



**MARINE AND COASTAL ECOLOGY OF THE INDO-  
PACIFIC: THE THAILAND PROJECT**  
*Winter 2017*  
**JANUARY 22 – MARCH 6**

**ACADEMIC SYLLABUS**

**Faculty:**

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**Contact Hours:** We will all be in close contact, meeting every day throughout the course. There will be a number of “check-in days” where we will schedule student-faculty meetings. If you would like to have a meeting outside of those times, you can certainly make an appointment or find an appropriate available time, we are happy to oblige.

**Class Meetings:** This Wildlands Studies Project involves seven days per week of instruction and field research. Class activities are planned for every day of the program, with a half-day break every 7-10 days. Faculty and staff work in close contact with students for 6-10+ hours a day and are available for tutorials and coursework discussion before and after scheduled activities. Typically, scheduled activities begin at 8:30am and finish at dusk. Most evenings, students are expected to review class material or work independently on class projects. We may have scheduled activities some evenings. When in the backcountry or at a field site, our activities may start as early as 4 am or end as late as 10 pm (e.g., for wildlife observation). It is necessary to be flexible and able to accommodate learning activities that may take place at any time of the day or night.

**Course Credit:** Wildlands Studies Project students receive credit for three undergraduate courses. These three courses have distinct objectives and descriptions, and we integrate teaching and learning through both formal learning situations (i.e., lectures and seminars) and field surveys. Academic credit is provided by Western Washington University. Extended descriptions follow in the course description section of this syllabus.

1. **ESCI 497T, Environmental Wildlands Studies (5 quarter credits)** – Field study of environmental problems affecting the natural and human-impacted ecosystems of our study region, including the role of human interactions.
2. **ESCI 497U, Environmental Field Survey (5 quarter credits)** – In this field-based course we conduct on-site examinations and analyses of environmental problems affecting wildlands and wildlife in our study region.
3. **ESCI 497V, Wildlands Environment and Culture (5 quarter credits)** – On-site field studies concerning the relationship between local culture groups and the environment. Using region- and culture-specific case studies, students assess ways in which local people utilize natural resources, according to both local tradition and modern ‘developed’ norms. Course examines the social and biological consequences of environmental and wildland/wildlife management policies.

**Readings:** A Course Reader has been compiled for this project and will be provided to students in advance of the project or upon arrival. Readings include selections from academic primary literature, technical reports, book chapters, and environmental impact assessments and planning documents. Field guides and textbooks supplement our field activities and are an integral part of our project. We will carry a shared reference library of these on all activities and backcountry trips.

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**I. Project Overview**

The Indo-Pacific region supports the highest diversity of tropical marine life on Earth. Hundreds of species of reef-building corals form the substrate for an ecosystem that is spatially complex, dynamic, and accessible. The number of fish and other animal species that are resident on the reef seems nearly uncountable, and many are highly co-evolved with one another.

Our time spent in the water and along the shoreline will enable us to observe cycles of predation, competition, and cooperation that push the limits of ecological credibility. Examples include sit-wait-predators like moray eels and mantis shrimp, the ‘wall of mouths’ supplied by voracious surgeonfishes that confront plankton at the reef edge, filter-feeding soft corals and crinoids, amphibious mudskipper fish and vividly colored fiddler crabs of the mangrove forest, and bump-head parrotfish whose feeding program involves pulverizing the coral with a head-butt, then consuming the debris.

Stresses on tropical near-shore habitats are also evident, the result of processes that are local (coastal runoff, over-fishing), regional (coral bleaching), or global (marine acidification). An important part of our program is to discuss and monitor change on the reef, to learn about processes of disturbance and recovery, and strategies that may help forestall the degradation of coastal habitat. For example, one of our field sites, the Surin Islands, lost much coral due to thermal bleaching in 2010. Since that time, small colonies of *Acropora* branching coral have begun to re-establish themselves, and we are eager to measure the progress since last winter.

Maritime Southeast Asia has long been a cultural crossroads where traders from China, India, and Arabia have mingled with indigenous people. This rich cultural context enables us to focus on human ecology as we conduct our environmental studies. Several of the places we’ll visit support ethnically distinct local populations, including indigenous groups like the Moken and the Urak Lawoi, whose animistic traditions foster a worldview different from the cultural norms of the Thai and Malay people. Our field studies will include visits to coastal communities that fish for a living, using gear that ranges from small-scale cast nets to large commercial trawlers. The depth of their indigenous knowledge about the sea is remarkable, and will enrich our program.

