FW 1901
Coral Reef Management
Freshman Seminar Abroad Spring, 2018, 3 credits
Syllabus

Instructor
Jim Perry, 320 Hodson
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Office hours 10:30 Wed & 11:30 Th at Lori’s (Cleveland & Buford)

Assistant Program Leader
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Office hours TBA

Class sessions 1:00-3:00 Thursdays, 415 Alderman, St Paul campus; March 10-18 in Belize

Introduction
Coral reefs are some of the world’s most beautiful, productive and threatened environments. These reefs are highly complex ecosystems that include whale sharks, sea turtles, hundreds of species of brightly colored fish and hundreds of species of plants, and they all are dependent on colonies of tiny animals (“simbiodinium”, previously called zooxanthellae). Those tiny creatures form symbiotic relationships with corals that build homes by taking calcium carbonate from the water and depositing it in a hard structure (i.e., the coral). Millions of people worldwide depend on coral reefs for their survival, some as fishers, some whose lives are protected from waves by corals, others who rely on reef biodiversity to bring tourism. Yet, thousands of miles of coral reef are threatened by a range of influences, including pollution, overfishing and bleaching. Bleaching occurs when climate change alters ocean chemistry and temperatures, exacerbating other influences, often leading to death of the coral.
The Mesoamerican Reef System (MAR) is the most biologically and economically significant reef in the Americas. It extends for more than 1,000 km along the coasts of Mexico, Belize, Guatemala, and Honduras. The MAR ecoregion includes oceanic habitats, islands, coastal zones, tropical forests, and watersheds that drain the Caribbean Basin. Coral reefs and mangroves provide critical protection against damage from hurricanes and tropical storms.

Those reefs have supported generations of fishers, providing food and income for millions of people. Over the last few decades, a prosperous tourism industry has arisen along the reef, relying on sunny beaches, snorkeling and diving reefs, and sport fishing. The region is known for its biodiversity: it is home to sea turtles, manatees, more than 65 species of coral, and more than 500 species of fish, including whale sharks. The pace of local cultures flows to the rhythms of the ocean and its species.

The Belize Barrier Reef is a UNESCO World Heritage Site and the longest barrier reef in the Western Hemisphere. Like all coral reefs, this one is under siege. Land-based influences like nutrients and sediment impact the plants and animals. Human activities like overfishing, mining and waste discharges damage marine communities. Global problems like climate change alter water temperature and chemistry, often causing coral bleaching and decay of the entire ecosystem.

Sustainable reef management relies on protected areas called “no-take” zones where species can breed, grow and sustain broader populations. Currently, no-take protection covers less than 4% of Belize’s territorial waters, 2-3% of the reef area on the Atlantic side of Mexico, less than 0.5% of Honduran reefs, and barely over 0% in Guatemala. It is widely understood that healthier ecosystems show greater natural resilience. The MAR Leadership Program (MAR-L) is a capacity development network designed to build that resilience. Its stated mission is to develop a network of multifunctional marine reserves to counteract reef degradation. MAR-L supports and empowers Fellows who are fishers or serve in businesses and government agencies, trying to achieve 20% protection of the territorial waters of each of the four MAR countries.

Our class
This overall goal of our class is to help you integrate a scientific, managerial and cross-cultural experience into one synthetic whole. We will learn about societal goals for coral reef management, ways we put those goals into policies and practices, and ways we restore damaged reefs. The class blends an active learning, classroom experience with field work on the Mesoamerican Reef in Belize.

Through this class, you will become familiar with the ways coral reefs are managed, the ways we empower and restrict human behavior to achieve management goals on the reef, and how people are
actively engaged in protecting coral reefs. Our field work in Belize will allow you to swim with parrotfish, eagle rays, and a range of other brightly colored reef fish. You will visit a Belizean city and a Mayan ruin as part of the cultural aspect of the class, gaining exposure to how coastal people rely on the terrestrial and marine landscape, how that landscape controls what the reef is and can be, and how humans have valued this landscape for centuries. You will choose one particular management practice you find especially interesting (e.g., no-take zones, coral planting for restoration) and learn enough about that to share your knowledge with others in the class. This class will serve as a valuable introduction to marine science for those who are or might become interested in the Marine Biology Minor.

**Student Learning Outcomes**

This class advances three of the University’s Student Learning Outcomes:

1. **Understand diverse philosophies and cultures within and across societies** Achieved by being exposed to Belize and its culture, and assessed through your journal writing.
2. **Locate and critically evaluate information** Achieved through reading, analyzing information, and conducting field work. Progress is assessed through participation, discussion and presenting results to peers in class and to the community in Belize.
3. **Acquire skills for active citizenship and lifelong learning** Achieved by helping you become more aware of the interaction between coral reef management and sustainability at the national, regional and global levels. Achievement is assessed through journals, discussions and your final critical assessment.

