Biology 450 Marine Biology
Spring 2015 Course Syllabus

Course Coordinators
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Instructors
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Location
Hatfield Marine Science Center, Education Building, Lecture room 30/32, Lab room 31.

Course Prerequisite and Credits
Bi 450 Prerequisites: BI 370 or BI 370H and ST 351 or ST 351H. ST 352 is recommended. Admission to BI 450 is by application in fall of the academic year students plan to attend.
Bi 450 is a 15 credit course devoted to classroom, laboratory, and field work. On average, the students spend 30 hours per week on classroom, laboratory, and fieldwork instruction and assignments, resulting in 300 hours of instruction for 15 credits.

Textbooks and Supplies
Marine Invertebrate Section: Optional guide

Marine Fishes Section: Required one of two fish field guides of your choice

Marine Macroalgae Section: Required
Your own 10X hand lens. For use in lab and field, a plastic 5X + 5X lens with wide field of view is optimal (e.g., #23202-3 http://www.indigo.com/magnify/gphmgnfy/plastic-geology-lens.html).

One of the following three macroalgae field guides:
Mondragon, Jennifer & Mondragon, Jeff. 2003. Seaweeds of the Pacific Coast: Common Marine Algae from Alaska to Baja California. Sea Challengers, Monterey, CA.

Other optional field guides:
Mac’s Field Guide to the Northwest Coastal Invertebrates. Mac’s (Laminated) Field Guides, The Mountaineers, Seattle, WA.
Course Description and Outcomes
Subject Matter and Format:

Marine Biology (Bi 450) is an intensive, term–long course based at Hatfield Marine Science Center (HMSC). The prerequisite for the course is Bi 370 or equivalent. The course is divided into 6 topics or sections that include:

1) Marine invertebrate biology and natural history (including the natural history of the Oregon coast)
2) Marine fish biology and natural history
3) Marine macroalgae and natural history
4) Marine community ecology
5) Marine conservation and policy
6) Small group research projects

The material is presented in a variety of ways including lectures, discussions, laboratory work, and field trips. The final 2 weeks are devoted to conducting small group research projects. This is a Writing Intensive Course (WIC) and there are a number of formal and informal writing assignments (see below).

Learning Outcomes:

Student goals or outcomes include the ability to comprehend, interpret, and subsequently synthesize information on the topics described above.

Students will learn to conduct a research project from start to finish including writing a research proposal, designing and executing an experiment, collecting, analyzing, and graphing data, writing a scientific research paper (~4,000 words), and giving a scientific talk.

Specific WIC outcomes include:

1) Develop and articulate content knowledge and critical thinking in biology through frequent practice of informal and formal writing.
2) Demonstrate knowledge and understanding of audience expectations, genres, and conventions appropriate to communicating in biology.
3) Demonstrate the ability to compose a document of at least 2,000 words through multiple aspects of writing, including brainstorming, drafting, using sources appropriately, and revising comprehensively after receiving feedback on a draft.

Student Expectations and Assessment

Grades:

Grades will be based on 100 points received each week of the course with a total of 1000 points possible. Points will be distributed in the following way: Marine Invertebrates–200 pts, Marine Fishes–150 pts, Marine Macroalgae–150 pts, Marine Community Ecology–200 pts, Marine Conservation–100 pts, Research Projects–200 pts. Points within each section will be distributed based on each instructor’s discretion but will include lecture and laboratory exams, reading discussions, writing assignments, and class participation. Most sections involve an exam and/or paper at the end. The last day of class is the Friday before finals week and there is no final exam. IMPORTANT NOTE: ALL ASPECTS OF THE COURSE ARE REQUIRED. FAILURE TO PARTICIPATE WITHOUT BEING EXCUSED BY THE INSTRUCTOR WILL RESULT IN A PENALTY.

Research Projects:

Research projects will be conducted mostly during the last 2 weeks of the course under the supervision of Drs. Henkel and Hacker and the teaching assistants. Students will work in groups of 3 people or fewer and be solely responsible for the design, implementation, analysis, and presentation of their research project, both as a seminar and written paper. The project should be a total group effort with the exception of the research paper, which will be written by each student individually. We will host a research symposium where groups will present their research to the class and other invited scientists.
Blog:

We will maintain a course blog over the term (http://www.marinebio450.blogspot.com/). A different group of ~2 students will make entries to the blog each week (and be graded for their work). The blog should document what happened in the course each week, what memorable species or habitats were seen, and contain a few good photos taken by the group or others in the class. We will give you an additional handout describing the blog in more detail.

Writing Intensive Course Assignments:

As a WIC, this course has a significant writing component aimed to 1) help students better learn the course material through writing, 2) help students to become better writers, and 3) help students better learn the kinds of writing important to the scientific profession in which they are entering. There are a number of writing assignments in the individual sections all of which culminate in a final research paper based on the small group research projects described above. The writing assignments are designed to help with writing the final research paper, as well as exposing students to formal and informal types of scientific writing used in the profession. The writing assignments will result in more than 10,000 words of writing and make up roughly 400 pts or 40% of the overall grade for the course.

Below is a list and brief description of the writing assignments in the course. The instructor of each section will provide further instructions for these writing assignments.

1) Marine Invertebrate Biology and Natural History:
   - Favorite Marine Invertebrate Paper (~500 words): This is a one-page paper designed to help with writing a formal introduction to a scientific paper. The assignment includes creating an annotated bibliography (15 pts).
   - Laboratory Notebooks (~750 words): These notebooks include drawings and written descriptions of marine invertebrate organisms. This writing assignment is designed to hone scientific observation skills (50 pts).
   - Blog (~1,000 words): An electronic journal (blog) is maintained throughout the course. This assignment helps with informal descriptive and narrative writing skills (20 pts).