As we travel overland through southern Thailand and the Malaysian Peninsula, we will discover that the coastal ecosystem is utilized in many different ways. In some places, appropriate, small-scale harvesting of marine resources provides a sustainable lifestyle; in other places, the human enterprise seems disruptive and unsustainable. Often, tranquil coastal communities become vulnerable to exploitation. Even within the national parks, there are challenges to maintaining healthy marine biodiversity and ecosystem function. For example, shrimp farms coexist uneasily with the mangrove forests, which are recognized for their value as a critical buffer between land and sea, protecting the land from storms and tsunamis, and filtering sediment eroded from the land. Fish trapping for commercial purposes threatens the marine diversity and the economic base in some coral reef areas, as does sloppy tourism development. With all these environmental challenges surrounding us, we will be able to include shoreline ecosystem management as another key focal area for the program.

We'll divide our time between marine national parks that lie on the mainland, protecting habitats that include mangrove forest and sea-grass estuaries, and offshore islands that support spectacular fringing coral reefs. Accommodations in these places range from national park bungalows to tent-camping on the beach. Following a three-day orientation in Bangkok, we will travel first westward to the island of Koh Rang, then southward, crossing the peninsula of southern Thailand to Ko Surin Marine National Park. The islands of Surin support some of Thailand's most pristine (and best protected) reefs, however, a bleaching event in 2010 damaged much of the coral, especially the rapidly growing *Acropora* species. Since we have 'before' and 'after' data, monitoring the recovery process at Surin is an important field activity for our group. Surin is also the homeland of the Moken, an indigenous group of nomadic seafarers who have been struggling for recognition of their cultural identity since they received unwanted fame in the aftermath of the 2004 tsunami. From Surin, we'll visit Khao Sok, a densely forested national park that surrounds a large, artificial reservoir, then we'll travel via the city of Trang to Satun Province at the southern end of Thailand's Andaman coast. Satun has interesting coastal landscapes of limestone and mangrove forest, and it includes Tarutao National Park, Thailand's oldest marine protected area. Our field site at Tarutao is the Adang-Rawi archipelago, which has been an annual destination for Wildlands Studies since 1992. Adang is another place where we have a long term monitoring effort, and firsthand experience with two cycles of coral destruction and recovery. Tarutao is a difficult park to manage, with numerous stakeholders whose agendas are at times hard to reconcile. Consequently, it is a good place to learn about the challenges to sustainable resource management in the tropical marine environment. After returning to the mainland in the city of Hatyai, we'll move on to Pulau Perhentian, an island group in the South China Sea of Malaysia. These islands have maintained intact reefs, and are subject to less fishing pressure than the islands in Thailand so they have larger fish, and a relatively large population of sea turtles. At Perhentian, students will engage in independent study projects that focus on the ecology of species, or groups of species that are of special interest. We conclude the course by returning from Perhentian to Hatyai in Southern Thailand.

## II. Learning Objectives

Following this project, students should have working knowledge of and experience in:

1. ***Identification and functional ecology of tropical marine organisms, with emphasis on taxonomic groups like corals, echinoderms, and fishes that are abundant, apparent, and have an important role in ecosystem dynamics.*** Learning will consist of field observation supplemented by presentations and readings. Part of each day will focus on field observation, with focal groups selected according to location. Coral reef ecosystems in particular offer the best opportunity on earth to view in real time ecological interactions like predation, competition, and symbiosis.

