

BIOE 158L: Field Methods in Marine Ecology

Tentative Syllabus for Summer 2020

Where: Online

When: Monday, Wednesday 9:00-12:30

Course website: Canvas

Instructor:

Josh Smith LML-COH 255 (JogSmith@ucsc.edu)

Office Hours: M/W 1-3pm (after class, **by appointment only here:**

http://bit.ly/BIOE158L_office_hours)

TA: Dan Wright (dbwright@ucsc.edu)

Office Hours: TBD

Course Objectives:

The purpose of this course is to introduce students both to commonly employed sampling designs and methods, and the diversity of coastal intertidal environments of the Monterey Bay area. The course involves class projects and supervised group research projects. Students will carry out a complete research project, including (1) the formulation of hypotheses, (2) the design and implementation of experiments, (3) collection, analysis, and interpretation of data, and (4) write up and oral presentation. Because participation in this course relies heavily on personal research effort, strong personal motivation to conduct field or lab research will be mandatory for successful completion of the course.

General Schedule:

The first half of this course involves lectures and virtual (online) group labs exploring several environments throughout the Monterey Bay area. The second half of the course involves group independent research and supervisory meetings (by appointment) with instructors.

Evaluation:

Students are evaluated by each of four major criteria:

- (1) participation during lectures and class virtual labs,
- (2) class project reports (in scientific format) during the first half of the class,
- (3) an oral presentation of the group research project.
- (4) write-up of a group research project (in scientific format) to be submitted during finals week.

These four criteria will be weighted as follows:

Class participation 10%

- **Field Notebooks (5%)**
- **Exit Questions (5%)**

Class project reports (2) 20%

Presentations 30%

Group research paper 40%

Lecture Schedule:

June 22	Course introduction, organizational meeting, and lecture on ecosystems of Monterey Bay.	Text Pgs. 1-14
June 24	Dune Vegetation (Project Report #1) Field methods: photoplots and transects	Text Pgs. 15-32
June 29	Seagrass Ecosystems Field methods: drone imagery	Text Pgs. 33-38
July 1	Kelp forests of Monterey Bay (Project Report #2) Field methods: subtidal photoplots and diver video	Text Pgs. 39-54
July 6	Deepwater rocky reefs Field methods: remotely operated vehicles	Text Pgs. 55-65
July 8	Classroom – Questions gallery, data analysis, and intro to independent projects	Text Pgs. 66-85
July 13	Independent Projects and instructor/student meetings	
July 15	Independent Projects and instructor/student meetings	
July 20	Independent Projects and instructor/student meetings	
July 22	Project Presentations	
July 24	Project write-ups due end of the day	

Assignment schedule:

June 24 Field notebook #1 due by midnight.

June 28 Report #1 Sand Dune Vegetation (submitted individually on Canvas, **due Sunday June 28** by midnight).

July 5	Report #2 kelp forests (submitted individually on Canvas, due Sunday July 5 by midnight).
July 10	Field notebook entries #2-4 due by midnight.
July 21	Group project presentation due (one submission per group) on canvas
July 22	In-class group project presentations
July 24	Final project write-ups (one submission per group) due on Canvas by midnight.

Required text book (available electronically):

Strunk, W. and E.B. White. 1979. (the most recent edition) *The Elements of Style*, Allyn & Bacon, Needham Heights, Massachusetts

Required software:

The following programs are required for the course. QGIS, VLC and Fiji are open-source programs (i.e., free!!) and JMP is available through UCSC and is free to students.

- [Zoom](#) – we will use Zoom for our class lectures and meetings.
- [QGIS](#) – we will use this software to analyze spatial data collected from drone imagery
- [VLC media player](#) – available for Mac and PC. We will use this software to analyze video data.
- **ImageJ with point-contact plugin (available on Canvas).** We will use this software to analyze photo quadrats.
- [JMP statistical software.](#) We will use this software to analyze data

Recommended Experimental and sampling design texts include:

- Cox, D.R. 1992. Planning of Experiments
- Hairston, G.H., Jr. 1989. Ecological Experiments: Purpose, Design, and Execution. Scheiner, S.M. and J. Gurevitch (eds). 2001. Design and Analysis of Ecological Experiments. Second Edition
- Underwood, A.J. 1997. Experiments in Ecology.
- Gotelli, N. J. and A. M. Ellison. 2004. A Primer of Ecological Statistics.