2) Marine Fish Biology and Natural History:
   - Subtidal Fish Species Report (~500 words): This is a one-page paper designed to help with writing a formal introduction to a scientific paper. The assignment includes creating an annotated bibliography (15 pts).
   - Group Tidepool Fish Project Report (~750 words): This short paper helps students with hypothesis testing, scientific data presentation, and reporting on results from field surveys (25 pts).
   - Field & Laboratory Notebook (~750 words): This notebook includes drawings and written descriptions of fishes found in the field or examined in the laboratory. This writing assignment is designed to hone scientific observation skills (25 pts).

3) Marine Macroalgae and Natural History:
   - Specimen Identification Cards (~750 words): Students develop flash cards for an assigned group of macroalgae, describing in a concise written manner the important characteristics needed for identification of each alga in the field and/or lab. These cards will be printed for group lab demonstrations and posted on-line as study guides. (25 pts)

4) Marine Community Ecology:
   - Community Structure Presentation (~750 words): This presentation helps students with hypothesis testing, scientific data presentation, and reporting on results from community surveys (50 pts).

5) Marine Conservation and Policy:
   - "Op-Ed" Newspaper Article (~750 words): This short article helps students learn one way for which scientist can voice their opinion to the public about timely topics. The assignment includes creating an annotated bibliography (40 pts).
6) Small Group Research Projects:

- Research Project Proposal (~1,000 words): This is a short 3-page formal proposal that describes the research to be conducted. Please see the projects instructions for details (50 pts).
- Final Research Paper (~3,000 words): This is a formal research paper that reports on the results of small group research projects. The paper is in the format of a scientific journal article (100 pts).

Blackboard:
We will use the Blackboard program available on the OSU website (my.oregonstate.edu/) to post syllabi, lecture notes, presentations, readings, etc.

Books, Lecture Notes, and Lab Notebooks:
There is one textbook, Lamb and Hanby (2005), which is strongly encouraged but optional. It is a guide to identifying marine organisms (including seaweeds) and will be used throughout the course but especially during the invertebrate biology section. You will also need fish and macroalgae guidebooks to be chosen from the selection above. There are optional field guides for the macroalgae and invertebrate sections; these are durable field books with nice color drawings or laminated cards that can literally be dropped in tidepools. Most instructors will rely heavily on lecture notes that you will need to obtain prior to their section via Blackboard (see above). Finally, we will have a number of books available on reserve in the library as well as some additional guidebooks and keys in the laboratory. You will need TWO plain white paper notebooks (8.5” x 11”) for drawings of organisms in the lab; heavy drawing paper works best. You will also need a waterproof notebook (such as Rite in the Rain; http://www.rainwriter.com/Rite-in-the-Rain-393-All-Weather-Journal-Notebook-p/ritr-393.htm) for field notes.

Research Material:
The Guin Library at HMSC has a number of journals and books that will serve as sources of research material for your papers and research projects. You will tour the library on the first day.

Field Gear and Equipment:
The course is very field trip oriented so you will need proper clothing and equipment for all weather types (e.g., in the past we have experienced rain, gale force winds, snow, and 90 deg weather all in 10 weeks!). At minimum, you will need raingear and rubber boots. The following clothing is recommended for the field: waders (preferably the neoprene type), fleece coat or warm jacket, long and short pants, long and short sleeved shirt (a few layers work well), long underwear, hat, gloves (rubberized garden gloves work well), and thick socks. Additional items include: back pack, magnifying field lens (as required for the macroalgae section), binoculars, head lamp, pocket knife, sunglasses, camera, sunscreen, water bottle, waterproof notebook, and field guides for identification. Field sampling equipment is provided by the course.

Acknowledgement of Risk and Waiver of Liability
We require every student to sign an Acknowledgement of Risk and Waiver of Liability form that covers activities that might incur risk and liability such as field trips or laboratory work. These forms must be filled out by the first day of class.

University and Departmental Policies
Students with Disabilities: “Accommodations are collaborative efforts between students, faculty and Disability Access Services (DAS). Students with accommodations approved through DAS are responsible for contacting the faculty member in charge of the course prior to or during the first week of the term to discuss accommodations. Students who believe they are eligible for accommodations but who have not yet obtained approval through DAS should contact DAS immediately at 541-737-4098.”
Rules on Student Conduct: The Department of Integrative Biology follows the university rules on student conduct. A full account of the conduct code can be found at: http://oregonstate.edu/studentconduct/home/. Below are the offenses proscribed by the University.

Offenses Proscribed by the University

A Student or Student Organization found to have committed any of the following proscribed acts is subject to sanctions under these rules:

(1) Obstruction or disruption of teaching, learning, research, administration, disciplinary procedures, or other institutional activities, including the institution's public service functions or other authorized activities on institutionally-owned or controlled property. Disruptive behavior may include but is not limited to the following, where it has the effect of obstructing or disrupting the University activities listed above:
   (a) Repeatedly leaving and entering the classroom without authorization;
   (b) Making loud or distracting noises;
   (c) Arriving late or leaving early;
   (d) Persisting in speaking without being recognized;
   (e) Behavior that would cause a reasonable person to fear for his or her safety. The instructor has authority to manage the classroom environment, which may include requiring a Student to leave when the Student’s behavior disrupts the teaching or learning environment. If the Student refuses to leave, the instructor may call the Department of Public Safety for assistance and should submit an Incident Report Form to SCCS to initiate disciplinary proceedings.

