

## MSL 320: Aquatic Ecology 3 credits

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**Instructor: Dr. Sarah L. Mincks**

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Office: 233 Irving II

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**Class Meetings: T / Th 2:00 - 3:30**

Prerequisites: BIOL F115, 116 or MSL 211, 212

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### **Catalog Description**

An introduction to the relationship between marine species and their environment with an emphasis on biological interactions and environmental factors that structure marine communities.

### **Course goal**

After taking this course, students will be able to articulate the ecological processes that structure marine communities.

### **Learning Objectives**

1. Interpret theories regarding marine ecological interactions
2. Discuss theories of evolution and their application in marine communities
3. Describe the flow of energy and organic material through marine ecosystems
4. Compare and contrast the roles of abiotic and biotic factors in shaping the distribution of marine organisms and assembly of marine communities.
5. Quantify factors that contribute to marine population variation.
6. Examine the role of inter- and intra-specific interactions in assembly of marine communities
7. Assess methods of diversity estimation and their application in marine habitats.
8. Develop and apply critical thinking skills in evaluating ecological models, and current topics in marine ecology.
9. Discuss current topics and issues in marine ecology.

### **Course Requirements and Instructional Methods**

This class will use multiple modes of learning, including: lectures, class discussions, assignments, and by reading and critiquing peer-reviewed scientific literature on current topics in marine ecology. Lectures will be delivered remotely via zoom during the scheduled class period. Lectures will not be routinely recorded, but can be recorded on request if students have a legitimate reason for missing class (e.g., illness, internet connectivity problems).

### ***Quantifying Ecological Processes***

Many of the ecological principles we cover in this course rely on mathematical methods/models for determining the mechanistic links between organisms and their environment. Throughout the semester, special attention will be given to the quantitative methods used in ecology. During lecture, we will practice quantitative approaches specific to the topic at hand. The exams will include questions that involve application of these quantitative approaches.

### ***Readings***

There is no required textbook for this course. Rather, lectures will rely heavily on material from the primary scientific literature. For each lecture / topic, **supporting readings** may be assigned that will include review papers from scientific journals and/or book chapters. Readings will be posted via Google

Classroom. A bibliography will be maintained as a Google doc accessible to all so that students may refer back to case studies or other articles referenced in lecture or discussion. The ability to acquire and synthesize information from scientific research papers is an important goal of this course and an essential skill for a career in the life sciences.

**Group Discussions (12 at 10 pts each, 120 pts total)**

Group discussions of the scientific literature will be held during class, as described below. These discussions will center around “case studies”, i.e. published examples illustrating concepts presented in lectures. *You are expected to be prepared and come to discussion having read the assigned articles carefully.* These sessions are meant to help you hone your critical thinking skills and explore topics more deeply. Do your best to identify the central message of each paper, and don’t be afraid to ask questions during the discussion.

We will discuss one to two readings from the primary literature at each discussion session. Most readings will be selected by the instructor, but students may also be asked to select papers on occasion. The group discussions will be student-led, and the lead student presenter will rotate weekly. Readings will be distributed at least one week in advance. Points will be awarded according to the following rubric:

Score	Criteria
10 pts	Actively engaged, asking questions and speaking multiple times during discussions, demonstrating thorough reading of the material
8 pts	Engaged, speaking during discussion, demonstrating some familiarity with the reading materials
6 pts	Somewhat engaged, speaks only when called upon during discussion, demonstrates only cursory reading of the material
4 pts	Not engaged, mostly silent, difficulty answering questions when called upon, has not read all material
2 pts	Present, but silent during discussion; unprepared
0	Absent

To help you to prepare for discussions, ask yourself the following questions:

- Why was this reading assigned? What is the relevance to the recent lecture topics? Does this paper add any new information not covered in lectures?
- What is the purpose of the paper? Is the purpose clearly stated? Justified?
- Are the methods sound? Are they appropriate to the hypothesis stated? What would you do differently? What assumptions are inherent in the methods? Are these assumptions reasonable/acceptable/justified?
- What are the key results? Do they address the stated hypothesis and/or objectives? Was the hypothesis accepted/rejected? Do the figures present the results clearly? Identify figures that are especially useful in conveying the important findings—What do they tell you?

