International Sustainable Development Studies Institute
สถาบันการศึกษาการพัฒนาที่ยั่งยืนนานาชาติ

Culture and Ecology of the Oceans: Islands, Reefs and Mangroves

Spring semester, 2023

Course Description

The oceans and coastal ecosystems are some of the most important and critically threatened ecosystems on the planet. This advanced course examines coastal and island communities as well as the near shore ecologies that they are embedded within — mangroves, sea grasses, coral reefs, as the surrounding ocean. Fishing — both small scale artisanal fishing and larger commercial enterprises — shape the communities as well as the ecosystems on which they depend. Multiple competing stakeholders and overlapping and transient resources make this a complex topic to study. All of this is happening in the broader context of climate change, ocean acidification, and rising sea levels.

In Southern Thailand coastal communities are working to conserve their traditional fishing practices through mangrove, reef, and seagrass conservation and restoration. This area, composed of extensive mangroves, beaches, reefs, islands, and rubber plantations, is under increasing pressure from the expansion of shrimp farms, commercial fishing, tourism, and the impact of climate change. The communities in Southern Thailand are also distinctive in that many are primarily Muslim, a minority group in predominantly Buddhist Thailand, facing both religious and ethnic discrimination.

The Islands Section of the course focuses on the study of tropical coral reefs, islands, and the role of state management of marine resources. The study site is the Tarutao National Marine Park, focused on the Adang-Rawi archipelago and the popular tourist destination of Koh Lipe. This is also the home of the Urak Lawoi, a traditionally semi-nomadic sea people. The course uses sea kayaks to explore the archipelago, re-tracing some of the traditional routes and camping sites of the Urak Lawoi, while focusing reef ecology and human impacts on the island and reef ecosystems.

By the end of the course students will understand the key issues in resource conservation and restoration in tropical coastal and islands ecosystems, the function and interrelationships between coral reefs, seagrass and mangroves, the role and limitations of both state and community management, and the broader challenges facing coastal communities in the context of climate change.

Course Objectives

The objectives for this course are to:

- Understand the key issues and challenges to ocean and costal ecosystems
- Have specific knowledge about field research and experiential studies of reefs, seagrasses and mangroves
- Understand the sociopolitical dynamics of resource management in Southern Thailand
- Understand the ecological context and constraints on fishing and resource use in Southern Thailand
- Be competent in both biological and social field research methods
- Understand the struggles of marginalized communities in Southern Thailand that depend on the oceans for their livelihood
- Be able to articulate the key challenges facing coastal and island communities in Southeast Asia and how it applies to global issues and climate change

Methodology

The course will integrate course lectures and readings with group discussions and seminars. Experiential field studies will be an important component of the course, both formal and informal. Guest lecturers will be a part of the course to share their experiences and perspective with students. Keeping up with readings, materials presented in class, and assignments is critical for success during this course.

