Honors 300/301/302

Pollution in the Sand

Summer 2010

INSTRUCTORS: Dr. Michel A. Boudrias & Dr. James P. Bolender
OFFICES (on campus): ST 267 (X4794) (MAB); ST380 (X4792) (JPB)
OFFICE HOURS: Nothing formal; Scheduled review sessions in Baja (TBA)
CLASS HOURS: Lectures at USD (ST 230)
Lab at USD (ST 494, 170)
(See attached Schedule for lectures in Baja)

TEXTBOOK: Readings from S.M. Libes **An Introduction to Marine Biogeochemistry;**
Assigned Readings in papers or portions of other Textbooks

GRADING: Quizzes (2): 50 pts.; Conceptual class material
Final = 200 pts; Comprehensive on class material and field methods
Final Project Reports: 250 pts.(**TOTAL**)
Research Paper (site specific) 100 pts.
Group Oral Presentation 100 pts.
Discipline specific executive summary 50 pts
Field and Lab Notebook/Journal: 100 pts.
Course participation: 50 pts

TOTAL POINTS = 600 points.

COURSE PHILOSOPHY

This team-taught course arose from a research trip to the Center for Coastal Studies in Baja California. For the past three years, Dr. Boudrias and his graduate students have been working in close collaboration with the School for Field Studies (SFS) on a research project quantifying the pollution impacts of a fish cannery on the sandy beach benthic communities in Puerto San Carlos. The cannery currently dumps organic and inorganic wastes into Bahia Magdalena. The majority of the impacts are apparent on the local beaches on the mainland side of the bay. In conjunction with SFS faculty and undergraduates, we have been monitoring the water quality and the benthic community composition at several sites in the bay. In March of 2000, Dr. Bolender joined the research team to help improve the quantification of the water quality analyses. Since then we have collected many samples that will provide the framework for our course.

During our first research trip to Bahia Magdalena, we saw the opportunity to provide USD Chemistry, Marine Science and Biology students with a unique interdisciplinary hands-on field experience. Thus the course is designed to integrate chemical principles with benthic ecology of shallow water marine habitats. The lectures will cover broad topics relevant to water chemistry and benthic ecology as well as specific topics affecting the environmental issues in Bahia Magdalena. You will learn a combination of laboratory-based and field-based techniques that will help you develop research skills that can be used to solve real life environmental problems. Furthermore, our course will continue the long-term monitoring of the water quality and benthic ecology of Bahia Magdalena and even provide some new comparative data.

Our backgrounds will influence the direction of this Honors “Pollution in the Sand” course. Dr. Boudrias’ areas of study are in biological oceanography, fluid dynamics, and crustacean ecology. He

has worked on many aspects of aquatic benthic ecology, human impacts on rivers, estuaries and beaches, crustacean functional morphology, and the fluid dynamics of locomotion in crustaceans. His main research interests are animal-fluid interactions, affecting both feeding and swimming, and the environmental effects of abiotic factors on coastal benthic communities. Therefore you will find that this course will combine physical characterization of habitats followed by the biological interactions that dominate each habitat in time and space. Prior to joining the USD-SFS research team, Dr. Bolender's research interests were focused on the application of spectroscopy to probe inter- and intra-molecular energy transfer phenomena. The courses he generally teaches at USD are general, analytical, and physical chemistry. Since joining the USD-SFS research team he has developed a stronger interest in quantitative lab and field techniques that can be used to monitor water quality. Therefore you will find that his contribution to this course will focus on quantification of results, the application of precise lab techniques to field data, and the impacts of chemistry on the shallow water beach communities.

The course will be primarily based on our lecture notes and your field experience. The textbook we have chosen is an excellent resource for the chemical and general abiotic components of the course. The Marine Science/Biology component will be covered through assigned readings from portions of other textbooks. We will supplement your text with readings from other textbooks, some scientific papers, and many class handouts. Extra reading assignments will be assigned to each palapa for you to read.

There will be a great deal of material to assimilate. The amount of information will build up rather quickly and will test your background in both chemistry and marine biology. We realize that you come from diverse backgrounds; some of you will be stronger in chemistry and some stronger in biology. We have tried to choose an intermediate level for each of our sections; it should challenge you but not bore you or overwhelm you. This will be an intense experience that will move very quickly (Think warp speed!). Your work will further be facilitated if you read assigned chapters as soon as you can. You must be prepared to learn and understand many new terms and concepts. Furthermore you must be prepared to learn how to write group scientific reports, analyze data critically and present your conclusions clearly both in written and oral form.

We intend to enjoy our teaching experience with you; we hope you plan to enjoy your learning experience as well. We are sure you will find this course challenging. We especially hope you will find it interesting, exciting, and even fun. We will work hard to provide you with the best coverage of the material as possible. If you are having any trouble with the course or the lab, please see us immediately. This course is a first for us too so we would appreciate feedback as we go along.

LABORATORY PHILOSOPHY

The labs in this course will be a mixture of field collection, laboratory analysis, and discussion of physical/chemical and biological data. We have emphasized interdisciplinary projects that should expose you to the various aspects of coastal oceanographic research. You will be grouped in teams to facilitate an organized collection of data. All data will be collated and shared by the whole class. It is imperative that you do your job right because the success of the whole project depends on the whole class working well together. The laboratory notebook will contain the following: 1) Field observations, 2) All laboratory data for your site, and 3) a minimum of five (5) journal entries that capture the field/lab experience in this locale.

Once the data are presented to the whole class, each team will be responsible for writing a complete scientific report for their site, which will then be integrated for the bay as a whole. Each team will write their own hypothesis, introduction, methods, complete results, and discussion; including all disciplinary aspects.. Each team will also be responsible for an Oral

presentation for their site. We will provide you with guidelines for the talks in Baja where you will have the opportunity to practice your presentation. Once we return to USD, each team will have to use PowerPoint to present their data in a formal Colloquium on July 23rd. We will have time in Baja and on our return to USD to help you with your talks. For both the paper and the talk, the group component will be 40% and the individual components will be 60% of your grade.

The disciplinary specific executive summary will be an individual 5 – 8 page paper that integrates your disciplinary data (Chem, Bio, MARS) into the context of the entire data set. In other words, what do your data mean with respect to the other five sites and the concepts presented throughout the course. For example, if you are a biologist, you will want to discuss the benthic meiofauna at your site with respect to the other five sites, and then connect this analysis to the benthic chemistry data. You can refer to your report (in other words, no figures or tables are necessary). We expect this paper to show that you understand how your field of study fits within this project.

The lab projects will incorporate the water quality data, the abiotic characterizations of the habitats, and the community ecology of your sites. You will all get to collect water, plankton and benthic samples from all sites. You will also learn lab techniques for analyzing water and sediment chemistry, for counting and identifying plankton and for determining benthic community composition. The benthic component will also include the geological characterization of the sediments. Finally, we will spend some discussion time on human impacts and on policies that might be implemented to solve real environmental problems in Mexico and in the US.

These projects are ambitious and primarily field based. There might be situations that make collection difficult or times when our analysis will not work perfectly. However, no matter what happens we will all learn a lot. We have designed these labs to show you how to do real science and to expose you to the type of field data used to determine policies and make management decisions. We will need your cooperation and hard work for these labs and this class to be successful. It is imperative that you organize your data in your lab notebook. We will discuss the details and importance of lab notebooks and provide you with the requirements we expect. We expect all of you to participate in every aspect of the field and lab.

PLEASE NOTE:

At the discretion of the instructors and the whims of Nature, the class or lab schedule may be subject to change.