(2) Academic or Scholarly Dishonesty:
   (a) Academic or Scholarly Dishonesty is defined as an act of deception in which a Student seeks to claim credit for the work or effort of another person, or uses unauthorized materials or fabricated information in any academic work or research, either through the Student’s own efforts or the efforts of another.
   (b) It includes:
      (A) CHEATING — use or attempted use of unauthorized materials, information or study aids, or an act of deceit by which a Student attempts to misrepresent mastery of academic effort or information. This includes but is not limited to unauthorized copying or collaboration on a test or assignment, using prohibited materials and texts, any misuse of an electronic device, or using any deceptive means to gain academic credit.
      (B) FABRICATION — falsification or invention of any information including but not limited to falsifying research, inventing or exaggerating data, or listing incorrect or fictitious references.
      (C) ASSISTING — helping another commit an act of academic dishonesty. This includes but is not limited to paying or bribing someone to acquire a test or assignment, changing someone’s grades or academic records, taking a test/doing an assignment for someone else by any means, including misuse of an electronic device. It is a violation of Oregon state law to create and offer to sell part or all of an educational assignment to another person (ORS 165.114).
      (D) TAMPERING — altering or interfering with evaluation instruments or documents.
      (E) PLAGIARISM — representing the words or ideas of another person or presenting someone else's words, ideas, artistry or data as one's own, or using one's own previously submitted work. Plagiarism includes but is not limited to copying another person's work (including unpublished material) without appropriate referencing, presenting someone else's opinions and theories as one's own, or working jointly on a project and then submitting it as one's own.
   (c) Academic Dishonesty cases are handled initially by the academic units, following the process outlined in the University’s Academic Dishonesty Report Form, and will also be referred to SCCS for action under these rules.

(3) Obstruction or disruption that interferes with freedom of movement, either pedestrian or vehicular, on institutionally-owned or controlled property.
(4) Hazing, defined as any action that endangers the physical, emotional, mental health or safety of an individual, or destroys or damages personal property for the purpose of initiation, membership, admission or participation in a group or organization. Expressed or implied consent of the person subject to hazing is not a defense. Apathy and acquiescence in the presence of hazing are not neutral acts; they are violations of this rule. Acts that constitute hazing when they endanger the physical, emotional, mental health or safety of an individual, or destroy or damage personal property, include but are not limited to:

(a) Acts that are prohibited under any applicable law, including but not limited to ORS 163.197, under which hazing is a criminal violation;
(b) Interfering with a Student’s academic performance by denying sufficient time for class, study or other academic activities;
(c) Compelling ingestion of any substance;
(d) Compelling participation in physical activities such as calisthenics, exercise, or other games or activities requiring physical exertion;
(e) Compelling exposure to weather elements or other physically or emotionally uncomfortable situations;
(f) Compelling excessive fatigue from sleep deprivation, physical activities, or exercise;
(g) Committing any act of physical brutality against another including but not limited to paddling, striking with fists, open hands or objects, and branding;
(h) Kidnapping or transporting another with the intent of stranding him or her;
(i) Compelling conduct that can be reasonably expected to embarrass or adversely affect the dignity of another, including the performance of public stunts and activities such as scavenger hunts;
(j) Intentionally creating work or labor for another;
(k) Compelling another to commit any sexual act or engage in lewd behavior;
(l) Compelling any act that results in the destruction, defacement or removal of private or public property.

(5) Harassment, defined as conduct of any sort directed at another that is severe, pervasive or persistent, and is of a nature that would cause a reasonable person in the victim’s position substantial emotional distress and undermine his or her ability to work, study or participate in his or her regular life activities or participate in the activities of the University, and actually does cause the victim substantial emotional distress and undermines the victim’s ability to work, study, or participate in the victim’s regular life activities or participate in the activities of the University. Stalking behavior that meets this definition constitutes Harassment within the meaning of this rule.

(6) Sexual Harassment, as defined in the University’s Policy on Sexual Harassment.

(7) Discrusatory Harassment, as defined in the University’s Policy on Discriminatory Harassment.

(8) Possession or use of explosives, dangerous chemicals, or other dangerous instrumentalities on institutionally-owned or controlled property, in contravention of law or institutional rules.

(9) Illegal use, possession, or distribution of drugs or illegal substances on institutionally-owned or controlled property.

(10) Alcohol violations, including possession or consumption of alcohol by persons less than 21 years of age, furnishing alcohol to persons less than 21 years, or consumption of alcohol by a Student of any age in violation of the University’s rules or policies on alcoholic beverages on University owned or controlled property or at University sponsored or supervised activities.

(11) Rape, sexual assault, or unwanted sexual contact of any kind, and the threat of such contact, are prohibited, as is any physical abuse. Sexual contact shall be considered "unwanted" or without consent if no clear consent is freely given; if inflicted through force, threat of force, or coercion; or if inflicted upon a person who is unconscious or otherwise without the physical or mental capacity to consent. If sexual contact is inflicted on someone who is intoxicated or impaired in the exercise of their judgment
by alcohol or drugs, it may be considered without consent.

(12) Detention or physical abuse of any person or conduct that threatens imminent bodily harm or endangers the health of any person on any institutionally-owned or controlled property.

(13) Invasion of another’s privacy, where that person has a reasonable expectation of privacy, including but not limited to the use of electronic devices to make an unauthorized audio or video recording of any person while on University owned or controlled property without his or her prior knowledge, or without his or her effective consent, when such a recording is of information or of images taken from or of a person at a time and place where she or he has a reasonable expectation of privacy and where the recording is reasonably likely to cause injury or distress.

(14) Unauthorized recording of a class or of organizational or University meetings. To obtain the required authorization, the Student or Student Organization must obtain expressed permission from the faculty member, Student Organization, or University representative or official in charge of the class, meeting, or activity.

(15) Malicious damage, misuse or theft of institutional property, or the property of any other person where such property is located on institutionally-owned or controlled property or, regardless of location, is in the care, custody, or control of an institution.

(16) Refusal by any person while on institutional property to comply with an order of the President or appropriate authorized official to leave such premises because of conduct proscribed by this rule when such conduct constitutes a danger to personal safety, property, or educational or other appropriate institutional activities on such premises.

(17) Unauthorized entry to or use of institutional facilities, including buildings and grounds.

(18) Smoking in unauthorized areas in violation of OAR 576-040-0010.

