

MARINE BIOLOGY, MS

Program Description

The Marine Biology Program is designed for students with an interest in one or more of the subdisciplines of marine biology who wish to pursue careers in higher education, government, or private industry. This degree program combines the strength of a diverse, internationally recognized faculty with high scholarly productivity and extramural funding. Additionally, Texas A&M University – Corpus Christi is located on the Gulf of Mexico, facilitating hands-on learning and research. Students can choose from a variety of classroom and field learning experiences and form committees with any participating faculty.

The Marine Biology program offers the Master of Science and the Doctor of Philosophy degrees in Marine Biology. A personalized graduate advisory committee guides each student through the conception, design, construction, and execution of marine biology-based inquiry.

Student Learning Outcomes

As part of their progression through the Marine Biology Program, Master of Science students will:

- Gain an in-depth of knowledge of essential and emerging concepts in the field of marine biology.
- Perform scholarly hypothesis-driven research grounded in marine biological principles and concepts.
- Prepare a committee-approved Master's Thesis proposal outlining planned research activities
- Write and successfully defend a Master's Thesis detailing original scholarly research performed during the degree and demonstrate a mastery of relevant scientific literature.
- Demonstrate advanced communication skills through either presentation of research results at professional scientific meetings and/or through peer-reviewed publication.
- Develop a skill set and research record such that they can secure employment in academia, state/federal agencies, private companies, or non-governmental organizations.

For Additional Information

Website: <https://www.tamucc.edu/science/departments/life-sciences/marine-biology/index.php> (<https://www.tamucc.edu/science/departments/life-sciences/marine-biology/>)

Campus Address:

Tidal Hall, Room 309
Phone: (361) 825-2754

Mailing Address:

Marine Biology Program, Tidal Hall 309
Texas A&M University-Corpus Christi
6300 Ocean Drive
Corpus Christi, Texas 78412

Admission Requirements

Those seeking admission to the Marine Biology Program should apply online through the Office of Recruitment and Admissions. In addition to the documents required by that office, applicants must submit an essay of no more than 1,000 words describing their educational and career goals, and interests as they relate to the faculty in the Marine Biology

Program; a list of names of program faculty members contacted; three letters of recommendation from people familiar with their potential for graduate studies; transcripts of all previous undergraduate/graduate work; Graduate Record Examination (GRE) scores that are not more than 5 years old; and a résumé. Additional requirements exist for international students, including TOEFL or IELTS scores from ETS taken within the last two years for students from countries where English is not the native language, and a course by course foreign transcript evaluation through an approved service (refer to the Admission section of this catalog). All relevant supplemental materials (such as publications or other documents that include information about relevant experiences) that are submitted with the application will be considered. Persons seeking admission to the M.S. Program in Marine Biology should first contact the program faculty and identify a faculty member willing to serve as the graduate advisor. Applicants will not be admitted to the program without a graduate advisor.

Completed applications must be received by the Office of Recruitment and Admissions by the specified priority deadlines:

- Fall Semester - December 1
- Spring Semester - June 1

Incomplete applications will not be considered. The applicant will be notified of acceptance or rejection by letter.

Teaching assistantships, graduate research assistantships, and fellowships may be available to admitted degree-seeking students who maintain full-time graduate student status (9 hours/fall and spring semester, and 3 hours/summer). The completed Teaching Assistant Application (<https://gradcollege.tamucc.edu/funding/index.html>) and all other materials requested for evaluation should be submitted as per instructions on that form. For full consideration, the deadline for submitting applications is December 1 for the following academic year. A limited number of fellowships are available, and faculty members conducting funded research projects often hire qualified graduate students as Research Assistants. Students will need to contact faculty members in their field of interest for information on these opportunities.

Academic Preparation

Students entering the Marine Biology Program are expected to have a strong background in biological and physical sciences, with competencies equivalent to those required of biology majors graduating from Texas A&M University-Corpus Christi (see the biology section of the undergraduate catalog).

Program Requirements

Advising and the Graduate Advisory Committee

After being accepted in the Marine Biology (MARB) program and enrolling, the student must form a graduate advisory committee (GAC). ***Students should form a graduate advisory committee with the approval of their advisor by the end of their first long semester in the MARB program to help guide them through their degree program.*** Students are ***strongly encouraged*** to meet with their committee at a minimum of once per year to seek continual guidance on their research program.

Composition and size of the committee should reflect the scope of the intended graduate studies and should be developed with substantial input from the student's advisor(s). The advisor(s) will serve as chair(s) of the committee. The majority of the committee members must be members of the Marine Biology Participating Graduate Faculty.

