

# **SIO 133. Marine Mammal Biology (4 units) – Winter Quarter 2025**

## **A. GENERAL INFORMATION**

Introduction to the biology, ecology, evolution, and conservation status of marine mammals. Description of marine mammal taxa (mysticetes, odontocetes, pinnipeds, sirenians, sea otters), their anatomy, physiology, ecology, and behavior. Impacts of whaling, fisheries interactions, and other anthropogenic threats. Prerequisites: BILD 3 and upper division standing or consent of instructor.

Although marine mammals are incredibly interesting and we expect this class to be fun for everyone, **this is a STEM class and students should expect to commit the same amount of time and energy as they do any other upper division STEM Course.** As a course in organismal biology, we will cover complex topics including from anatomy, physiology, ecology, and evolution.

### **Instructors**

Simone Baumann-Pickering – SBP (sbaumann@ucsd.edu)

Pronouns: she/her/hers

Office hours: directly after lecture

Dovi Kacev – DK (dkacev@ucsd.edu)

Pronouns: he/him/his

Office hours: directly after lecture

### **Teaching Assistants**

Natalie Champagne (nrchampa@ucsd.edu)

Pronouns: she/her/hers

Office Hours: Wednesdays before lecture (10-11 am) at the tables outside Sverdrup Hall

Pete Ahlers (pahlers@ucsd.edu)

Pronouns: he/him/his

Office Hours: Tuesdays (10:45-11:45 am) at the tables outside Sverdrup Hall

## **B. LECTURES**

**Lecture:** MW 11-12:20 Sumner Hall

Though lecture podcasts will be made available, the course is designed to be a **synchronous, in-person** class. Students are expected to attend lecture and rely on the podcast only when necessary.

## **C. DISCUSSION SECTIONS**

Teaching assistants will give sections each week. While attendance is mandatory, we recognize that there will be circumstances that will preclude your attendance, in which case you can participate via discussion thread.

Starting week 2, students will be asked to submit questions about the previous week's material on Canvas (via a discussion thread) prior to their section meeting. Then, in each session, the TA will open with a discussion question followed by haphazardly selecting students, one after another, and they will present their question to the class, who will then discuss possible answers.

TAs will continue selecting students until end of the session. You will be scored for having turned in your question and attending the ENTIRE discussion section. By having you come up with questions, we are encouraging you to actively and critically engage with the course material. This will help you get more out of the course. We also may use the top questions in our exams! Even if you cannot attend section, please submit questions to facilitate group discussion, also provide answers to at least two of your classmates' questions in the discussion thread.

For Week 1, sections will meet as scheduled to go over introductory material. Students should come prepared having read through the syllabus.

A01: M 4-4:50 pm Humanities and Social Sciences 2154 (Natalie Champagne)

A02: M 5-5:50 pm Humanities and Social Sciences 2154 (Natalie Champagne)

A03: W 3-3:50 pm Humanities and Social Sciences 2154 (Pete Ahlers)

A04: W 4-4:50 pm Humanities and Social Sciences 2154 (Pete Ahlers)

#### **D. RECORDINGS OF LECTURE**

This course is designed to be an **in-person, synchronous class**. Discussions and questions will be facilitated during lecture.

Our lectures will be video podcasted so that students who are ill, may be ill, or have had recent exposure to a community pathogen do not need to (and should not) attend lecture. Community health should be a priority and we ask that we all (students and instructors alike) commit to following campus guidelines with testing and minimizing exposure. If you suspect that you may be sick or may have had exposure please do not come in to lecture or discussion, rather participate remotely. If an instructor falls ill, we will either provide lecture/discussion remotely via Zoom, or find an acceptable substitute to cover the lecture.

#### **E. TEXTBOOKS**

Berta, A., J.L. Sumich, and K.M. Kovacs 2015. Marine Mammals: Evolutionary Biology. 3<sup>rd</sup> Edition. Academic Press; link to online version of textbook (from UCSD network)

<https://www.sciencedirect.com/science/book/9780123970022>

Encyclopedia of Marine Mammals. 3<sup>rd</sup> Edition, 2018. B. Würsig, J.G.M. Thewissen, and K. M. Kovacs (editors). Academic Press; link to online version (from UCSD network)

<https://www.sciencedirect.com/book/9780128043271/encyclopedia-of-marine-mammals>

#### **F. GRADE**

20% Discussion participation, 20% Weekly Quizzes; 30% Term Paper; 30% Final Exam

Discussion Participation (10 pts/week).....	90 points
Weekly Quiz (10 points/week) .....	90 points
Term Paper (point breakdown below).....	135 points
Final Exam .....	135 points
<b>Total.....</b>	<b>450 points</b>

