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## Biology and Marine Biology

## Graduate Biology/Marine Biology at UMass Dartmouth

### Faculty and Fields of Interest

### Department of Biology, College of Arts and Sciences

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**Campbell, Ronald A.**

Chancellor Professor. PhD Iowa State University, MA University of Richmond, BS Roanoke College. *Specialization:* Parasitology; *Current research:* Helminth systematics and ecology, Cestode systematics and faunal ecology in elasmobranch fishes.

**Connor, Richard C.**

Assistant Professor. PhD University of Michigan, BA University of California at Santa Cruz. *Specializations:* Evolutionary biology; marine mammal biology. *Current research:* Dolphin behavior; evolution of cooperation.

**Edgar, Robert K.**

Professor. PhD, MS Rutgers University, BA University of Virginia. *Specialization:* Evolutionary biology; *Current research:* diatom paleolimnology of Great Lakes of East Africa; New England saltmarsh diatom paleoecology; evolution of diatom life histories; cranberry pest population dynamics.

**Ellis, Debra**

Assistant Professor. PhD University of Maryland, BA Wellesley College. *Specializations:* Microbial and molecular ecology. *Current research:* Saltmarsh and soil microbial ecosystems; microbial bioremediation; biotechnological applications in agriculture, textiles, and aquaculture; molecular systematics of fungi, plants, and aquatic animals.

**Griffith, Robert**

Professor. PhD, MS Yale University, BA Catawba College. *Specialization:* Vertebrate physiology. *Current research:* Osmoregulation and endocrinology of fish; influence of pituitary and gonadal secretions in fish, evolutionary scenarios.

**Ibara, Richard M.**

Professor. PhD University of California, MA, BA University of Hawaii. *Specialization:* Fish ecology; *Current research:* Ecology, physiology and behavior of fishes.

**Kazama, Frederick Y.**

Professor. PhD University of California, AB University of Nebraska. *Specializations:* Microbiology; food technology. *Current research:* Seafood processing technology and microbiology.

**Leamson, Robert**

Professor. PhD University of Illinois, MS, BS Notre Dame University. *Specializations:* Cell and molecular biology, virology.

**Longo, Palma J.**

Assistant Professor. PhD, MPhil Columbia University, MA Fairleigh Dickenson University, BS St. Bonaventura University. *Specialization:* Science education. *Current research:* Visual thinking, networking, gender differences in representing knowledge, teacher cognition.

**Matsumoto, Barton M.**

Professor. PhD University of California, MS University of Hawaii, BS University of Oregon. *Specializations:* Biological control, insect ecology; *Current research:* Study of parasitoids of cranberry fruitworm in non-commercial cranberry bogs in southeastern Massachusetts.

**Mulcare, Donald J.**

Professor. PhD University of Notre Dame, BS St. Procopius College. *Specialization:* Developmental biology; *Current research:* Culturing amphibian cells, studies of aging and tumors.

**O'Connor, Nancy J. (Graduate Program Director)**

Associate Professor. PhD North Carolina State University, MS University of Delaware, BS Southeastern Massachusetts University. *Specialization:* Marine invertebrate ecology; *Current Research:* Molting of crab larvae in response to habitat cues; ecology of regional non-native crab species; anti-biofouling materials in aquaculture.

**Read, Dorothy**

Professor. PhD University of California, BS Antioch College. *Specialization:* Molecular biology of prokaryotes; *Current research:* Stress-induced genes and transcription initiation in bacteria.

**Sears, James R.**

Professor. PhD, MS University of Massachusetts Amherst, BA University of Oregon. *Specialization:* Marine Algal ecology; *Current research:* Community structure and ecology of benthic marine algae.

**Turner, Jefferson**

Chancellor Professor. PhD Texas A & M University, MA University of South Florida, BS Guilford College. *Specialization:* Biological oceanography; *Current research:* Plankton and water quality dynamics in Buzzards Bay; zooplankton/harmful algal bloom interactions; zooplankton feeding ecology.