Recognized scholars who are not a member of the TAMU-CC graduate faculty may serve on a student's committee by submitting a letter of request from the advisor, through the TAMU-CC Marine Biology Program Coordinator, with the individual's resume attached as well as a completed "Form 2 (https://gradcollege.tamucc.edu/contact_us/forms.html)" from CGS (Graduate Faculty Status Application). The scholar may serve upon approval of the TAMU-CC CGS. Only one CGS appointed scholar may be counted toward the minimum committee member composition. For Masters of Science in Marine Biology degrees, the committee shall consist of no fewer than three members, two of which must belong to the MARB Graduate Faculty, including the advisor(s). The Chair (and/or Co-Chair) must be a member of the MARB Graduate Faculty.

Enrollment Requirements

All students are required to maintain continuous registration until completion of all requirements for graduation unless a specific leave of absence is granted in writing by the department. Students funded through scholarships, fellowships and assistantships are required to maintain a minimum of 9 hours/fall and spring semester, and 3 hours/summer. To meet enrollment requirements after completing all formal coursework on the degree plan, a student may register for MARB 5940 Master's Project Research (1-9 sch).

Coursework and Research

The MS in Marine Biology is designed for graduate students who wish to become knowledgeable leaders and professionals with an in-depth education and specialized skills in the field. Students will develop a sense of creative independence that will allow them to practice in and contribute to a variety of professions and fields of scholarship. A student may request approval for transfer of a maximum of nine semester credit hours of graduate courses from other colleges to a MS in Marine Biology degree plan. Students must demonstrate to the GAC that the selection of classes or research projects produces a coherent course of study focused on the student's particular area of emphasis.

1. Specialized and Elective Coursework

Depending on the emphasis area, elective and specialized coursework selections may be chosen from biology, biomedical sciences, chemistry, coastal and marine system science, computer science, environmental science, geographic information science, geospatial surveying engineering, geology, fisheries and mariculture, mathematics, or other course offerings as stipulated and approved by the GAC. Classes or research projects designated as part of the specialized coursework requirement must receive the approval of a student's GAC.

2. Coursework Requirements and Limitations

The program specifies the minimum number of semester credit hours (SCH) that must be earned from regular, graded (non-research, non-variable credit) coursework: for MS thesis students, 23 of 32 total hours.

Thesis Option

The thesis Master's Degree requires a thesis based upon original research conducted during the period that the student is enrolled at Texas A&M University-Corpus Christi. The research must include a review of relevant literature, a description of the results from original research on a topic approved by the GAC, statistical analysis when appropriate, and an appropriate discussion of the results. To graduate under the thesis degree plan, a student must complete a minimum of 32 graduate semester credit hours.

Code	Title	Hours
Core Courses		
MARB 6312	Communicating Science Seminar	3
MARB 6340	Marine Organisms and Processes	3
MARB 6341	Evolution and Genomics of Marine Organisms	3
MATH 6315	Statistical Methods in Research I	3
Thesis Option		
MARB 5392	Thesis Proposal	3
MARB 5393	Thesis Research	3
MARB 5394	Thesis Submission ¹	3
Select 11 hours of elective, specialized, and topical coursework		11
Total Hours		32

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Students must enroll in MARB 5394 Thesis Submission (3 sch) during their last semester when their theses will be completed.

Final Oral Defense Examination

Each student must pass a final oral defense examination during the last semester before graduation. Students should enroll in MARB 5394 Thesis Submission (3 sch) during the semester in which they are planning to defend their thesis and/or graduate. The student's GAC administers this examination which covers topics related to:

1. all graduate coursework undertaken for the Marine Biology program,
2. the student's specific research area, and
3. broad concepts of general and marine biology including familiarity with the literature.

The student is responsible for scheduling the defense with the faculty involved. A student who fails the defense may repeat it once after an interval of four months or more. If a student fails the second defense, the student will be terminated from the program.

Courses

MARB 689 Special Topics

4 Semester Credit Hours (3 Lecture Hours)

MARB 5293 Thesis Research

2 Semester Credit Hours

Implementation of the Thesis Proposal and the production of a rough draft of the thesis submitted to the graduate committee of the student for initial editing and comment. A course section will be created for the student to enroll.

Prerequisite: MARB 5292.

