Mammal Diversity and Evolution

Biology 455.3.2

January 2014

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Lecture: MWF, 10:30–11:20, Room 125, Biology Building.

Lab: Fridays, 1:30–5:20 PM, Rooms 123 and 124, Biology Building.

Description:

This course is designed for undergraduate students specializing in biology with interest in the ecology and evolution of mammals. The course includes three lectures and one lab per week. The first portion of the course examines early evolution of the synapsid line and defining adaptations of the Class and its major lineages (Subclass, Infraclass). I then concentrate on more detailed evolution and ecology of mammalian orders and families (including extinct groups within living orders and families). My goal is to approach mammalogy in the context of adaptation; hence, rather than designing this course around a simple survey of extant orders (as is often done for a course in Mammalogy), I have structured the syllabus according to key adaptations found within and among mammal groups. Relationships based on cladistic classification are emphasized.

Learning Objectives:

Having successfully completed this course, you will appreciate the ecology and evolution of the major mammalian groups, be able to identify extant species to Order and Family (and some species to Genus and Species), understand the phylogenetic relationships between species of different groups, and have practiced writing a scientific review paper in the area of mammalian evolutionary history.

Prerequisite(s):

BIOL 121 and 224 (or 203) and 228 (or 253); BIOL 302 (or 401) is recommended.

Readings:

Readings will be provided in class. Textbooks that I have used in developing lecture notes are available for short-term loan (4 hr) from the reserve collection of the Natural Sciences Library. These texts include:

Feldhamer, G.A., L.C. Drickamer, S.H. Vessey, and J.F. Merritt. 2004. Mammalogy: adaptation, diversity, and ecology. 2nd edition. McGraw-Hill, New York, NY. 576 pp.

Vaughan, T.A., J.M. Ryan, and N.J. Czaplewski. 2000. Mammalogy. 4th edition Harcourt, Fort Worth, TX. 566 pp.

***Required Text (Lab Manual):**

Martin, R.E., R. Pine, and A.F. DeBlase. 2011. A Manual of Mammalogy: with Keys to Families of the World, Third Edition. Waveland Press, reissued Nov 30, 2011 - Science - 333 pages

**This book is out of print as a hard copy; however, the manual is available for purchase as a Google eBook, a re-issue of the 3rd edition (2001 hard copy McGraw-Hill) by Waveland Press. Hard copies are still available from various bookstores online (e.g., Amazon); however, it may be easiest for you to purchase the ebook for $31.24CAD (as of January 2, 2014) at*: http://books.google.ca/books?id=kQEZAAAAQBAJ&dq=manual+of+mammalogy&source=gbs_navlinks_s

Winter 2014 Lecture Schedule	
Week	**Topic**
Jan 6, 8, 10	Introduction; Cladistics; Mammal evolution and the fossil record; Geological time and plate tectonics in the context of mammalian evolutionary history, Origins of the Synapsida
Jan 13, 15, 17	Origins of the Synapsida; Evolution of mammal-like reptiles
Jan 20, 22, 24	From mammal-like reptiles to mammals; Prototheria
Jan 27, 29, 31	Metatheria; The marsupial-placental dichotomy; Introduction to the Eutheria; K-T extinction event
Feb 2, 5, 7	Ecology and evolution in mammals since KT extinction event – Adaptations to insectivory and terrestrial carnivory
Feb 10, 12, 14	Terrestrial carnivory, cont.; Adaptation to life in water
Feb 14	**Midterm Exam During Lab Period**
Feb 17, 19, 21	**Midterm Break, No Classes**
Feb 24, 26, 28	Life in water, cont.; Life in the air
March 3, 5, 7	Life in air, cont.; The "rodent" model
March 10, 12, 14	Large herbivores I
March 17, 19, 21	Large herbivores II
March 24, 26, 28	Primates
March 31, April 2, 4	Human Evolution
April 7	Catch-up/Review
TBA	**Final Exam**

Laboratory Component:

The laboratory is designed to present information on mammal biology not covered in detail in the lecture, promote your appreciation of diversity within Mammalia using specimens housed in the Biology Department's extensive Museum collection, and complement material presented in the lecture on mammalian ecology and evolution. The first five labs include assignments which will not be graded, and thus are not mandatory; however, completing the assignments is highly recommended for proper preparation for the final lab exam. Labs in the latter half of the course are designed for you to practice identifying specimens of the different mammalian orders discussed in the lecture. There will be no assignments associated with these latter labs. A cumulative lab practical exam worth 30% of your final grade is scheduled for the end of the term (there is no lab midterm exam). This exam will test you on aspects of material presented in the first half of the lab, your ability to identify specimens to Order, Family, Genus or Species, and any special adaptations of those specimens. In place of weekly assignments in the lab, a term paper in the area of mammalian evolution will be assigned as an additional component of the lab portion of the course (15% of your final grade). Potential topics for the term paper will be discussed by your lab instructor early in the semester.