## G. SCHEDULE OF LECTURES

Week	Date	Topic	Instructor
1	6-Jan	Introduction to Course; Oceanography	DK
1	8-Jan	Marine Environment as a Selective Force for Secondary Marine Forms	SBP
2	13-Jan	Cetacean Taxonomy and Classification / Systematics and Evolution	DK
2	15-Jan	Pinniped and Sirenian Taxonomy and Classification	DK
2	<b>17-Jan</b>	<b>Term Paper Topic due</b>	
3	<b>20-Jan</b>	<b>Martin Luther King Jr. Day</b>	
3	22-Jan	Pinniped Systematics and Evolution	DK
4	27-Jan	Marine Mammal Biogeography, Mustelids, Ursus	SBP
4	29-Jan	Anatomy & Locomotion	SBP
<b>4</b>	<b>31-Jan</b>	<b>Term paper outline due</b>	
5	3-Feb	Diving & Energetics	SBP
5	5-Feb	Thermoregulation & Osmoregulation	SBP
6	10-Feb	Sensory Systems - Vision	DK
6	12-Feb	Sensory Systems - Sound	SBP
7	<b>17-Feb</b>	<b>Presidents' Day</b>	
7	19-Feb	Cetacean Acoustics	SBP
<b>7</b>	<b>21-Feb</b>	<b>Term paper draft due for peer review</b>	
8	24-Feb	Behavior & Social Systems	DK
8	26-Feb	Mating, Life History & Population Dynamics	DK
<b>8</b>	<b>28-Feb</b>	<b>Term paper peer reviews due</b>	
9	3-Mar	Seal Harvest	DK
9	5-Mar	Whaling & Bycatch	DK
<b>9</b>	<b>7-Mar</b>	<b>Term paper due</b>	
10	10-Mar	Disease & Pollution (incl. Noise)	SBP
10	12-Mar	Climate Change Impacts	SBP
<b>Final</b>	<b>17-Mar</b>	<b>Final exam – 11:30a-2:29p</b>	

## **H. TERM PAPER**

Your term paper, a review paper, should be a concise, comprehensive synthesis of the primary literature on a topic relating to marine mammals. It should thoroughly review your topic and include the most significant references. Your paper may address a scientific, management, or conservation issue, or provide a summary of what is known about a particular species or group. A list of example topics is given below but we encourage you to develop your own ideas for a topic that aligns with your interests. As one of the goals of this assignment is to help you become familiar with using primary literature, your sources must be published in peer-reviewed scientific journals or monographs.

### **Requirements**

The text of the paper must be between 5-7 pages in length, double-spaced, and typed in 12-point Times New Roman font.

At least two tables and/ or figures are required. These can be replicated from a cited paper or created by the student). These should be placed at the end of the paper, before the reference list. Each table or figure needs a caption, citation, and an in-text reference.

A 'Literature Cited' reference list is mandatory. References must be formatted as in the journal MARINE MAMMAL SCIENCE (see under [reference list in guide for authors](#) of the journal for more details). This reference list is not included in the 5-7 page requirement.

At least 10 sources from the primary literature should be used and cited. Literature must be original research published in peer-reviewed scientific journals or monographs. Lectures or websites are NOT appropriate sources for this paper.

All submissions will be made through the Canvas class site.

### **Grading**

Grades will be based on both content, structure and on the clarity of the writing. Papers will be graded on a scale of 0-135 points based on the criteria set forth in the Term Paper Grading Rubric, see below.

### **Plagiarism**

Students agree that by taking this course all required papers will be subject to submission for textual similarity review to Turnitin.com for the detection of plagiarism. All submitted papers will be included as source documents in the Turnitin.com reference database solely for the purpose of detecting plagiarism of such papers. Use of the Turnitin.com service is subject to the terms of use agreement posted on the Turnitin.com site.

***We will not allow for plagiarism of any kind and if found in the final paper it will result in -25 points on the assignment.***

### **Late Submission Penalties**

Submissions after each deadline (11:59pm PST), will incur a late submission penalty of -5 points for each day.

## **I. OTHER**

**Social Integrity:** This class and UCSD are an inclusive environment. We are dedicated to fostering respect for all people.

**Academic Integrity:** Integrity of scholarship is essential for an academic community. For students, this means that all academic work will be done by the individual to whom it is assigned, without unauthorized aid of any kind. All suspicions of integrity violation will be reported to the Academic Integrity Office according to university policy. Integrity violation is not just blatant cheating (e.g., copying off another student during an exam), but include copying other students' papers or homework, copying or using old papers/report, using another student's clicker in class, working with others on individual assignments. Those students found to have committed academic misconduct will face administrative sanctions imposed by their college Dean of Student Affairs and will also face consequences for this course, which may range in severity from an F on the exam or an F in the course. Students who assist in or are complicit with cheating could also be in violation of the Policy. Thus, students who become aware of their peers either facilitating academic misconduct or committing it should report their suspicions to us for investigation. For more information on academic integrity please refer to The Policy on Integrity of Scholarship ([academicintegrity.ucsd.edu](http://academicintegrity.ucsd.edu)).