MARB 5392 Thesis Proposal

3 Semester Credit Hours

Thesis students must submit a completed proposal for their thesis project. A course section will be created for the student to enroll. Upon successful completion and submission of the proposal signed by the graduate committee of the student, students may then register for MARB 5393 - Thesis Research. If course is not completed by end of the semester, a grade of "IP" will be awarded. An "IP" is a permanent, non-punitive, grade notation. In order to receive a qualitative grade the student must enroll in this course in a subsequent semester.

MARB 5393 Thesis Research**3 Semester Credit Hours**

Implementation of the Thesis Proposal, and the production of a rough draft of the thesis submitted to the graduate committee of the student for initial editing and comment. A course section will be created for the student to enroll. If course is not completed by end of the semester, a grade of "IP" will be awarded. An "IP" is a permanent, non-punitive, grade notation. In order to receive a qualitative grade the student must enroll in this course in a subsequent semester.

Prerequisite: MARB 5392.

MARB 5394 Thesis Submission**3 Semester Credit Hours**

Completion of the final draft of the thesis, signed by the graduate committee of the student and ready for binding and distribution. A course section will be created for the student to enroll. If course is not completed by end of the semester, a grade of "IP" will be awarded. An "IP" is a permanent, non-punitive, grade notation. In order to receive a qualitative grade the student must enroll in this course in a subsequent semester.

Prerequisite: (MARB 5392 and 5393*).

* May be taken concurrently.

MARB 5397 Directed Research**3 Semester Credit Hours**

Emphasis on experimental design as related to selected biological topics. Application of research skills. For M.S. students selecting the non-thesis option. Students may register for up to 9 semester hours, but only 3 semester hours will count towards a non-thesis degree. Directed Research is only open to M.S. students. If course is not completed by end of the semester, a grade of "IP" will be awarded. An "IP" is a permanent, non-punitive, grade notation. In order to receive a qualitative grade the student must enroll in this course in a subsequent semester.

MARB 5940 Master's Project Research**1-9 Semester Credit Hours**

Research related to the M.S. project. Open only to M.S. students in marine biology with consent of the graduate advisor. Does not count as credit toward regular graded (non-research, non-variable credit) coursework for M.S. degree requirement in marine biology.

MARB 6301 Coral Reef Conservation Issues**3 Semester Credit Hours (3 Lecture Hours)**

Survey of challenges and threats facing coral reef ecosystems in the 21st century and discussion of conservation and management strategies. Topics include biology and ecology of reef ecosystems, climate change impacts, coral bleaching, over-fishing and the effectiveness and design of marine protected areas.

Prerequisite: (BIOL 3428).

MARB 6310 Physiological Adaptations in Animals**3 Semester Credit Hours (3 Lecture Hours)**

A study of the physiological adaptations of animals to their environment, including osmoregulatory and temperature regulatory mechanisms.

Prerequisite: BIOL 3430.

MARB 6312 Communicating Science Seminar**3 Semester Credit Hours (3 Lecture Hours)**

Covers communication topics ranging from proposal writing to professional presentations with a minor emphasis on additional non-traditional communication formats. Must be taken to fulfill degree plan requirements by all Marine Biology graduate students and is recommended in the first spring of the degree.

MARB 6314 Aquatic Animal Nutrition**3 Semester Credit Hours (3 Lecture Hours)**

The study of current concepts in aquatic animal nutrition including nutrient sources and requirements, deficiency effects, ingestive/digestive/metabolic processes, formulation and processing of feeds, and practical feeding considerations for selected aquatic species.

MARB 6327 Marine Restoration Ecology**3 Semester Credit Hours (3 Lecture Hours)**

Overview of the rapidly expanding practice of restoring degraded marine, estuarine, and coastal ecosystems. Teaching methods will include lectures, discussion, paper critiques, field visits, and restoration plans. Course will explore ecological theory as it applies to restoration, restoration planning and implementation strategies, and controversies surrounding the practice of restoration.

MARB 6333 Marine Benthic Ecology**3 Semester Credit Hours (3 Lecture Hours)**

The ecology of benthic assemblages with emphasis on species and habitats below diver depths. Micro to mesoscale spatial patterns, including bathymetric distribution, abundance and size-structure, diversity gradients, energetics and feeding strategies, and zoogeography of the benthos will be covered. Hydrothermal vents, cold seeps and sea mount fauna will receive special attention.

MARB 6335 Aquatic Microbiology**3 Semester Credit Hours (3 Lecture Hours)**

Types and distribution of microorganisms in aquatic environments. Interactions with other organisms. Role in nutrient cycling, degradation of organic substances, pollution, water purification.

