.S. universities, professional societies, potential employers, state and federal research laboratories and agencies) to determine their needs;
- d. Obtain Memoranda of Understanding with partner institutions and agencies.

c. Submission date of program proposal

Fall of 2011

d. Workload/budget implications during planning period

Jo-Ann Leong and Chris Womersley will assume this responsibility without requests for reduction in workload or budget adjustments.

6. Program Description (Objectives and relationship to campus mission and strategic plan)

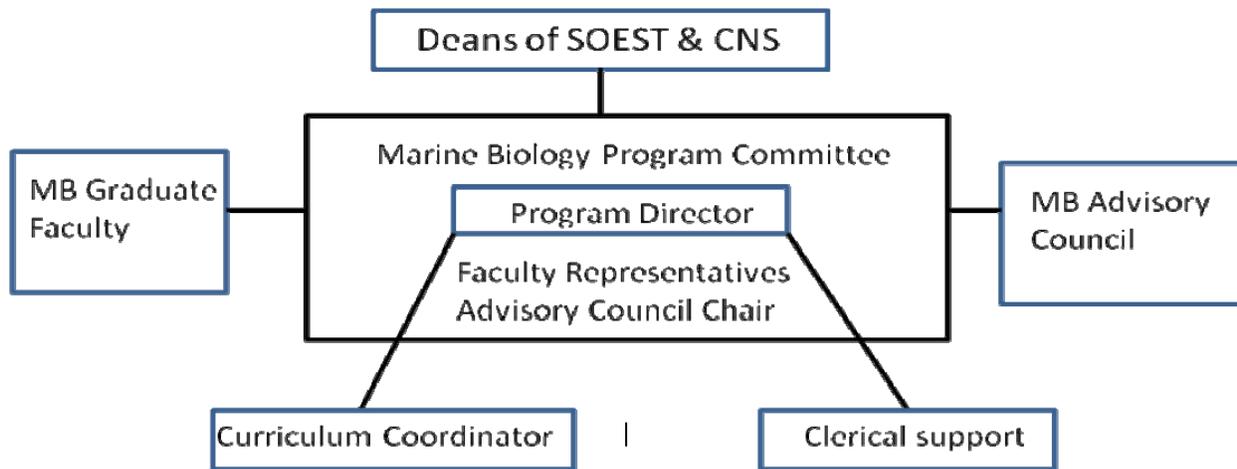
This proposal calls for the establishment of a modern, broad-based graduate academic program in marine biology with the objective to train postgraduate students in fisheries, behavioral biosystematics, coral reef biology, ecological and evolutionary genetics, marine policy and natural resource management as they relate to tropical marine life and systems. This program directly addresses System Strategic Plan Goal 2 [objectives 1 (*to excel in basic and applied research for the discovery and dissemination of new knowledge*) and 2 (*to support Hawai'i's economy, workforce development, and improved access and flow of education in Hawai'i from preschool through a lifetime of learning by building partnerships within the University and with other public and private educational, governmental, and business institutions*)] and Goal 3 [objective 1 (*to establish the University of Hawai'i and the State of Hawai'i as the research, service, and training hub of Oceania, with bridges to the Asia-Pacific region, the Americas, and the rest of the world*)]. The program also supports the UH-Mānoa Strategic Plan core commitment to research and Chancellor Hinshaw's investment criterion No. 2, *building academic excellence, especially to meet cross-campus needs*. By virtue of its location and research faculty and staff, Mānoa is uniquely positioned to excel in tropical marine biology, and this program will provide the opportunity to expand extramural support for faculty and students. The Hawaiian Island archipelago contains the largest coral reef habitats in the United States, and one of the largest marine refuges in the world. It is a natural laboratory for the study of marine ecosystems, marine bio/geochemical processes, reef and oceanic fisheries, and human/marine interactions. Technically trained scientists, managers and policy officials are needed to manage these resources and understand the processes that govern tropical marine ecosystems. The Marine Biology graduate program will offer core courses for this training, and be flexible to allow students to select specific courses, advisers, and research foci in a wide range of specialties offered in the participating colleges on the Mānoa campus.

