

Tropical Marine Biological Research

Summer 2018

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- Dates:** June 25 – July 13: Tropical Marine Organismal Biological Research (BIOL437A) 6 cr
July 14 – July 27: Tropical Marine Ecological Research (BIOL 437B) 6 cr
- Pre-requisite:** BIOL397A, BIOL437A is a co-requisite for BIOL437 B,
BIOL437B is a co-requisite for BIOL437A
- Location:** Unidad Pichilingue, La Paz, Baja California Sur, México
- Coordinator:** Alejandro Acevedo (email: acevedo@biol.wwu.edu, phone: 650-3653)

You will learn to conduct marine biological research in different tropical habitats from Western Washington University (WWU) and Universidad Autónoma de Baja California Sur (UABCS) faculty. The course will be based at the Unidad Pichilingue, B.C.S., México.

Course Aims

- 1) You will enhance your science process skills in preparation of a career as a scientist: identifying appropriate sources of information; gathering, synthesizing and critically evaluating knowledge; thinking analytically and conceiving scientific questions; designing a research project, including questions, hypotheses, predictions, methods and statistical analyses; collecting and analyzing data; communicating ideas and results concisely and effectively in written and oral form; and working in collaboration with others to integrate knowledge into a coherent body of work.
- 2) You will construct knowledge about the biology and ecology of tropical organisms.
- 3) You will learn to work and interact with students from a different country, culture, and background.

We will use innovative teaching techniques fulfill these aims.

In the classroom you will:

- Participate in activities to share your ideas on key concepts, obtain experimental or observational evidence to test your ideas, and infer conclusions from your evidence.
- Work in randomly-assigned groups to construct your own knowledge.
- Prepare concept maps to identify the theoretical framework of published research and develop your research ideas within an appropriate framework.
- Be actively engaged in brief lectures to learn the most relevant information and current research.

In the lab and field you will:

- Prepare species lists of key tropical habitats from visual and photographic surveys.
- Complete guided physiological, genetic, and behavioral studies on tropical marine organisms.
- In collaboration with other classmates, conceive, develop, complete, and present orally and in writing an independent research project.

Course Description

You should view this course as an apprenticeship in marine biological research, and we will treat you as the fledging scientist that you are. The course will rely on class activities, discussions, laboratory experiments, and field projects. You will engage in extensive independent work, with faculty as your mentors and guides.

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The Gulf of California and the Pichilingue Research Institution are an excellent setting for this course. Many diverse and rich marine habitats are easily accessed from the facilities, and provide the opportunity to conduct tropical marine biological research through direct observations and research. The facilities allow for both field and laboratory projects.

Provided References

- Copies of research papers. (Distributed by faculty.)
- Kerstitch, A. & Bertsch, H. 2007. Sea of Cortez Marine Invertebrates 2nd edn (revised). Sea Challengers, Gif Harbor, WA.
- Levinton, J. S. 2017. Marine Biology. Function, Biodiversity, Ecology. 5th edition. Oxford University Press. ISBN-13: 978-0190625276
- Steinbeck, J. The Log from the Sea of Cortez.
- Thomson, D. A., Findley, L. T. & Kerstitch, A. N. 2000. Reef Fishes of the Sea of Cortez: The Rocky-Shore Fishes of the Gulf of California (revised edition). University of Texas Press, Austin, TX.

Evaluation and Grading

BIOL437A

- Scientific questions and hypotheses of observed patterns*: Cantamar, Calerita, Balandra, Bahia Magdalena, Cabo Pulmo (due July 10th) 15 %
- Species list*: Cantamar, Calerita, Balandra, Bahia Magdalena, Cabo Pulmo (due July 10th) 10 %
- Photo evidence*: Cantamar, Calerita, Balandra, Bahia Magdalena, Cabo Pulmo (due July 10th) 10 %
- Paper on one guided project (due July 11h, 14th or 20th) 30 %
- Concept maps for each guided project (due July 5th, 8th or 14th) 10 %
- Individual review of classmates' guided project (due July 8th, 11th or 17th) 10 %
- Participation, includes attendance and completing ungraded assignments: 15 %
 - Analysis of habitat observations (due June 30th)
 - Scientific questions (due June 30th)
 - Choice of guided project paper to write (due June 30th)
 - Draft paper of one guided project (due July 6th, 9th or 15th)

BIOL437B

- Concept map and proposal of independent project* (due July 16th) 15 %
- Independent project presentation* (due July 24th) 30 %
- Independent project paper* (due July 26th) 40 %
- Participation, includes performance in activities and attendance 15 %

**Group assignments for which individual effort will be taken into account when assigning grades.*

Grading Scale

95% or greater:	A	78-81%:	B-	66-68%:	D+
90-94%:	A-	75-77%:	C+	63-65%:	D
86-89%:	B+	72-74%:	C	60-62%:	D-
82-85%:	B	69-71%:	C-	below 60%:	F

Given the collaborative nature of the class attendance is MANDATORY and assignments will not be received after the DUE date and time.