Prerequisite: BIOL 2420.

MARB 6340 Marine Organisms and Processes**3 Semester Credit Hours (3 Lecture Hours)**

This course will introduce students to the biology of major plant and animal groups in the ocean. Students will also learn about important physical and chemical features of the oceans, and how these interact with marine life to regulate marine ecosystem function.

MARB 6341 Evolution and Genomics of Marine Organisms**3 Semester Credit Hours (3 Lecture Hours)**

This course will introduce students to the evolutionary history of life in the ocean. Students will also learn about modern evolutionary theory, processes of speciation and processes which create diversity and adaptive capacity within species. Finally, the course will touch on functional genetics and the use of modern molecular techniques to understand organismal evolution and function.

MARB 6342 Genomics, Proteomics and Bioinformatics**3 Semester Credit Hours (3 Lecture Hours)**

An introduction to integrative biological study using genome-wide approaches and bioinformatics. The "-omics" technologies (Genomics, Proteomics, Metabolomics, etc.) will be surveyed for current and potential contributions to understanding biological function at molecular, cellular, organismal and ecosystem levels. Offered in Fall semester of odd-years only. Cross listed with BIOL 5340.

MARB 6343 Oceans and Human Health**3 Semester Credit Hours (3 Lecture Hours)**

Oceans are increasingly recognized for their role in the health of the human population, both as a source of waterborne disease and a source of new bioactive (medicinal) agents. Indeed, healthy oceans are essential to the habitability of our planet – for humans and all other forms of life. Students will explore links between oceans, pollution, human well-being, ecosystem services, resource management, and the science and legislation governing the enforcement of water quality standards. This multidisciplinary subject will be addressed using a combination of lecture and discussion of primary literature. Offered in Fall semester of even-years only.

MARB 6353 Down the River: Ecology of Gulf Coast Fishes**3 Semester Credit Hours (3 Lecture Hours)**

This course covers aspects of ecology and biogeography of riverine and estuarine fishes while exposing students to field sampling techniques and museum preparation of specimens. This will be a unique opportunity for students to gain an in-depth understanding of the biological complexity of Texas Gulf Coast river systems while gaining hands-on experience in field and museum ichthyological techniques that are employed by state, federal and academic researchers alike.

Co-requisite: SMTE 0091.

MARB 6360 Computation for 21st Century Biologists**3 Semester Credit Hours (3 Lecture Hours)**

This is a 3 credit course for graduate students that introduces the powerful open-source computing tools that are used in biological research for the creation, organization, manipulation, processing, analysis, and archiving of “big data”. This course is designed to prepare and enable students to use computational tools for bioinformatic applications in advanced courses and independent research projects. The primary topics covered are: data formats and repositories, command line Linux computing and scripting, regular expressions, super-computing, computer programming with PYTHON and R, data visualization with R, version control and dissemination of scripts and programs with GIT, typesetting with LATEX, and organizing data with SQL relational databases. While not a formal requirement, it is assumed that students have a firm command of basic algebra. Cross listed with BIOL 4360 and BIOL 5360

MARB 6362 Global Change and Its Impact on Aquatic Ecosystems**3 Semester Credit Hours (3 Lecture Hours)**

This course will introduce students to the effects of climatic and anthropogenic change on aquatic ecosystem structure and function. Includes readings from the current literature and development of a research proposal. Cross-listed with CMSS 6362.

MARB 6363 Geomicrobiology**3 Semester Credit Hours (3 Lecture Hours)**

An exploration of the interface between geological and biological processes focused on the mutual effects of microorganisms and Earth's chemistry. Topics include biomineralization, origin and evolution of life, microbial weathering and rock formation, and influences on environmental problems.

MARB 6371 Evolutionary Genetics**3 Semester Credit Hours (3 Lecture Hours)**

An advanced introduction to evolutionary processes and their genetic basis, focusing on theoretical and experimental approaches to the study of population genetics, phylogeography, coalescence theory, evolutionary ecology, and molecular evolution.

Prerequisite: BIOL 2416.

MARB 6373 Marine Biodiversity and Conservation Science**3 Semester Credit Hours (3 Lecture Hours)**

Biodiversity, including genetic diversity of individual populations to ecosystem diversity, will be addressed, with focus on the marine realm. Methods for assessing and quantifying diversity will be included. Threats to biodiversity, including resource extraction, invasive species, habitat alteration, global warming and ocean acidification, will be covered, as will techniques for recovering and restoring damaged ecosystems. Marine ecosystem management will be discussed, including marine protected areas, and state, federal and international fisheries and resource management issues.

