

Student Learning Outcomes

The following learning outcomes address content and competencies specific to the discipline of marine biology.

Table 1: Student learning outcomes

Content: Students will understand, apply, and evaluate:

Basic biological science content (Ecology, evolution, cell and molecular biology)	Core biology courses: BIO180; BIO 200
Basic biological science content, with a marine focus	FISH/OCEAN 250; OCEAN 200/201
Basic oceanography to understand influence of unique characteristics of marine environments on marine life	OCEAN 210
Mechanistic understanding of how processes occurring within organisms interact with higher-level organization. Contributes to students’ ability to understand and test cause-and-effect and to use both reductionist and integrative approaches to solving marine biology problems	FISH/OCEAN/MARBIO 270 MB Electives: Organismal Processes Integrative field experience
Integrated perspective on evolution and biodiversity of marine organisms, and relationship with changing marine environment. In depth for select taxa and trophic groups. Enhances advanced application of evolutionary theory and practice in the marine sciences.	MB Core: FISH/OCEAN/370; MB Electives: Biodiversity; Integrative Field experience
Integrated approaches to studying population ecology, marine habitats, and ecosystems. In depth for select habitats or ecosystems. Contributes to student’s ability to work in biology across scales, to use integrative skills to understanding the influence of the marine environment on population dynamics, and the influence of marine life on abiotic processes.	MB Core: OCEAN 330; MB electives: Ecology & Ecosystems; Integrative Field experience
How and why oceans change. This area includes reciprocal connections between humans and the environment, in the context of other drivers and scales of variability. Provides students with not just a list of problems, but also empowers them to see how to create and implement solutions.	MB Core: Fish 323; MB Electives: Changing Oceans; Integrative Field experience

Table 2: Student Learning Outcomes.

Skills: Students will demonstrate the ability to use:

Quantitative approaches to collecting and understanding information	Calculus and Statistics, MB Core and select electives; Integrative field experience
Written and oral approaches to communicating information, in order to share one's work with a variety of audiences, including scientific community and general public	MARBIO 305, MB Core and electives; Integrative field experience
Collaboration to work together effectively in teams to solve problems	Group Projects During Integrative Field experience, and in MARBIO 305, Fish 323, OCEAN 330, MARBIO 370

From the perspective of career opportunities, potential employers emphasize disciplinary knowledge but also skills. During development of the proposal, these career-related aspects were incorporated through emphasis on writing, oral presentation, teamwork, and fieldwork.

Student learning outcomes also align well with concepts and competencies for biological literacy identified by AAAS (AAAS, Vision and Change in Undergraduate Biology Education – A Call to Action, 2012). The left-hand side of each of the following two tables states these national concepts and competencies in biology, and the right-hand side suggests how competency is likely to be achieved within the MB curriculum.

Table 3: Core Concepts in Biology

Evolution	FISH/OCEAN/MARBIO 370 Marine Evolutionary Biology Upper-level electives: Biodiversity
Structure and function	FISH/OCEAN/MARBIO 270 Aquatic Ecophysiology: Structure and Function Upper-level electives: Organismal Processes
Information flow, exchange, and storage	BIOL 180, BIOL 200 Introductory Biology (including genetics) FISH/OCEAN/MARBIO 370 Marine Evolutionary Biology, Upper-level electives: Organismal Processes at genetic and cellular levels
Pathways and transformations of energy and matter	BIOL 180 Introductory Biology (including ecology) FISH/OCEAN/MARBIO 270 Aquatic Ecophysiology OCEAN 330 Marine Biogeochemical cycles

	Upper-level electives: Processes at physiological and ecosystem levels
Systems	OCEAN 210 Integrative Oceans Upper-level electives: Ecology and Ecosystems Upper-level electives: Biodiversity

Table 4: Core Competencies in Biology

Ability to apply the process of science	MB Core courses, Integrative Field experience
Ability to use quantitative reasoning	Calculus and statistics, OCEAN 210, FISH 323, OCEAN 330, MARBIO 370, select electives
Ability to use modeling and simulation	OCEAN 210, FISH 323, OCEAN 330, MARBIO 370; modeling courses are included in the electives and labeled "M" for easy identification
Ability to tap into the interdisciplinary nature of science	FISH/OCEAN/BIOL 250 or OCEAN 200/201, Fish 323. Upper division electives, Integrative field experience. Marine Biology itself requires interdisciplinary approaches
Ability to communicate and collaborate with other disciplines	MARBIO 305, Integrative Field Experience
Ability to understand the relationship between science and society	Upper-level electives: Changing Oceans