Attendance:

Senior students are expected to make mature decisions about their attendance at labs. Attendance will not be taken; however, past experience has shown us that absences reflect in performance on the final lab exam. Setting up the labs for this course is time intensive: specimens must be carefully removed from the museum and displayed under supervision. **Course organisers will not retrieve demonstration materials of missed labs for absent students.** That said, if absences are for a University approved reason (e.g., illness, death in the family, official University business) and course organisers are given the appropriate documentation (required in all circumstances), arrangements to help students meet the course requirements can be made.

Winter 2014 Lab Schedule

Lab	Topic	Lab Manual Chapters
January 10	General characteristics of mammals Diagnostic characteristics; handling of specimens Skulls and teeth Identifying basic cranial features; obtaining cranial measurements; anatomy of teeth; types of teeth and their functions; understanding dental formulae	1, 2 and 3
January 17	The Integument, Horns and Antlers Histology of mammalian skin and hair; hair types and coloration patterns; anatomy of horns and antlers	4 and 5
January 24	Limbs and Locomotion Anatomy of claws, nails, and hooves; appendicular skeletal anatomy; limb adaptations for different modes of locomotion	6 and 7

January 31	Reproduction Reproductive histology and anatomy; placental anatomy	Lab handout
February 7	**NO LAB; <u>Outline for Term Paper Due</u>**	
February 14	**MIDTERM EXAM DURING LAB PERIOD**	
February 28	Identifying Monotremes, Marsupials, Insectivores, Colugos, Bats	10–14
March 7	Identifying Primates, Tupaiids, Xenarthrans, Pangolins, Carnivores	15–19
March 14	Identifying Whales, Macroscelideans, Rodents, Lagomorphs	20– 23
March 21	Identifying Tubulidentata, Subungulates, Perissodactyla, Artiodactyla	24– 27
March 28	Review lab (limited specimens available)	
April 4	**Practical Lab Exam** (emphasizing identification of species)	
April 7	**Term paper due last day of class**	

Grading Criteria:

Mid-term exam	20%
Final exam	35%
Laboratory final exam	30%
Term paper	15%
Total	100%

A Special Note Regarding the Final Exam: ***The Final Exam will be a cumulative exam, with emphasis (80% of questions) on material delivered after the midterm exam.***

Deferred Examinations and Labs:

You must take examinations during their scheduled periods, and treat due dates for lab reports as seriously as that of a scheduled exam. If absence from a lecture exam or missed due date for a report is for a University approved reason (e.g., illness, death in the family, official University business) and course organisers are given the appropriate documentation (required in ALL circumstances), arrangements to help students meet course requirements can be made. Applications for a deferred midterm exam or report must be submitted with appropriate documentation promptly. Final exams are rescheduled ONLY with a fee and by application to your College, following University-approved procedures.

Special Needs or Disabilities:

Students with special needs or disabilities are encouraged to contact the instructor and let me know about your needs as soon as classes begin. Every effort will be made to accommodate the requirements of students with special needs. Please take advantage of the programs offered by Disability Services http://www.students.usask.ca/disability/dss/

Academic Honesty:

Honesty and integrity are expected in class participation, examinations, assignments, and other academic work.

- Perform your own work unless specifically instructed otherwise;
- Use your own work to complete assignments and exams;
- Cite the source when quoting or paraphrasing someone else's work;
- Follow examination rules;
- Be truthful on all university forms;
- Discuss with your professor if you are using the same material for assignments in two different courses;
- Discuss with your professor if you have any questions about whether sources require citation;
- Use the same standard of honesty with fellow students, lab instructors, teaching assistants, sessional instructors and administrative staff as you do with faculty.

Beware of plagiarism!!!! Academic honesty is a must in our institution and plagiarism will be strictly penalized.

You are also expected to consult the following websites:

http://www.arts.usask.ca/students/academics/appeals-integrity.php

http://www.usask.ca/university_secretary/honesty/policies_and_procedures.php