- Do the conclusions follow from the results? How do they fit into the broader context of other work done in the field? Are there broader implications for the field of marine science/biology/fisheries? Are there any major questions suggested by the findings?
- Was the paper easy to follow? Why or why not? Was there information missing that would have helped clarify any aspect of the study?

### **Exams**

Two **midterms (100 pts)** and one **final exam (150 pts)** will be given during the course. The exams will be take-home, open-book short essay questions. The final exam will include material presented throughout the semester, but will be weighted more heavily toward material covered after the second midterm. Exams will focus on material covered in lectures, thus it is imperative that you attend lectures. Given that exams are take-home, late papers will NOT be accepted. However, if students become seriously ill they should notify the instructor as soon as possible and alternative arrangements should be made.

### **Evaluation and Grading**

Final semester grades will be assigned according to the following scale (fractions will be rounded up to the nearest whole number):

#### **Course point breakdown:**

12 Case Study Discussions (10 pts each)	120
Presentation	30
Midterm 1	100
Midterm 2	100
Final	150
<b>Total</b>	<b>500</b>

Final grades will be awarded according to the following criteria:

A+ 98-100%	A 93-97%	A- 90-92%
B+ 87-89%	B 83-86%	B- 80-82%
C+ 77-79%	C 73-76%	C- 70-72%
D+ 67-69%	D 63-66%	D- 60-62%
F <60%		

We follow the University of Alaska Fairbanks Incomplete Grade Policy: "The letter "I" (Incomplete) is a temporary grade used to indicate that the student has satisfactorily completed (C or better) the majority of work in a course but for personal reasons beyond the student's control, such as sickness, has not been able to complete the course during the regular semester. Negligence or indifference are not acceptable reasons for an "I" grade."

## Course Schedule

Course themes	Theme	Week	Day	Lecture topic	Quantitative approaches
<b>Introduction</b>	Web of Life	1	T	Course intro and overview; scientific method	
			Th	Basic principles: levels of organization	
<b>Organisms and their environment</b>	Physical Environment	2	T	Physical Environment	
			Th	Aquatic Biomes	
	Ecological Physiology	3	T	Ecophysiology	<b>Q10</b>
			Th	Ocean Change Physiology	
<b>Evolutionary Ecology</b>	Evolution and ecology	4	T	Evolution and Ecology; Climate and Human Impacts on Evolution	<b>Hardy-Weinberg Equation</b>
			Th	Diversity and Evolution of Aquatic Life-History Strategies	
		5	T	Behavioral Ecology	
			Th	<b>Midterm 1</b>	
<b>Populations</b>	Population distribution and dynamics	6	T	Population Distribution and Abundance	
			Th	Aquatic Population Dynamics	<b>Exponential growth</b>
<b>Biotic Interactions</b>	Predation/competition	7	T	Predation effects in aquatic systems	
			Th	Competition	<b>Lotka-Volterra competition model</b>
	Parasitism/mutualism/commensalism	8	T	Parasitism and Disease	
			Th	Mutualism and Commensalism	
<b>Communities</b>	Communities	9	T	Drivers of community structure	<b>Diversity Indices</b>
			Th	Foundation vs Keystone Species; Interaction strength	<b>Interaction strength</b>
	Dispersal/settlement	10	T	Dispersal and recruitment impacts on community structure	
			Th	The role of disturbance in community structure	
			T	Habitat loss	
			Th	<b>Midterm 2</b>	
<b>Ecosystems</b>	Biogeography	12	T	Quantifying species diversity across spatial scales	<b>Species area curves</b>
			Th	Principles of biogeography	