Field Notebooks:

One of the most powerful tools of an ecologist is a field notebook. There's no substitute for detailed notes of observations *in situ*, or as they happen in the field. Some of the greatest natural history records were derived from ecologists' field notebooks. Indeed, Darwin wrote *The Origin* based off his detailed field notes from the voyage of the *HMS Beagle*.

There are multiple roles for a field notebook. Notably (pun intended), records of time, weather, general site descriptions, and observations of species behavior can form the backbone

of ecological monitoring. For each site we visit, your objective is to create an accurate written record of your field activities, investigations, observations and thoughts. Field notebooks should contain *at least* the following elements: *date/time (use 24-hour clock format – 1435 for 2:35pm, location (place, lat/long, GPS readings), weather (temperature, cloud types, wind, rain, etc.), habitat (forest, desert, intertidal), sampling strategy (e.g., line UPC, quadrat, etc.), list of species seen, vegetation, general notes.*

Here is an example of what a field notebook entry might look like:

09 July, 2019 Weather: partly cloudy Pg. 6
Start time: 0823 Temp: 17C
End time: 1345
Location: Terrace Point Rocky Intertidal

Habitat: Gentle sloping shale beds exposed to a southwest facing swell. Swell approx. 2-4 ft. Wind approx. 12 kts.

Sampling: UPC in 0.5m quadrats along a 100m transect line at every 5m interval.

Species Observed:

D. imbricata

P. californicus

A. marginata

M. californica

General Notes: The large breaking waves appeared to carve-out channels perpendicular to the water line. These channels revealed distinct vertical stratification patterns. The deeper low low-water line was the most diverse, comprised of mussels, anemones, snails, polychaetes, and various brown algae. The shallow zone was dominated by acorn barnacles. During our survey the tide came in too far to finish the 85-100 meter zones on transect.

Field lab 1: Sand dune vegetation

Our sand dune lab is intended to accomplish four things. First, we want to introduce you to a community and habitat that you may not be familiar with. Coastal sand dunes constitute a very small and reduced (relative to original area) habitat that contains a large number of species. Moreover, the habitat seems very simple – it is sand. Second, we want to introduce you to methods appropriate for sampling this sort of ecological community. Third, we want you to think across spatial and temporal scales and assess this community in the context of hypotheses that we will discuss in class for the maintenance of species diversity. Fourth, we want you to use the data you collect to assess the plausibility of those hypotheses. In this lab, we will collect data from photo-plots collected as part of BIOE 158L’s ongoing long-term monitoring research at

Sunset State Beach. Data collected by our group will be submitted to the State Park to inform conservation and management.

Field lab 2: Seagrass Ecosystems

In this lab, we will be looking at the cover of seagrass (*Zostera marina*) in Tomales Bay, California, using aerial drone imagery. The goal is to get you observing nature looking for patterns and to start thinking about processes that might explain those patterns. Throughout the quarter we will use a variety of methods to quantify the distribution and abundance of organisms living on the surface of a substratum. Describing distributional patterns and the environmental causes of patchiness or gradients is pretty straightforward when species occur on, rather than in, habitats because the individuals are visually apparent. One emergent technology used to sample the distribution and cover of organisms (particularly for seagrasses and kelp canopy) is drone imagery. We will use drone imagery to quantify the cover of seagrass at restored and unrestored sites in order to evaluate both the distribution of seagrass and the efficacy of restoration strategies. Data collected by our group will be used to inform ongoing seagrass restoration research.