**Preparing for the experience**

In applying to join this trip, you completed an essay that addressed three questions. Those questions were: 1. **How do you anticipate that study abroad will impact your personal, academic, and long-term goals?** 2. **Why did you select this program?** 3. **How are you preparing for your experience?** Now you have been accepted into the program, and it is time to prepare in more depth. Before we leave the country, you will join me in examining our respective views of other cultures and highlighting experiences we hope to have to help us gain increased cross-cultural sensitivity.

**CLE Environment theme**

This also class satisfies the university’s Environment Theme.

- The course addresses environmental issues of major significance. The central issue we address class is human valuation and management of coral reef ecosystems. We address conservation through watershed and ridge-to-reef-scale issues as well as more localized management of individual species and locations.
- The course gives explicit attention to interrelationships between the natural environment and human society. We address that interface every day in this class as we strive to understand what society values about coral reefs, and what management practices allow us to sustain those values.
- To excel in the class, you will demonstrate an understanding that solutions to environmental problems will only be sustained if they are consistent with the ethics and values of society. We discuss many environmental issues; there always are conflicts among competing uses and limits to the kinds and amounts of goods and services that can be provided by a coral reef ecosystem. Humans must make value judgments, choosing which attributes to retain and which to sacrifice. Critically, every such decision also must be adaptive; that is, we must take actions, measure the results against our intended goals, and readjust either actions or goals as appropriate. That iterative, reflective, adaptive practice is built into our discussion and experimentation in the classroom and all of our explorations and discussions in Belize.
The rigors of field work
This class focuses on management of reef ecosystems and occurs in three large sections: understanding enough about the resource that we can set management goals, instituting and assessing management practices and policies, and restoring systems that have damaged by mismanagement. We learn about the tropical, marine conditions that allow corals to grow, about the plants and animals that live in the reef, and about how we assess and monitor the health of those plants and animals. We learn about anthropogenic influences on the reef, like climate change, sediment, overfishing and nutrients. We learn about management policies and practices that control health of the reef, focusing our discussions on Marine Protected Areas (MPAs).

You will work in small groups to identify a coral reef management practice or research question you find interesting. You will read about and lead discussions about how that practice has been tested and how its effects have been assessed in Belize. You will frame questions you hope to address in-country. Before we leave for Belize, each person will discuss his/her findings and questions with the rest of the class, and with one or more Mesoamerican Reef colleagues via Skype. Our field work will take place over Spring Break in Belize, where we will meet local scientists, local marine protected area managers, fishers, local tourist operators, and other key stakeholders. You will conduct your field explorations in Belize. The culmination of that work will be a presentation to the local community on Tobacco Caye on our final full day on the island. When we return to campus, we will continue our discussion, reflecting on the international experience and examining how that experience influenced each person’s personal and professional goals.

Field equipment
In Belize, we will spend extensive time in the water. Each person must be able to swim. Protective floatation is available for people who want additional support in the water. We also will have one or more guides with us at all times for safety. Each person must bring their own snorkeling equipment (i.e., mask, snorkel, fins) and must be comfortable using that equipment. We will not be SCUBA diving. Before we leave for Belize, each student must check in with, and demonstrate his/her ability to swim for a UMN swimming instructor. If a student doesn’t pass the swim test, he/she can still come to Belize, but will precede the field work with at least 2 private lessons in the pool to ensure safety and improve the experience in Belize. Certification of swimming ability is due February 15; if necessary, documentation from the swimming instructor is due by March 1, 2018.

Alcohol policy
Our experience in Belize is intense and demanding. I want that experience to be rewarding and safe. Our alcohol policy is strictly enforced. We will have a sign-up sheet at each bar (there are only two) on Tobacco Caye. You may have one drink per night if you choose, at your own cost. You cannot save them up and have all of your drinks on one night. You cannot “give or sell” your allotment to another student. I respect you as adults, and I want to ensure that we don’t lose anyone in the ocean or have increased risk of heat stroke or dehydration due to hangovers. We don’t have time for irresponsible behavior, and I won’t tolerate it. Be prepared. I expect a lot out of you, and I know you are up for it. Violation of the alcohol policy will result in suspension of the privilege (i.e., the violator will not be allowed alcohol during the rest of the trip). Flagrant and/or excessive violation may result in the offender being sent home.