2. ***Taxonomic relationships among the organisms that constitute a coral reef ecosystem.*** Because diversity is so exceptionally high at the phylum level, our field studies, in conjunction with readings and presentations on evolution and physiology, will expand students' understanding of comparative zoology.
3. ***Ecology of coastal habitats in the Indo-Pacific region, particularly mangrove, estuarine, and coral reef ecosystems.*** We will consider processes that structure these ecosystems, the role of keystone species and disturbance, and the 'services' that these ecosystems provide.
4. ***Artisanal fishing methods and traditional subsistence activities as practiced by coastal communities in the Indo-Pacific region.*** During our program, we will become acquainted with several ethnic groups that have a tradition of subsistence on marine resources. With the help of local specialists and a bilingual course instructor, students will have the opportunity to interview and learn from Moken, Urak Lawoi, Thai and Malay fisher folk.
5. ***Threats to the tropical marine ecosystem.*** Rapid economic development, uneven regulation, and misunderstanding of impact have degraded Indo-Pacific coastal and marine habitats significantly. Carbon-related problems like thermal bleaching and marine acidification, imposed at a global-scale, add to the uncertainty. During the program, we will have ample opportunity to observe and discuss the scope and severity of threats that include over-fishing, inappropriate tourism development, industrial shrimp farming, and coastal impacts of increasing atmospheric CO<sub>2</sub> concentrations.
6. ***Management strategies for conserving tropical marine habitat in the Indo-Pacific region.*** We will examine firsthand how strategies are developed through education, exclusion, remediation, and restoration. We will look critically at the role played by various stakeholders, including local residents, small businesses, commercial fisheries, non-government and government organizations.
7. ***Techniques for collecting data and monitoring coastal ecosystems in the tropics.*** Our course will consist of several group field activities. These include replicate photography to compare the state of the reef in 2017 to its state in past years, and photographic documentation of recovering *Acropora* colonies in areas that have been subjected to bleaching. We also census indicator species along 20-meter transects, including echinoderms, corals, and important fish species.

These topics will be addressed through classroom lecture and discussion, course readings, field activities, visits with local experts, exposure to ongoing research, and field research projects. The course generally progresses from faculty-led instruction in the beginning (i.e., more lectures and readings) to student-led critical evaluation, analysis, and synthesis at the end of the course. Our overarching goal is to have students leave the course with an extensive knowledge of our region, a set of broader skills, and an understanding of ecological, geological, and social sciences that allow students to critically evaluate information in other settings in their future lives and careers.

### III. Course Descriptions

We teach these three courses in an integrated format in the field. However, students will receive transcript credit for the following three courses (these were introduced on page 1):

**ESCI 497T, Environmental Wildlands Studies (5 quarter credits)** – Ecological field study of selected Indo-Pacific marine and coastal habitats that are subject to varying degrees of human disturbance. We will devote attention to understanding the dynamics of the system, and we will focus on how human impacts may be affecting the system on a variety of scales.

Experiences/Activities: Students will become familiar with the ecology and biological diversity of the major coastal ecosystems of Southern Thailand and Peninsular Malaysia, including mangrove, estuarine, littoral, and coral reef ecosystems. They will be instructed in methods of field observation, and how to recognize important taxonomic groups in this hyper-diverse part of the world. In the mangrove, there will be some emphasis on physiological methods of adaptation to the saline intertidal. Community level interactions (predation, competition, and symbiosis) are emphasized on the coral reefs. Instructors will teach the students through structured presentations, and students will also learn much through direct observation and experience.

Outcomes: Students will demonstrate knowledge of ecosystems, natural history, key organisms and proficiency with keys and manuals. Students will also keep a list of fish species encountered at the four main coral reef sites we will visit on this program.

Evaluation and Assessment: Students will receive two examinations and two short quizzes, and give an oral presentation to the group. Success will require consistent attendance and participation in class activities.

**ESCI 497U, Environmental Field Survey (5 quarter credits)** – Field-based examination and critical analysis of how human activities at both local and global scales are affecting the landscapes and wildlife populations of selected marine and coastal habitats in the Indo-Pacific region.

Experiences/Activities: Wildlands Studies students have been collecting field data in the marine national parks of Thailand for more than twenty years, generating data that holds modest but significant value for understanding ecosystem processes at work in this part of the world. Students contribute to this ongoing effort by monitoring the coral reef ecosystem in two specific ways. First, students use GPS to locate specific observation stations in order to make and analyze replicate photographs, tracking the establishment and demise of specific coral colonies. Second, students establish 20-meter transects on reef flats to compare the abundance of grazing and predatory echinoderms (sea cucumbers and sea urchins) on various islands with different management histories. We know from experience that both of these projects are interesting for students and suitable for those who are still learning the fundamentals of tropical marine ecology. Other monitoring activities include an ongoing study of beach erosion and deposition at Laem Son on Adang Island.

Outcomes: Student gain practical experience with the logistics of sampling, data collection, and GPS navigation in a marine environment. They learn methods of data analysis, including basic statistical methods for comparing results of transect surveys, and image processing and interpretation of underwater photographs. Beyond technical experience collecting data in a marine environment, this course gives students a practical understanding of ecosystem processes and how they are affected by the many disturbances that occur on coral reefs, including both 'natural' and anthropogenic. These practical insights will be used as a platform to facilitate discussion about future trends, especially how ongoing change in atmospheric composition is likely to affect the coral reef ecosystem through changes in sea water chemistry and surface temperature.