The Department of Biology offers programs leading to the Master of Science degree in Biology or Marine Biology. Either program may be undertaken as a research or library thesis course of study. Students interested in a research career or continued graduate education may elect a program culminating in a research thesis. Educators and others interested in broadening their backgrounds in biology, but not in laboratory or field research, should elect a program of study culminating in a library thesis.

UMass Dartmouth's proximity to a variety of coastal habitats provides a special emphasis in both faculty research and course offerings on the estuaries and near-shore environments of the Buzzards Bay region of the Massachusetts coast. The University is within a one-hour drive of the major libraries, museums, and academic and research institutions of the Boston and Woods Hole areas. The Department houses several teaching and research laboratories that are equipped for most standard physiological, and ecological analyses. A fifty-foot oceanographic research vessel, *R/V Lucky Lady*, and a Boston whaler are available for coastal marine research. The Department also maintains a scanning electron microscope and museum collections of fishes and invertebrates, seaweeds, diatoms, and the terrestrial plants of the southeastern Massachusetts region. A few students may undertake their research at the university's Center for Marine Science and Technology. The university library subscribes to many marine biological journals and supports state-of-the-art literature search engines.

Recent graduate student projects have been in fields such as molecular ecology, plankton ecology, harmful algal blooms, environmental microbiology, gene transcription, aquaculture, marine mammal biology, marine bioinvasions, biofouling, parasites of marine fishes, diatom morphometrics, and fisheries biology. Some projects have involved collaborative research with the National Marine Fisheries Service, the Department of Fisheries and Oceans Canada, the Woods Hole Oceanographic Institution, the UMass Cranberry Experiment Station, and the Mystic and New England Aquarium.

Graduate students plan their course of study with the assistance of their thesis committee, and are urged to complete most of their course requirements during their first year.

### Admission Requirements

Applicants for the MS in Biology/Marine Biology must submit the required application materials to the Graduate Office. In addition,

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## Degree Requirements (MS degree)

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- They must submit Graduate Record Examination general and subject test scores.
- Their personal statement must indicate their specific biological interests and goals.

Applicants are selected both on the basis of their qualifications and the fit of their research interests with those of the faculty who have openings for graduate students.

### Financial Assistance

A limited number of assistantships are available on a competitive basis. Applicants desiring teaching or research assistantships should submit completed applications by March 15th. Other assistance, such as loans or work study, may be available to you. Please refer to the chapter on "Expenses and Financial Assistance."

### Research Thesis plan

The Research Thesis course of study is designed primarily for individuals pursuing biology as a profession. It requires:

1. Thirty (30) hours of course work and research credits, divided as follows:

15 hours (minimum) of graduate courses numbered 500 or above. Three hours of Independent Study unrelated to thesis research may be allowed if approved by all members of the thesis committee.

1 hour (required) of BIO 525, Graduate Student Seminar. This course may be repeated, but a maximum of two hours will be accepted for the degree requirements.

6 hours (maximum) of undergraduate courses numbered 400 or above, if approved by all members of the thesis committee.

10 hours (maximum) thesis-related research credits (as Independent Study, Graduate Research, Graduate Thesis).

2. Approval of curriculum by all members of the thesis committee.

3. Approval of a research thesis proposal by all members of the thesis committee.

4. Oral presentation of research thesis results.

5. Defense of research thesis and approval by all members of the thesis committee; preparation of the thesis for placement in the permanent library collection, with required department, college, and university approvals.

### Library Thesis plan

The Library Thesis course of study is designed primarily for individuals pursuing a career in secondary education, and not planning further graduate study in biology. It requires:

1. Thirty-five (35) hours of course work, divided as follows:

24 hours (minimum) of graduate courses number 500 or above. Three hours of Directed Study unrelated to the library problem may be allowed if approved by all members of the thesis committee.

1 hour (required) of BIO 525, Graduate Student Seminar. This course may be repeated, but a maximum of two hours will be accepted for

the degree requirements.

