

Marine and Tropical Coastal Ecosystems: Whales, Sea Turtles, and Reefs

Short Name: Thai Tropical Marine Ecology

Credits: 4

Contact Hours: 68 total

Lecture Hours: 28

Directed Field Studies: 40 (80 at 2:1 ratio)

Course Description

This 4-week summer course focuses on tropical marine ecology and the interactions between humans and marine ecosystems. Students will explore the Gulf of Thailand to study sea turtles, baleen whales, and coral reefs, gaining practical research skills and contributing to ongoing marine ecology research. The program emphasizes the development of research methodologies, equipping students with the ability to conduct independent studies and analyze ecological data. This hands-on approach ensures students gain real-world experience in marine science.

Understanding marine and tropical coastal ecosystems is essential as these regions are among the most biodiverse and ecologically significant areas on Earth. They provide critical ecosystem services, including carbon sequestration, fisheries, and coastal protection, while also supporting millions of livelihoods. However, these ecosystems face increasing threats from climate change, pollution, overfishing, and habitat destruction. This course equips students with the knowledge and skills needed to address these challenges and contribute to the conservation and sustainable management of marine environments.

Course Objectives

The objectives for this course are to:

- Understand the ecology and behavior of key marine species, including sea turtles, baleen whales, and coral reefs.
- Analyze the impacts of human activities on marine and coastal ecosystems.
- Develop practical skills in marine research methodologies and SCUBA diving.
- Evaluate conservation strategies and their effectiveness in the context of Thai marine ecosystems.

Methodology

This course combines lectures, readings, and discussions with hands-on field experiences. Activities include:

- *Seminars*: Discussions with key stakeholders in marine conservation, including government officials and NGO representatives.
- *Fieldwork*: Direct observation and study of sea turtles, baleen whales, and coral reefs in their natural habitats.
- *Research*: Training leading to PADI Open Water certification for students without prior certification.
- *Independent Research*: Conducting field research projects contributing to ongoing marine ecology studies.

Grading and Assessment

Component	Details	Total
Engagement	This means participation in and out of the classroom, being an active member of the course, and being fully present and engaged in the field. This includes participation in discussions during seminars and in the village, etc. This also means being an active and supportive member of the course, including as a designated leader and active follower/self leadership.	25
Writing	<i>Seminar and Observation Notes (5)</i>: 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 daily journal of observations outside the classroom. Please put the date at the top of each page. <i>Essays (20)</i>: There are two (2) essays during the course. Essays should be 3 pages long by typing, and cover the following points: • How this issue or topic links to the overall topic of the course. (1) • Why you are interested in this specific issue or topic. (1) • A description and analysis of the specific issue and why it is important. (5) • Reference to interviews or observations during the course. (2) • Other questions that this issue raises for you to explore further. (1)	25
Independent Field Research Project (IFRP)	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 <i>emphasis is primarily on field observations</i> drawing on field studies as well as independent observations. This is not a book report or literature review, but field research. Students must receive instructor approval for their chosen topic/issue. Proposal (10): The IFRP proposal is a written outline and a short presentation to the class explaining the question, how it is related to the course topic, how data will be gathered, and any potential challenges you may anticipate running into. 1 page typed as well as an in-class presentation. Progress update (5): An update during the course on what the student has discovered about their topic so far, what further questions this raises, any challenges and how they have been overcome, as well as further information they will be looking for during the second half of the field study. 1 page written in your notebook as well as an in-class presentation. Final Presentation (15): On the last day of the course each student will give a five minute presentation on their research. Focus on clarity, field observations, interviews/discussions with community members, and analytical depth. 5-10 slides in PDF format. <i>Organization for final presentation</i> 1. What did you study/research focus? How is this related to the course topic? (2) 2. How did you study this, including observations and interviews? (5) 3. What did you learn? Findings and analysis. (10) 4. Further questions this raises for you. (2) 5. Final slide of references / interviews. (1)	30
Final Exam	The final exam will be a comprehensive review of course topics with an emphasis on what was learned during the field portion of the course. There will be 5 short answer questions. Students may use their notes but not their readers or the internet during the exam.	20
Total		100

Course Schedule

Saturday - May 29

Student arrival in Thailand.

Sunday - May 30

Orientation — Health, Safety and Cultural Orientation; Program Introduction; Survival Thai. Lunch: Food Orientation.

Module 1: Sea Turtle Conservation

This week will focus on sea turtle conservation, habitat, and related ecosystems and pressures on their populations.

Sea turtles are keystone species, critical for maintaining the health of seagrass beds and coral reefs. Understanding their life cycles and the threats they face is vital for creating effective conservation measures. This week's activities connect students to practical strategies for mitigating human impacts on these endangered species.