A Marine Biology Specialization is currently offered under the Graduate Interdisciplinary Specializations Program (see <http://www.soest.hawaii.edu/oceanography/marbiol.html> or attached description), but this program is informal, and lacks an integrative course curriculum. Despite this, approximately 50% of graduate applicants in the areas of biological oceanography and zoology have indicated marine biology as their area of specialty. The proposal will expand and formalize this popular specialization into a full program of graduate study. The program will continue to be multidisciplinary, with current core faculty in the Departments of Botany, Microbiology, Oceanography, and Zoology, as well as research faculty at the Hawai'i Institute of Marine Biology (HIMB). Planning will include development of formal partnerships with State and federal agencies, other academic institutions and foundations. The purpose of these alliances is to enhance education, research, and employment opportunities for Marine Biology graduate students in SOEST and CNS. The program is intended to be Pacific-wide, with exchange agreements and/or joint degree offerings in the western United States, Canada, Mexico and Central America, New Zealand and other Pacific Island nations, U.S. Territories, Japan, Korea, Southeast Asia and Australia. Ultimately, graduates of the program will provide a workforce to serve scientific, management and policy needs in marine biology for the State of Hawai'i, federal government and international agencies. If the Authorization to Plan is approved, we will consult with the Office of International and Exchange Programs for assistance on drafting international agreements for the program.

The proposed program will build upon and expand the current marine biology academic and research infrastructure at the University, and involve research and instructional faculty in SOEST and CNS. Formal coursework for all students will include a new core curriculum to be taken under existing academic programs at the University of Hawai'i at Mānoa. Non-core courses will include several existing and new

graduate courses and seminars. We will also investigate development of a complementary distance education component to integrate learning opportunities over a wide geographic area. Research experience will be obtained by traditional dissertation and thesis research. International partnerships with other institutions will permit students to obtain experience that is scientifically, culturally and politically relevant. Research opportunities will be enhanced by the formation of an organized graduate student support program that will be developed through agreements with state, federal, educational and other institutional agencies.

We propose a structure for the program that includes three components: a Marine Biology Program Committee, Marine Biology Graduate Faculty and a Marine Biology Advisory Council. These are described below.



Central to the degree program will be the Marine Biology Program Committee. This committee will be chaired by a dedicated program director appointed jointly by the deans of SOEST and CNS, and approved by the Marine Biology Graduate Faculty. From 2005-2007, the Marine Biology graduate specialization program was administered by Dr. David Karl of the Oceanography Department, and before that by Dr. Julie Brock of the Zoology Department. Dr. Jo-Ann Leong, Director of the Hawai'i Institute of Marine Biology, is currently Chair of the specialization and will serve until the proposed graduate degree program is approved.

The committee will also include one faculty representative from each academic department (Botany, Microbiology, Oceanography, Zoology) and HIMB. The faculty representatives and program director will be responsible for design of the Marine Biology degree program during the planning phase, and program decisions in concert with the curriculum coordinator and advisory council chair (see below) during the implementation phase. The curriculum coordinator will report to the program director, and the program director will oversee clerical support.

The program director will organize and chair regular meetings of the committee and carry recommendations of the committee directly to the deans of SOEST and CNS. If the program is approved, the director will oversee duties of a curriculum coordinator who will be responsible for the day-to-day academic administrative functions of the program as well as some student services. Clerical functions and student services will be absorbed by existing staff during the provisional phase of the program. The planning committee will work to confirm funding through the Pelagic Fisheries program at the NOAA Pacific Island Fisheries Science Center whose administration has in the past supported funding for a curriculum coordinator through the Joint Institute for Marine and Atmospheric Research (JIMAR).

The program will include a Marine Biology Graduate Faculty body that consists of tenured/tenure-track faculty in marine biology oriented academic and research units at UH Mānoa. More than 40 faculty conduct research or teach in marine biology in CNS [Departments of Botany (2), Microbiology (1), Zoology (14)], SOEST [Department of Oceanography (10) and Hawai'i Institute of Marine Biology (13)]. Marine biology faculty members from these units are the crucial components of the proposed program. They already teach many marine biology-related graduate courses and supervise graduate student

projects. Members of the Marine Biology Graduate Faculty will be expected to work with their faculty representative to implement assessment procedures. (Please note that the FTE noted here are not included in the mini-cost revenue template because these are pre-existing faculty whose teaching load will not increase. Rather, the mini-cost revenue template reflects the projected budget for new faculty hires.)

A Marine Biology Advisory Council, which will consist of non-University partners, will be created to provide information on the employment and research needs of the region. It is proposed to consist of the Marine Biology Program Director and potential representatives from the Department of Business, Economic Development and Tourism (DBEDT) Energy Division; Department of Land and Natural Resources, Division of Aquatic Resources; National Marine Fisheries Service; the Director of the UH Sea Grant program; representatives of the Deans of SOEST and CNS who provide resources for the program; and other partner institutions. We will solicit letters of support from these agencies during the planning phase of this program. The chair of the Advisory Council will have a two-year rotation among the members. The Advisory Council will review current issues, and provide recommendations to their chair for presentation at program committee meetings. This council will be responsible for identification of important issues in the community, state, nation and beyond that are directly applicable to development and operation of the degree program. We should also expect members of the council to facilitate learning and research opportunities for graduate students in the proposed program.