Credits and Workload Expectations
This is a 3 cr class; university policy is that each semester credit carries an expectation of 15 hours of instructor-interaction, and an additional 30 hours of study and work outside of class. We will meet face to face for two hours each week for seven weeks before leaving for Belize, and for three weeks upon our return. While we are in the field, we will be together, interacting about class content approximately 12 hours per day for eight days.

**Grading**
Grading is based on the quality of participation, discussions, and presentation. Each week on campus, we have discussions led by the instructor and assigned students. While we are in Belize, each person is expected to participate in each activity. Each student will participate in a group which makes a final presentation to the rest of the class, presenting the field explorations upon which they focused throughout the semester. A grade of **A** is achievement that is outstanding. A **B** is achievement significantly above the level necessary to meet the requirements. A **C** is achievement that meets the basic course requirements.
# Tentative schedule

## Spring Semester
1:00-3:00 Thursdays, 145 McNeal, St Paul campus

<table>
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<tr>
<th>Wk</th>
<th>Activities</th>
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| 18 Jan | **Introduction, overview, learning objectives, structure, goals**  
- Opening session (Jim, Markus)  
  - Welcome, introductions, syllabus  
  - Team leadership, assignment of reef questions  
  - Visit from LAC colleagues (Erica, perhaps Lindsey)  
- The future from here  
  - Introduction to journals; first weekly journal prompt  
  - Packing list  
  - Text *(TME)* and ID cards  
- **After class**  
  - Read *(TME)*: pgs 15-21  
  - Each person collects initial information on his/her reef question  
  - Assignment of exploratory questions |
| 25 Jan | **Guests from last year: Advice from the experts.**  
*What would each do differently and how would he/she suggest preparing?* (Ashley, Michelle, Isaac and Natalie)  
- Introduction to ocean acidification  
- Introduction to the MesoAmerican Barrier Reef  
  - Where is the MAR & how does it fit in the wider Caribbean?  
  - How is it like or different from other coral reefs?  
  - What large scale processes influence it?  
  - How does MAR-L relate to all that and what does it achieve?  
- Share reef question information; 4 min/person  
- Guest: Dr. Ranjan, last year’s instructor. Advice on making this most successful  
- **Advance reading:** [Report card for the](#) |
### MesoAmerican Reef

- **TME**: pgs 11-13

<table>
<thead>
<tr>
<th>Date</th>
<th>Event Details</th>
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| **1 Feb** | **Build and sustaining coral reefs: Flows of energy and other materials**  
- Coral: Basics and requirements for survival  
- Fishes of the reef: Fish morphology and behavior  
- Activity: Discussion of Reef questions, sampling designs  
- *I am from* … experience within and among reef teams  
- **Advance reading TME**: pgs 45-75  
- **Reef Team Methods for Discussion** |
| **8 Feb** | **Fish ID and Fun Facts**  
- **LAC pre-departure orientation**  
- **Reef question check-in**  
- **Study ID**  
- **Bring 1 reef question research paper to share**  
- **Journals due IN class** |
| **15 Feb** | **Ridge to reef**  
- **Fish ID and Fun Facts**  
- **“Ridge to reef” Connections between land, water, and ecosystem function**  
  - Impacts and management of sediment and nutrients on reef communities  
- **Reef question planning session**  
- **Introduction to Healthy Reefs for Healthy People**  
- **Perhaps guest lecture from Dept Head and Restoration Ecologist Professor Sue Galatowitsch**  
- **Study ID**  
- **Advance reading TME**: pgs 37-41 |
| **22 Feb** | **Marine Protected Areas (MPAs)**  
- **Fish ID and Fun Facts**  
- **MPAs and Belize geography**  
  - How are MPAs defined in Belize?  
  - What are the values and goals of MPAs?  
- **Biodiversity**  
  - Activity on biodiversity  
- **2:00 Skype call** with Mathilde, our host from the Tobacco Caye Marine Station |

**Movie Night #1: McNeal Fireside Room (6:30-7:30)**

**1 Feb**

- [Image of MesoAmerican Reef]

**Movie Night #2: McNeal Fireside Room (6:30-7:30)**

**8 Feb**

- [Image of McNeal Fireside Room]

**Movie Night #3: McNeal Fireside Room (6:30-7:30)**

**15 Feb**

- [Image of Ridge to reef]