(19) Falsification or misuse of University information, including but not limited to records, permits, documents, computer resources, identification cards, etc.; or the furnishing of false or misleading information to the University or its representative; or refusal to provide one’s name, class, school, and local address when requested by a University official, provided the official is identified and indicates legitimate reason for the request.

(20) Unauthorized use of University computing resources in violation of the University’s Acceptable Use of Computing Resources Policy.

(21) Inciting others to engage in any of the conduct or to perform any of the acts prohibited herein. Inciting means that advocacy of proscribed conduct which calls on the person or persons addressed for imminent action, and is coupled with a reasonable apprehension of imminent danger to the functions and purposes of the institution, including the safety of persons and the protection of its property.

(22) Violating the State Board of Higher Education’s Policy on Intercollegiate Athletics as described in Section 8 of its Internal Management Directives, specifically including the subsection thereof entitled Code of Ethics.

(23) Violation of any federal or state law or city or local ordinance or University rule or policy that applies to the Student.

Disclaimer:
The schedule, policies, and assignments in this course are subject to change in the event of extenuating circumstances or by mutual agreement between the instructor and the students.
SCHEDULE

PART 1: Marine Invertebrates and Natural History of the Oregon Coast (Instructor: Dr. Sally Hacker; TA: Reuben Biel)

March 31 (M)
09:00-12:00 Course Introduction, HMSC Tour, IT Issues, Housing, Library Tour
12:00-13:00 Lunch Break
13:00-14:00 Lecture 1: Why Study Marine Biology?
14:00-15:00 Lab orientation/setup tanks

April 1 (T)
09:00-10:30 Lecture 2: Natural History of the Oregon Coast (Reading: Komar pgs. 1–61)
10:30-11:00 Break
11:00-16:00 Field Trip 1: Viewing Coastal Headlands, Estuaries, and Dunes (Cascade Head)
16:00-20:00 Dinner Break
20:00-21:00 Evening Discussion of Komar Reading

April 2 (W)
08:00-11:00 Field Trip 2: Collection of Invertebrates at Boiler Bay (Low tide (LT): −0.2 m @ 08:55)
11:00-13:00 Laboratory Work
11:30-13:00 Lunch Break
13:00-14:00 Lecture 3: Introduction to Marine Invertebrates
14:00-14:15 Break
14:15-15:00 Lecture 4: The Sponges: Phylum Porifera
15:00-17:00 Laboratory Work

April 3 (Th)
08:00-12:00 Field Trip 3: Collection of Invertebrates at Strawberry Hill (LT: −0.1 m @ 09:40)
12:00-14:00 Lunch Break
14:00-15:00 Lecture 5: The Anemones, Corals, and Jellies: Phyla Cnidaria, Ctenophora
15:00-17:00 Laboratory Work

April 4 (F)
09:00-11:00 Field Trip 4: Collection of Invertebrates at Yaquina Bay (LT: 0.04 m @ 10:24)
11:00-13:00 Laboratory Work
11:30-13:00 Lunch Break
13:00-14:00 Lecture 6: The Worms, Part 1 (Acoelomates and Pseudocoelomates): Phyla Platyhelminthes, Nemertea, Nematoda
14:00-14:30 Break
14:30-15:30 Lecture 7: Revenge of the Worms (the Coelomates): Phyla Annelida, Sipuncula
15:30-17:00 Laboratory Work; check of working draft of notebooks due by 17:00

WEEKEND (APRIL 5, 6)

April 7 (M)
09:00-10:30 Lecture 8: The Crustaceans and a Cute Relative: “Phylum” Arthropoda, Phylum Tardigrada
10:30-11:00 Break
11:00-12:00 Guest Lecture: Dr. Sylvia Yamada, Will the European Green Crab persist in Pacific NW Estuaries?
13:00-17:00 Laboratory Work
April 8 (T)
09:00-10:00  Lecture 9: Assorted Snails, Bivalves, and Octopuses: Phylum Mollusca
10:00-11:00  Lecture 10: The Lophophorates: Phyla Bryozoa, Phoronida, and Brachiopoda
11:00-12:30  Field Trip 6: Collection at the Newport Docks
12:30-14:00  Lunch Break
14:00-17:00  Laboratory Work

April 9 (W)
09:00-10:00  Lecture 11: The Spiny Skinned Critters: Phylum Echinodermata
10:00-10:30  Break; Donuts
10:30-11:00  Lecture 12: Our Closest Non-vertebrate Relative: Phylum Chordata
11:00-12:00  Presentation Prep/Laboratory Work
12:00-13:00  Lunch Break
13:00-17:00  Presentation Prep/Laboratory Work
17:00-19:30  Dinner Break
19:30-22:00  9th Annual Marine Invertebrate Presentation and Dessert Extravaganza!

April 10 (Th)
09:00-11:00  Study Session for Exam
All day       Study Independently, Finish Notebooks; Marine Invertebrate paper due by 17:00

April 11 (F)
09:00-13:00  Study Independently, Finish Notebooks
13:00-14:00  Final Exam: Marine Invertebrates and Natural History of the Oregon Coast
14:00-14:30  Break
14:30-16:00  Marine Invertebrate Laboratory Practicum (Notebooks are DUE)
16:00        Clean up (required)

WEEKEND (APRIL 12, 13)

PART 2: Marine Fishes and Natural History (Instructor: Dr. Su Sponaugle; TA: Jessie Reimer)

April 14 (M)
09:00-10:30  Lecture 1: Introduction to Marine Fishes section
10:30-11:00  Break
11:00-12:00  Lecture 2: Fish Functional Anatomy
12:00-14:00  Lunch Break
14:00-16:00  Laboratory: Fish Identification & Dissection
16:00-17:00  Lecture 3: Fish Habitats: Estuaries & Tidepools

