

BIO 164 MARINE BIOLOGY, SPRING 2009

PROFESSOR JAN A. PECHENIK

OFFICE: DANA 224 (X 73199)

OFFICE HOURS: **By appointment.** To arrange a meeting time, please contact me by e-mail and **give me 3 times that you are available.** I will pick one that also works for me and get right back to you.

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Graduate Student Teaching Assistant: **Brian Taverna (btavernia@hotmail.com)**
Office hrs: Fridays 1:30 – 2:30 PM, Barnum 216B, x75346).

MARINE BIOLOGY

Scope: The course is a complete introduction to the biology of marine organisms: who they are, how they work, where they live, and how they interact with each other and with their environment.

Grading: 12% Scheduled Quizzes
25% Exam I
28% Exam II
35% Final Exam

Specific readings are assigned from the following texts:

J. A. Pechenik. 2005. *Biology of the Invertebrates*, 5th edition.

T. M. Niesen. 2000. *The Marine Biology Coloring Book*, 2nd edition.

Allsopp, M., R. Page, P. Johnston, and D. Santillo. 2007. *Oceans in Peril*. Order directly from <http://www.worldwatch.org/node/5352> (comes in hard copy or as an e-book for \$9.95).

Quizzes cover only the portion of the reading material indicated on the following pages; you will **not** be quizzed on any "Research Focus" boxes, unless told otherwise. **No make-up quizzes will be given.** However, I will count only 10 of the 13 quiz scores, which means you can actually miss 3 quizzes and still get a perfect quiz score. The quizzes are intended to help you keep up with the assigned reading, which is in turn orchestrated to prepare you for lectures.

The three examinations will cover all of the material listed on the next several pages (including reading material you were not quizzed on), plus material covered in lectures.

Interested students should also check out these two websites from time to time:

<http://www.worldwatch.org/topics/nature/ocean/>

(Worldwatch Institute, environmental information)

<http://www.slagoon.com>

(The world's only Marine Biology cartoon)

Tentative Lecture Schedule

I. Cast of Characters

Lecture

- 1 Introduction. Seawater as a biological medium. Predicting the effects of pollution and global warming.
- 2 Principles of the hydrostatic skeleton.
- 3 Introduction to the annelids.
- 4 The Annelida: locomotory mechanics of oligochaetes and polychaetes.
- 5 Figuring out evolutionary relationships.
- 6-8 The Arthropoda.
- 9-10 The Mollusca.

FIRST EXAMINATION: TUESDAY, FEBRUARY 17

- 11 Deuterostomes: Echinoderms and Chordates.
- 12 Chordates: Fish and marine mammals.
- 13 The Platyhelminthes: The friendly and not-so-friendly flatworms.
- 14 3 smaller groups of amazing animals: chaetognaths, ctenophores, and nematodes.
- 15 The Cnidaria.
- 16 Cnidarians and sponges.
- 17 Phytoplankton. Bioluminescence: distribution and adaptive value.

SPRING VACATION (MARCH 14-23)

II. Marine Habitats

- 1 Coral reefs.
- 2 The intertidal zone; estuaries; mangroves; salt marshes.
- 3 The deep sea: life without photosynthesis

SECOND EXAMINATION: TUESDAY, MARCH 31

III. Ecological Factors Controlling the Abundance and Distribution of Marine Organisms.

- 1-3 Food chains, food webs, and fisheries management
- 4-6 Larval substrate selection.
- 7-8 Effects of predation, cropping, and competition.
- 9 Effects of pollution.
10. Guest lecturer: John Crawford, Conservation Law Foundation: establishing Marine Protected Areas off the New England Coast.

FINAL EXAMINATION: Wednesday May 6, noon – 2 PM

(Barnum 104)

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READING ASSIGNMENTS

The first few lectures follow the assigned readings rather closely, to accommodate late entries to the class. As the course continues, lectures and readings diverge considerably, but remain complementary. Please look carefully at the figures, too! Quizzes cover only the material specified; Research Focus boxes are not required reading. **Quiz dates and associated readings** are in **color**.