Monday - May 31

PM: Course Introduction — Seminar "Introduction on Tropical Marine Ecosystem Overview." 6 PM: Welcome Dinner.

Tuesday - June 1

AM: Travel to Bangkok. PM: Travel to Sattahip, Chonburi (Royal Thai Navy sea turtle conservation unit). Travel to Rayong.

Wednesday - June 2

AM: Talk with DMCR Research unit and visit to the Marine and Natural Museum; Seminar — Biology of Sea Turtles. PM: Reef Ecology.

Thursday - June 3

All day: Sea turtle nursery and coral propagation study at Koh Mannai.

Friday - June 4

All day: Endangered marine animal rescue center — sea turtle care practice.

Saturday - June 5

AM: Endangered marine animal rescue center — sea turtle care practice, continued. PM: Travel to Samut Sakorn.

Activities

- Field visits to sea turtle conservation centers and hatcheries.
- Discussions with researchers on the impact of climate change on nesting sites.
- Practical activities such as tagging and monitoring nesting turtles.

Focus Topics

- Sea turtle ecology and conservation.
- Threats to sea turtles, including climate change and bycatch.

Readings

- Charuchinda, Mickmin, and Supot Chantrapornsy. "Status of Sea Turtle Conservation and Research in Thailand." Phuket Marine Biological Center.
- Chanrachkij, Isara, Suppachai Ananpongsuk, and Worawit Wanchana. "An Assessment of Fishing Gears that Contribute to Increased Sea Turtle Mortalities: A Case Study in Rayong Province, Thailand." Southeast Asian Fisheries Development Center.

- Chomchat, Poommate, Worata Klinsawat, Kaitkanoke Sirinarumitr, Natnaree Inthong, and Theerapol Sirinarumitr. "Genetic Structure and Diversity of Green Turtle (*Chelonia mydas*) in the Gulf of Thailand." *Veterinary World* 17 (January 2024).
- Escobedo-Bonilla, Cesar Marcial, Noelia Maria Quiros-Rojas, and Esteban Rudín-Salazar. "Rehabilitation of Marine Turtles and Welfare Improvement by Application of Environmental Enrichment Strategies." *Animals* 12 (2022): 282.
- Kanghae, H., K. Thongprajukaew, P. Yeetam, T. Jarit-ngam, W. Hwan-air, S. Rueangjeen, and K. Kittiwattanawong. "Optimal Feeding Frequency of Captive Head-Started Green Turtles (*Chelonia mydas*)."
- Martins, Samir, Juan Patiño-Martinez, Elena Abella, Nuno de Santos Loureiro, Leo J. Clarke, and Adolfo Marco. "Potential Impacts of Sea Level Rise and Beach Flooding on Reproduction of Sea Turtles." *Climate Change Ecology* 3 (2022): 100053.
- Musick, J. A. "Sea Turtles." Virginia Institute of Marine Science.
- Patrício, Ana R., Lucy A. Hawkes, Jonathan R. Monsinjon, Brendan J. Godley, and Mariana M. P. B. Fuentes. "Climate Change and Marine Turtles: Recent Advances and Future Directions." *Endangered Species Research* 44 (2021): 363–95.
- Pritchard, Peter C. H. "Evolution, Phylogeny, and Current Status." Chapter 1 in *The Biology of Sea Turtles*. Boca Raton: CRC Press, 1997.
- Prampramote, Jindarha, Worakan Boonhoh, Sutsiree Intongead, Watchara Sakornwimol, Pimchanok Prachamkhai, Chalutwan Sansamur, Orachun Hayakijkosol, and Tuempong Wongtawan. "Association of Ocean Macroplastic Debris with Stranded Sea Turtles in the Central Gulf of Thailand." *Endangered Species Research* 47 (2022): 333–43.
- Sirinarumitr, Kaitkanoke, Pornchai Sanyathitiseree, Kornchai Kornkaewrat, Piyawan Suthunmapinunta, Patcharaporn Kaewmong, Komsin Sahatrakul, and Sontaya Manawatthana. "Reproduction in Sea Turtle." *Thai Journal of Veterinary Medicine* Suppl. 1 (2014): 85–88.

Module 2: Marine Mammals

Understanding and conserving marine mammals like Bryde's whales are critical for maintaining healthy marine ecosystems, as they play a significant role in nutrient cycling and ecosystem balance. Observing their behavior and engaging with stakeholders provide students with a practical understanding of conservation challenges and strategies.

Sunday - June 6

All day: Whale watching with touring boat; talk with whale-watching ecotourism operators.