Evaluation and Assessment: Students conduct structured fieldwork including data collection and analysis as described above. This will require participation in instructional presentations, a mastery of equipment and techniques commonly employed by ecologists working in the marine environment, and an overall understanding of the relevance of the task. Students will work together in teams to complete this part of the course, but each student will have specific responsibilities.

**ESCI 497V, Wildlands Environment and Culture (5 quarter credits)** – Human ecology of coastal environments in the Indo-Pacific region.

Experiences/Activities: This course considers the human component of the Indo-Pacific coastal environment, as manifested through traditional cultural institutions, anthropogenic impacts on the ecosystem, and environmental management practices. Students will learn about two indigenous coastal communities, the

Moken and the Urak Lawoi as well as the cultures of the majority Thai and Malay fishers who inhabit this region. Local environmental impacts are manifold. Examples include conversion of mangrove to shrimp farms, unsustainable fishing practices at both artisanal and industrial levels, inappropriate tourism development, and mismanagement of national parks and protected areas. We will also consider global impacts and their effect of the coastal environment of the Indo-Pacific region. These include four manifestations of increased atmospheric CO<sub>2</sub>: sea level changes (expected to be especially severe in SE Asia); marine acidification (another direct consequence of CO<sub>2</sub> increase); coral bleaching due to warmer sea surface temperatures; and changes in the timing and intensity of the Asian monsoon.

The Urak Lawoi community of Tarutao National Park will comprise a particularly informative case study, as Ajan Thanit, course instructor, has several years experience working among the Urak Lawoi people as a consultant for a UNESCO project conducted there during the 2000s. Students will have the opportunity to meet with community leaders of the Urak Lawoi and Moken to discuss issues of concern. Local national park managers and members of the onshore business community (shrimp farmers and ‘eco-tour’ concessionaries) will also provide their insights to the students.

**Outcomes:** Students will gain a practical understanding as to how disenfranchised ethnic minority groups perceive the efforts of outsiders to influence their future. Methods for identifying and assessing the impact of coastal development, especially tourism development, are emphasized. Students will achieve an understanding of the mechanisms that underlie threats to the coastal ecosystem, threats that manifest themselves locally and globally. Students will gain an in-depth understanding of one aspect of global climate change: its effect on coastal ecosystems due to warming, sea level rise, and ocean acidification. Students will become familiar with the notion of marine fisheries as an iconic manifestation of the ‘tragedy of the commons.’ Students will know the principles involved in restoring mangrove and ‘seeding’ colonies of *Acropora* coral.

**Evaluation and Assessment:** Structured learning will derive from presentations by course instructors supplemented by discussions with local experts, national park managers, and stakeholders in the coastal communities that we visit. Students will also read extensively from the peer-reviewed literature on the local impacts of both local and global sources of anthropogenic disturbance. Students are required to be engaged during the discussions, to do the readings, observe the purported impacts with a critical eye and learn skills of field appraisal.

#### IV. Assessment

The following is an overview of the academic requirements for the program. Some of the assignments are ongoing (student presentation, course readings, and field studies); others have specific dates (midterm and final examinations). Due dates will be reconfirmed (or may be adjusted) once the course begins. Final grades for each course listed above will be based on the following items:

Course Number	Assessment Item	Date Due	Percent of Grade
ESCI 497T	Mid-Term Examination	9 February	20
	Final Examination	5 March	20
	Short quizzes	To be announced*	10
	Oral Presentation	Variable**	20
	Individual Field Projects	2 March	30

ESCI 497U	Mid-Term Examination	9 February	20
	Final Examination	5 March	20
	Participation in group field project	24 February	40
	Participation in data analysis	4 March	20
ESCI 497V	Mid-Term Examination	9 February	25
	Final Examination	5 March	25
	Short quizzes	To be announced	10
	Participation in interviews and class discussions	variable	40

\*Quiz dates are at the instructors' discretion, and may or may not be announced in advance

\*\*Dates of each student's oral presentation will be assigned at the beginning of the program

Quizzes will cover material that has been presented in recent days. They will be of short duration and may or may not be pre-announced. We anticipate that there will be 2-3 quizzes during the program.