April 15 (T)
08:30-10:30  Field Trip: Yaquina Bay: Beach seine collection of shallow bay fishes (LT: -0.09 @ 07:12)
10:30-11:00  Clean-up
11:00-12:00  Lecture 4: Reproduction
12:00-13:00  Lunch Break
13:00-15:00  Laboratory: Fish Identification & Notebook time
15:00-16:00  Lecture 5: Early Life History & Recruitment
16:00-17:00  Feedback on Field & Laboratory Notebooks
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<thead>
<tr>
<th>Date</th>
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<th>Activity</th>
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<tr>
<td>April 16 (W)</td>
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<td><strong>Lecture 6: Age &amp; Growth</strong></td>
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<td>09:00-10:00</td>
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<td>10:30-11:30</td>
<td>Lecture 7: Fish Habitats: Rocky Reefs &amp; Kelp Beds (<em>Guest Lecture: Dr. Robert Cowen</em>)</td>
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<td>11:30-12:30</td>
<td>Lunch Break</td>
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<td>12:30-16:30</td>
<td><strong>Field Trip: Oregon Coast Aquarium: Subtidal Fish Species Report</strong></td>
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<td>16:30-17:30</td>
<td>Lecture 8: Swimming, Schooling, &amp; Migration</td>
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<td>17:30-18:00</td>
<td><em>Report time &amp; Reading assignment A (Tidepool fishes)</em></td>
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<td>April 17 (Th)</td>
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<td><strong>Field Trip: Boiler Bay: Hand net collection of tidepool fishes (-0.3 m @ 08:30)</strong></td>
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<td>08:00-10:30</td>
<td>Lecture 9: Fish Sensory Systems</td>
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<td>11:00-12:00</td>
<td>Lunch Break</td>
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<td>12:00-13:00</td>
<td>Lecture 10: Plankton Ecology (<em>Guest Lecture: Jessica Luo</em>)</td>
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<td>13:00-14:00</td>
<td>Discussion: Reading assignment A (Tidepool fishes) &amp; project planning</td>
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<td>16:30-17:30</td>
<td><em>Report time</em></td>
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<td>18:00-18:30</td>
<td>Deploy light &amp; minnow traps from dock</td>
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<td>April 18 (F)</td>
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<td><strong>Field Trip: Strawberry Hill: Hand net collection of tidepool fishes (LT: -0.3 m @ 09:15); group projects (pack lunch)</strong></td>
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<td>08:00-10:30</td>
<td>Lecture 11: Feeding &amp; Food Webs</td>
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<td>14:00-15:00</td>
<td>Field &amp; laboratory: Retrieve &amp; process light &amp; minnow trap samples</td>
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<td>15:00-17:00</td>
<td>Reading assignment B (Population Connectivity)</td>
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<td>Weekend (April 19, 20)</td>
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<td>April 21 (M)</td>
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<td><strong>GROUP TIDEPOOL PROJECT REPORT DUE</strong></td>
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<td>08:00-10:30</td>
<td>Field Trip: Yaquina Bay trawling (<em>Guest Scientist: Dr. Waldo Wakefield)</em></td>
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<td>13:00-14:00</td>
<td>Lunch Break</td>
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<td>14:00-15:00</td>
<td>Lecture 12: Population Ecology of Fishes</td>
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<td>15:00-16:00</td>
<td><em>Notebook time</em></td>
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<td>16:00-16:45</td>
<td>Discussion: Population Connectivity reading assignment</td>
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<td>16:45-17:30</td>
<td>Lecture 13: Conservation &amp; Management</td>
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<tr>
<td>April 22 (T)</td>
<td></td>
<td><strong>FIELD NOTEBOOKS &amp; CLASS SPECIES LIST DUE</strong></td>
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<tr>
<td></td>
<td>09:00-10:30</td>
<td>Study time</td>
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<tr>
<td></td>
<td>15:00-17:00</td>
<td>SECTION EXAM</td>
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<tr>
<td></td>
<td>17:00-18:00</td>
<td>Laboratory cleanup and return of remaining fishes to field (required)</td>
</tr>
<tr>
<td>April 23 (W)</td>
<td></td>
<td><strong>DAY OFF! NO CLASS</strong></td>
</tr>
<tr>
<td>PART 3: Marine Macroalgae and Natural History (Instructor: Dr. Annette Olson; TA: Jessie Reimer)</td>
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<tr>
<td>April 24 (Th)</td>
<td></td>
<td><strong>INTRODUCTION</strong></td>
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<tr>
<td></td>
<td>08:30-09:30</td>
<td>Lecture: Introduction: Section goals + Ecological significance of macroalgae</td>
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<tr>
<td></td>
<td>09:30-10:15</td>
<td>Lecture: Evolutionary origins</td>
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<td></td>
<td>10:30-11:30</td>
<td><em>Tea</em></td>
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<td></td>
<td>10:30-11:30</td>
<td>Lecture: Morphology &amp; life histories</td>
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<tr>
<td>Time</td>
<td>Activity</td>
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<tr>
<td>11:30-12:00</td>
<td><strong>Lab</strong>: <em>Overview of macroalgal phyla</em> (demo)</td>
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<tr>
<td>12:00</td>
<td>Lunch break</td>
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<tr>
<td>13:00-14:00</td>
<td><strong>Lab/Field</strong>: <em>Lab &amp; field goals and assignments</em></td>
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<td><strong>Note</strong>: Meet in lecture room</td>
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<td></td>