Monday - June 7

AM: Talk with DMCR Research unit (Upper Gulf of Thailand) — Biology of Marine Mammals; endangered marine animal survey.

Tuesday - June 8

AM: Whale watching with veterinarian. PM: Whale and sea turtle discussion.

Activities

- Seminars with Thai government officials and international NGOs on marine conservation.
- Field observations of Bryde's whales and Irrawaddy dolphins.
- Discussions with community members and scientists on shipping traffic impacts on marine mammals.

Focus Topics

- Marine mammal ecology and behavior.
- Human impacts on marine mammals, including shipping traffic.

Readings

- Adulyanukosol, Kanjana, Surasak Thaongsukdee, and Kongkiat Kittiwattanawong. "Cetaceans and Mass Strandings in Thai Waters."

- Iwata, Takashi, Tomonari Akamatsu, Surasak Thongsukdee, Phaothep Cherdskujai, Kanjana Adulyanukosol, and Katsufumi Sato. "Tread-Water Feeding of Bryde's Whales." *Current Biology* 27 (November 6, 2017): R1154.
- Mananunsap, Somchai. "Status and Research on Cetaceans in Thailand." Eastern Marine and Coastal Resources Research Center, Department of Marine and Coastal Resources.
- Roman, Joe, James A. Estes, Lyne Morissette, Craig Smith, Daniel Costa, James McCarthy, JB Nation, Stephen Nicol, Andrew Pershing, and Victor Smetacek. "Whales as Marine Ecosystem Engineers." *Frontiers in Ecology and the Environment* (2014).
- Sakornwimon, W., S. Thongsukdee, S. Passada, T. Prempre, and R. Sujittosakul. "Preliminary Health Assessment and Threats of Bryde's Whale (*Balaenoptera edeni*) in the Gulf of Thailand; January 2014–December 2015." *Thai Journal of Veterinary Medicine* Suppl. 46 (2016): 81–84.
- Thongsukdee, Surasak, Kanjana Adulyanukosol, Surachai Passada, and Theerawat Prempre. "A Study of the Bryde's Whale in the Upper Gulf of Thailand." Marine and Coastal Resources Research and Development Center.
- "*Balaenoptera edeni* (Bryde's Whale)." Encyclopedia entry, 143.

Module 3: Coral Reefs in the Gulf of Thailand

This week we will shift our focus to two areas. First, we will work on acquiring the skills to do marine research, specifically SCUBA diving. For those who are not yet certified they will complete a PADI Open Water Diver course, and additional training for learning about data collection on reefs will be completed.

Second, we will focus on understanding coral reefs in the Gulf of Thailand, including ecosystem dynamics and anthropogenic pressure and impacts on the reefs. Coral reefs are biodiversity hotspots that support millions of marine species and provide critical ecosystem services. This week's activities emphasize the importance of monitoring reef health and working with communities to implement sustainable conservation practices.

Wednesday - June 9

AM: Travel to Chumphon. PM: Travel to Koh Tao. Evening: Scuba orientation.

ESSAY #1 DUE @ 5 PM

Thursday - June 10

Open Water Scuba Diving. AM: Class. PM: Pool.

Friday - June 11

Open Water Scuba Diving. AM: Class. PM: Pool.

Saturday - June 12

Open Water Scuba Diving. AM: Class. PM: Pool.

Sunday - June 13

Advanced Open Water Scuba Diving. AM: Class. PM: Pool.

Monday - June 14

Advanced Open Water Scuba Diving. AM: Pool. PM: Buoyancy special practice.

Tuesday - June 15

AM: Review of Reef Ecology and threats to marine ecosystems. PM: Diving.

Wednesday - June 16

AM: Marine debris and reef survey methods. PM: Diving (reef survey).

Thursday - June 17

AM: Reef survey methods. PM: Diving (reef survey).

Friday - June 18

AM: Eco-tourism and sustainable livelihoods. PM: Talk with key stakeholders and community members.

Saturday - June 19

AM: Coral propagation. PM: Diving.

Sunday - June 20

AM: Coral propagation. PM: Diving.

Monday - June 21

Reef survey, all day.

Activities

- SCUBA diving and coral reef health assessments.
- Discussions on coral bleaching and reef restoration efforts.
- Engagement with local communities involved in reef conservation.

Focus Topics

- Coral reef ecology and biodiversity.
- Impacts of climate change and human activities on coral reefs.