Grading and Assessment

Course Component Details	Total
Participation	
In class participation: This means being an active participant in classes, contributing meaningfully to the discussions, questions, and ongoing learning.	5
Projects: Throughout the class participating in a meaningful way in projects and assignments in-class.	5
Field Studies: Participating in field studies outside of the classroom, both through asking questions in the field, engaging in activities, and being an active and engaged learner during field studies.	5
Total Participation	**15**
Writing	
Seminar and Observation Notes: An important component of learning to observe and analyze the issues during this course is taking notes in class as well as keeping an on-going journal of observations outside the classroom. This means writing daily in your journal, even if only for brief or significant observations.	10
Field Research Notebook: A more structured way of taking notes and learning outside the classroom, FRNs will be assigned to specific field studies and experiential learning opportunities.	15
Essays: For this course essays are longer reflections and analysis. There are two (2) essays during the course, generally one every two weeks. Essays should be 4-5 pages long in your journal, and cover the following points: • How this issue or topic links to the overall topic of the course. • Why you are interested in this specific issue or topic. • An analysis of a specific issue observed or learned about during the two weeks — describe this and why it is important. • Reference to a reading either from the course reader or outside sources. • Other questions that this issue raises for you to explore further.	20
Total writing	**45**
Independent Research Project/Focused Inquiry	
Each student will choose an issue related to the course to study independently. This should be a combination of research, observations, and analysis of a topic that the student is interested in. The **emphasis is primarily on field observations** broadly defined, drawing on both class-related field studies as well as independent observations in Thailand on your own time. This is not a book report or literature review, but a field study.	
Proposal: The IRP proposal will be a written outline and a short presentation to the class explaining a statement of intent, how data will be gathered, the feasibility of studying this during the course, and any potential challenges you may anticipate running into.	10
Progress update: This part of the IRP is a short update during the course (both an outline and a presentation) on what the student has discovered about their topic so far, what further questions this raises, any challenges they have faced and how they have overcome them, as well as further information they will be looking for during the second half of the	10
Final Presentation: On the last day of the course each student will give a five to ten (5-10) minute presentation on their topic, focusing on the initial question, methods, challenges, and the outcome of their focused inquiry. This should be presented with supporting slides. This will be followed by questions and comments from fellow students and instructors. **Rubric for final presentation** 1. Clarity and organization — is the issue clearly explained, linked to the topic and readings of the course, and well organized? 2. Experiential learning/field studies/observations — does the presentation link to specific examples of observations? 3. Interviews — does the presentation reflect discussions, interviews, and talks with local people and community members? 4. Depth — is the issue analyzed and explained well and thoroughly?	20
Total Independent Research Project	**40**

Seminar Week Topics and Schedule

Readings are in the course reader. The readings are a resource for the seminars, field studies, and for your final presentation. There are a lot of readings the first week, which you will refer to later on during the field section of the course. **Be strategic in your reading** so that you focus on new materials and information, and then go back and dive deeper into the readings as needed.

Monday
13.00-15.30
Ecosystem and Environmental Overview
By Ajaan Saisunee

Levinton, Jeffrey, *Marine Biology: Function, Biodiversity, Ecology*, Oxford University Press, New York, 2018.
- Chapter 2: The Oceanic Environment, pp. 12-32.
- Chapter 4: Ecological and Evolutionary Principles of Marine Biology, pp. 46-73.

Barbier, E.B. et al., "The value of estuarine and coastal ecosystem services," *Ecological Monographs*, Vol 81(2):169-193, 2011

Tuesday
13.00-15.00
Threats to Marine Ecosystems—Climate Change and Pollution
By Ajaan Saisunee

Levinton, Jeffrey, *Marine Biology: Function, Biodiversity, Ecology*, Oxford University Press, New York, 2018.
- Chapter 3: Climate Oscillations and Climate Change, pp. 33-45.

Bijma, J. Portner, H.O., Yesson, C., & Rogers, A.D., "Climate change and the oceans—What does the future hold?," *Marine Pollution Bulletin*, vol. 74, pp. 495-505, 2013.

Luís Gabriel Antão Barboza , et.al, "Marine microplastic debris: An emerging issue for food security, food safety and human health" *Marine Pollution Bulletins,* Vol 133: 336-348, 2018.

Kelsey R., *et al*., Understanding Cause of Gear Loss Provides a Sound Basis for Fisheries Management. Marine Policy. 96, pp 278-284, 2018.

Wednesday
Threats to Marine Ecosystems— Illegal, Destructive fishing and Overfishing

Pitcher, Tony J., & WL Cheung. "Fisheries: Hope or despair?," *Marine Pollution Bulletin,* Vol. 74.2: 506-516, 2013.

Lehmköste, J., *et a*l. "Exploiting a living resource: Fisheries " *World Ocean Reviews: Living with the Ocean 1,* Maribus, Hamburg, 2010. pp.126-135.

Lehmköster, J., *et al.* " Illegal Fishing- The Fisheries of the Future," *World Ocean Reviews: Living with the Ocean 2*. Maribus, Hamburg, 2013. pp.70-97.

Thursday
Ocean Governance

Hass Biance et. al., The Future of Ocean Governance. Springer Nature Switzerland AG. Rev Fish Biol Fisheries (2022) 32:253-270.