**22 Feb**

- [Image of Marine Protected Areas]
### Field Session in Belize 10-18 Mar

<table>
<thead>
<tr>
<th>Date</th>
<th>Activity</th>
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<tbody>
<tr>
<td>Sat Mar 10</td>
<td>Leave your home well before 4:00 AM, fly to Belize City, arriving in the afternoon (Flight: 6:00 AM departure, MSP-Miami; 12:00 pm departure, Miami-Belize; arrives 1:41 PM) Drive about 1 hour to Monkey Bay Field Station Afternoon: settle in, orientation, bird walk in the tropical forest Evening visit to the Belize City zoo (half hour away)</td>
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<tr>
<td>Sun Mar 11</td>
<td>Breakfast lecture: <em>Ridge to Reef in Belize</em>, led by a Dr Ed Boles, Belizean watershed ecologist Visit to Xunantunich Mayan ruin Float down the Sibun River, studying geology, soils, vegetation, wildlife, and water <strong>Message:</strong> how do we understand the influence of the land on the reef?</td>
</tr>
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### 1 Mar

- ID Quiz (1:00-1:30)
  - Focus on fisheries
  - “Fisheries: their successes and their problems”
  - Continue work on ID and harvest guilds
  - Disruptive fishing practices (e.g., night lights)
  - Disruptive beach management (e.g., egg harvest, shore lights)
  - Human values
  - Overfishing and fishing down the food web
  - MPAs, and no-take zones as management tools

- Reef question preparation session
  - Prepare for next week’s call with Mathilde
  - Supply list
  - Study design
  - List of questions

### 8 Mar

- Planning for Belize
  - **1:00 Skype call** with Mathilde, our host from the Tobacco Caye Marine Station
  - What to expect when you get here
  - Pre-travel questions and logistics
    - Each student comes prepared with one question about “what is this going to be like?”
<table>
<thead>
<tr>
<th>Date</th>
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<tbody>
<tr>
<td>Mon Mar 12</td>
<td>Bus to port city of Dangriga. Boat to meet Mark &amp; Mathilde, Managers of Tobacco Caye Marine Station. Tobacco Caye is a 5 ac island with 3 small lodges and 20 residents; it is our home in Belize. Demonstrate safe snorkeling; discuss staying safe and avoiding marine hazards. Evening discussion with Mark &amp; Mathilde outlining our time together.</td>
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<td><strong>All activities on Tobacco Caye are exemplary; actual choice depends on weather, our interests and abilities, and the guidance of the Tobacco Caye Station Directors</strong></td>
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<td>Each day we have a ~1 hour morning seminar in which we discuss reef management, what we have seen to date, and what we expect to see in the upcoming day</td>
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<tr>
<td>Tue Mar 13</td>
<td>Snorkel around the island, viewing corals, fish, sea grass, invasive lionfish, sea fans, tarpon, barracuda and more. Night snorkel seeing lobsters, squid, lionfish, millions of tiny neon blue fish, sparkling phosphorescence, ... and the resident 8’ long Moray eels. <strong>Journals due</strong></td>
</tr>
<tr>
<td>Wed Mar 14</td>
<td>Boat to Bird Island, seeing several thousand mating and nesting Magnificent Frigate Birds and Black Boobies. Continue to snorkel in the Mangroves, seeing upside down jellyfish, anemones, mangrove roots and millions of larval fish. Drift snorkel back to the island, lying very still for hours as the current carries us toward home and we watch the sea floor and the coral reefs pass underneath.</td>
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<tr>
<td>Thur Mar 15</td>
<td>Boat to Glover’s Reef, one of the very few Atolls in the Atlantic and the least disturbed of all. Snorkel on the fore and outer reefs, contrasting diversity among habitats. Second night snorkel</td>
</tr>
<tr>
<td>Fri Mar 16</td>
<td>Professional Services Day. We will spend all day in the water, learning about the techniques marine scientists use to assess the underwater environment. Evening session in which each group presents results of their exploration to the Tobacco Caye community (even though there will be more of us than them).</td>
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<tr>
<td>Sat Mar 17</td>
<td>Leave about 9:00 AM for Dangriga, back on the shore. Bus from Dangriga to Belize City, with a stop at Monkey Bay for lunch, arriving early afternoon. Hot showers, clean sheets, a restaurant with a menu, and a chance to buy souvenirs.</td>
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<tr>
<td>Sun Mar 18</td>
<td>Leave from Belize City. Flight departure: 1:00 PM. Arrive in Charlotte at 6:10 PM. Depart Charlotte 7:49 PM to arrive home at MSP at 9:28 PM.</td>
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22 Mar