Examinations are based mainly on presentation material, including presentations by course instructors, guest lecturers, and your fellow students. An understanding of material from the readings may also be required to gain full credit. Examinations are 'closed-book' and consist mainly of objective questions, with a few longer, more subjective questions in which students are asked to evaluate an issue. Students are not time-limited on the exams. Exams are graded anonymously.

Individual field projects will be conducted at Pulau Perhentian, and students will give a seminar at the end of the program in which they summarize their findings. Students will also submit a brief report with references, sketches, and quantitative data if applicable.

The group project will consist of replicate underwater photography of coral colonies that we have monitored and try to revisit annually, and 20-meter transects in shallow reef-edge habitat. Data will be collected by students working in small teams, and the data will be analyzed and presented collaboratively. We plan to conduct group projects at two sites: the Surin islands and the Adang island group. The product will be a display presentation of comparative photographs with a narrative-based comparison to previous years. The transect data is analyzed quantitatively and compared to previous years.

## V. Grading Scheme

To convert final grade percentages to letter grades for each course that will appear on your transcript, we will use the following grading scheme:

Letter grade	Percentage
A	92.5- 100+
A-	90.0- 92.4
B+	87.5- 89.9
B	82.5- 87.5
B-	80.0- 82.4

Letter grade	Percentage
C+	77.5- 79.9
C	72.5- 77.4
C-	70.0- 72.4
D+	67.5- 69.9
D	62.5- 67.4
D-	60.0- 62.4
F	< 60.0

## VI. General Reminders

*Academic Integrity* is as relevant in this field course as it is at your home institution. Plagiarism, using the ideas or materials of others without giving due credit, cheating, or putting forth another student's work as your own will not be tolerated. Any plagiarism, cheating, or aiding another to cheat (either actively or passively) will result in a zero for the assignment. Cases of academic dishonesty may be reported to your home institution.

*Assignment deadlines* are established to promote equity among students and to allow for ample assessment time from faculty before other assignments are due or other activities are to occur. Therefore, deadlines are firm and late work will receive at a minimum a 10% loss of grade points for each day they are late. If you believe that extenuating circumstances have prevented you from completing your work on time, make sure to discuss this with the relevant faculty as soon as possible and certainly before the work is due.

*Participation and attendance* are crucial throughout this project. Because of the demanding schedule and limited time, all components of the program are mandatory (unless indicated) and missing even one lecture may have a significant effect on your final grade. Hence, it is important to be prompt and prepared with the needed gear for all activities.

Students with special needs should meet with the lead faculty member as soon as possible to discuss any special accommodations that may be necessary.

## VII. Academic Schedule & Course Content

This outline is provisional and subject to change. Activities and reading assignments may be updated in December 2016.

<i>Date</i>	<i>Location</i>	<i>Presentation Topics and Activities</i>	<i>Work Due</i>
22-Jan-17	Bangkok	<i>Activities: Group meets, transfer to Shanti Lodge.</i>  <i>Meet and greet, orientation, scripted safety-talk for Bangkok.</i>  <i>Present: Grading practices, rules and etiquette, program overview</i>  <i>Present: Thai cultural norms.</i>	

23-Jan-17	Bangkok	<p><i>Present: Geography of Maritime SE Asia and the Indo-Pacific.</i></p> <p><i>Present: Urban ecology of a coastal metropolis.</i></p> <p><i>Activities: Museum of Siam, Thonburi canal excursion. Thai Buddhism at Wat Po, Bangkok's heritage as a coastal merchant port, Chinese mercantile influence, river and canal culture.</i></p>	
24-Jan-17	Bangkok	<p><i>Activities: Pasteur Centre snake venom</i></p> <p><i>Present: Water management, land-subsidence. Coastal cities and climate change in SE Asia.</i></p> <p><i>Scripted safety talk – train, car, boat, and water safety.</i></p> <p><i>Afternoon available for shopping and communication.</i></p>	
25-Jan-17	Koh Rang	<p><i>Transfer to Trat Province by bus. Transfer by boat to Koh Rang (4 nights)</i></p> <p><i>Present: Introduction to SE Asian Marine ecosystem</i></p> <p><i>Activities: Reach Koh Rang, introduction to Koh Chang National Park</i></p>	Quiz 1
26-Jan-17	Koh Rang	<p><i>Day 1 at Koh Rang</i></p> <p><i>Present: Introduction to coral reef ecosystem. Corals and coral evolution.</i></p> <p><i>Present: Protected area management in Thailand – key themes.</i></p> <p><i>Present: Main taxonomic groups of reef animals.</i></p> <p><i>Activities: Introduction to snorkeling, getting acquainted with the marine ecosystem.</i></p>	