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Course Aim	Learning Objective	Indicators of Performance (assessment for learning)	Evaluators of Performance (summative assessment)
Development of science process skills	Students will gather, synthesize, and critically evaluate knowledge.	-Whiteboards; discussions; draft paper of guided project.	- <i>Concept map and paper of guided project.</i> - <i>Review of peer's guided project.</i> - <i>Concept map & proposal of independent project.</i> - <i>Paper and presentation of independent project.</i>
	Students will think analytically, develop scientific questions, and design a research project.	-Whiteboards; discussions; self-assessment; concept map of scientific reading; draft paper of independent project.	- <i>Scientific questions from habitat surveys</i> - <i>Concept map and paper of guided project.</i> - <i>Concept map & proposal of independent project.</i> - <i>Paper and presentation of independent project.</i>
	Students will collect and analyze data.	-Whiteboards; discussions; lab experiments; field observations.	- <i>Species list and photo evidence.</i> - <i>Concept map and paper of guided project.</i> - <i>Paper and presentation of independent project.</i>
	Students will communicate ideas concisely and effectively in both written and oral forms.	-Whiteboards; discussions; concept map of scientific reading; draft paper of independent project.	- <i>Scientific questions from habitat surveys</i> - <i>Concept map and paper of guided project.</i> - <i>Review of peer's guided project.</i> - <i>Concept map & proposal of independent project.</i> - <i>Paper and presentation of independent project.</i>
	Students will work in collaboration with others to integrate knowledge into a coherent body of work.	-Whiteboards; discussions; self-assessment; lab experiments; field observations.	- <i>Scientific questions from habitat surveys</i> - <i>Attendance and participation.</i> - <i>Species list and photo evidence.</i> - <i>Paper and presentation of independent project.</i>
Knowledge of tropical marine biology	You will describe the organisms found in tropical marine habitats.	-Whiteboards; discussions; lab experiments; field observations; analysis and presentation of diversity study	- <i>Species list.</i> - <i>Photo evidence of species list.</i>
	You will understand the influence of key factors on the physiological performance of tropical marine organisms.	-Whiteboards; discussions; lab experiments; draft paper of guided project.	- <i>Concept map of guided project.</i> - <i>Paper of guided project.</i> - <i>Review of peer's guided project.</i>
	You will understand the transfer of genetic information in tropical marine organisms.	-Whiteboards; discussions; lab experiments; draft paper of guided project.	- <i>Concept map of guided project.</i> - <i>Paper of guided project.</i> - <i>Review of peer's guided project.</i>
	You will describe the interaction between behavior and environment in tropical marine organisms.	-Whiteboards; discussions; lab experiments; draft paper of guided project.	- <i>Concept map of guided project.</i> - <i>Paper of guided project.</i> - <i>Review of peer's guided project.</i>
	You will understand the relationships between tropical marine organisms and their environment.	-Whiteboards; discussions; lab experiments; field observations; draft paper of guided project.	- <i>Species list and photo evidence.</i> - <i>Concept map and paper of guided project.</i> - <i>Review of peer's guided project.</i> - <i>Concept map & proposal of independent project.</i> - <i>Paper and presentation of independent project.</i>

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Biology Department Learning Goals and Objectives

The Biology department has identified content and practices learning goals, with associated learning objectives, that all biology students should attain by the end of their education at WWU. The goals specifically addressed in this class are:

Science Content Goals

- Our students will acquire in-depth knowledge from the major areas of biology and be able to integrate principles from these areas. They will be able to explain and apply their understanding of the:
 - relationship between structure and function at all levels: molecular, cellular, and organismal.
 - importance of evolutionary theory as a unifying principle of biology.
 - cellular basis for physiological processes
 - interactions between organisms and their abiotic and biotic environment.
- Our students will gain lab and field skills needed to answer biological questions. They will be able to:
 - perform a variety of lab techniques.
 - perform a variety of field techniques.
 - design a biological study and statistically analyze data.