Readings

- Hughes, Terry P., Nicholas A. J. Graham, Jeremy B. C. Jackson, Peter J. Mumby, and Robert S. Steneck. "Rising to the Challenge of Sustaining Coral Reef Resilience." *Trends in Ecology & Evolution*.
 - Phongsuwan, Niphon, Anchalee Chankong, Chaimongkol Yamarunpatthana, Hansa Chansang, Ronnawon Boonprakob, Padorn Petchkumnerd, Naline Thongtham, Sathika Paokantha, Thanongsak Chanmethakul, Paitoon Panchaiyapoom, and On-Anong Bundit. "Status and Changing Patterns on Coral Reefs in Thailand during the Last Two Decades." *Deep-Sea Research II* 96 (2013): 19–24.
 - Roth, F., F. Saalman, T. Thomson, D. J. Coker, R. Villalobos, B. H. Jones, C. Wild, and S. Carvalho. "Coral Reef Degradation Affects the Potential for Reef Recovery after Disturbance." *Marine Environmental Research*.
 - Suraswadi, Pinsak, and Thamasak Yeemin. "Coral Reef Restoration Plan of Thailand." *Galaxea, Journal of Coral Reef Studies*, Special Issue (2013): 428–33.
 - Sutthacheep, Makamas, Kazuhiko Sakai, Thamasak Yeemin, Sittiporn Pengsakun, Wanlaya Klinthong, and Watchara Samsuvan. "Assessing Coral Reef Resilience to Climate Change in Thailand." *Ramkhamhaeng International Journal of Science and Technology* 1, no. 1 (2018): 22–34.
 - Sutthacheep, Makamas, Charernmee Chamchoy, Sittiporn Pengsakun, Wanlaya Klinthong, and Thamasak Yeemin. "Assessing the Resilience Potential of Inshore and Offshore Coral Communities in the Western Gulf of Thailand." *Journal of Marine Science and Engineering* (2019).
 - Valderrama Ballesteros, Laura, Jennifer L. Matthews, and Bert W. Hoeksema. "Pollution and Coral Damage Caused by Derelict Fishing Gear on Coral Reefs around Koh Tao, Gulf of Thailand." *Marine Pollution Bulletin* 135 (2018): 1107–16.
 - Yeemin, Thamasak, Vipoosit Mantachitra, Sakanan Plathong, Paulwatt Nuclear, Wanlaya Klinthong, and Makamas Sutthacheep. "Impacts of Coral Bleaching, Recovery and Management in Thailand." In *Proceedings of the 12th International Coral Reef Symposium*, Cairns, Australia, July 9–13, 2012.
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Module 4: Conservation Challenges and Solutions / Wrap Up

Conservation efforts require collaboration among communities, governments, and scientists to succeed. This week's focus on policy and community engagement provides students with a holistic perspective on tackling marine conservation challenges.

The final week we will continue our study of reef ecology before returning to Chiang Mai for the presentation of student Independent Field Research Projects.

Tuesday - June 22

AM: Wrap up.

Wednesday - June 23

AM: Travel to Surat Thani.

ESSAY #2 DUE @ 5 PM**Thursday - June 24**

PM: Travel back to Chiang Mai. IFRP prep.

Friday - June 25

AM: IFRP presentation; Final Exam. Farewell Lunch.

Activities

- Independent research project presentations.
- Discussions on integrated conservation strategies for marine ecosystems.
- Visits to coastal villages and marine protected areas.

Focus Topics

- Community-based conservation.
- Policy frameworks for marine ecosystem protection.

Readings

- Kaewmong, Patcharaporn, Chawanya Chiakwathanyu, Rachawadee Chanttra, Hirun Kanghae, and Kongkiat Kittiwattanawong. "Marine Endangered Species Status and Crisis in Thailand." Marine Endangered Species Unit, Department of Marine and Coastal Resources.
- Lennon, Rachel L., Rosie S. Williams, Kathryn J. Allan, Mariel T. I. ten Doeschate, Nicholas J. Davison, Simon A. Babayan, and Andrew C. Brownlow. "An Approach to Using Stranding Data to Monitor Cetacean Population Trends and Guide Conservation Strategies."
- Pradip Na Thalang, Pangram, Sukanya Thongratsakul, and Chaithep Poolkhet. "Spatial, Temporal, and Geographical Factors Associated with Stranded Marine Endangered Species in Thailand during 2006–2015." *Biology* 12 (2023): 448.
- Prampramote, Jindarha, Worakan Boonhoh, Kannawee Swangneat, Chayanis Daochai, Watchara Sakornwimol, Orachun Hayakijkosol, and Tuempong Wongtawan. "Two Decades of Cetacean Population Status and Mortality in Thailand: Spatiotemporal Trends, Environmental Drivers, and Anthropogenic Stressors."

Course Policies

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	93–00	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.