7. Program Justification (Needs and Rationale. Include, as appropriate, internal and external factors driving need for this program; description of needs assessment; number of interested student per year; need for such a program in relation to workforce development, graduate studies, etc.).

The State of Hawai'i is surrounded by diverse marine habitats and includes the largest coral reefs in the country. Marine organisms are important components of Hawaiian culture, commercial and sport fisheries, and tourism. Thus, advanced education and research in Hawaiian tropical marine life is critical to their effective management. The State of Hawai'i and the University have recognized this need and recently implemented undergraduate degree programs in Marine Biology (UH Mānoa) and Marine Science (UH Hilo). However, there is currently no graduate marine biology degree program in the State. Rather, a graduate student in the "Marine Biology Specialization" may request a notation on the diploma from the Graduate Division that identifies their research as being related to the study of marine life. Interest in a marine biology graduate program continues to be strong with 103 applicants in 2007, 77 applicants in 2008, and 92 applicants to date in 2009. Formal training in marine biology, including fisheries, conservation genetics, and marine ecosystems analysis is obtained at the graduate level in an ad hoc manner. Further, no core curriculum trains our graduate students in important and emerging problems. In contrast, most of our competing institutions offer advanced marine biology degrees. In addition, a formal marine biology degree program can provide local opportunities for recent graduates from UH undergraduate programs in Marine Biology and Global Environmental Science (UH Mānoa), and in Marine Science (UH Hilo). We anticipate that a formal graduate degree program in marine biology will increase education and retention of local experts on Hawaiian marine biological systems. The most recent Hawai'i Science and Technology Report (October 2008) cites a growth rate of 6.4% for ocean sciences related employment opportunities. Further, estimated retirements (based on eligibility) of NOAA scientists by 2014 are significant: oceanographers, 44%; physical scientists, 36%; **fisheries scientists, 32%**; and meteorologists, 28% (remarks made by Louisa Koch, NOAA Office of Education, Silver Spring, MD, April 20, 2010). The proposed program will also provide a timely supply of technical expertise to address current and future problems in marine biology for the nation, Pacific Basin and beyond.

Over the years, UH has established cooperative relationships with major universities in Asia and the Pacific. There are research exchange programs with Ehime University in Japan, Ocean Research Institute at the University of Tokyo, and Taiwan National University in Taiwan in marine biology-related sciences. These liaisons can channel the development of mutually beneficial formal and informal student and faculty exchanges and facilitate international field research. Since we do not devote resources in addition to support for existing UHM faculty on these exchange programs now, we expect that we will continue these exchanges without requesting additional personnel and funding from the State. The University can be in a position to become a major center of research and teaching of marine biology for Hawai'i, the Pacific and Asia by pooling resources with our partner institutions. The proposed program will enable in-state students to obtain regionally relevant graduate training in marine biology in Hawai'i instead of going to the mainland where they would work with temperate rather than tropical species. The

proposed program could also attract Pacific Basin students who now attend other U.S. or international institutions. As the program evolves, we envision that partnerships with institutions in the Pacific Basin will offer Pacific Island nations the opportunity to educate promising young men and women and mid-career administrators in the management and culture of tropical coastal and marine resources with direct application to their own fisheries management issues, other marine life industries, and policy development. In addition, the program meets the joint commitment of the State of Hawai'i and its University to support the developing nations of the Pacific region and Asia. Federal funding will be sought for the international exchange programs.

As research directed toward increasing the food supply and conservation of marine resources ascends in importance, there will be greater demand for employment in academia, and in public and private research. There is a continued need for highly qualified professionals to characterize and manage our natural resources. Fishery and coral reef resources play an important role in Hawai'i's present and future economy for food production, recreation, and tourism. Industry and government needs formally trained marine biologists to solve problems in the development of all sustainable coastal and marine resources.

8. Description of resources required

a. Faculty (existing and new FTEs):

The courses to be used already exist and are regularly offered by existing faculty for the current graduate specialization in Marine Biology. Based on current enrollment of 29 students, we estimate use of existing faculty and staff resources at approximately 2.5 FTE annually in terms of administration (0.5 FTE), student services (0.5 FTE), and Faculty (1.5 FTE) distributed across the participating institutes and academic departments at UH Mānoa (primarily SOEST, CNS and PBRC). Salary and start-up estimates for up to 4.0 new FTE, phased in over the first four years of the program are included in section 9. Existing faculty have sufficient expertise to successfully offer the program, however, we anticipate that retirements will create the need for additional hires.

b. Library resources (including an evaluation of current resources and an estimate of the cost of additional resources required)

The library currently maintained by the University of Hawai'i (Hamilton) is adequate to support the graduate program. Hamilton Library offers major search engines for research publications as well as a fully serviced and well subsidized interlibrary loan program for all books and research papers that are not held within the UH system.

c. Physical resources (space, equipment, etc.)

