

## SEMESTER AT SEA COURSE SYLLABUS

### Summer 2012

<b>Discipline:</b>	Biological Sciences
<b>BIOL 1559:</b>	Marine Biology
<b>Division:</b>	Lower Division
<b>Faculty Name:</b>	Daniel C. Abel
<b><u>Pre-requisites:</u></b>	None

### COURSE DESCRIPTION

This course is an introduction to organisms living in saltwater ecosystems. Topics include in-depth studies of marine ecosystems and organisms, including physiology, behavior, and ecology. Emphases will be placed on marine environmental issues and the adaptive and evolutionary mechanisms of organisms that allow them to occupy marine habitats. Field practica include trips to local habitats, aquaria, seafood markets, and/or fishing fleets. (This course should not be taken contemporaneously with oceanography.)

### COURSE OBJECTIVES

#### Learning Objectives/Student Learning Outcomes for Marine Biology Course

Upon completion of this course, students should be able to:

- 1) Classify marine life based upon distinguishing characteristics and adaptations of multiple categories, including major taxonomic groups (domains, kingdoms, major marine phyla, etc.), major categories of aquatic life (plankton, nekton, benthos), and major biogeographic and habitat/depth patterns related to the physical characteristics of the ocean.
- 2) Identify 50 species of marine organisms by sight.
- 3) Describe the major anatomical and physiological adaptations of organisms to the physical, chemical, and geological conditions of marine and estuarine environments. Examples include the impact of variations in temperature, salinity, light, density, depth, and nutrient and dissolved oxygen availability on morphology, thermoregulation, osmoregulation, locomotion and buoyancy, sensory biology, and distribution.
- 4) Interpret the influence of interacting factors on marine primary production, including nutrient availability, light, water column hydrography, biogeochemical cycles, grazing activity, and latitudinal/seasonal patterns.
- 5) Describe and interpret patterns of marine secondary production, including energy flow through marine food webs, trophic structure and efficiency, and the microbial loop.
- 6) Describe the manner in which marine organisms interact with other organisms through processes such as growth, reproduction, competition, predation, and varied symbioses. Describe how these behaviors and processes are influenced by the physical environment.
- 7) Describe the major marine community types, including their dominant habitat, community

structure, and ecological characteristics. Examples include rocky and sandy intertidal, soft sediment and hard bottom shallow subtidal, estuarine, salt marsh, mangrove, seagrass, kelp forest, coral reef, deep sea, and vent/seep communities.

- 8) Define *sustainability* and assess the current state of the marine environment with respect to its sustainability. Describe current and potential anthropogenic impacts upon marine ecosystems, and the conservation biology of marine organisms. Topics include: impacts of population growth and coastal development, global climate change and sea level rise, fisheries, marine pollution, habitat destruction and alteration, and others.
- 9) Investigate, analyze, interpret, and report on the concepts above using critical thinking, visual and quantitative skills, library and web resources, and effective writing.

### REQUIRED TEXTBOOKS

**AUTHOR:** Abel, Daniel C. and McConnell, Robert L.  
**TITLE:** Environmental Oceanography: Topics and Analysis  
**PUBLISHER:** Jones and Bartlett  
**ISBN #:** 978-0-7637-6379-4  
**DATE/EDITION:** 2010 (1<sup>st</sup> ed.)  
**COST:** \$55

**AUTHOR:** Morrissey, John F. and Sumich, James L.  
**TITLE:** Introduction to the Biology of Marine Life  
**PUBLISHER:** Jones and Bartlett  
**ISBN #:** ISBN-10: 0763781606  
 ISBN-13: 978-0763781606  
**DATE/EDITION:** 2012 (10<sup>th</sup> ed.)  
**COST:** \$120.95 (E-TEXT available for less)

### TOPICAL OUTLINE OF COURSE

Class Meeting	Topic	Readings/Assignments (Unless otherwise noted, for next class meeting)
C1 June 19	Introduction to course; Adaptations of marine organisms; Thinking like a scientist	Abel and McConnell: pp. 2 – 6, 19 – 26
C2 June 20	Marine species you should know. Part I Review discussion on science Sustainable oceans	(1) <b>ISSUE 1 -- READ</b> pp. 87 – 96. <b>ANSWER QUESTIONS</b> 1-9 through 1-16 <u>in journal</u> . (This and all media analyses in A & M are on the SAS Intranet site) (2) Morrissey and Sumich: Chap. 1
C3 June 21	Marine species you should know. Part II Intro to oceans and plate tectonics	A & M: Read Issue 4 & 5 (no questions)
C4 June 22	<b>Quiz 1 (including “Marine species...” from C3)</b> <b>Discussion: The Science of Climate Change</b>	M & S: Chap. 1 (continued)

