5BIO 164 MARINE BIOLOGY, SPRING 2010

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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Office hrs: Friday 11-12, Barnum 216-C

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. 2010. *Biology of the Invertebrates*, 6th edition.
T. M. Niesen. 2000. *The Marine Biology Coloring Book*, 2nd edition.

Later in the semester I will also supply the PDF for a research article that I'll ask you to read for the April 13 quiz.

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)

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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 23

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 20-28)

II. Marine Habitats

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

SECOND EXAMINATION: TUESDAY, April 6

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.
9-10 Effects of pollution, climate change

FINAL EXAMINATION: Tuesday May 11, 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.

Topic	**Reading**		**Quiz**
A. Environmental Considerations	Pechenik	1-5	
B. Biological Basis of Classification	Pechenik	7-19 (ignore "deuterostome" characteristics in table)	
C. Marine Animals: The Cast of Major Characters			
The Protostomous Coelomates			
Hydrostatic skeletons	Pechenik	97-99	
Phylum Annelida			
General Characteristics	Pechenik	295-297	
Class Polychaeta	Pechenik	297-304 (left)	Fri. 1/29 (1)
	Niesen	27 & 28	
(One particular polychaete group, the "siboglinids", will be discussed later in the course, when we talk about life in the deep sea)			
Class Clitellata	Pechenik	318	
The oligochaetes (class Oligochaeta)		318-322	
The leeches (class Hirudinea)		322-325	
Deducing Evolutionary Relationships	Pechenik	19-31 (ignore Table 2.2, p 27)	Wedn.2/3 (2)
Phylum Arthropoda			
General Characteristics	Pechenik	341-345 (left)	
Compound eyes		345 (right) – 349 (top left)	
Subphylum Mandibulata		358	
Class Crustacea		373 (defining characters only)	
	Niesen	35, 36 & 68	
Subclass Malacostraca	Pechenik	374-379	Wedn. 2/10 (3)
Subclass Cirripedia		389 (left)	
Subclass Copepoda		381 (right)-382	
Crustacean Development		389 (ending w/ "…quickly ensue")	
	Niesen	81	
Subphylum Chelicerata			
Class Merostomata		352	
Phylum Mollusca			
General Characteristics	Pechenik	215-218	
Class Gastropoda		224-238	
	Niesen	32, 100, 106	
Class Bivalvia			Tues. 2/16 (4)
General characteristics, gill function	Pechenik	238-241	
Nutrition and lifestyles		245 (right: "Details of particle capture…")-247	
The Anomalodesmata (the septibranchs")		254	

Class Polyplacophora ("the chitons")	Pechenik	218-222	
Class Scaphopoda		255	
Class Cephalopoda		256-265 (top left)	
	Niesen	33, 34 & 80	Fri. 2/19 (5)
Phylum Bryozoa	Pechenik	480-481	

EXAMINATION NO. 1 (TUESDAY, FEBRUARY 23)

Topic	**Reading**		**Quiz**
The Deuterostomous Coelomates			
Phylum Echinodermata			
General Characteristics	Pechenik	497-500	
Class Crinoidea		500-503 (top right)	
Class Stelleroidea		503-509	Fri. 2/26 (6)
	Niesen	39 & 40	
Class Echinoidea	Pechenik	509-513 (top right)	
Class Holothuroidea		513-518 (top right)	
Phylum Chordata			
Subphylum Urochordata	Pechenik	540-547 (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	Tues. 3/2(7)
Marine mammals		59 & 60	
Echolocation		61	
Some Noncoelomates			
Phylum Nematoda	Niesen	25	
Phylum Platyhelminthes	Pechenik	149-156	Tues. 3/9 (8)
Phylum Cnidaria			
General Characteristics	Pechenik	101-104	
Class Scyphozoa		104-108	
Class Cubozoa	Pechenik	108-110 (top left)	
Class Hydrozoa	Pechenik	110-114	
Class Anthozoa	Pechenik	118-125	
Phylum Porifera	Pechenik	79-88	
	Niesen	22	Tuesday 3/16 (9)
Kingdom Protozoa			
Key marine protozoans: ciliates, dino-zoans, foraminiferans and radiolarians	Pechenik	33-38 (left), 54 (rt)-58 65-67 (left)	

Topic	Reading		Quiz
SPRING BREAK, MARCH 20 - MARCH 28			
D. Marine Habitats			
Intertidal Zone	Niesen	3 & 4	
Estuaries, Salt Marshes	Niesen	7	
Beaches and Mudflats	Niesen	9 & 10	Wedn. 3/31 (10)
Deep Sea	Niesen	16 & 17	
The "pogonophorans" (siboglinids)	Pechenik	304-312	
Coral Reefs	Niesen	12 & 13	
EXAMINATION NO. 2 (TUESDAY, APRIL 6)			
E. Marine Photosynthesizers			
Phytoplankton:			
The cyanobacteria, dinophytes, diatoms, and coccolithophorids	Niesen	19	
Seaweeds:	Niesen	20 & 21	Wedn 4/7 (11)
Anthophytes: the grasses and mangroves	Niesen	18	
F. Food webs and Fisheries			
Fisheries and Aquaculture as food sources	Duarte et al. 2009 BioScience*		Tues 4/13 (12)
G. Competition and other interactions	Niesen	91, 96-98	
H. Reproduction + Dispersal			
of seaweeds	Niesen	73	
of invertebrates	Pechenik	555-581	Tues 4/20(13)
of vertebrates	Niesen	86 & 88	
I. Pollutants in the Sea			
COMPREHENSIVE FINAL EXAM TUESDAY, MAY 11, NOON - 2:00 PM			

REMINDERS

Summary of Quiz Dates: Fri. 1/29, Wedn.2/3, Wedn. 2/10, Tues. 2/16, Fri. 2/19, Fri. 2/26, Tues 3/2, Tues 3/9, Tues 3/16, Wedn 3/31, Wedn 4/7, Tues 4/13, Tues 4/20,

1. **EXAMS:** **Exam I:** **TUESDAY, FEBRUARY 23**
Exam II: **TUESDAY, APRIL 6**
Final Exam: **TUESDAY, MAY 11, NOON - 2:00 PM**

*Duarte et al. 2009. Will the oceans help feed humanity? *BioScience* 59: 967-976.