Lehmköster, J., *et al.* " The Future of Fish- The Fisheries of the Future" *World Ocean Reviews: Living with the Ocean 2*. Maribus, Hamburg, 2013. pp.108-119.

Fabinyi Michael *et a*l., Coastal Transition: Small scale Fisheries, Livelihoods, and Maritime Zone Developments in Southeast Asia. Journal of Rural Studies 91 (2022) 184-194.

Friday
Resource Management - Coastal livelihood approach, and Impacts of the Covid-19 pandemic on the fisheries and livelihood

Chanrachakij C. *et.al.*, "Severity of the Impacts of COVID-19 Pandemic on Small-scale Fisheries of Thailand: A Preliminary Assessment," *Fish for the People*. Vol.18 No.2: 2020, pp. 43-47.

Newell *et al.*, The Potential for Locally Manage Marine Area (LMMAs) as a Participatory Strategy for Coastal and Marine Ecosystems- the Global Commons. OIDA International Journal of Sustainable Development, 12:04, pp.48-62, 2019

Reid, Hannah, “Ecosystem-and community-based adaptation; learning from community-based natural resources management,” *Climate and Development*, 8:1, 4-9, 2015.

ESSAY #1 DUE
IRP PROPOSAL DUE

Field Schedule

17+ days of this course will be in the field. The field schedule will be handed out before leaving for Southern Thailand.

Due to the inherent unpredictability of the marine/ocean environment, the schedule for this field expedition has to be flexible. (For example, mudflat studies need to take place during low tides, etc.) Daily activities will be decided on in advance based on the tides, wind, waves, currents, and weather conditions.

Field Activities
The following are some of the major field study and field research activities during the expedition portion of the course. Activities may be added or dropped depending on availability of local stakeholders as well as the wind, waves, weather, and tides.

1. Homestay at Modtanoi village
2. Meeting with Iman and village leaders
3. Village survey in Trang
4. Seagrass conservation and community enterprise study
5. Tie dye / batik and use of natural materials from mangrove forest
6. Costal ecological survey with local experts
7. Meeting with community leaders
8. Meeting with Department of Marine Conservation
9. Fishing with host families
10. Mangrove sea kayak survey
11. Seagrass and mudflat survey
12. Meeting with commercial trawlers and commercial fish processing facility
13. Meeting with indigenous Urak Lawoi community members and activists
14. Sea kayaking surveys / paddle days (Koh Lipe to Koh Adang to Koh Rawi)
15. Meeting with National Park officials at Koh Adang
16. Zonation and transect studies
17. Biodiversity studies
18. Community Studies
19. Village survey on Koh Lipe

Field Readings
The following readings are in the reader and will be helpful for your time in the field. You should also review the readings for seminar week, as it forms the basis for the overall course and your understanding of the complex inter-related ecosystems of the coast.

Levinton, Jeffrey, *Marine Biology: Function, Biodiversity,* Ecology, Oxford University Press, New York, 2018.

- Chapter 16: The Tidelands: Rocky Shores, Soft-Substratum Shores, Marshes, Mangroves, Estuaries, and Oyster Reefs, pp. 317-364
- Chapter 17: The Shallow Coastal Subtidal: Sea Grass Beds, Rocky Reefs, Kelp Forests, and Coral Reefs, pp. 365-408.
- Chapter 21: Fisheries and Food from the Sea, pp. 471-503.

PEMSEA and Department of Marine and Coastal Resources (DMCR, Thailand). 2019. “National State of Oceans and Coasts 2018: Blue Economy Growth of Thailand,” Partnerships in Environmental Management for the Seas of East Asia (PEMSEA), Quezon City, Philippines.

Bennet, Nathan James, Philip Dearden, Ana Maria Peredo. “Vulnerability to multiple stressors in coastal communities: a study of the Andaman coast of Thailand.” *Climate and Development,* 2014: (1-24).

