

BIOL 4601 - Functional Biology of Fish - (Winter 2018)

Instructor

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Course Description

Anatomical, cellular, physiological and behavioral aspects of selected functions and processes, and how they relate to the fish's environment and life style.

Books / Reference Material

No Required Textbook

Books on Reserve

Bone, Q. and Moore, R.H. 2008. *Biology of Fishes*, 3rd Edition.

Helfman, G.S., Collette, B.B., Facey, D.E., Bowen, B.W. 2009. *The Diversity of Fishes*, 2nd Edition

Evans, D.H. and Clairborn, J.B. 2006. *The Physiology of Fishes*. 4th Edition.

Moyle, P.B. and Cech, J. *Fishes: An Introduction to Ichthyology*, 5th Edition

On-Line Resource - Encyclopedia of Fish Physiology (<http://lib.myilibrary.com.qe2a-proxy.mun.ca/Open.aspx?id=311405>)

Classes

Lectures: Tuesday and Thursday, 10:30 - 11:45, SN 2041

Lecture Schedule (tentative)

January 4

Introduction: organization and scope of the course; requirements etc.

Fish taxonomy / diversity: major groups of fishes, anatomy, morphology

January 9

Fish taxonomy, diversity and morphology: major groups of fishes, anatomy, morphology

January 11 and 16

Locomotion, swimming and bouyancy: swimming modes, muscle function/use, measuring swimming capacity and metabolism, swimbladder structure and function (rete mirabile, gas gland), other methods of bouyancy control

January 18

Thermal biology: regulation of fish body temperature, temperature adaptation.

January 23, 25 and 30

Respiration, circulation and blood oxygen transport: buccal and opercular pumps; structure and function of gills; CO_2/O_2 transport in blood, heart anatomy/function under various conditions, vascular system

February 1 (First Midterm)

February 6 and 8

Metabolism and environmental limits: energy budgets, metabolic scope/capacity, temperature limits, effects of temperature and hypoxia on metabolism

February 13, 15 and 27

Osmoregulation and acid-base balance: water and ionic balance in elasmobranchs, and marine and freshwater teleosts; role and functioning of intestine, gills and kidneys in ionic balance, structure and function of fish kidneys and gills (chloride cells), acid-base balance.

February 19 - 23. No Class - Winter Break

March 1 and 6

Nervous and endocrine systems: central and peripheral nervous systems, endocrine glands, hormones and mechanisms of action

March 8 (2nd Midterm Exam)

March 13

Growth and development: growth rates, regulation of growth; age determination; fish embryology.

March 15 and 20

Feeding, digestion and nutrition: feeding modes and mechanisms; anatomy, histology and function of digestive structures and glands; regulation of feeding behavior (appetite); nutritional requirements; digestion/assimilation and associated costs

March 22 and 27

Reproduction: functional anatomy; male and female reproductive tract; external sexual characters; gametogenesis; fish reproductive strategies and adaptations; endocrine and environmental control of reproduction; fecundity of fish.

March 29 and April 3

Sensory Systems and Communication: electric organs and electroreception; smell and taste; hearing and the acoustico-lateralis system; sound production, eyes and vision.

April 5: Spare Lecture

April ??? Final Exam

Examinations and Grading

1. First Midterm - 25%
2. Second Midterm - 25%
3. Final Exam - 25%
4. Outline - 5%
5. Essay - 20%

Term Paper

Deadlines

Topic choice and outline due in class on **February 8** (handing in before this date preferred/advisable). Papers due **March 20th**.

Topics

All topics have to be approved and no single topic will be given to two students. Make a choice as soon as possible. Inform me of your essay topic no later than **February 8**. The term paper gives

you an opportunity to study a chosen aspect of fish biology (which will not be covered in class at any depth).

Included below are some examples of essay topics.

- Adaptations to the deep sea
- Migration and homing
- Bioluminescence in fish
- Physiology of tuna's
- Adaptations/physiology of lungfishes
- Adaptations to surviving anoxia
- Fish as models for biomedical research
- Effects of ocean acidification
- Shark repellents
- Adaptations in amphibious fish
- Adaptations in Antarctic fishes
- Effects of endocrine mimics on fish physiology
- Environmental effects on fish immunology
- The Biology of coelocanths

Instructions for writing term paper

Outline

1. Your outline must indicate exactly which topics will be addressed and in which order. Provide headings and subheadings. It must include at least 10 of the major literature citations upon which the term paper will be based (These are scientific articles and book chapters...i.e. not text books or web sources).
2. The outline should be approx. 2 pages (DOUBLE-SPACED; not including references), and thus will contain enough information for me to know exactly what story will be told. The outline will constitute 5% of your mark in the course, and I will provide you with feedback.

Term Paper

1. Text should be close to, but not exceed, 15 pages (not including illustrations/tables/figures or references). The text should be DOUBLE SPACED (with the exception of table titles, figure captions and references, which should be single spaced). Font to be used -Time Roman 12 pt. Figures and tables should be on separate pages, and placed in the document shortly after they are mentioned in the text. It is expected that the number of references used will be in excess of 25.
2. Do not merely do a "historical review". Analytical/synthesis skills need to be demonstrated in the paper (e.g. synthesize concepts and ideas, be critical of the experimental evidence, identify gaps in knowledge/areas for future research etc.).
3. Do not base your essay on textbook materials or web sources. You should use recent book chapters from 'reference books' and the primary literature (journal articles) for your paper.
4. Use headings and subheadings to help you organize the paper.

5. When using diagrams, tables or illustrations to enhance your paper(which is encouraged), always give a title or a legend (as in a publication). Reference the source from which the diagram is obtained or modified. Please use format as used in publications

6. Proper scientific citations are required. Choose a format used by a recognized scientific journal or use format style that I will go over in class (see file uploaded to D2L). Please ensure that all papers identified in the text are present in your citation list.

7. You are expected to hand in your outlines / essays when they are due. If they are late, the following reduction in the possible mark that can be achieved will be applied: 1 day = 10%; 3 days = 25%; 1 week = 50%; > 2 weeks, a grade of 0 will be recorded.

Note: Academic misconduct (e.g. cheating, plagiarism) is a serious issue and is governed by Section 6.1.2 of the University's Regulations (see <https://www.mun.ca/regoff/calendar/sectionNo=REGS-0748#REGS-0761>)