The current "Marine Biology Specialization" serves 29 students; 11 of those are SOEST students and 18 are CNS students. However, this greatly underestimates the actual number of graduate students doing research in marine biology at the University. For example, there are approximately 75 graduate students in the Zoology graduate program who work on marine organisms. We anticipate an initial enrollment of 10-20, gradually increasing to >100 over a period of 5 years. Although current space and physical resources at UHM probably will be sufficient to accommodate the program during the initial ramp-up phase, additional space requirements may be identified during the planning phase. Since the existing courses will be utilized in this program we don't expect that there will be an immediate need for new equipment just for this program. However, as the program grows and new faculty are hired, the budget shown in Section 9 reflects start-up costs that usually include small (<\$50K) equipment and supplies. Start-up cost requirements for faculty hires vary significantly depending on the discipline; the costs in the spreadsheet represent an estimate. The start-up costs are allocated in the year of hire, although a faculty member may carry-over the funds into subsequent years. A summary of physical resources available to the program is attached.

d. Other resources required (staff, graduate assistantships, etc.)

Our intention is to support the growth of the program by aggressively pursuing extramural funding. Specifically, the curriculum coordinator will be funded via JIMAR. The development of a campus-wide graduate program at the University of Hawai'i that involves partnerships with a variety of universities, agencies and corporations around the Pacific Rim and Basin presents a wealth of opportunities to pursue funding from the National Science Foundation and the National Oceanic and Atmospheric Administration. There are many funding programs and agencies that UH could successfully tap as a result of the international and Pacific-wide nature of the collaborations suggested in the authorization to plan. This will

enable UH to compete for agency and private funding on a wider scale than ever before. Initially, at least half of the graduate students will be supported as RAs on extramural grant funds. We anticipate supporting most graduate students via grant funds as the program grows. No G-funded GAs are requested.

9. Five-Year Business Plan. Provide a five-year projected budget for the program that includes:

In the initial phase of the program, no additional position counts will be requested from the State. We anticipate that a new graduate core curriculum in Marine Biology may require at least 3-5 new faculty positions that would become available from retirements or vacancies from existing positions. A competitive graduate program will also require resources that attract top student candidates (such as assistantships, grants and awards). We will work with federal and private institutions to establish extramural resources for these needs. New faculty hires will be situated in existing departments/research units, therefore we are not budgeting for additional clerical staff.

a. Annual costs to implement the program

We anticipate that salary and start-up costs for new, tenure-track faculty hires will be about \$200,000 per year. The curriculum coordinator will be a non-tenure track faculty specialist or APT, funded via extramural funds.

b. Projected enrollment and estimated tuition revenue

See below.

c. How will the program be funded?

Existing faculty will be funded as they are currently; as existing faculty retire, costs for new hires are shown in the following spreadsheet. Curriculum coordinator will be funded via extramural funds. Graduate research assistants will be funded via extramural funds.

d. Does the current or proposed budget (Department/College/Campus) include funds or a request for funds for the proposed program? Please provide details.

The proposed budget does not request funds for the proposed program. Realistically, we anticipate retirements over the next three years, and have budgeted for that accordingly.

e. Given a “flat budget” situation, how will the proposed program be funded?

No new university funds are requested.

f. Mini Cost Revenue Template (Excel; top of next page)

ENTER VALUES IN HIGHLIGHTED CELLS ONLY					
YEAR	FY2012	FY2013	FY2014	FY2015	FY2016
PROGRAM COSTS					
Faculty w/o fringe	\$90,000 ^a	\$180,000 ^b	\$270,000 ^c	\$400,000 ^d	\$400,000 ^e
Other personnel costs w/o fringe	\$60,000 ^f	\$65,000	\$70,000	\$75,000	\$80,000
Library					
Equipment/Supplies	\$100,000	\$110,000	\$125,000	\$140,000	\$25,000
Other					
TOTAL Expenses	\$250,000	\$355,000	\$465,000	\$615,000	\$505,000
REVENUES					
Projected Enrollment (M.S. and Ph.D)	25	35	40	45	50
No. of Courses ^g	2	4	6	6	6
No. of Credits	8	16	24	24	24
SSH	200	560	960	1080	1200
Tuition Rate/Credit *5% increase/year	790	830	872	916	962
Total Revenue from Tuition	158,000	464,800	837,120	989,280	1,154,400
Other Sources of Income *extramural/priv	200,000	300,000	400,000	500,000	600,000
TOTAL Revenues	358,000	764,800	1,237,120	1,489,280	1,754,400

^aIn 2012, we expect to hire one faculty member through a partnership with NOAA. The equipment and supplies represents the start up package for the faculty hire. In the case of the first year (2012) hire, NOAA has agreed to pay for start up costs.