Sudtongkong, Chanyut and Webb L. Edward. “Outcomes of State vs. Community-Base Mangrove Management in Southern Thailand” *Ecology and Society,* 13(2):27.2008.

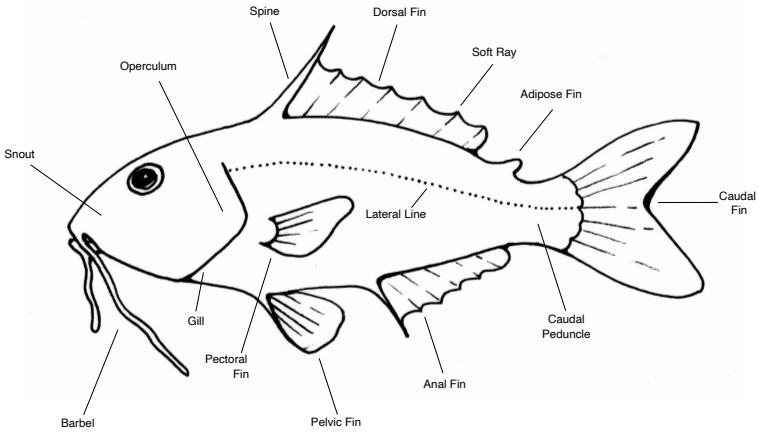
Bennet, Nathan James, Philip Dearden. “Why local people do not support conservation: Community Perceptions of marine protected area livelihood impacts, governance and management in Thailand.” *Marine Policy,* 44 (2014): (107-116).

Wongbusarakum, Supin. (2007) “The Urak Lawoi’ of the Adang Archipelago, Thailand”. Bangkok: Themma Group. Chapter 1, 2, 3, 4 and 7.

Field Study Topics
The following topics and studies are an important part of the course. Depending on the conditions as well as availability of local partners (communities, national park staff, etc.) we may not be able to do all of these studies, but will do as many as is possible in the time allotted.

For the field studies, you will be using both your Field Research Notebook (Field Research Notebook) as well as your own field notes to record what you learn, questions to follow up on, and materials for your Independent Research Project (IRP).

- Community resource management of both marine and non-marine resources
- National parks and state resource management
- Community life, including cultural practices, religion, organization, and management
- Fishing, both commercial and small scale artisanal
- Marine environment
- Sea grass ecology and conservation
- Mangrove ecology and conservation
- Reef ecology and conservation
- Coastal ecology
- Fisheries management, both state management and local conservation and management



Field research is an important component of this course, and mastery of the field research methods will help make the course a success. Each student will record detailed field observations and studies in their Field Research Notebook as a critical part of the learning on this course. Some of the key methodologies and techniques are described below. Specific days and assignments for the field research will be assigned.

The questions and format in the Field Research Notebook will be more extensive and detailed.

Coastal/Marine Plant and Animal Identification

During the time in the coastal and marine ecosystems of southern Thailand, we will encounter an amazing amount of biodiversity. By collecting detailed information on **at least 10 unique species**, you will acquire a more focused understanding of how a few species fit into the diverse ecologies of these areas. During field activities, whether snorkeling, surveying seagrasses, or scrambling through a mangrove, take the time to carefully observe the organisms around you. There should be ample time to swim or sit and record taxonomic and ecological information from a variety of living things. Combine your first-hand observations with available field guides, readings, and conversations with local people. This process will enhance your and the group's understanding of this organism's part in the greater ecosystem.

Complete 10 entries to the greatest degree possible. You may choose to do more, but 14 poorly described species do not substitute for 10 well described species. It will typically take multiple sources of information, and several revisits to complete each entry. Please cite when and were you saw each specimen and which sources you used for the ecological role and cultural significance categories.

You must record the English language common name (if any), the scientific name, as well as the Thai language name.

YOU MUST OBSERVE EACH SPECIES YOU IDENTIFY IN THE FIELD.

Summarize your findings on the "Species List" for all observed species.