## **J. IMPORTANT DATES:**

- January 17** Term Paper Topic  
Submit proposed paper topic (1-2 sentences, including a tentative title).
- January 31** Term Paper Outline  
Submit an outline of the paper with bullet points per subsection, including a list of references (1- 2 pages total).
- February 21** Term Paper Final Draft  
Provide a complete and final draft of the term paper for peer review.
- February 28** Peer Review  
Peer review two papers of your fellow students.
- March 7** Final Paper  
Submit final draft of term paper after revision.
- March 17** Final Exam, Monday, 11.30 am – 2.29 pm

## **K. SAMPLE PAPER TOPICS (STUDENTS ARE ENCOURAGED TO CREATE THEIR OWN)**

### **Taxonomy and Systematics**

- How has our understanding of marine mammal taxonomy changed over time? Discuss new techniques and types of data that have had a big impact on our understanding of marine mammal taxonomy/systematics.

### **Evolution**

- What is the evolutionary history of modern-day sperm whales? Beaked whales? Ice breeding phocid seals?
- Compare and contrast evolutionary adaptations of marine mammals to the ocean environment with those of other secondary marine forms (marine reptiles, marine birds).
- Why did the “:insert taxon:” go extinct? (e.g. Steller’s Sea Cow, Caribbean Monk Seal)

### **Oceanography and Ecology**

- Are killer whales responsible for sequential megafaunal collapse of other marine mammals in Alaskan waters? (and/or elsewhere)
- What is the krill surplus hypothesis and what evidence exist to support or refute it?
- How do marine mammals compete with commercial fisheries?

### **Biogeography**

- Compare distribution patterns among pinnipeds and possible explanations for why these patterns exist.
- Why are some marine mammal species globally distributed whereas others are very localized?

### **Sensory Systems**

- Compare a certain sensory system (e.g. vision or hearing) across taxa (e.g. pinnipeds vs. cetaceans, baleen v. toothed whales; eared v. earless seals).

### **Anatomy**

- Describe convergent evolution of Carnivora and Cetacea to life in the marine environment.

### **Locomotion**

- Explore the physics and physiology of cetacean movement through water. How is anatomy linked to locomotion?

### **Diving Physiology**

- Compare diving adaptations of shallow-water and deep-diving species.
- What adaptations do deep-diving animals have for surviving under extreme conditions?

### **Health**

- What are major disease threats to pinniped populations? How are these related to their amphibious lifestyle?
- What are the possible health effects of long-term exposure to chemical pollutants (via direct exposure or consumption in prey)?
- What effects are caused by stress from anthropogenic interaction (e.g. dolphin/tuna fishery interactions, fishing gear entanglement, ship avoidance)

### **Acoustics Biosonar and Communication (Odontocetes or Mysticetes)**

- How do Mysticetes generate and use sound?
- Compare and contrast biosonar of multiple odontocete species.
- How do members of one pinniped family use acoustic communication for aspects of their survival and reproduction?

### **Whaling: Past, Present, and Future**

- Why aren't all whales recovering from commercial whaling?
- What is known about illegal whaling?
- What whaling (or pinniped harvesting) operations are currently ongoing and legally allowed?
- What is the history of pinniped harvesting in North America (or in the Antarctic), how did it impact pinniped populations, and are those populations fully recovered today?
- What types of non-commercial marine mammal hunting occur today, where, for what purpose?

### **Behavior and Social Systems**

- Compare and contrast different social systems that exist in marine mammal populations.
- What is known about the behavior and social system of “:insert taxon:”? (e.g. bottlenose dolphins, killer whales, sea lions, sperm whales)
- How does human activity disrupt normal marine mammal behavior and/or social systems?

### **Why do baleen whales migrate?**

- Compare and contrast migrations among different species.

### **Impacts of Anthropogenic Sound**

- What is known about the impacts of Navy sonar on marine mammals?
- How might changes in ambient noise impact cetacean populations (e.g. increased ship noise and/or seismic exploration and extraction)?

### **Conservation: Bycatch and Indirect Effects**

- What are the threats to Vaquita and what is being done to address those?
- Why did the Yangtze River Dolphin go extinct and what lessons can we learn from this loss?
- Why are Hawaiian Monk Seals critically endangered and what is being done to recover them?