<u>Topic</u>	<u>Reading</u>	<u>Quiz</u>
A. Environmental Considerations	Pechenik 1-4	
B. Biological Basis of Classification	Pechenik 5-13 (ignore “deuterostome” characteristics)	
C. Marine Animals: The Cast of Major Characters		
<u>The Protostomous Coelomates</u>		
Hydrostatic skeletons	Pechenik 93-95	
Phylum Annelida		
General Characteristics	Pechenik 285-286	
Class Polychaeta	Pechenik 287-295 (left)	Fri. 1/23 (1)
	Niesen 27 & 28	
Class Clitellata	Pechenik 302	
The oligochaetes (class Oligochaeta)	302-305	
The leeches (class Hirudinea)	306-308	
(Another annelid group, the “pogonophorans”, will be discussed later in the course, when we talk about life in the deep sea)		
Deducing Evolutionary Relationships	Pechenik 14-28 (left) (ignore Table 2.2)	Wedn. 1/28 (2)
Phylum Arthropoda		
General Characteristics	Pechenik 329-333	
Compound eyes	333 (right) – 337 (top left)	
Subphylum Mandibulata	345	
Class Crustacea	358 (defining characters only)	
	Niesen 35, 36 & 68	
Subclass Malacostraca	Pechenik 359-363	Wedn. 2/4 (3)
Subclass Cirripedia	373	
Subclass Copepoda	365 (right)-367	
Crustacean Development	373-376 (ending w/ “quickly ensue”)	
	Niesen 81	
Subphylum Chelicerata		
Class Merostomata	339-340	
Phylum Mollusca		
General Characteristics	Pechenik 207-210	
Class Gastropoda	216-230	
	Niesen 32, 100, 106	
Class Bivalvia		Tues. 2/10 (4)

General characteristics, gill function	Pechenik	230-235 (left)	(+ see next page)
Nutrition and lifestyles		239 (“Details of particle capture...”)-243	
Septibranchs (the Anomalodesmata)		243-246	
Class Polyplacophora	Pechenik	210-214	
Class Scaphopoda		246-247	
Class Cephalopoda		247-255	
	Niesen	33, 34 & 80	Fri. 2/13 (5)
Phylum Bryozoa	Pechenik	468-469	

EXAMINATION NO. 1 (TUESDAY, FEBRUARY 17)

<u>Topic</u>	<u>Reading</u>	<u>Quiz</u>
<u>The Deuterostomous Coelomates</u>		
Phylum Echinodermata		
General Characteristics	Pechenik	485-488
Class Crinoidea		488-490
Class Stellerioidea		491-497
	Niesen	39 & 40
		Fri. 2/20 (6)
Class Echinoidea	Pechenik	497-502 (top)
Class Holothuroidea		502-507 (top)
Phylum Chordata		
Subphylum Urochordata	Pechenik	523-531 (top left)
	Niesen	42
Subphylum Vertebrata		
Fishes: (3 classes)	Niesen	43, 44, 47, 49
Turtles, sea snakes, reptiles	Niesen	53 & 54
Marine birds	Niesen	55 & 58
Marine mammals		59 & 60
Echolocation		61
		Tues. 2/24(7)
Some Noncoelomates		
Phylum Nematoda	Niesen	25
Phylum Platyhelminthes	Pechenik	143-149 (left)
		Tues. 3/3 (8)
Phylum Cnidaria		
General Characteristics	Pechenik	97-100
Class Scyphozoa		100-105
Class Cubozoa	Pechenik	105
Class Hydrozoa	Pechenik	105-113 (top)
Class Anthozoa	Pechenik	113-119
Phylum Porifera	Pechenik	75-85
	Niesen	22
		Tuesday 3/10 (9)
Kingdom Protozoa		
Key marine protozoans: ciliates, dinoflagellates, foraminiferans and radiolarians	Pechenik	33-35 (left), 59 (rt)-63 (free-living only)

Topic

Reading

Quiz

SPRING BREAK, MARCH 14 - MARCH 23

D. Marine Habitats

Intertidal Zone	Niesen	3 & 4	
Estuaries, Salt Marshes	Niesen	7	
Beaches and Mudflats	Niesen	9 & 10	Wedn. 3/25 (10)
Deep Sea	Niesen	16 & 17	
The “pogonophorans” (siboglinids)	Pechenik	295-300	
Coral Reefs	Niesen	12 & 13	

EXAMINATION NO. 2 (TUESDAY, MARCH 31)

E. Marine Photosynthesizers

Phytoplankton:			
The cyanobacteria, dinophytes, diatoms, and coccolithophorids	Niesen	19	
Seaweeds:	Niesen	20 & 21	Wedn 4/1 (11)
Anthophytes: the grasses and mangroves	Niesen	18	

F. Food webs and Fisheries

Fishery depletion	Allsopp et al.	13-18	Tues 4/7 (12)
Promoting sustainability	Allsopp et al.	29-37	

G. Competition and other interactions

Niesen 91, 96-98

H. Reproduction + Dispersal

of seaweeds	Niesen	73	
of invertebrates	Pechenik	539-565	Tues 4/14 (13)
of vertebrates	Niesen	86 & 88	

I. Pollutants in the Sea

Assigned paper

COMPREHENSIVE FINAL EXAM WEDNESDAY, MAY 6, NOON - 2:00 PM

REMINDERS

Summary of Quiz Dates: 1/23, 1/28, 2/4, 2/10, 2/13, 2/20, 2/24, 3/3, 3/10, 3/25, 4/1, 4/7, 4/14

1. **EXAMS: TUESDAY, FEBRUARY 17**
- TUESDAY, MARCH 31**
- FINAL: WEDNESDAY, MAY 6, NOON - 2:00 PM**