10 total described species must include:
3 well described plant/algae species (minimum)
3 well described invertebrate species (minimum)
3 well described vertebrate species (minimum)
1 additional well described organisms of any category

Ecological Field Surveys

During this course you will be using ecological field survey methods in several different and distinct ecosystems.

There are three major ecosystems where you will be using these methods:
- Mangroves (including mudflats)
- Sea grasses
- Coral Reefs

Due to the experiential and field-based nature of this course, the types and locations of the surveys will depend in part on the wind, waves, and access to the specific ecosystems.

Some of the ecological field surveys will be conducted in multiple locations to allow for comparison and a deeper understanding of the ecological processes at work. For example, a community study on one side of an island with strong off shore currents may look different than a community study in the lee side of an island.

Data for each type of study needs to include the following:

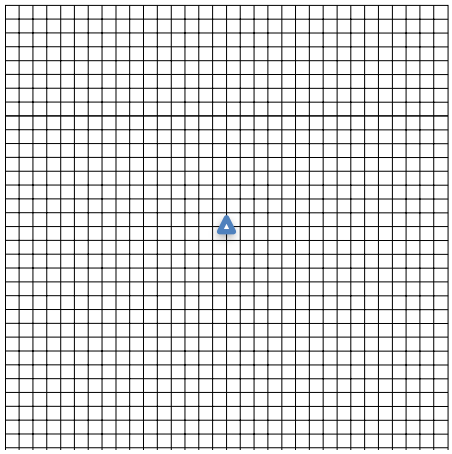
Date:	Site Name:

Coordinates:	Time of day:
Current Direction: ❑ Calm ❑ Light ❑ Moderate ❑ Strong	Weather: ❑ Clear ❑ Overcast ❑ Cloudy ❑ Rain
Wave Height: ❑ Calm ❑ Light ❑ Moderate ❑ High	Wind: ❑ Calm ❑ Light ❑ Moderate ❑ High
Tide ❑ ⬆ ❑ ⬇ ❑ Low ❑ Mid ❑ High Max: Min:	Moon ❑ Waxing ❑ Waning ❑ Full ❑ New Days until full:

Biodiversity survey: The purpose of the biodiversity survey is to learn about all of the diversity of life (vertebrates, invertebrate, etc.) in a specific area. The goal is to understand the **number** of **different** species in the designated area. The goal is to identify as many different species as possible in the area.

Species	Habitat	Depth/Location	Notes

Community study: The purpose of a community study is to look in-depth at a **specific area** and note the species diversity as well as **map the species** within a bounded area. The goal is to identify and count the number of **different species** as well as the **numbers of individuals** of that species in the area.



- Map and identify distribution of organisms within the area studied.
- Note the scale on your map (1 large square = 1 meter or 2 = 1 meter, etc.)
- Orient towards North at the top, and record the scale between the heavy grid lines.

Transect survey: A transect is a survey along a line in a designated area. The purpose of the transact is to understand **diversity**, **abundance**, and **distribution** along the transect line. The goal is to map out along the line, noting scale/distance in total, as well as where individuals cross or are immediately adjacent to the transect.

- Tally all organisms within one (1) meters of both sides of the transect line (e.g. 2 meters total width).
- Record the substrate directly below the transect line at the mark. If there is anything of note and/or intersecting the line, record (e.g. nets, dynamite fishing).

Meter	Substrate	Species (vertebrate, invertebrate, plants, etc)
1		
2		
3		

Zonation survey: The zonation survey is a **transect along a gradient** (e.g. salinity or water depth) to understand how species and diversity varies along the gradient in question. The goal is to map out along the line, noting scale/distance in total, as well as where individuals cross or are immediately adjacent to the transect.

- Tally all organisms along your survey line, and record the substrate and if it changes.
- If possible, survey in both directions of the gradient (e.g. out and back).
- Turn the page sideways and draw an elevation profile.

Mangrove Channel Study

Through this study you will gain first hand insight into the ways abiotic and biotic conditions vary within mangrove ecosystems by comparing how abiotic and biotic factors change with distance from the coastline. Observations will be compared between sites to obtain a general impression of how conditions and communities can vary within mangroves depending on location and microenvironment.