MARB 6392 Dissertation Proposal**3 Semester Credit Hours**

Ph.D. students must submit a completed proposal for their dissertation project. A course section will be created for the student to enroll. Upon successful completion and submission of the proposal signed by the graduate committee of the student, students may then register for MARB 6393 - Dissertation Research. If course is not completed by end of the semester, a grade of "IP" will be awarded. An "IP" is a permanent, non-punitive, grade notation. In order to receive a qualitative grade the student must enroll in this course in a subsequent semester.

MARB 6393 Dissertation Research**3 Semester Credit Hours**

Implementation of the Dissertation Proposal, and the production of a rough draft of the dissertation submitted to the graduate committee of the student for initial editing and comment. A course section will be created for the student to enroll. If course is not completed by end of the semester, a grade of "IP" will be awarded. An "IP" is a permanent, non-punitive, grade notation. In order to receive a qualitative grade the student must enroll in this course in a subsequent semester.

Prerequisite: MARB 6392.

MARB 6394 Dissertation Submission**3 Semester Credit Hours**

Completion of the final draft of the dissertation, signed by the graduate committee of the student and ready for binding and distribution. A course section will be created for the student to enroll. If course is not completed by end of the semester, a grade of "IP" will be awarded. An "IP" is a permanent, non-punitive, grade notation. In order to receive a qualitative grade the student must enroll in this course in a subsequent semester.

Prerequisite: MARB 6392 and (MARB 6393 or 6393*).

* May be taken concurrently.

MARB 6408 Microbial Ecology**4 Semester Credit Hours (3 Lecture Hours, 3 Lab Hours)**

Relationships between microorganisms and their biotic and abiotic environments. Role of microorganisms in biogeochemical cycling. Methodology in microbial ecology. Biotechnological aspects.

Co-requisite: SMTE 0092.

MARB 6428 Fisheries Ecology**4 Semester Credit Hours (4 Lecture Hours)**

FISHERIES ECOLOGY Advanced study of theory and techniques in fisheries science including behavior of fisheries populations and applications to resource management with emphasis in tidal-influenced waters. Includes readings in the current literature and a research project. The laboratory will emphasize practical sampling design and data interpretation. SMTE 0091 is a co-requisite for this course. Documented completion of this safety training is required early in the semester for continued participation in this course.

MARB 6430 Marine Plankton**4 Semester Credit Hours (4 Lecture Hours)**

Investigation of the systematics, distribution and ecology of marine plankton. Cross listed with BIOL 5430.

Co-requisite: SMTE 0091.

MARB 6431 Phycology**4 Semester Credit Hours (4 Lecture Hours)**

Study of the major groups of freshwater and marine algae; morphology, ecology, systematics, life cycles and physiology. Laboratories emphasize collection, identification and culturing techniques.

Co-requisite: SMTE 0092.

MARB 6436 Marine Ecology**4 Semester Credit Hours (4 Lecture Hours)**

Advanced studies in structure and habitats of marine environments. Emphasis on factors influencing distribution of marine organisms, including field trips to areas along the Texas coast.

Prerequisite: BIOL 3428.

Co-requisite: SMTE 0091.

MARB 6452 Ecology and Evolution of Fishes**4 Semester Credit Hours (3 Lecture Hours, 3 Lab Hours)**

This course covers aspects of fish ecology from individual, population, community, and ecosystem levels. We discuss the role of the environment on fish physiology and behavior, food-web dynamics, community assembly and diversity, ecosystem interactions, and anthropogenic impacts on fishes with a focus on conservation.

Co-requisite: SMTE 0091.

MARB 6590 Special Topics**5 Semester Credit Hours (5 Lecture Hours)**

An advanced study of a biological topic. May be repeated with full credit in another area of marine biology.

Prerequisite: SMTE 0091*, 0092* or 0093*.

* May be taken concurrently.

MARB 6596 Directed Independent Study**1-5 Semester Credit Hours (1-5 Lecture Hours)**

Study in areas of current interest. A total of six semester hours of Directed Independent Study may be counted towards the M.S. or Ph.D. degree.

MARB 6940 Dissertation Project Research**1-9 Semester Credit Hours**

Research related to the dissertation project. Open only to Ph.D. students in Marine Biology with consent of the graduate advisor. Does not count as credit toward regular graded (non-research, non-variable credit) coursework for Ph.D. degree requirement in Marine Biology.