### **Climate Change**

- In what ways could climate change impact marine mammals and do we see potential evidence of these impacts today?
- How might long-term changes in sea ice affect marine mammals in the Arctic or Antarctic? Consider both direct and indirect effects of sea ice on marine mammal species.

### **Legislation and Ecosystem-based Approaches to Conservation**

- How are marine mammals currently managed in the US? How does that compare with other countries worldwide?
- Are there success stories of ecosystem-based approaches to conserving marine mammals anywhere in the world?

## L. PAPER RUBRIC: POINT BREAKDOWN

Topic: 10 points

Outline: 20 points

Rough Draft: 35 points

Peer Review: 20 points

Final Paper: 50 points

**Total: 135 points**

### Rubric

Criteria	Deficient	Good	Very Good
<b>Structure</b>			
<i>Subheadings</i>	Paper does not contain subheadings	Paper contains reasonable subheadings	Paper contains particularly engaging subheadings; clear thought has been put into choice of headings
<i>2 Points:</i>	0	1	2
<i>Appropriate length</i>	Paper is over or under 5-7 pages	Paper is 5-7 pages	
<i>2 Points</i>	0	2	
<i>Flow of the paper</i>	Ordering of subsections and/or material does not make sense and impedes the reader's understanding	Paper shows some consideration for the order of topics and has a generally logical flow	Paper flows exceptionally well. Significant thought has been put into the ordering of topics and subtopics in a way that is pleasant to read.
<i>2 Points</i>	0	1	2
<i>Formatting</i>	Paper is not double spaced, 12-point font (Times New Roman)	Paper is written in double-spaced, 12-point Times New Roman	
<i>1 Points</i>	0	1	
<b>Clarity of Writing</b>			
<i>Concise writing</i>	Writing is not concise. Run-on or rambling sentences may be present.	Writing is appropriately concise and does not impede understanding	Writing is - straightforward, clear, and compelling. Sentence structures are varied and interesting.
<i>3 Points</i>	1	2	3
<i>Grammatical Errors</i>	Paper contains many errors in grammar that impede the flow of reading	Paper contains some minor grammatical errors that do not impede reading	Paper contains no grammatical errors
<i>3 Points</i>	1	2	3
<b>Content</b>			
<i>Clarity of Purpose</i>	Central idea and clarity of purpose are absent or incompletely expanded.	The central idea is expressed though it may be vague or too broad; Some sense of purpose is maintained throughout	Central idea is well- developed and clarity purpose is exhibited throughout the paper
<i>8 Points</i>	4	6	8
<i>Critical and Original Thought</i>	Little or no evidence of critical, careful thought, analysis and/or insight	Some evidence of critical, careful thought, analysis and/or insight	Abundance of evidence of critical, careful thought, analysis and/or insight
<i>8 Points</i>	4	6	8



<i>Supporting Evidence</i>	Little supporting evidence is provided, or supporting evidence is not relevant.	Supporting evidence is good and relevant, but general.	Supporting evidence is abundant, relevant, and specific.
<i>8 Points</i>	4	6	8
<i>Appropriate Topic</i>	Paper is not focused on marine mammals	Paper is well-focused on marine mammals	
<i>2 Points</i>	1	2	
<b>Figures/ Tables</b>			
<i>Clarity</i>	Figures and tables presented are unclear or not useful to the paper.	Figures/tables are clear and aid in understanding of the paper	Figures/tables are exceptionally well- presented, and add significantly to the paper
<i>2 Points</i>	0	1	2
<i>Citation</i>	Student does not cite, or cites incorrectly, the tables/figures used	Student correctly cites the tables/figures used in the caption	
<i>1 Point</i>	0	1	
<i>In-text references</i>	Figures/tables are not cited, or incorrectly cited, in the text	Figures/tables are correctly cited in the text	
<i>1 Point</i>	0	1	
<i>Correct number</i>	Student does not have 2 tables and/or figures from primary literature	Student has 2 tables and/or figures from primary literature	
<i>1 Point</i>	0	1	
<b>References</b>			
<i>Appropriate citation of references</i>	In-text references are not cited in the correct format and/or some references included are not cited in the text	All included references are cited in the text, in the correct format	
<i>2 Points</i>	0	2	
<i>Number of references</i>	Student has less than 10 references	Student has 10 or more references	
<i>1 Point</i>	0	1	
<i>Appropriate references</i>	Students has some references that are not from primary literature sources	All references are from primary literature sources	
<i>2 Points</i>	0	2	
<i>Correctly formatted references</i>	References are not in the correct format (Marine Mammal Science)	References are in the correct format	
<i>1 Point</i>	0	1	