

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

Short Name: Thai Tropical Marine Ecology

Credits: 4

Contact Hours: 68

- Lecture Hours: 28
- Directed Field Studies: 40 (80 at 2:1 ratio)

### Course Description

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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 Bryde's whales, sea turtles, 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

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The objectives for this course are to:

- Understand the ecology and behavior of key marine species, including Bryde's whales, sea turtles, 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

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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 Bryde's whales, sea turtles, 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

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### 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. 10

### 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 daily journal of observations outside the classroom. Please put the date at the top of each page. 5

**Field Research Notebook:** A more structured way of taking notes and learning outside the classroom assigned to specific field studies. 15

**Essays:** There are two (2) essays during the course. Essays should be 4-5 pages long in your journal, and cover the following points: 20

- 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)

### 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 **emphasis is primarily on field observations** 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:** 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. 10

**Progress update:** 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. 5

**Final Presentation:** 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. 15

#### Organization for final presentation

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)

### 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 10 short answer questions. Students may use their notes but not their readers or the internet during the exam. 20

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TOTAL 100

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## Course Schedule

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### Week 1: Introduction and Marine Mammals

This week will introduce the course and field research methods. We will start the course in Chiang Mai at ISDSI's campus. We will then travel to coastal Thailand to start our study of the marine and coastal ecosystems in the Gulf of Thailand.

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.

#### 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:

- Thongsukdee, S., Adulyanukosol, K., Passada, S., & Prempre, T. (2014). A Study of the Bryde's Whale in the Upper Gulf of Thailand. Proceedings of the Design Symposium on Conservation of Ecosystem, 2, 26–31. *Proceedings of the Design Symposium on Conservation of Ecosystem*. [https://repository.kulib.kyoto-u.ac.jp/dspace/bitstream/2433/185133/1/13thseastar\\_026.pdf](https://repository.kulib.kyoto-u.ac.jp/dspace/bitstream/2433/185133/1/13thseastar_026.pdf)
- Kato, H., & Perrin, W. F. (2009). "Bryde's Whales *Balaenoptera edeni/brydei*." In *Encyclopedia of Marine Mammals* (pp. 158-163). Academic Press. [https://marinemammal.uga.edu/index.php?key=balaeden&page=species%2Fspecies\\_page](https://marinemammal.uga.edu/index.php?key=balaeden&page=species%2Fspecies_page)
- Tershy, B. R., & Wiley, D. N. (1992). "Asymmetrical Pigmentation in Bryde's Whales, *Balaenoptera edeni*." *Marine Mammal Science*, 8(3), 315-318. [https://bpb-us-e1.wpmucdn.com/sites.ucsc.edu/dist/e/1760/files/2024/07/Tershy\\_1992\\_2.pdf](https://bpb-us-e1.wpmucdn.com/sites.ucsc.edu/dist/e/1760/files/2024/07/Tershy_1992_2.pdf)
- Smith, B. D., & Tun, M. T. (2008). "Status and Conservation of Irrawaddy Dolphins *Orcaella brevirostris* in the Ayeyarwady River of Myanmar." *Aquatic Mammals*, 34(3), 337-347. [https://www.ykrasi.org/wp-content/uploads/2021/04/Smith-et-al-2007-min\\_compressed.pdf](https://www.ykrasi.org/wp-content/uploads/2021/04/Smith-et-al-2007-min_compressed.pdf)
- Jefferson, T. A., & Smith, B. D. (2016). *Marine Mammals of the World: A Comprehensive Guide to Their Identification*. Academic Press, Chapters 5-7, pp. 120-175. <https://www.elsevier.com/books/marine-mammals-of-the-world/jefferson/978-0-12-409542-7>
- Iwata, T., et al. (2017). Tread-water feeding of Bryde's whales. *Current Biology*, 27(21), R1154-R1155. [https://www.cell.com/current-biology/fulltext/S0960-9822\(17\)31243-5](https://www.cell.com/current-biology/fulltext/S0960-9822(17)31243-5)