<td><strong>Team sign-up</strong></td>
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<tr>
<td>14:00-14:30</td>
<td><strong>Lab/Field</strong>: <em>Taxonomy and identification</em></td>
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<tr>
<td>14:30-15:00</td>
<td><strong>Lab</strong>: <em>Lab skills I: Using keys and references</em></td>
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<td></td>
<td><strong>Tea</strong></td>
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<tr>
<td>15:00-16:30</td>
<td><strong>Lab</strong>: <em>Lab skills II: Microscope care and use, specimen preparation, green filaments</em></td>
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<tr>
<td>16:30-17:00</td>
<td><strong>Prep for Friday afternoon field trip</strong></td>
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<td>17:00</td>
<td>Supper break</td>
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<td>19:00-20:00</td>
<td><strong>Required Workshop</strong>: <em>Pressing seaweeds</em></td>
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<td>20:00-22:00</td>
<td><strong>Team appointment slots</strong> (5 @ 20 min/team)</td>
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<td></td>
<td><strong>April 25 (F)</strong></td>
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<tr>
<td>07:30-08:15</td>
<td><strong>Team appointment slots</strong> (2 @ 20 min/team)</td>
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<td><strong>Note</strong>: Meetings held before class</td>
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<td></td>
<td><strong>CHLOROPHYTA</strong> (greens)</td>
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<tr>
<td>08:30-09:00</td>
<td><strong>Lab</strong>: <em>Overview of greens</em> (demo)</td>
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<tr>
<td>09:00-10:30</td>
<td><strong>Lecture</strong>: <em>Chlorophyta</em></td>
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<td><strong>Tea</strong></td>
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<tr>
<td>10:30-11:30</td>
<td><strong>Lab</strong>: <em>Chlorophyta: Filaments, sheets &amp; tubes</em></td>
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<td>11:30</td>
<td>Lunch break</td>
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<td>11:30-12:15</td>
<td><strong>Team appointment slots</strong> (2 @ 20 min/team)</td>
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<td><strong>Note</strong>: Meetings held at lunch break</td>
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<td></td>
<td><strong>OCHROPHYTA: PHAEOPHYCEAE</strong> (browns)</td>
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<tr>
<td>13:00-13:30</td>
<td><strong>Lab</strong>: <em>Overview of kelps &amp; fucoids</em> (demo)</td>
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<tr>
<td>13:30-15:00</td>
<td><strong>Lecture</strong>: <em>Phaeophytes I</em></td>
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<td>15:15</td>
<td><strong>DEPART FOR FIELD TRIP</strong></td>
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<tr>
<td>15:30-17:00</td>
<td><strong>Seal Rock</strong>: <em>Common taxa. High zone communities.</em> LT@ 16:06: +0.16m (+0.5ft) [1.5 hr in field]</td>
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<td>17:00-17:30</td>
<td>Travel from field, store samples</td>
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<tr>
<td>17:30-17:45</td>
<td><strong>Prep for Monday morning field trip</strong></td>
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<td>17:45</td>
<td>Supper break</td>
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<td></td>
<td><strong>WEEKEND (APRIL 26, 27)</strong></td>
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<td></td>
<td><strong>Optional collecting trip</strong>: Meet @ Boiler Bay, Sunday 06:00 [LT: -0.11m (-0.4ft') @ 05:42]</td>
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<td><strong>April 28 (M)</strong></td>
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<tr>
<td>05:45</td>
<td><strong>DEPART FOR FIELD TRIP</strong></td>
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<tr>
<td>06:00-08:00</td>
<td><strong>Seal Rock</strong>: <em>Mid- to low-zone. Sand-influenced communities.</em> LT @ 06:28: -0.28m (-0.9ft') [2.0 hr in field]</td>
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<td>08:00-08:30</td>
<td>Travel from field, store samples, clean up</td>
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<tr>
<td>08:30</td>
<td><strong>Short (30 min) breakfast break</strong></td>
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<tr>
<td>09:00-09:30</td>
<td><strong>Lab</strong>: <em>Overview of small browns</em> (demo)</td>
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<td><strong>April 28 (M)</strong></td>
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<td><strong>Continued</strong></td>
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<tr>
<td>09:30-10:00</td>
<td><strong>Lecture</strong>: <em>Phaeophytes II</em></td>
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<tr>
<td>10:00-11:30</td>
<td><strong>Lab</strong>: <em>Phaeophytes II: Sacs &amp; crusts, small blades &amp; tubes</em></td>
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<tr>
<td>11:30</td>
<td>Lunch break</td>
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<td></td>
<td><strong>RHODOPHYTA</strong> (red macroalgae)</td>
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<tr>
<td>12:30-13:00</td>
<td><strong>Lab</strong>: <em>Overview of small reds</em> (demo)</td>
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<tr>
<td>13:00-14:30</td>
<td><strong>Lecture</strong>: <em>Rhodophyta I</em></td>
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</tbody>
</table>
14:30-16:00  **Lab:** *Rhodophyta I: Sheets, filaments, finely branched axes*
  Tea
16:00-17:30  “Tank talks”: *Review of collected specimens with instructors* (4 slots @ 15 min/team)
  **17:30**  Short (1 hr) supper break (bring supper to seminar room)
18:30-19:30  Invited speaker: *Few costs to selfing? The mixed mating system of the sea palm kelp*,
  Allie Barner, OSU Grad student
19:30-22:00  “Tank talks”: *Review of collected specimens with instructors* (5 slots @ 15 min/team)