27-Jan-17	Koh Rang	<p><i>Day 2 at Koh Rang</i></p> <p><i>Present: Introduction to methods of field study. Learn how to distinguish between live and dead coral. Major coral groups.</i></p> <p><i>Present: Meet the Echinoderms</i></p> <p><i>Activities: Practice geo-locating on the reef. Field recognition of key species.</i></p>	
28-Jan-17	Koh Rang	<p><i>Day 3 at Koh Rang</i></p> <p><i>Present: Eight fish families co-evolved to reefs.</i></p> <p><i>Activities: Getting acquainted with key fish families. Visit nearby small islands.</i></p>	
29-Jan-17	Chanthaburi	<p><i>Transfer to Chanthaburi. Overnight in guesthouse or hotel (2 nights)</i></p> <p><i>Activities: Get acquainted with Chanthaburi. Tropical coastal agriculture.</i></p> <p><i>Present: Shrimp farming and aquaculture in Thailand.</i></p>	
30-Jan-17	Chanthaburi	<p><i>Chanthaburi - Visit coast and coastal mountains.</i></p> <p><i>Present: Coastal forest biodiversity – the ‘Chanthaburi high rainfall pocket’.</i></p> <p><i>Activities: Possible visits to shrimp farm, Possible day trip to Namtok Phlio National Park or Sea Farming Demonstration Unit.</i></p>	
31-Jan-17	Train	<p><i>Transfer to Bangkok by bus. Connect for overnight train to Suratthani</i></p>	

01-Feb-17	Kuraburi	<p><i>Transfer from Suratthani to Kuraburi. Overnight in Guesthouse, 1 night.</i></p> <p><i>Activities: Orchard crops of the Thai Peninsula: Oil Palm, rubber and robusta coffee. Prepare for Surin.</i></p> <p><i>Present: Geography of the Malaysian Peninsula and Andaman Sea.</i></p> <p><i>Present: Tropics defined.</i></p>	
02-Feb-17	Koh Surin	<p><i>Morning boat transfer to Surin islands. Set camp at Chong Kad (5 nights)</i></p> <p><i>Presentation: Koh Surin National Park – Resources and management challenges</i></p>	
03-Feb-17	Koh Surin	<p><i>Day 1 at Koh Surin</i></p> <p><i>Activities: Training and discussion of field methods. Look for evidence of coral bleaching and recovery.</i></p> <p><i>Practice to methods for transects and replicate photography (1)</i></p> <p><i>Present: Reef Ecosystems - fish guilds, invertebrate groups. Major coral growth forms. Substrate categories: sand, rubble, massive corals (e.g. Porites), branching corals (<u>Acropora</u>).</i></p>	
04-Feb-17	Koh Surin	<p><i>Day 2 at Koh Surin</i></p> <p><i>Activities: Transects and replicate photography</i></p> <p><i>(2): Relocate and establish photo sites at Ao Mae Yai.</i></p> <p><i>Present: Physiological ecology of hermatypic corals, role of symbiotic dinomastigotes.</i></p>	

05-Feb-17	Koh Surin	<p><i>Day 3 at Koh Surin</i></p> <p><i>Activities: Moken and ethnic assimilation – visit Moken village, cultural activities with Ajan Narumon and local guides. Kabang boat trials.</i></p> <p><i>Guest Presentation by Dr. Narumon: The culture of the Moken.</i></p> <p><i>Present: 2004 Tsunami - its tectonic origins, human/economic toll, local impact on Andaman coast of Thailand.</i></p> <p><i>Present: Acute underwater vision of Moken children.</i></p>	
06-Feb-17	Koh Surin	<p><i>Day 4 at Koh Surin</i></p> <p><i>Activities: Ao Mai Ngam, and shallow water mangrove area. Transects and replicate photography (3).</i></p> <p><i>Present: Fish evolution and taxonomy.</i></p> <p><i>Present: Reef Fish evolution: Monte Bolca, constraints on reproduction (Wainwright and Bellwood).</i></p>	
07-Feb-17	Koh Surin	<p><i>Day 5 at Koh Surin</i></p> <p><i>Activities: Transects and replicate photography (4). Exploratory.</i></p> <p><i>Presentation: Coral Taxonomy, major groups of corals as they are understood by taxonomists.</i></p> <p><i>Present: Surin recap.</i></p>	Quiz 2
08-Feb-17	Kuraburi	<p><i>Transfer to Mainland. Overnight in Kuraburi.</i></p> <p><i>Activities: Return to mainland.</i></p> <p><i>Present: Color vision and light on reefs. Feedback in color patterns.</i></p>	

