

GLOBAL KELP SYSTEMS FIELD COURSE

PUERTO MONTT, CHILE

January 17-24, 2015



Professors:

Dr. Alejandro Buschmann – Universidad De Los Lagos

Dr. Alejandro Perez-Matus – Pontifica Universidad Catolica De Chile

Dr. Sylvain Faugeron – Pontifica Universidad Catolica De Chile

Dr. Michael Graham – Moss Landing Marine Laboratories, California USA

Dr. Scott Hamilton - Moss Landing Marine Laboratories, California, USA



The presence of kelp populations in nearshore regions significantly enhances the diversity and productivity of coastal ecosystems. Despite early interest in how kelp forests function, however, little is known about the temporal and spatial scales at which kelp forest communities respond to variability in kelp distribution and abundance. Such information is not only vital to basic studies of community assembly but also to more applied questions of societal concern, for example the prediction of ecosystem consequences due to global climate change, habitat modification, and human exploitation of kelp forest resources.

Space is limited, 12 student maximum

For more information contact:

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Course Description:

This course will touch on three themes that can be summed up by the following questions: *(1) What is the role of kelps in nearshore systems? (2) Can kelp trophic and habitat associations be untangled? (3) What are the ecosystem consequences of kelp addition to a system?* These research questions are challenging and the global scientific community studying kelp ecology is divided into provincial research programs demarcated by political, social, and economic boundaries. Kelp forests, however, are structured by processes that are ignorant of these sorts of boundaries. As such, scientific provincialism can impede the study and understanding of kelp ecosystem functioning at regional to global scales ... the scales at which such functioning is ultimately expressed. **The goal of this course is to develop an integrated education-research curriculum that addresses the functioning of global kelp systems.**

The class will include lectures, laboratory work, and field trips to the intertidal and subtidal via SCUBA. Students must be present at i-mar research Centre in Puerto Montt for opening remarks at 2 pm on January 17th, 2015. The course ends when students check out of housing at 2 pm on January 24th, 2015.

Room and board will be arranged, but students are responsible for the costs.

If you are interested please send a short paragraph by January 5th, describing how this class would be useful to you and your research, this paragraph can be written in Spanish.

MS 233: GLOBAL KELP SYSTEMS SPRING 2015

COURSE TITLE: MS 233 – Advanced Topics in Marine Ecology: Global Kelps Systems

INSTRUCTORS:

Dr. Michael Graham (Moss Landing Marine Labs, email: mgraham@mlml.calstate.edu)

Dr. Alejandro Buschmann (Universidad de Los Lagos, email: abuschma@ulagos.cl)

Dr. Scott Hamilton (Moss Landing Marine Labs, email: shamilton@mlml.calstate.edu)

Dr. Silvain Faugeron (P. Universidad Católica de Chile, email: sfaugeron@bio.puc.cl)

Dr. Alejandro Pérez-Matus (P. Universidad Católica de Chile, email: aperez@bio.puc.cl)

WHAT THIS COURSE IS ABOUT: Kelp forests represent some of the most diverse, productive, and dynamic ecosystems on the planet, and the distributions of many organisms are known to be linked tightly to the presence of kelp due to a variety of trophic and habitat associations. The presence of kelp populations in nearshore regions also significantly enhances the diversity and productivity of coastal ecosystems. Despite early interest in how kelp forests function, however, little is known about the temporal and spatial scales at which kelp forest communities respond to variability in kelp distribution and abundance. Such information is not only vital to basic studies of community assembly but also to more applied questions of societal concern, for example the prediction of ecosystem consequences due to global climate change, habitat modification, and human exploitation of kelp forest resources.