^bIn 2013, we expect to hire from reassigned position through retirements. This table represents cumulative salary costs. The start-up costs are one-time only costs in the year of hire; this means no additional costs for this faculty member's start-up in subsequent years.

^cIn 2014, we expect to hire from reassigned position through retirements. This table represents cumulative salary costs. The start-up costs are shown only for the year of the faculty hire.

^dIn 2015, we expect to hire from reassigned position through retirements. This table represents cumulative salary costs. The start-up costs are shown only for the year of the faculty hire.

^eIn 2016, we do not expect to hire additional faculty.

^fIn 2012, we will hire a curriculum coordinator using extramural funds under an existing commitment from NOAA/JIMAR.

^gStudents currently enrolled in the Specialization select from the following list of courses. Although no new courses are required, we anticipate that newly hired faculty may wish to develop new courses in their particular sub-disciplines or that address new program needs.

- ANSC 450 Aquaculture Production (3)
- BOT 480 Algal Diversity and Evolution (4)
- BOT 680 Marine Macrophytes Seminar (2)
- OCN 450 Aquaculture Production (3)
- OCN 621 Biological Oceanography (3)
- OCN 626 Marine Microplankton Ecology (4)
- OCN 627 Ecology of Pelagic Marine Animals (4)
- OCN 628 Benthic Biological Oceanography (4)
- OCN 750 Topics in Biological Oceanography (V)
- ZOOL 466 Fisheries Science (3)
- ZOOL 467 Ecology of Fishes (3)
- ZOOL 475 Biology of Invertebrates (3)
- ZOOL 620 Marine Ecology (3)

10. Impact on current courses or programs.

The graduate degree program is expected to have a positive impact on programs at UHM because it will attract students who otherwise would not have selected UH. Presently several academic units receive

graduate applications for studies in marine biology but these programs cannot support the large number of highly qualified applicants. Thus, this program should reduce student loads on these programs. The program will be designed to directly support graduate educational goals as identified by the Strategic Plan. The home unit of each instructor that contributes to the program will receive the returned tuition as incentive to participation.

11. If this program is multidisciplinary, provide evidence of commitment for support from the colleges, departments, programs, and/or individuals expected to participate.

Table 1 presents a list of faculty from institutes/departments who currently participate in the education of graduate students in the Marine Biology Specialization under the Graduate Interdisciplinary Specializations Program. All have indicated a willingness to participate in the Marine Biology Graduate Program. Table 2 lists new faculty who have indicated a desire to participate in the Marine Biology M.S./Ph.D. program.

Reviewed by: *(The ATP has completed the campus approval process prior to review by Council of Chief Academic Officers)*

Campus Chief Academic Officer:
Comments and Recommendations:

Print Name	Signature	Date
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Council of Chief Academic Officers (Systemwide Consultation):
Comments/Recommendations:

Print Name	Signature	Date
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Chancellor: ___ Approved ___ Disapproved

Print Name	Signature	Date
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(Final signed copy is provided to the Vice President of Academic Planning and Policy for Program Action Report) 6/12/07

Research and education enhancing our understanding of the ocean

OCEANOGRAPHY

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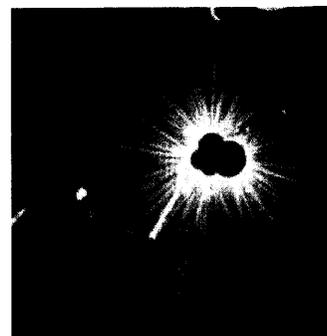
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Specialization in Marine Biology

Students who apply to the graduate programs in botany, microbiology, oceanography, or zoology at the University of Hawai'i may choose to specialize in marine biology. The marine biology specialization allows students to interact with an interdisciplinary group of faculty in the above programs rather than with the faculty from only one or two of these areas. The purpose of the specialization is therefore to give the student greater flexibility in choosing the faculty who will serve as mentors on his/her MS or PhD committee. Areas of expertise of the marine biology graduate faculty include aquaculture, behavioral biosystematics, botany, cognition, ecology, genetics, microbiology, molecular biology, biological oceanography, fisheries, coral reef biology and zoology.