<b>C5</b> June 23	The ocean as habitat: chemical and physical environment	(1) A & M: pp. 65 – 85 (2) M & S: chap 2
<b>C6</b> June 24	Marine species you should know. Part III Ecological and evolutionary principles	(1) A & M: ISSUE 14 (answer questions through Media Analysis 1) (2) M & S: chap 3
<b>C7</b> June 25	Marine species you should know. Part IV Phytoplankton and primary production	
<b>C8</b> June 26	<b>Quiz 2 (including “Marine species…” from C7)</b> The Mediterranean Sea and its inhabitants (Part I)	FOR C10: 1) A & M: ISSUE 23 (2) M & S: chap 4, 5 (for 7/9)
<b>6/27–6/30</b>	<b>Barcelona</b>	
<b>7/1</b>	<b>Global Studies Italy Day</b>	
<b>7/2 - 7/4</b>	<b>Civitavecchia</b>	
<b>7/5 – 7/7</b>	<b>Naples</b>	
<b>C9</b> July 8	Spain and Italy Recap The Mediterranean Sea and its inhabitants (continued)	1) A & M: <b>ISSUE 23</b> (2) M & S: chap 4, 5 (for 7/9)
<b>C10</b> July 9	Marine Plants: seaweeds and seagrasses Marine invertebrates Marine Biology of Croatia	For C12: (1) A & M: <b>ISSUE 13</b> (2) M & S: chap 5 & 6
<b>7/10–7/13</b>	<b>Dubrovnik</b>	
<b>C11</b> July 14	Croatia Recap Refocus: Marine species you should know. Part V	For C12: (1) A & M: <b>ISSUE 13</b> (2) M & S: chap 5 & 6
<b>C12</b> July 15	Marine species you should know. Part VI Marine invertebrates  Intro to Chordates Marine vertebrates – fish, mammals, birds, reptiles Marine bio of Greece, Turkey	M & S: chap 7
<b>7/16-7/19</b>	<b>Piraeus</b>	
<b>7/20</b>	<b>Global Studies Turkey Day</b>	
<b>7/21-7/25</b>	<b>Istanbul</b>	
<b>C13</b> July 26	Greece & Turkey Recap Refocus: Species Review Marine vertebrates – fish, mammals, birds, reptiles	M & S: chap 7
<b>C14</b> July 27	<b>QUIZ 3</b> Marine vertebrates – fish, mammals, birds, reptiles	M & S: chap 8
<b>C15</b> July 28	Marine vertebrates – fish, mammals, birds, reptiles Ecosystems: Estuaries	M & S: chap 8, 9
<b>C16</b> July 29	Estuaries; Intertidal Zone	(1) A & M: <b>ISSUE 16</b> (2) M & S: chap 10
<b>C17</b> July 30	Coral reefs	
<b>C18</b> July 31	<b>Species Identification Practical</b> Synthesis, discussion, catch-up	M & S: chap 11
<b>8/1 – 8/5</b>	<b>Lisbon</b>	
<b>C19</b> Aug. 6	The open sea Morocco mar biol	M & S: chaps 12 & 13

<b>8/7 – 8/10</b>	<b>Casablanca</b>	
<b>C20</b> Aug. 11	Morocco Recap The deep-sea floor; Marine environmental issues	A & M: <b>ISSUE 24</b>
<b>C21</b> Aug. 12	Marine environmental issues	
<b>C22</b> Aug. 13	Review, synthesis, discussion, catch-up	<b>Journal Due</b>
Aug. 14	<b>Global Studies Exam/Study Day</b>	
<b>C23</b> Aug. 15	<b>Final Exam</b>	
<b>Aug. 18</b>	Arrive Baltimore	
<b>Aug. 20</b>	Start classes at Coastal Carolina University	

### Field Assignments

Each student in my *Marine Biology* course must complete one class field lab (snorkeling in Dubrovnik, Croatia) and one independent practicum or approved standard SAS trip. These may be selected from a limited number of standard SAS trips and/or independent field trips or practica. Recommendations are listed below. In all cases, students are expected to keep a journal of their observations, including descriptions of ecosystems observed and a list of the species observed or discussed, with notes on their biology, ecology, and conservation. Additional guidelines will be provided later.