**April 29 (Tu)**
05:30  DEPART FOR FIELD TRIP
06:00-08:30  **Boiler Bay:** *Elevation vs. wave-exposure. Mosaics and turfs.* LT @ 07:10: -0.38m (-1.2ft)
  [2.5 hr in field]
08:30-09:15  Travel from field, store samples, clean up
  **09:15**  Short (45 min) Breakfast break
10:00-10:30  **Lab:** *Overview of large reds (demo)*
10:30-11:30  **Lecture:** *Rhodophyta II*
11:30-13:00  **Lab:** *Rhodophyta II: Coarsely branched axes; corallines*
  13:00  Lunch break
14:00-17:30  **Lab:** *Rhodophyta III: Blades*  **Note:** Specimen ID sheets due tomorrow at noon
  17:30  Supper break
19:30-20:30  Independent lab review: Review algae, ask questions about Specimen IDs or team projects

**April 30 (W)**
INDEPENDENT STUDY / TEAM PROJECTS
09:00-12:00  Independent study: Complete Specimen ID Sheets, begin Team demo prep
  10:00  **Coffee & Doughnuts in Staff Lounge**
12:00  Specimen ID Sheets due
13:00-17:00  Team projects: Demo prep & setup
  17:00  Supper Break
19:00-21:00  Team projects: *Team-led lab demos* [required]

**May 1 (Th)**
ECOLOGY
09:00-10:00  **Lecture:** *Limpet feeding preferences and distribution of reproductive phases*
  10:00  Tea
REVIEW / INDEPENDENT STUDY
10:30-12:30  **Lab:** *Team-led lab review* [required]
  12:30  Lunch Break
13:30-15:00  **Lecture:** *Instructor-led lecture review* [recommended]
15:30-17:30  Independent study: Lab open
  17:30  Supper Break
19:00  Independent study: Lab open  **Note:** Last opportunity for lab review before exams

**May 2 (F)**
EXAMS
08:00-10:00  Independent study:  **Note:** Lab closed for setup of practicum
10:00-11:30  Lecture Final
  11:30  Lunch Break
12:30-14:00  Independent Study
14:00-16:00  Lab Practicum  **Note:** Team Demo files due
16:00-17:00  **Lab Cleanup Required**
WEEKEND (MAY 3, 4)

PART 4: Marine Conservation and Policy (Instructor: Dr. Sarah Henkel)

May 5 (M)
09:00-09:15 Introductions, Overview of week
09:15-10:15 Lecture 1: State of the Oceans
10:15-10:30 Break
10:30-11:30 Lecture 2: Climate Change and Oceans
11:30-12:15 Prepare for discussion (READ)
12:15-13:15 Lunch break
13:15-14:00 Lecture 3 & Discussion 1: Emerging Ocean Uses - Aquaculture
14:00-14:30 Break
14:30-16:00 Lecture 4 & Discussion 2: Emerging Ocean Uses – Renewable Energy
16:00-17:00 Paper and oral presentation assignments; Begin research

May 6 (T)
09:00-09:15 Questions about Policy Project
09:15-10:15 Lecture 5: Marine Protected Areas and Marine Reserves
10:15-10:30 Break
10:30-12:00 Lecture 6 and Discussion 3: Marine Reserves in Oregon
12:00-13:15 Lunch break
13:15-14:15 Lecture 7: The Science-Policy Interface
14:15-14:30 Break
14:30-16:00 Discussion 4: Science, Policy, and Ethics
16:00-17:00 Independent research

May 7 (W)
08:45-09:45 Lecture 8: Fisheries
09:45-12:15 FIELDTRIP to Bayfront for dock walk & lunch at Local Ocean Seafoods
12:30-14:00 Check-in with instructor: Project progress / Independent research
14:00-15:00 Lecture 9 & Discussion 5: New Tools for Fisheries Management
15:00-16:00 Lecture 10: Seabirds: The Land-Sea Connection
16:00- Independent research

May 8 (Th)
08:45-15:30 FIELDTRIP to Cape Perpetua & Ten-Mile Creek Restoration Project (pack lunch)
15:30-20:00 Independent research
20:00 Mini writing assignment due (email to Sarah)

May 9 (F)
08:30-10:30 Finalize papers and presentations
10:30-12:00 Presentations: Round 1 - all Annotated Bibliographies (individual & team) due at 10:30
12:00-13:00 Lunch break
13:00-14:30 Presentations: Round 2, End of Section

WEEKEND (MAY 10, 11)
# PART 5: Marine Community Ecology (Instructor: Dr. Bruce Menge; TA: Elizabeth Cerny-Chipman)

<table>
<thead>
<tr>
<th>Date</th>
<th>Time</th>
<th>Activity</th>
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</thead>
<tbody>
<tr>
<td><strong>May 12 (M)</strong></td>
<td>0900-1200</td>
<td>Procedures (BAM, EC-C): Field Trip Preparation: How to Quantify Community Patterns (spatial structure, diversity, food webs). See “Quantification of Community Structure: Methods” in Course Notes.</td>
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<td>1200-1300</td>
<td>Lunch Break</td>
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<td></td>
<td>1300-1500</td>
<td>Lecture 1 (BAM): <em>Community structure and dynamics</em> (Ch. 1 in Class Notes)</td>
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<td>1530-1600</td>
<td>Break</td>
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<td>1600-1700</td>
<td>Discussion: “Writing the data report”</td>
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<td>1900-2000</td>
<td>Special Lecture: Elizabeth Cerny-Chipman “Environmental stress and the foraging ecology of whelks”</td>
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<td><strong>May 13 (T)</strong></td>
<td>0530</td>
<td>LEAVE FOR FIELD TRIP</td>
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<td></td>
<td>0600-1000</td>
<td>Field Trip 1 (BAM, EC-C). Community Sampling Transects and Predator Diets I. Boiler Bay. (Low tide: -0.7 ft @ 0610).</td>
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<td>1030-1100</td>
<td>Laboratory: Post-field trip activities, Clean gear</td>
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<td>1100-1230</td>
<td>Lunch Break</td>
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<td>1230-1400</td>
<td>Computer Laboratory: Data Management: Entry and Analysis</td>
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<td>1400-1600</td>
<td>Lecture 2 (BAM): <em>Biotic Interactions and Community Structure</em> (Ch. 2 in Class Notes)</td>
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<td>1600-1900</td>
<td>Independent time</td>
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<td>1900-2000</td>
<td>Special Lecture: Elizabeth Cerny-Chipman “Environmental stress and the foraging ecology of whelks”</td>
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<td><strong>May 14 (W)</strong></td>
<td>0530</td>
<td>LEAVE FOR FIELD TRIP</td>
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<td>0615-1030</td>
<td>Field Trip 2 (BAM, EC-C). Community Sampling Transects and Predator Diets II. Strawberry Hill (Low tide: -1.3ft @ 0650).</td>
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<td>1100-1200</td>
<td>Lunch Break</td>
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<td>1200-1400</td>
<td>Computer Laboratory: Data Entry</td>
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<td>1400-1600</td>
<td>Lecture 3 (BAM): <em>Modification of Biotic Effects on Community Structure</em> (Ch. 3 in Class Notes)</td>
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<td>1600-1700</td>
<td>Computer Laboratory: Data Entry</td>
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<td>1900-2000</td>
<td>Special Lecture: Jeremy Rose “Impact of ocean acidification on intertidal communities”</td>
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<td><strong>May 15 (Th)</strong></td>
<td>0600</td>
<td>LEAVE FOR FIELD TRIP</td>
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<td>0630-1000</td>
<td>Field Trip 3 (BAM, EC-C). Biodiversity Survey I. Boiler Bay. (Low tide: -1.8ft @ 0732)</td>
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<td>1030-1100</td>
<td>Laboratory: Post-field trip activities, clean gear</td>
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<td>1100-1200</td>
<td>Lunch Break</td>
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<td>1200-1400</td>
<td>Computer Laboratory: Data Entry; begin analysis of transect data</td>
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<td>1400-1600</td>
<td>Lecture 4 (BAM): <em>Complex Interactions and Community Structure</em> (Ch. 4 in Class Notes)</td>
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<td>1600-1700</td>
<td>Computer Laboratory: Data Entry; begin analysis of transect data</td>
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<td>1900-2000</td>
<td>Special Lecture: Chenchen Shen “Turf algae as ecosystem engineers”</td>
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<td><strong>May 16 (F)</strong></td>
<td>0600</td>
<td>LEAVE FOR FIELD TRIP</td>
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<td>0645-1030</td>
<td>Field Trip 4 (BAM, EC-C). Biodiversity Survey II. Strawberry Hill. (Low tide: -2.0ft @ 0815)</td>
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<td></td>
<td>1100-1130</td>
<td>Laboratory: Post-field activities, clean gear</td>
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1130-1300 Lunch Break
1300-1400 Computer Laboratory: Data Entry; analysis of transect data
1400-1600 Lecture 5 (BAM): Recruitment: Patterns and Effects on Community Structure (Ch. 5 in Class Notes)
1600-1700 Computer Laboratory: Data Entry; analysis of transect data