6 hours (maximum) of undergraduate courses numbered 400 or above, if approved by all members of the thesis committee.

5 hours (maximum) Directed Study related to the library problem.

2. Approval of curriculum by all members of the thesis committee.

3. Approval of the library thesis proposal by all members of the thesis committee.

4. Comprehensive examination, which may be written and/or oral at the discretion of the examining committee. The student shall demonstrate to all members of the committee satisfactory knowledge of General Biology and three of the following: Botany, Ecology, Genetics, Microbiology, Physiology, Statistics, Zoology.

5. Defense of library thesis and approval by all members of the thesis committee; preparation of the thesis for placement in the permanent library collection, with required department, college, and university approvals.

The requirements for the degree must be completed within four years of matriculation for a full-time student and six years for a part-time student. A student must be registered for two consecutive semesters prior to graduation.

### Repeating of Courses

A student may repeat a graduate course only with permission of the thesis committee.

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### Contact

Dr. Nancy J. O'Connor  
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## Biology Courses

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### Dual-listed undergraduate/graduate courses

Graduate credit may be earned for undergraduate courses offered in dual-numbered format if the student fulfills additional quantitative and/or qualitative requirements as established by the instructor. Graduate standing and consent of instructor are required for graduate credit. Course descriptions for the undergraduate biology courses below are contained in the current edition of the university's *General Catalogue*.

**BIO 413/513** four credits  
**Biology of Fishes**

**BIO 414/514** three credits  
**Biology of Marine Mammals**

**BIO 416/515** four credits  
**Biology of Algae**

**BIO 421/521** four credits  
**Developmental Biology**

**BIO 424/524** four credits  
**Biology of Animal Parasites**

**BIO 427/527** three credits  
**Molecular Biology**  
In addition to undergraduate requirements, graduate students will present two typical reviews of current problems in molecular biology, both as written expositions and as interactive lecture presentations to other class members. Pre- and post-presentation interviews with the instructor are also required.

**BIO 428/528** four credits  
**Evolutionary Ecology**

**BIO 437/537** three credits  
**Evolutionary Biology**

**BIO 438/538** one credit  
**Evolutionary Biology Laboratory**

**BIO 430/530** four credits  
**Introduction to Biological Statistics**

**BIO 454/554** three credits  
**Biology of Sharks**

**BIO 452/552** three credits  
**Virology**

**BIO 471/571** four credits  
**Marine Microbiology**

### Graduate-level courses

**BIO 510** four credits

#### **Marine Biotechnology**

Designed for persons who wish to participate in research and development within biotechnology. This course features extensive hands-on laboratory work with current techniques and experimental approaches, integrated with an exposition of the principles underlying the techniques.

**BIO 511** one to four credits

#### **Graduate Seminar in Biology**

One to four hours in varied formats  
Selected topics in biology. In recent years these have included physiology and biochemistry of marine animals, evolutionary ecology, biology of marine mammals, morphometrics and phylogenetic systematics, and extremophiles.

**BIO 518** three credits

#### **Biogeography**

Prerequisite: Senior or graduate standing  
The study of present and past global distributions of plant and animal taxa in terrestrial, marine and freshwater habitats. Distributional patterns will be considered in relation to changes of the physical environment over geological time, such as in global patterns of climate and resources. The evolution of recent association of organisms will also be examined in relation to ecological interactions between organisms, such as competition and predation.

**BIO 520** three credits

#### **Animal Behavior**

Prerequisite: Graduate standing and consent of instructor  
The study of comparative and evolutionary aspects of behavior of invertebrate and vertebrate animals. Structure and function of nervous systems, simple behavioral patterns including reflexes and other forms of innate behavior as well as more complex patterns including learning and social behavior are stressed.

**BIO 525** one credit

#### **Graduate Student Seminar**

Prerequisite: Graduate status  
Each student will present a seminar related to the current semester's theme and based on several contemporary publications. Students are responsible for preparing a comprehensive bibliography, an abstract and evaluations of peers' seminars. (One semester required; maximum two credits towards MS degree.)