This course will touch on three themes that can be summed up by the following questions: *(1) What is the role of kelps in nearshore systems? (2) Can kelp trophic and habitat associations be untangled? (3) What are the ecosystem consequences of kelp addition to a system?* These research questions are challenging and the global scientific community studying kelp ecology is divided into provincial research programs demarcated by political, social, and economic boundaries. Kelp forests, however, are structured by processes that are ignorant of these sorts of boundaries. As such, scientific provincialism can impede the study and understanding of kelp ecosystem functioning at regional to global scales ... the scales at which such functioning is ultimately expressed. **The goal of this course is to develop an integrated education-research curriculum that addresses the functioning of global kelp systems.**

COURSE STRUCTURE: The course is organized around morning “challenge” lectures in which the instructors present a brief background (2 hours) on ecological concepts in order to stimulate student discussion. The lectures are complimented by extensive reading of the primary literature and round-table discussions of key concepts, methodologies, and research directions. Intensive laboratory will follow each lecture, so that students can immediately apply their new concepts and skills. All exercises will utilize real data resulting from a field experiment to be conducted by the students. Understanding of the role of kelp abundance in regulating the structure and functioning of global kelp systems requires knowledge of processes spanning various fields, and spatial, temporal, and taxonomic scales. As such, we have compiled a group of US and Chilean instructors with

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expertise in: (1) physiology, ecology, molecular biology, and experimental design; (2) organisms, populations, and communities; and (3) algae, invertebrates, and vertebrates.

CLASS EXPERIMENT: In addition to lectures and laboratories, students will conduct a field experiment in southern Chile to test the organismal, population, and community-level responses of kelp systems to the functional addition of kelp. We will be sampling areas near Puerto Montt (Metri Bay). This site is part of a larger project to study the ecology of annual populations of giant kelp where unique interactions take place. We will be sampling (1) natural kelp populations, (2) evaluation of kelp and mollusk exclusion experiments, (3) and patterns of kelp herbivore interactions. The sampling will be conducted by the students and instructors to estimate (a) the abundance of algae, invertebrates, and fishes, (b) the effect of exclusion treatments on algal recruitment and abundance, and (c) the impact of grazers on kelp abundance, among other issues. The following are some of the hypotheses that will be tested during this course:

- Grazers affect kelp recruitment
- Secondary substrata may affect indirectly kelp recruitment
- Predators are more abundant when kelps are present
- Herbivore and predator diets are more diverse when kelps are present
- Herbivores and predators are larger when kelps are present
- Species richness and diversity are higher when kelps are present

EXAMS & GRADING:

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|----------------------|-----|
| Final exam: | 25% |
| Assignments: | 25% |
| Research paper: | 25% |
| Class participation: | 25% |

Final exam: A written exam will be handed out after the last laboratory exercise to be completed in 24 hours. All students must turn in the exam in order to receive a grade. Students *may not* work together on the exam.

Assignments: Three laboratory assignments will be due the morning after they are assigned. All students must turn in the assignments in order to receive a grade. Students *can* work together on the assignments.

Research paper: A research paper on the field study data is due on April 10, 2015.

Class participation: This includes discussions in class and helping with laboratory and fieldwork. It is assumed that the students will work together to learn the material, conduct analyses, and discuss the readings.

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SCHEDULE:

Students arrive on Jan 16 at housing site in Puerto Montt.

| Date | Morning | Afternoon | Assignment* |
|----------------|---|--|---------------------------|
| Jan 17 (Sat) | | 1. Brief introduction to the goals of the course, the experiment, and the methods (Graham) 2:30 – 5:30 pm lecture room | Welcome BBQ 6 p |
| Jan 18 (Sun) | 2. Carbon and nitrogen physiology of kelps and kelp population ecology (Buschmann) 9 – 12 am lecture room | 3. Ecology Overview of Metri (Buschmann) 1:30-3 pm lecture room 3-6 pm Metri Field trip? | |
| Jan 19 (Mon) | 4. Population genetics and kelp evolution (Faugeron) 9 – 12 am lecture room | FIELD STUDIES (Metri) | |
| Jan 20 (Tues) | 5. Species interactions and community structure (Hamilton) 9 – 12 p lecture room | FIELD STUDIES (Metri) | |
| Jan 21 (Weds) | 6. Kelp Community ecology (Perez-Matus) 9 – 12 am lecture room | FIELD STUDIES (Metri) | |
| Jan 22 (Thurs) | FIELD STUDIES (Bahía Mansa) | FIELD STUDIES (Bahía Mansa) | |
| Jan 23 (Fri) | 7. Ecosystem processes and energy flow (Graham) 10 - 12 lecture room | DATA ANALYSES | Final Exam |

* All assignments are due the morning after they are assigned. Final exam is take-home and due the following afternoon (Jan 24, Sat).