09-Feb-17	Khao Sok	<p><i>Transfer by charter bus and boat to Khao Sok National Park (4 nights)</i></p> <p><i>Tour the dam site and hydroelectric facilities</i></p> <p><i>Present: Ecology of Freshwater swamp forests.</i></p>	
10-Feb-17	Khao Sok	<p><i>Day 1 in Khao Sok</i></p> <p><i>Present: Geology and Ecology of Tropical Karst Limestone and Tropical Caves</i></p> <p><i>Activities: Hike in lowland tropical forest, visit nearby cave</i></p>	
11-Feb-17	Khao Sok	<p><i>Day 2 in Khao Sok</i></p> <p><i>Present: Habitat Fragmentation.</i></p> <p><i>Present: Ecology of Caves in SE Asian Tropics.</i></p> <p><i>Karsts as 'arks of biodiversity'</i></p> <p><i>Activities: Explore Khao Sok National Park, cave ecosystems</i></p>	
12-Feb-17	Khao Sok	<p><i>Explore karst limestone highland areas.</i></p> <p><i>Comprehensive review session for midterm exam on 2/14</i></p>	
13-Feb-17	Trang	<p><i>Charter bus transfer from Khao Sok to Trang. Overnight at guest house (2 nights)</i></p> <p><i>Afternoon review for midterm exam.</i></p>	
14-Feb-17	Trang	<p><i>Activities: Morning free to study and review, afternoon midterm exam.</i></p> <p><i>Late afternoon visit to Trang town to shop and explore.</i></p>	Midterm Exam
15-Feb-17	Thungwa	<p><i>Transfer to Thungwa. Community based tourism program including hydroponic farm, carnivorous plant nursery, fossil museum.</i></p>	

16-Feb-17	Thungwa	<i>Tham Mastodon, mangrove ecosystem. Kayaking program through a limestone cave, then boat trip to mangrove forest around Thungwa estuary.</i>	
17-Feb-17	Adang	<i>Morning transfer to Pak Bara. Speedboat transfer to Koh Adang.</i>  <i>Present: Marine ecology of the Adang Archipelago.</i>  <i>Present: Life history and behavioral ecology of selected taxa - why so many sea urchins here?</i>  <i>Present: Reef trophic structure and importance of invertebrates.</i>	
18-Feb-17	Adang	<i>Activities: Orientation survey of Adang island group: Hin Ngam Island, West Adang, Jabang shoal soft coral if conditions permit. Establish transects at Laem Son.</i>  <i>Present: Signals of distress in a reef ecosystem.</i>  <i>Present: Ecological effects of <i>Acanthaster planci</i> the 'crown-of-thorns'</i>	
19-Feb-17	Adang	<i>Activities: Replicate photography project at Ao Laem Son.</i>  <i>Present: Twenty years of ecological change at the Adang Island group.</i>  <i>Present: Storms and reef architecture in space and time.</i>	
20-Feb-17	Adang	<i>Activities: Replicate photography project at Laem Son and West Adang. Transects at West Adang.</i>  <i>Present: Marine acidification and its impact on organisms that fix CaCO<sub>3</sub>.</i>	

21-Feb-17	Adang	<p><i>Activities: Cultural ecology project – Urak Lawoi fishing culture and tourism development at Lipe Island.</i></p> <p><i>Activities: Beach erosion monitoring project with GPS.</i></p> <p><i>Present: Cultural ecology and policies toward the indigenous Uraklawoi People.</i></p>	
22-Feb-17	Adang	<p><i>Activities: Marine eco-tourism – survey condition of site adjacent to educational snorkeling trail at Haad Sai Khao (Rawi Island). Reef recovery and shift in species dominance at Yaang Island.</i></p> <p><i>Finish replicate photography project.</i></p> <p><i>Present: Tourism impacts and management: Case studies from Ko Adang and Lipe.</i></p>	
23-Feb-17	Adang	<p><i>Wrap-up Field Activities at Adang Island</i></p> <p><i>Discussion: Park managements effect on fringing reef ecosystem in the Andaman Sea</i></p>	
24-Feb-17	Hat Yai	<p><i>Activities: Travel to Hat Yai. Shopping and clean-up.</i></p>	
25-Feb-17	Hat Yai	<p><i>Activities: Free morning.</i></p> <p><i>Afternoon: Organize media to compare reef condition in Surin and Adang to past years.</i></p> <p><i>Present: Slide Show of Reef Fauna. Species identification workshop.</i></p>	
26-Feb-17	Kuala Besut	<p><i>Activities: Traveling. Cross border to Malaysia.</i></p> <p><i>Present: Introduction to Malay coastal fishing culture.</i></p>	