Study Locations

Mouth: The opening of the mangrove to the ocean
Mid-Channel: Where the channel is 8-10 meters across
Narrow Channel: Where the channel is less than 4 meters across

Directions

Snorkel in the channel and near the roots of the mangroves, looking carefully for juvenile fish and invertebrates. Visibility may be poor, but observe as much as you can. Use dive slates to collect observations.

Questions

1. What is the substrate (bottom) like? Describe.
2. Describe if there is leaf litter present. Are there signs of herbivory or observable decomposition? Can you observe what is eating the leaf litter?
3. Do you see any invertebrates? What species / size / location?
4. Do you see any fish or other vertebrates? What species / size / location?
5. Using the field guides, identify and list the predominant tree species at this location.
6. How dense is the tree canopy cover in this location? Does much light reaches the water?
7. How does this compare to the other two locations?

Mangrove Channel Study: Synthesis

Identify and write down one difference between the 3 zones and hypothesize a source of this difference.

How does this shape the ecosystem?

In the space below, sketch the three zones and annotate to highlight differences between them.

Marine Life Discussion with Community

This activity is designed to help you learn more how local people use the local environment to help fulfill their needs, including how their relationship to the surrounding environment has or has not changed over time.

Prepare questions to learn about the following issues, and record answers in your field journals:

1. What do community members collect from the marine environment, and from where? Mangroves, sea grass, reef, deeper water?
2. What tools do they use to catch/collect from these environments?
3. What time of day? What season / time of year?
4. How have things changed over time? What is it like now? What was it like when they were young?
5. Have the size and diversity of fish, for example, changed compared to now and when they were young?
6. For each thing collected, is this for family/personal use, or is it sold?
7. Who in the family does this? Is it everyone, mostly men, mostly women, depends on who is available?
8. Does the community manage access to these resources? If so, how? Are there any rules or traditions around collecting/catching in the marine or coastal environment?

Attendance Policy
Students are expected to be on time and attend all classes. If you are ill or otherwise need to miss a class, please inform your instructor or teaching assistant.

Academic Integrity
Academic integrity is essential to a positive teaching and learning environment. All students enrolled in ISDSI courses are expected to complete coursework responsibilities with fairness and honesty. Failure to do so by seeking unfair advantage over others or misrepresenting someone else's work as your own can result in disciplinary action.

Scholastic Dishonesty
Scholastic dishonesty means plagiarizing; cheating on assignments or examinations; engaging in unauthorized collaboration on academic work; taking, acquiring, or using test materials without faculty permission; submitting false or incomplete records of academic achievement; acting alone or in cooperation with another to falsify records or to obtain dishonestly grades, honors, awards, or professional endorsement; altering forging, or misusing an academic record; or fabricating or falsifying data, research procedures, or data analysis. Within this course, a student responsible for scholastic dishonesty can be assigned a penalty up to and including an "F" or "N" for the course. If you have any questions regarding the expectations for a specific assignment or exam, ask.

Grading Standards

Letter grade	Score or percentage	Description
A	93–100	Achievement that is outstanding relative to the level necessary to meet course requirements.
A-	90–92	Achievement that is significantly above the level necessary to meet course requirements.
B+	87–89	Achievement that is significantly above the level necessary to meet course requirements.
B	83–86	Achievement that is significantly above the level necessary to meet course requirements.
B-	80–82	Achievement that meets the course requirements in every respect.
C+	77–79	Achievement that meets the course requirements in every respect.
C	73–76	Achievement that meets the course requirements in every respect.
C-	70-72	Achievement that is worthy of credit even though it fails to meet fully the course requirements.
D+	67-69	Achievement that is worthy of credit even though it fails to meet fully the course requirements.
D	60-66	Achievement that is worthy of credit even though it fails to meet fully the course requirements.
F	0-59	Represents failure (or no credit) and signifies that the work was either (1) completed but at a level of achievement that is not worthy of credit or (2) was not completed and there was no agreement between the instructor and the student that the student would be awarded an Incomplete.