Students who wish to specialize in marine biology must apply to and be accepted by either the botany, microbiology, oceanography, or zoology fields of study. Applications from

students who have been accepted by one of these programs and who have indicated a desire to specialize in marine biology are reviewed by the Marine Biology Admissions Committee, which decides which students will be accepted into the area of specialization. Coursework required for completion of the student's graduate degree is determined by the requirements of the student's graduate field of study. This required course work may be supplemented by courses specific to marine biology, the particular selection of courses being determined by the student in consultation with his/her advisory committee. All of the programs include seminars, colloquia, field research and/or laboratory studies as part of the student's graduate education. Students are expected to complete an original research project and present a thesis or dissertation based on that research.



Program of Study

The program in marine biology provides integrated graduate education for students seeking careers in research and teaching with emphasis on recent advances in understanding of marine systems at the ecological, organismal, and cellular-molecular levels. It is an interactive University-wide program offering possibilities for degrees in graduate programs in the College of Natural Sciences and the School of Ocean and Earth Science and Technology. The program allows students to become specialists in the marine field of their choice by selecting courses, advisors, and research opportunities from many disciplines, including aquaculture, behavioral biosystematics, marine botany, ecology, genetics, virology and marine microbiology, molecular biology, biological oceanography, fisheries, coral reef biology and zoology. The specialization includes faculty whose research interests are focused in these areas and who provide a program of special excellence at the University of Hawai'i. The University is based in a tropical setting on geographically the most isolated archipelago in the world. The Pacific Ocean location and volcanic origin of the islands are key factors to many of the unique research opportunities available at the University of Hawai'i in marine biology.

The specific program of each student who specializes in marine biology is tailored to his/her interests in consultation with an advisory and a graduate (MS or PhD) committee appointed for the student. The program of study includes courses related to marine biology already existing within the curriculum of participating fields of study. Coursework is supplemented by seminars, colloquia, field programs and laboratory research in the various fields of study. The student will be expected to pass a qualifying examination in his/her field of study, complete an original research project, and present a thesis or dissertation on that research.

Summary

Prospective students must first apply for admission to the graduate programs in Oceanography, Zoology, Microbiology, or Botany. At that time, the student may select the Marine Biology specialization. The graduate program requirements for these four fields of study must be fulfilled first.

Research Facilities

Graduate student research is carried out in the research laboratories of the graduate faculty. These laboratories are located in Edmondson Hall, Snyder Hall, the St. John Laboratory of Botanical Sciences, the Marine Science Building, the Hawai'i Institute of Marine Biology (located on Coconut Island in Kāne'ohe Bay), and the Kewalo Marine Laboratory of the Pacific Biomedical Research Center. These laboratories are well equipped for the specialized research of the faculty and include capabilities for state-of-the-art DNA sequencing using PCR technology; video and acoustic recording for ecological and behavioral studies of coral reef and planktonic organisms; electron,

ultraviolet, and light microscopy; electrophoretic analysis; flow cytometry; and radioisotope tracer work. There is a university-wide centralized computer data base, biotechnology center, and there are also excellent library facilities.

Financial Aid

Most students who specialize in marine biology receive graduate assistantship and/or tuition waivers. This financial assistance comes from a variety of university and extramural sources. Updated information on financial aid can be accessed at <http://www.hawaii.edu/graduatestudies/financial/html/financial.htm#compensation>.

Cost of Study

For the Academic Year 2010–2011, the regular graduate tuition is listed in the Table below.

Academic Year 2010–2011 (nine-month period)		
	Resident	Non-Resident
Regular graduate tuition	\$9,960	\$24,168
Basic fees	\$209 (2009-10)	\$209 (2009-10)
Living expenses, books and supplies	\$15,000	\$15,000

Student Body

There are approximately 14,400 undergraduates and 6,300 graduate and professional students enrolled at the Mānoa campus of the University of Hawai'i. According to the 2003 report of the Institutional Research Office, a plurality of students at the University of Hawai'i at Mānoa are **Caucasian**, making up twenty-four percent of the student body. **Japanese Americans** represent twenty percent, **Chinese Americans** represent nine percent, **Filipino Americans** represent eight percent as do **native Hawaiians**. Ten percent of the student body is racially mixed. Smaller populations of Pacific Islanders and other ethnic groups make up the remainder.