No class: Decompress and adjust to being back home

29 Mar

LAC full day (Markus)
- Decompress as a group. Share feelings and thoughts about coming back home
- Description of final synthesis assignment and presentation
  - **Journals due final time**

5 Apr

**Final presentations (Professional and academic goals)**

Celebratory dinner

18 Apr

**Final (personal) goal assessment due, to be posted to Canvas**

Grading

<table>
<thead>
<tr>
<th>Item</th>
<th>Due date</th>
<th>Points</th>
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<tbody>
<tr>
<td>1 Hopes and challenges</td>
<td>21 Jan</td>
<td>5</td>
</tr>
<tr>
<td>2 Opening essay</td>
<td>28 Jan</td>
<td>5</td>
</tr>
<tr>
<td>3 Reef team methods</td>
<td>1 Feb</td>
<td>6</td>
</tr>
<tr>
<td>4 Journal check #1</td>
<td>8 Feb</td>
<td>10</td>
</tr>
<tr>
<td>5 Two questions for Dr Galatowitsch</td>
<td>11 Feb</td>
<td>5</td>
</tr>
<tr>
<td>6 Reef team refined methods</td>
<td>15 Feb</td>
<td>9</td>
</tr>
<tr>
<td>7 ID quiz</td>
<td>1 March</td>
<td>15</td>
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<tr>
<td>8 Journal check #2 (in Belize)</td>
<td>13 Mar</td>
<td>10</td>
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<tr>
<td>9 Reef team presentation (in Belize)</td>
<td>16 Mar</td>
<td>15</td>
</tr>
<tr>
<td>10 Journal check #3</td>
<td>29 Mar</td>
<td>10</td>
</tr>
<tr>
<td>11 Final group presentation, professional &amp; academic goals</td>
<td>5 April</td>
<td>10</td>
</tr>
<tr>
<td>12 Final individual essay, personal goals</td>
<td>18 Apr</td>
<td>10</td>
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<tr>
<td>13 Participation semester long, on campus</td>
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<td>20</td>
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<td>14 Participation during the Belize field trip</td>
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<td>20</td>
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<td><strong>Total</strong></td>
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<td><strong>150</strong></td>
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**Academic dishonesty** Academic dishonesty in any portion of the academic work for a course shall be grounds for awarding a grade of F for the entire course. I will follow the University of Minnesota policies on academic conduct ([http://www1.umn.edu/regents/policies/academic/StudentConductCode.pdf](http://www1.umn.edu/regents/policies/academic/StudentConductCode.pdf)) and academic integrity ([http://www.osai.umn.edu/](http://www.osai.umn.edu/)). Scholastic misconduct is broadly defined as "any act that violates the right of another student in academic work or that involves misrepresentation of your own work. Scholastic dishonesty includes, (but is not necessarily limited to): cheating on assignments or examinations; plagiarizing, which means misrepresenting as your own work any part of work done by another; submitting the same paper, or substantially similar papers, to meet the requirements of more than one course without the approval and consent of all instructors concerned; depriving another student of necessary course materials; or interfering with another student's work."

**Policy on late assignments and incompletes** All assignments must be turned in on the scheduled due dates. *In the event of extreme circumstances that prevent you from completing coursework on time, consult with me to discuss alternatives.*

**Sexual Harassment** University policy prohibits sexual harassment (see the December 1998 policy statement, available at the Office of Equal Opportunity and Affirmative Action). Questions or concerns about sexual harassment should be directed to the office in 419 Morrill Hall.

**Student Writing Support** Student Writing Support ([http://writing.umn.edu/sws](http://writing.umn.edu/sws), 15 Nicholson Hall and satellite locations varying by semester (612-625-1893) offers face-to-face consulting to assist with any writing project. You might also benefit from SWS’s web-based resources ([http://www.writing.umn.edu/sws/webresources.htm](http://www.writing.umn.edu/sws/webresources.htm)) and from the On-Line Writing Lab at Purdue ([http://owl.english.purdue.edu/owl/](http://owl.english.purdue.edu/owl/))

**University Libraries** You can find research assistance at [http://tutorial.lib.umn.edu](http://tutorial.lib.umn.edu). The library tutorial, QuickStudy, is a self-paced tutorial covering the research process at the University of Minnesota Libraries.

**Disability Services** It is University policy to provide, on a flexible and individualized basis, reasonable accommodations to students who have disabilities that may affect their ability to participate in course activities or to meet course requirements. If you have special needs, please consult with me and/or Disability Services (180 McNamara (612-626-1333) V/TTY [http://ds.umn.edu/](http://ds.umn.edu/)).