**BIO 526** four credits

#### **Marine Benthic Ecology**

Three hours lecture, three hours laboratory

Prerequisite: Graduate standing or consent of instructor

An advanced overview of the structure and function of marine benthic communities from the intertidal zone to the deep sea, focusing on the power of experimental studies in elucidating ecological processes. Students will improve writing skills via preparation of short research proposals, a term paper, and thorough peer review of other students' work. Students will also lead discussions of journal articles, and plan, undertake, and present the results of a field biofouling study.

**BIO 531** four credits

#### **Advanced Ichthyology**

Three hours lecture, three hours laboratory  
Prerequisite: Graduate standing or consent of instructor  
Studies of fish phylogeny and classification, physiological problems peculiarly faced by fish, and aspects of fisheries' hydrography. The laboratory stresses independent work on the structure of fish populations, measurement of physiological parameters, and morphometric analysis.

**BIO 535** four credits

#### **Analysis of Biological Data**

Three hours lecture, two 1-1/2 hour laboratory meetings  
Prerequisite: Introduction to biological statistics or equivalent  
The processing and analysis of biological, and especially ecological data. Topics include problems encountered in processing and handling of data, distributions and transformations, associations, computer simulations, parametric and nonparametric methods, and usefulness and limitations of multivariate methods.

**BIO 536** four credits

#### **Estuarine Ecology**

Three hours lecture, 3 hours laboratory  
Prerequisite: Graduate standing or permission of instructor  
An overview of biological, geological, physical, and chemical factors and processes important for organisms in estuarine environments. Emphasis is on contemporary research areas, including human impacts in estuaries. Students will design, perform, analyze, and present the results of semester-long field projects characterizing a local salt marsh ecosystem.

**BIO 545** four credits

#### **Biological Oceanography**

Three hours lecture, three hours laboratory  
Prerequisite: BIO 316 or equivalent, or permission of instructor  
The cycle of productivity in the marine

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environment and the physiological and morphological adaptations of plant, animal and bacterial populations within various oceanic regions. Interrelationships of the plankton, the nekton, and the benthos are stressed.

**BIO 546** four credits

**Biology of Marine Larvae**

Three hours lecture, three hours laboratory  
Prerequisite: Graduate standing or permission of instructor

An analysis of factors important for animals with complex life cycles, focusing on marine benthic invertebrates. Larval stages will be examined from a wide range of perspectives: ecological, evolutionary, oceanographic, Pbehavioral, physiological, and developmental. Students will hone verbal skills through presentations on species and topics of interest, and by leading class discussion. The laboratory will examine larval types and aquacultural techniques.

**BIO 593** one to three credits

**Graduate Research Project**

Prerequisite: Graduate standing and consent of instructor

Directed research for graduate students, hours by arrangement. Graded A-F.

**BIO 595** three credits

**Graduate Independent Study**

Prerequisites: Graduate standing; permission of instructor, graduate director, and college dean  
Study under the supervision of a faculty member in an area not otherwise part of the discipline's course offerings. Terms and hours to be arranged.

**BIO 596** three credits

**Graduate Directed Study**

Prerequisites: Graduate standing; permission of instructor, graduate director, and college dean  
Study under the supervision of a faculty member in an area covered in a regular course not currently being offered. Terms and hours to be arranged.

**BIO 599** not to exceed ten credits

**Graduate Thesis**

Prerequisite: Graduate standing and consent of instructor  
Terms and hours to be arranged. Graded A-F.

**Course for the MAT Program**

**BIO 600** three credits

**Teaching Science in the Elementary School**

*Not for credit in Biology MS program*

Life, physical, and earth sciences that are involved in the development of scientific concepts and processes for elementary school science. A variety of natural phenomena, such as the plant, *Brassica rapa*, will be used as models to develop an inquiry and standards approach to the learning and teaching of science.