Species diversity	13	T	Global patterns in biodiversity; Latitudinal and bathymetric gradients	
		Th	Facilitation, habitat complexity, environmental stress	
Production/ chemosynthesis	14	T	Primary and secondary production (including chemosynthesis)	
		Th	Structure of Aquatic Food Webs; Methods in Food Web Studies	
Nutrient supply/cycling	15	T	Benthic-pelagic coupling	
		Th	Nutrient cycles and Aquatic Microbes	
Energy flow/food webs	16	T	Ecosystem services	<b>Bio-accumulation</b>
		Th	Design of marine reserve areas	
			<b>FINAL EXAM</b>	

### Course Policies

**(1) Attendance:** Students will not be penalized for poor attendance; however, students are expected to attend all scheduled classes and will be held responsible for all material presented in lecture, discussion, and assigned readings. Students who miss class should work with classmates to obtain missed material; the instructor will not be responsible for providing lecture notes. Lectures will be presented using PowerPoint and copies of slides will be made available after lecture. It is important to note that these slides contain only an outline of the material covered; you are unlikely to be successful in this course if you fail to attend class and take notes.

Please note that in-class activities such as discussions can't be made up, regardless of the reason for missing class (except under circumstances listed above under the exam section).

**(2) Support and Disability Services:** The Office of Disability Services can be reached by phone- (907) 474-5655, or email- [fydso@uaf.edu](mailto:fydso@uaf.edu), and can be located in WHIT 203 on the UAF campus. The Office of Disability Services is available for students with physical or learning disabilities. If you feel that you are differently abled and need these services, please contact the office or ask the instructor to make arrangements.

**(3) Courtesy:** Please turn off all audible sounds to any electronic devices (phones, laptops, tablets etc.) while in lecture. Refrain from using your laptops for activities not related to lecture during class time, e.g. emailing or browsing the web. Use of these items is strictly prohibited during exams. Students are free to record lectures. You may bring food or drink in the classroom unless otherwise instructed, for example when shared computers are in use.

**(4) Plagiarism and academic integrity:** Plagiarism will not be tolerated in any way during this course. All assignments are expected to consist of students' original ideas and/or information from properly cited published sources. Students may seek assistance with proper referencing of scientific literature from the instructor as needed. Students are expected to conduct themselves according to the UAF Student Code of Conduct, which can be found in the course catalog. Failure to comply with these guidelines will result in a failing grade, and the student may face consequences at the university level, depending on the

severity of the offense. ***We use a program that can identify plagiarism from any internet source, so keep this in mind when contemplating using cut and paste for your assignments.***

**(5) Student protections and services statement:** Every qualified student is welcome in our classroom. As needed, we are happy to work with you, disability services, veterans' services, rural student services, etc. to find reasonable accommodations to support your learning and participation. Students at this university are protected against sexual harassment and discrimination (Title IX), and minors have additional protections. As required, if we notice or are informed of certain types of misconduct, we are required to report it to the appropriate authorities. For more information on your rights as a student and the resources available to you to resolve problems, please go to the following site: [www.uaf.edu/handbook/](http://www.uaf.edu/handbook/).

**(6)** UA is an AA/EO employer and educational institution and prohibits illegal discrimination against any individual: [alaska.edu/nondiscrimination](http://alaska.edu/nondiscrimination).

**(7) Effective communication:** Students who have difficulties with oral presentations and/or writing are strongly encouraged to get help from the UAF Department of Communication's Speaking Center (907-474-5470, [speak@uaf.edu](mailto:speak@uaf.edu)) and the UAF English's Department's Writing Center (907-474-5314, Gruening 8th floor), and/or CTC's Learning Center (604 Barnette st, 907-455- 2860).

**(8)** Students should keep up-to-date on the university's policies, practices, and mandates related to COVID-19 by regularly checking this website:

<https://sites.google.com/alaska.edu/coronavirus/uaf/uaf-students?authuser=0>

Further, students are expected to adhere to the university's policies, practices, and mandates and are subject to disciplinary actions if they do not comply.