Field lab 3: Monterey Bay kelp forests

Kelp forests are one of the most biologically diverse and productive ecosystems in the entire world. In 2014, a widespread sea urchin outbreak shifted Monterey Bay's expansive forests to a patchy mosaic of kelp forests interspersed with sea urchin 'barrens' that are void of kelp. In this lab, we will sample patches of forests and barrens to determine whether the algae and invertebrate assemblages differ between these two fundamental temperate habitats. We will quantify the relative abundances (percent cover or density) of species using uniform point contact (UPC) to estimate percent cover, and quadrats (not quadrants!) to estimate densities. Surveys will be conducted along replicate transects within each habitat type (barren, kelp forest) to characterize community structure.

Field lab 3: Deepwater rocky reefs

California hosts incredible assemblages of invertebrates and fishes in cold deep water (~60-300 meters) rocky reef habitats. However, conducting research in these environments presents substantial challenges because they are beyond the depth limitation of SCUBA. In this lab, we will survey deep water rocky reef fish communities at two locations – Bodega Bay and Catalina Island – using videographic imagery collected by a remotely operated vehicle. The purpose of this lab is to explore the 3-dimmensional structure of the marine environment and to investigate habitat associations. We will also test hypotheses related to the mechanisms that drive latitudinal variation in species diversity.

Class Project Reports:

You will submit two class project reports in the first half of the class. The purpose of these reports is to get you to (1) begin thinking about how to communicate science in formal writing and (2) receive feedback from instructions that you can incorporate into your final class paper. We will lecture on scientific writing on the first day of class and then revisit key concepts on July 10, before you embark on independent data collection. All of the science writing tips are

posted on Canvas, **including a content rubric for how you will be graded on both your project reports and final paper.**

Project Report #1 – Dune vegetation lab

Using the summary graphs provided to you by the facilitators, develop a hypothesis (or a few hypotheses) that describes the relationship between observed species (think about diversity), distance from the beach, and dune slope. Be sure to explicitly state your questions, hypotheses, methods for testing each hypothesis, results, and your interpretation of the results.

Project Report #2 – Kelp forest diversity

Using your understanding of the relationship between species richness and sampling effort, support or refute a hypothesis about a comparison of species richness between kelp forests and sea urchin barrens habitats. Be sure to include (and correctly reference!!) a description of the summary graphs provided to you by the facilitators.

Student Hours

Students are expected to spend a total of 15 hours per week (3 hours per credit) for the five-week course. Approximately 8-hours per week will be spent in-class, and 7-hours outside of class.

Remote Learning Resources

The link below includes useful resources to help students learn and study remotely. Resources include, but are not limited to: Virtual Tools (Zoom, chat, canvas), Loaner Laptop Program, Class Materials, Wifi access points, at-home internet options, and practices for safe computing.

<https://its.ucsc.edu/covid-19/students-remotely.html>

Important Summer Session Remote 2020 Deadlines:

Session 1:

Drop: Monday, June 29

Request for “W”: Friday, July 10

Session 2:

Drop: Monday, August 3

Request for “W”: Friday, August 14

8-Week:

Drop: Monday, July 6

Request for “W”: Friday, July 24

10-Week:

Drop: Monday, July 6

Request for “W”: Friday, July 24

Summer is unique. **You will not be dropped for non-attendance or non-payment.**

You must drop yourself. Dropping before the deadline results in a full-tuition reversal/refund. Withdraw posts a W for the grade and full tuition is charged (no refund).

For all dates and deadlines, including ‘change of grade option’ (P/NP) and grades due, here is the summer academic calendar: <https://summer.ucsc.edu/studentlife/index.html>

For questions about dropping, requesting a W grade for a course, or withdrawing from the summer quarter, email summer@ucsc.edu.

Academic Dishonesty

Academic integrity is the cornerstone of a university education. Academic dishonesty diminishes the university as an institution and all members of the university community. It tarnishes the value of a UCSC degree. All members of the UCSC community have an explicit responsibility to foster an environment of trust, honesty, fairness, respect, and responsibility. All members of the university community are expected to present as their original work only that which is truly their own. All members of the community are expected to report observed instances of cheating, plagiarism, and other forms of academic dishonesty in order to ensure that the integrity of scholarship is valued and preserved at UCSC.