Science Practices Goals

- Our students will develop critical thinking skills. They will be able to:
 - identify questions that can be addressed scientifically.
 - interpret data and draw conclusions from experiments.
 - demonstrate the ability to read, understand, and critically review scientific papers.
- Our students will develop effective quantitative reasoning skills. They will be able to:
 - use mathematical equations to represent and explain biological phenomena.
 - use mathematical equations and models to predict biological outcomes.
- Our students will communicate precisely and analytically in written and oral forms. They will be able to:
 - discuss biological processes using precise scientific terminology.
 - prepare written and oral reports in standard scientific formats.
- Our students will engage independently and collaboratively in the scientific process. They will be able to:
 - apply the scientific process, including designing and conducting experiments and examining hypotheses.
 - acquire the laboratory and/or field skills necessary to perform laboratory exercises and experiments.
 - place their research in a broader scientific context based on current literature.
 - evaluate the work of their peers.

Instructor Responsibilities

We are responsible for teaching you about tropical marine biology and the process of science. You should expect the following from us:

1. Clear learning objectives and criteria needed to succeed in the class: sharing learning objectives for the day and examples of prior student assignments.
2. Innovative learning activities that allow you to construct and expand your understanding of tropical marine biology and the process of science, and elicit evidence of learning: collaborative activities, white-boarding, classroom discussions, critical-thinking questions, and training assignments.
3. A supportive learning environment and instructors that care deeply about whether you learn the material, stimulate your interest and motivate you: positive, engaging, and friendly classroom atmosphere; and constructive, timely and productive feedback on your work.
4. Opportunities for you to become a learning resource to one another: reviewing the work of classmates.
5. Opportunities to monitor your own learning and become aware of your understanding: self-assessment of the learning objectives and big ideas of the class.

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Student Responsibilities

There are both personal and intellectual responsibilities for students. First, you will live in a foreign country in close quarters with other students. This requires that you are mature, considerate, and congenial. Second, this is an upper-division, intellectually-challenging course. This requires that you participate in course activities, work hard and effectively by yourself and with others, think critically, develop your own ideas and opinions, and share your ideas in both written and oral forms.

Shared responsibilities in the classroom:

	Where the learner is going	Where the learner is	How to get there
Teacher	1. Clarification of learning objectives and criteria needed to succeed in the class, including why it is important to learn it.	2. Engineering innovative learning activities that allow learner to construct knowledge and elicit evidence of learning.	3. Providing a supportive learning environment and constructive feedback that moves learner forward.
Peer	4. Activating students as learning resources for one another, including providing constructive feedback and encouragement.		
Learner	5. Becoming owner of her/his own learning, including being motivated, curious and responsible.		

You need to behave appropriately throughout the course to receive a grade in the class.

Inclusiveness and Respect

You are encouraged to speak up and participate during class. Because the class will represent a diversity of individual beliefs, backgrounds, and experiences, each one of us will respect, appreciate, and embrace every other member of this class.

We are firmly committed to diversity and equality in all areas of life. In this class, we will work to promote an inclusive environment where everyone feels safe and welcome. We recognize that discrimination can be direct or indirect and take place at both institutional and personal levels. We believe that such discrimination is unacceptable and we are committed to providing equality of opportunity for all by eliminating any and all discrimination, harassment, bullying, or victimization. The success of this policy relies on the support and understanding of everyone in this class. We all have a responsibility not to be offensive to each other, or to participate in, or condone harassment or discrimination of any kind. Without failing to speak up, we also have the opportunity to think the best of everyone and give one another the benefit of the doubt.

Equal Opportunity Rights

You have the right to an educational experience that is free from illegal harassment or discrimination on the basis of race, color, creed, religion, national origin, sex, disability, age, veteran status, sexual orientation, gender identity or expression, marital status or genetic information. If you believe you have experienced harassment or discrimination, inform your instructor or Western's Equal Opportunity Office as soon as possible. The Equal Opportunity Office may be reached at eo@wwu.edu or (360) 650-3307.

Intellectual Honesty

Science is based on trust. If a scientist states that she carried out a particular study and obtained certain results, the rest of us trust that she did such thing. This is one reason why there is no tolerance for people who are not intellectually honest, and this class will be no exception. <https://wp.wwu.edu/academichonesty/>

From WWU's web site: Plagiarism is presenting as one's own in whole or in part the argument, language, creations, conclusions, or scientific data of another without explicit acknowledgement. Examples include but are not limited to:

- Using another person's written or spoken words.
- Using information from a World Wide Web site, CD-ROM or other electronic sources.

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- Using statistics, graphs, charts and facts without acknowledging the source of the ideas.
- Paraphrasing, which is using someone else's argument without acknowledging the source by imitating the argument using other words.

Resources for Student:

- [Understanding and Avoiding Plagiarism](#)
- [The Student's Guide to Avoiding Plagiarism](#) (pdf), WWU Dept. of Sociology Student Writing Guide.
- [What is Academic Integrity?](#)

Changes might be made to the syllabus along the course. These changes will be announced in advance.