Location

The Mānoa campus is located on approximately 1.2 sq. km. in the Mānoa valley, a residential section close to the heart of metropolitan Honolulu, a cosmopolitan city with a population of about 800,000 people. Cultural and recreational features include the Honolulu Symphony, the Honolulu Academy of Arts, the Bishop Museum, the Waikiki Aquarium, the Honolulu Zoo, beaches, mountains, parks, and spectator and participant sports.

The University and the Program

The University of Hawai'i was founded in 1907 as a land-grant institution. Although it is a statewide institution, all marine biology graduate programs are conducted at the Mānoa campus.

Applying

Completed applications should be sent to the

Graduate Division Admission Office
University of Hawai'i at Mānoa
2540 Maile Way, Spalding Hall #354
Honolulu, HI 96822.

U.S. and foreign applicants should have a bachelor's degree emphasizing the biological sciences. Results of the Graduate Record Examination (and TOEFL scores for applicants whose native language is not English) must be submitted with the application.

Correspondence

Dr. Jo-Ann Leong, Chairperson, Graduate Specialization in Marine Biology
Hawai'i Institute of Marine Biology
P.O. Box 1346,
Kāne'ohe, Hawai'i 96744
joannleo@hawaii.edu

Marine Biology Graduate Faculty

Alam, Maqsudul, Ph.D. (Microbiology, Moscow State University, Russia; biochemistry, Max-Planck-Institute), Professor, Microbiology. Signal transduction of halophilic Archaea, microbial diversity in lakes of the Hawaiian Archipelago, microbial genome sequencing.
alam@hawaii.edu

Atkinson, Marlin, Ph.D., (University of Hawai'i), Professor, Hawai'i Institute of Marine Biology. Coral Reef biogeochemistry, solid state sensor technology. mja@hawaii.edu

Au, Whitlow, Ph.D. (Washington State University) Professor, Hawai'i Institute of Marine Biology. Acoustics of marine animals — especially dolphins and whales, echolocation, broadband sonar R&D. wau@hawaii.edu

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Selph, Karen, Ph.D. (University of Hawai'i), Associate Specialist, Oceanography. Macrozooplakton grazing dynamics and applications of flow cytometry in microbial oceanography. selph@hawaii.edu

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Thomas, Florence, Ph.D. (University of California at Berkeley) Associate Researcher, Hawai'i Institute of Marine Biology. Physiological ecology, bio-mechanics, ecosystem function, and reproductive ecology in marine invertebrates, algae, seagrass beds and coral reefs. fithomas@hawaii.edu

Toonen, Robert, Ph.D. (University of California at Davis) Assistant Researcher, Hawai'i Institute of Marine Biology. Dispersal, settlement choices and recruitment patterns of larvae; population genetics, evolution & ecology of marine invertebrates; coral reef biology; molecular ecology; marine conservation & MPA design; ornamental aquaculture & aquarium science. toonen@hawaii.edu

Tricas, Timothy, Ph.D. (University of Hawai'i) Professor, Zoology. Behavioral ecology and sensory biology of fishes. tricas@hawaii.edu

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Emeritus Professors

Abbott, Isabella A , Ph.D. (University of California, Berkeley), Professor, Botany. Systematics of marine algae, phytoplankton. iabbot@hawaii.edu

Grigg, Richard W., Ph.D. (Scripps Institution of Oceanography, University of California), Researcher, Oceanography. Coral reef ecology, paleoceanography, fisheries management. grigg@hawaii.edu

Loh, Phillip, Ph.D. (University of Michigan), Professor, Microbiology. Viral pathology, environmental virology and marine viral diseases, animal cell culture. pilp@hawaii.edu

Losey, George, Ph.D. (Scripps Institution of Oceanography, University of California), Professor, Zoology. Marine animal behavior. losey@hawaii.edu

Parrish, James, Ph.D. (University of Rhode Island), Adjunct Associate Professor, Zoology. Community ecology, fishery biology. parrishj@hawaii.edu

Reese, Ernst, Ph.D. (University of California, Los Angeles), Professor, Zoology. Behavior, ecology, sociobiology. ereese@hawaii.edu

Whittow, G. Causey, Ph.D. (University of Malaya), Professor of Anatomy, Biochemistry and Physiology. Environmental and hyperbaric physiology. whittow@hawaii.edu

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While under development, comments or questions about this page go to **Brooks Bays**.
Last update Thu 24 Sep 09.