In the event a student is found in violation of the UCSC Academic Integrity policy, he or she may face both academic sanctions imposed by the instructor of record and disciplinary sanctions imposed either by the provost of his or her college or the Academic Tribunal convened to hear the case. Violations of the Academic Integrity policy can result in dismissal from the university and a permanent notation on a student’s transcript.

For the full policy and disciplinary procedures on academic dishonesty, students and instructors should refer to the [Academic Integrity page](#) at the Division of Undergraduate Education.

Disability Resource Center (DRC)

UC Santa Cruz is committed to creating an academic environment that supports its diverse student body. If you are a student with a disability who requires accommodations to achieve equal access in this course, please submit your Accommodation Authorization Letter from the Disability Resource Center (DRC) to me privately during my office hours or by appointment, as soon as possible in the academic quarter, preferably within 1 week. I also encourage you to discuss with me ways we can ensure your full participation in this course. I encourage all students who may benefit to learn about the DRC and the UCSC accommodation process. You can visit the DRC website at drc.ucsc.edu. You can make an appointment and meet in-person with a DRC staff member. The phone number is 831-459-2089, or email drc@ucsc.edu.

DRC Remote Accommodations:

The Disability Resources Center reduces barriers to inclusion and full participation for students with disabilities by providing support to individually determine reasonable academic accommodations. Operations continue via remote appointments. If you have questions or

concerns about exam accommodations or any other disability-related matter, email the DRC Schedulers at drc@ucsc.edu for an appointment.

Title IX:

The university cherishes the free and open exchange of ideas and enlargement of knowledge. To maintain this freedom and openness requires objectivity, mutual trust, and confidence; it requires the absence of coercion, intimidation, or exploitation. The principal responsibility for maintaining these conditions must rest upon those members of the university community who exercise most authority and leadership: faculty, managers, and supervisors.

The university has therefore instituted a number of measures designed to protect its community from sex discrimination, sexual harassment, sexual violence, and other related prohibited conduct. [Information about the Title IX Office](#), the [online reporting link](#), applicable campus resources, reporting responsibilities, the [UC Policy on Sexual Violence and Sexual Harassment](#), and the UC Santa Cruz Procedures for Reporting and Responding to Reports of Sexual Violence and Sexual Harassment can be found at titleix.ucsc.edu.

The Title IX Office is actively responding to reports and requests for consultation. If you are not currently working with someone in the office and want to make a report/request a consult, you can expect the fastest response by using our [online reporting link](#).

For more information please visit the [Title IX Operations under Covid-19](#) page.

CARE

UCSC Campus Advocacy, Resources & Education (CARE) believes that all people deserve to live and engage in an environment free from violence. We believe in promoting an environment where people can learn and work while being safe and healthy. We celebrate the differences on this campus and believe in working collectively to create a community that is free from violence, exploitation, and harassment and instead promotes safety and equity. For an appointment, call 831-502-2273 or email care@ucsc.edu.

Small Group Tutoring

Small Group Tutoring (SGT) supports students academically to advance educational equity by designing inclusive learning environments outside of the classroom. In SGT, you can expect the Tutor to facilitate cooperative group activities designed to have students work together on the course content and develop study skills for the course. SGT is offered at least three times each week for the entire quarter. The Tutor is an undergraduate student who took the class, did well, and is trained to facilitate group sessions to focus on students' needs to succeed in the course. SGT is open to all students enrolled in the class and they must sign up on our online system: TutorTrac. When students sign up for SGT, they are committing to attend every week. For Summer 2020, students can begin signing up for tutoring on **Monday, June 22nd** and tutoring will begin **Wednesday, June 24th**. Students only have to sign up once for tutoring and their appointments will repeat weekly. Sign-ups will close on **Friday, August 14th** for all Summer Session Sign-Ups. This means that after **August 14th**, no new students can sign up for tutoring.

Want SGT to be successful for you? Bring your books, lecture notes, questions, and be open to working collaboratively with your peers. You can sign up using this link: <https://ucsc.redrock.com/tracweb40/NoAccess.4sp?errText=insufficient%20credentials%20to%20view%20content>. You can also find the link on our website: <https://lss.ucsc.edu/index.html>