WEEKEND (MAY 17, 18)

May 19 (M)
0900-1000 Computer Laboratory: Data Entry; analysis of transect data, preparation of figures.
1000-1100 Lecture 6, part 1 (BAM): Variation in Marine Communities: Chaos or Generality? (Ch. 6 in Class Notes)
1100-1200 Data Analysis, Figure preparation & Discussion
1200-1300 Lunch Break
1300-1400 Data Analysis, Figure preparation & Discussion
1400-1500 Lecture 6, part 2 (BAM): Variation in Marine Communities: Chaos or Generality? (Ch. 6 in Class Notes)
1500-1700 Data Analysis, Figure preparation & Discussion
1900-2000 Special Lecture: TBA

May 20 (T)
0900-1000 Preparation of Data Reports
1000-1100 Lecture 7, part 1 (BAM): Species Diversity Gradients In Marine Communities (Ch. 7 in Class Notes)
1100-1200 Preparation of Data Reports
1200-1300 Lunch Break
1300-1400 Lecture 7, part 2 (BAM): Species Diversity Gradients In Marine Communities (Ch. 7 in Class Notes)
1400-1700 Preparation of Data Reports
1900-2000 Special Lecture: TBA

May 21 (W)
0800-1000 Data Reports: Oral Presentations
1000-1200 Independent Study
1200-1300 Lunch Break
1300-1400 Independent Study
1400-1600 Review Session (BAM)
1600-1700 Independent Study

May 22 (Th)
0800-1200 Independent Study
1200-1300 Lunch Break
1300-1400 Independent Study
1400-1600 EXAM
1600 Written Data Reports due

PART 6: Student Research Projects (Instructors: Drs. Sarah Henkel, Sally Hacker; TAs: Elizabeth Cerny-Chipman, Reuben Biel)

May 23 (F)
08:30-9:00 Class Meeting about Research Projects
9:00-12:30 Meetings with individual groups about Research Projects
12:30-17:00 Work on Research Project Proposal; Gather equipment; Make schedule
17:00 Research Project Proposal Due

**MEMORIAL HOLIDAY WEEKEND (MAY 24, 25, 26)** (May 24 LT: 0.17 m @ 03:45; May 25 LT: -0.06 m @ 04:40; May 26 LT: -0.24 m @ 05:30)

**May 27 (T)**
All day Research Projects (LT: -0.37 m @ 06:15)

**May 28 (W)**
All day Research Projects (LT: -0.43 m @ 06:54);
13:00-17:00 Groups meet with Sarah/TA about Project Progress

**May 29 (Th)**
All day Research Projects (LT: -0.44 m @ 07:34)

**May 30 (F)**
All day Research Projects (LT: -0.40 m @ 08:12)
Start Research Project Data Analysis and Writing

**WEEKEND (May 31, June 1)** (May 31 LT: −0.33 m @ 08:50; June 1 LT: -0.22 m @ 09:28)

**June 2 (M)**
All day Research Project Data Analysis and Writing
Anytime First Drafts of Research Projects due, if possible

**June 3 (T)**
All day Research Project Data Analysis and Writing; Make Revisions on First Draft, if possible
17:00 **All First Drafts of Research Projects DUE**

**June 4 (W)**
All day Make Revisions on First Draft; Prepare Seminar

**June 5 (Th)**
All day Make Revisions on First Draft; Prepare Seminar

**June 6 (F)**
09:00 Research Papers Due (email to Sarah and Sally, bring 1 hard copy to lab)
09:00-11:00 Lab Clean Up (REQUIRED)
11:00-11:30 Break
11:30-13:00 Lunch Celebration
13:00-17:00 Research Symposium, Visitor Center Auditorium
17:00 End of Course