Table 1. Marine Biology Graduate Faculty (listed in description in Graduate catalog)

Name	Affiliation
Alam, Maqsudel	Microbiology
Atkinson, Marlin	HIMB
Bidigare, Robert	HIMB
Bailey-Brock, Julie	Zoology
Birkeland, Charles	Zoology
Bowen, Brian	HIMB
Cann, Rebecca	Cell & Molecular Biology
Conant, Sheila	Zoology
de Couet, H. Gert	Zoology
Donachie, Stuart	Microbiology
Douglas, James	Microbiology
Gates, Ruth	HIMB
Grau, Gordon	HIMB
Holland, Kim	HIMB
Humphreys, Tom	Cell & Molecular Biology
Hunter, Cynthia	Biology
Jameson, David	Cell & Molecular Biology
Jokiel, Paul	HIMB
Karl, David	Oceanography
Karl, Stephen	HIMB
Leong, Jo-Ann	HIMB
Nachtigall, Paul	HIMB
Rappe, Michael	HIMB
Selph, Karen	Oceanography
Smith, Celia	Botany
Steward, Grieg	Oceanography
Thomas, Florence	HIMB
Toonen, Robert	HIMB
Tricas, Timothy	Zoology
Wang, Guangyi	Oceanography

Table 2. New Participating Graduate and Affiliate Faculty

Name	Affiliation
Ako, Harry	CTAHR
Asquith, Adam	Sea Grant
Brainard, Rusty	Pacific Islands Fisheries Science Center, HIMB
Church, Mathew	Oceanography
Demartini, Edward	Pacific Islands Fisheries Science Center, HIMB
Drazen, Jeff	Oceanography
Friedlander, Alan	Zoology
Haws, Maria	Sea Grant
Howerton, Robert	Sea Grant
Kelley, Christopher	Oceanography
Lee, Cheng-Sheng	CTAHR
Leung, Ping Sun	CTAHR
Lower, Ken	Urban Planning
McManus, Margaret	Oceanography
Pooley, Samuel	Pacific Islands Fisheries Science Center, HIMB
Seki, Michael	Pacific Islands Fisheries Science Center, HIMB
Sherwood, Allison	Botany
Tamaru, Clyde	CTAHR
Watling, Les	Zoology

Physical Resources

Laboratories

Participants will have access to state-of-the-art laboratories operated by SOEST (http://www.soest.hawaii.edu/soest_web/soest.research.htm) and other UH academic and research units. HIMB will provide access to an NSF-funded laboratory-classroom which can host about 20 students and has lab benches and seawater flowthrough. Graduate student research is carried out in the laboratories of the graduate faculty. These include laboratories in Edmundson Hall, Snyder Hall, the St. John Laboratory (botanical sciences), SOEST facilities in Marine Science Building and HIMB, the Bekesy Laboratory, and the Kewalo Laboratory.

Computing Facilities

SOEST academic departments and research units have excellent computing facilities. In addition to equipment located in their offices and laboratories, faculty and staff have 24-hour access to work stations distributed among 3 computer labs (2 PC Labs with CPU speeds between 2GHz and 3GHz and 2-4GB of memory, 1 Mac lab with 2.5GHz CPU's and 2GB of memory). All are networked and have open access to the Internet and a number of free-use peripherals, such as postscript laser printers and digital scanners. SOEST faculty and research staff have another 1000+ workstations of various types in their offices and laboratories, including several clusters in 2 datacenters. UH is also responsible for the Maui High-Performance Computing Center (<http://www.mhpcc.hpc.mil/>). Network connectivity is excellent. UH currently uses several channels to provide data, video and voice communications between campuses and research facilities. In addition, T-1 subchannels are also utilized for telemedicine projects, private branch exchange links (voice), general data, and distance learning. The Hawaii Interactive Television System (HITS) is on the state SONET network and provides continuous service. Some of this bandwidth is designated distance learning.

Office and Classroom Space

Office space for participating faculty and staff will be provided by their home units for the duration of the program. UH will provide meeting places for the advisory council and for specialized workshops, as necessary. SOEST and CNS have A/V capable classroom facilities seating from 50 to 120 persons each on the University of Hawaii at Manoa Campus available for classroom instruction. At HIMB, the two Pauley classrooms are A/V capable and can host about 40 persons.

Specialized Equipment

HIMB has a fleet of Boston Whales, 17-ft small boats from which participants can conduct field activities. The larger 40-ft *Honu Kai* vessel, based on Coconut Island, which is used for transportation to and from the institute can also be used for plankton tows. SOEST maintains a fleet of coastal and blue-water marine vessels, mini-submarines, ROVs and AUVs. Please refer to the web site for details <http://www.soest.hawaii.edu/UMC/index.html>. Most of the analytical equipment necessary for the program is currently available in shared-use facilities operated by SOEST, CNS, and PBRC on the UH Manoa campus. Periodic upgrades to these facilities are funded by combined means of extramural and matching (UH) funds.