27-Feb-17	Perhentian	<p><i>Activities: Visit port at Tok Bali to observe pelagic fishery in South China Sea.</i></p> <p><i>Transfer to Perhentian Islands.</i></p>	
28-Feb-17	Perhentian	<p><i>Activities: Student independent projects – ecological analysis of a selected species or taxonomic group.</i></p> <p><i>Present: Marine National Park Management in Thailand and Malaysia – a comparison.</i></p>	
01-Mar-17	Perhentian	<p><i>Activities: Student independent projects.</i></p> <p><i>Present: Sea Turtle Conservation in the Indo-Pacific Region.</i></p>	
02-Mar-17	Perhentian	<p><i>Activities: Student independent projects.</i></p> <p><i>Present: Coral Reef Biogeography: Factors that affect endemism and species richness.</i></p>	
03-Mar-17	Perhentian	<p><i>Activities: Student independent projects. Begin presentations of group and individual study projects.</i></p> <p><i>Present: Sharks: adaptive radiation, importance to the marine ecosystem, conservation.</i></p> <p><i>Review session for final examination.</i></p>	Group Project Due
04-Mar-17	Hat Yai	<p><i>Activities: Transfer by boat and taxi to Thai border. Enter Thailand, chartered minibus to Hat Yai.</i></p>	Individual Projects Due
05-Mar-17	Hat Yai	<p><i>Final Examination in the afternoon. Farewell dinner.</i></p>	Final Exam
06-Mar-17		<p><i>Program ends. Students may fly to Bangkok for connecting flight home, or remain in Southern Thailand.</i></p>	

**VIII. Reading List** (*This list is provisional, may be modified for winter 2017*)

Complete readings in final syllabus at start of project.

1. Psychology of the Thai People
2. Thai Cultural Values - Smiles and Sawasdee
3. Lese Majeste and the Thai Royalty
4. Thailand's floods/ Rising damp
5. Floods Reduce Thailand Economy
6. Moken Good Practices
7. Moken (Ivanoff)
8. Mangroves among the most carbon-rich forests in the tropics
10. Avoiding Empty Ocean Commitments at Rio+20
12. Coastal Ecosystem Mgt with Nonlinear Returns.pdf
13. Down on the Shrimp Farms - Science.pdf
14. Coral Reef Biology - Coral Reef Information System (CoRIS) - NOAA.pdf
15. The evolution of modern corals and their early history.pdf
16. A Global Crisis for Seagrass Ecosystems
17. Blessing of the commons - Small scale fishery rights
18. Climate Change, Human Impacts and Reef Resilience
19. Connell - Diversity in Rain forests and Coral Reefs
20. Dugong and Seagrass in Thailand - Status and Challenges
21. Eco-Tipping Point (Trang and Earth Island)
22. Extinction and Evolution in the Brave New Ocean
23. Hard Summer for Corals 2010
24. Mean life on pristine reefs
26. Ocean Acidification Unprecedented
27. Projecting Coral Reef Futures under Warming and Acidification
28. Regional-Scale Assembly Rules and Biodiversity of Coral Reefs
29. Science - Reefs in Trouble
30. Thinking outside the reef
31. Why Are Reef Fish so Colorful - Greg Laslo
33. Ecology of Fishes on Coral Reefs, Chapter 1
34. Ecology of Fishes on Coral Reefs, Chapter 3
35. Biology of Mangroves and Seagrasses, Chapter 2 – Mangroves and their environment
36. Biology of Mangroves and Seagrasses, Chapter 3 – Seagrasses and their environment
37. Indigenous communities and the management of protected areas
38. Essentials of Oceanography, Chapter 9 – Tides
39. The Urak Lawoi of Adang Archipelago
40. Fishing Down Aquatic Food Webs