### INDEPENDENT FIELD TRIPS BY PORT (Spain/Italy Only – Others Available on Voyage)

<b>Location</b>	<b>Activity</b>
Barcelona	Snorkeling at the Medes Islands (numerous vendors)
Barcelona	Institute of Marine Sciences ( <a href="http://www.icm.csic.es/en/content/institute-marine-sciences">http://www.icm.csic.es/en/content/institute-marine-sciences</a> )
Barcelona	L'Aquarium Barcelona (Great exhibit of marine life of Med.) ( <a href="http://www.aquariumbcn.com/AQUARIUM/index.php?wlang=en">http://www.aquariumbcn.com/AQUARIUM/index.php?wlang=en</a> )
Barcelona	Snorkeling on the Costa Brava
Civitavecchia	Snorkeling near Campania (e.g.: <a href="http://www.initaly.com/regions/seaside/diving.htm">http://www.initaly.com/regions/seaside/diving.htm</a> )
Naples	Lots of locations along the Amalfi coast for snorkeling
Naples	Anton Dohrn Aquarium (Acquario) (small public aquarium)

### TENTATIVE STANDARD SAS TRIPS

<b>Location</b>	<b>Trip</b>
TBA	TBA

### SAMPLE INDEPENDENT PRACTICA

#### 1. Field Assignment on Seafood Markets/Restaurants

Visit local seafood markets and restaurants in 3 or more countries. Report what kinds of seafood (finfish and shellfish as well as algae) are for sale or are on the menu. How abundant are they at the seafood market? What kinds of sharks or rays are for sale? Compare your findings for three or more countries (including your own experiences in your home country). Discuss ways in which the

seafood markets or restaurants are and/or are not contributing to sustainability of the marine environment and its inhabitants. If permitted, document your observations with digital photos.

## **2. Field Assignment on Aquaria**

Visit aquaria in two or more of the port cities and report on the marine organisms you observe there. In general, how many and what kinds are there? What geographical areas are they from? What kinds of ecosystems? Observe and report on the behavior of any of the species in the tank. How do they interact with the other species in the tank? If possible, talk with an aquarist and ask questions about the biology, ecology, and conservation of some the species. Discuss ways in which the aquaria are and/or are not contributing to sustainability of the marine environment and its inhabitants. Compare your findings for 2 or more aquaria. If permitted, document your observations with digital photos.

## **3. Marine Fisheries and Conservation**

Visit a department of fisheries or marine conservation, university fisheries or marine conservation department, NGO, or other institution (e.g. some aquaria have fisheries or conservation specialists) and talk with a scientist or other specialist about local/regional/national fisheries. Discuss whether the fisheries are sustainable. Report and analyze your findings. Note: This practicum requires that you contact an institution or individual prior to arriving in port. I can help you with this **early in the voyage.**

## **4. Sharks (or other marine species) and Society**

As you tour a city, make observations on the presence of sharks (or other marine species) as images/statues/curios, etc. What do they symbolize? How important have these organisms been to the locality? Record and analyze your observations. If permitted, document your observations with digital photos.

## **5. Local Marine Ecosystems**

Visit local marine ecosystems (estuaries, mangrove systems, seashores, coral reefs, etc.) and make observations on the ecosystem and its inhabitants. What are the prominent features of the system? What are the major environmental factors affecting the organisms? What animals or plants dominate it? How abundant is the wildlife? Discuss whether the system is relatively pristine or human-impacted, i.e., whether it is sustainable or not.

## **6. Cruise Log**

Observe the ocean and skies from the deck of the *MV Explorer* throughout the voyage and record your observations in a field notebook. List and describe what you observe, including the kind and abundance of organisms and the type of ecosystem. Observations should include date, location, and descriptions of the organisms and their behavior. Discuss your observations from the perspective of sustainability of the marine environment.

## **METHODS OF EVALUATION**

Quizzes (3)	30
Species Identification Practical	20
Final Exam	25
Journal (based on 9 contact hours of field trips)	<u>25</u>
	100%

Student journals will be assessed based on criteria that include:

- 10% **Complete description of activity** (nature of field experience, location, site description, date, environmental conditions [if appropriate])
- 10% **Scientific accuracy, including use of scientific and common names of organism and appropriate vocabulary** (appropriate for non-majors, e.g. attention to detail)
- 10% **Quality of writing** (flow, clarity, appropriate use of vocabulary, grammar, and spelling)
- 10% **Organization** (not stream of consciousness, but logically ordered account and analysis)
- 25% **Scientific inquiry/critical thinking** (detailed observations, insights, hypotheses, questions)
- 25% **Summary and conclusions** (what was learned, highlights, additional comments)
- 10% **Overall quality** (how the components fit together)

## **RESERVE LIBRARY LIST**

**AUTHOR: Wirtz, P. & H. Debelius**

**TITLE: Mediterranean and Atlantic Invertebrate Guide**

**PUBLISHER: Hollywood Import & Export, Inc. (September 2003)**

**ISBN #: ISBN-10: 3925919627**

**ISBN-13: 978-3925919626**

**DATE/EDITION: 2003**

**COST: \$68.99**

**AUTHOR: Debelius, H.**

**TITLE: Mediterranean and Atlantic Fish Guide**

**PUBLISHER: Hollywood Import & Export, Inc**

**ISBN #: ISBN-10: 3931702995**

**ISBN-13: 978-393170**

**DATE/EDITION: 1997**

**COST: \$68.99**