### Week 2: 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.

#### 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

- Dunbar, S. G., Angkhananuchat, P., & Kittiwattanawong, K. (2020). The First Gulf of Thailand Sea Turtle Nesting Recovery Network Workshop. *Marine Turtle Newsletter*, 161, 35–39. <http://www.seaturtle.org/mtn/archives/mtn161/mtn161-13.shtml>
- Prampramote, J., et al. (2022). "Association of Ocean Macroplastic Debris with Stranded Sea Turtles in the Central Gulf of Thailand." *Endangered Species Research*, 47, 333-343. <https://www.int-res.com/articles/esr2022/47/n047p333.pdf>
- Chomchat, T., Kittiwattanawong, K., & Mahaprom, R. (2024). Genetic Structure and Diversity of Green Turtle (*Chelonia mydas*) in the Gulf of Thailand. *Veterinary World*, 17(1), 35–44. <https://www.veterinaryworld.org/Vol.17/January-2024/5.pdf>
- Juntarashote, K. (2001). An Assessment of Fishing Gears that Contribute to Increased Sea Turtle Mortality in Thailand. *SEAFDEC Special Publication*, 8(2), 1–8. <https://repository.seafdec.org/bitstream/handle/20.500.12066/811/sp8-2%20fishing%20gears.pdf>
- Spotila, J. R. (2004). *Sea Turtles: A Complete Guide to Their Biology, Behavior, and Conservation*. Johns Hopkins University Press, Chapters 2-4, pp. 45-110. <https://jhupbooks.press.jhu.edu/title/sea-turtles>

### Week 3: Coral Reefs and Marine National Parks 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.

#### 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:

- Rinkevich, B. (2019). "Ecological engineering approaches in coral reef restoration." *ICES Journal of Marine Science*, 78(1), 410–420. <https://academic.oup.com/icesjms/article/78/1/410/5780429>
- Mumby, P. J., & Steneck, R. S. (2008). "Coral reef management and conservation in light of rapidly evolving ecological paradigms." *Trends in Ecology & Evolution*, 23(10), 555–563. [https://www.researchgate.net/publication/23189556\\_Coral\\_reef\\_management\\_and\\_conservation\\_in\\_light\\_of\\_rapidly\\_evolving\\_ecological\\_paradigms](https://www.researchgate.net/publication/23189556_Coral_reef_management_and_conservation_in_light_of_rapidly_evolving_ecological_paradigms)

- Pongsuwan, T., Yamarun, S., & Phongsuwan, N. (2019). "Monitoring of coral communities in the inner Gulf of Thailand influenced by elevated seawater temperature and flooding." *Acta Oceanologica Sinica*, 38(2), 102–111. <https://link.springer.com/article/10.1007/s13131-019-1376-8>
- Sutthacheep, M., Yeemin, T., Pengsakun, S., Klinthong, W., & Sangmanee, K. (2013). "Impacts of the 1998 and 2010 mass coral bleaching events on the Western Gulf of Thailand." *Deep Sea Research Part II: Topical Studies in Oceanography*, 96, 25–31. [https://www.academia.edu/24838520/Impacts\\_of\\_the\\_1998\\_and\\_2010\\_mass\\_coral\\_bleaching\\_events\\_on\\_the\\_Western\\_Gulf\\_of\\_Thailand](https://www.academia.edu/24838520/Impacts_of_the_1998_and_2010_mass_coral_bleaching_events_on_the_Western_Gulf_of_Thailand)
- Hughes, T. P., et al. (2017). "Global warming and recurrent mass bleaching of corals." *Nature*, 543(7645), 373–377. <https://www.nature.com/articles/nature21707>
- Graham, N. A. J., et al. (2015). "Predicting climate-driven regime shifts versus rebound potential in coral reefs." *Nature*, 518(7537), 94–97. <https://www.nature.com/articles/nature14140>
- Hoegh-Guldberg, O., et al. (2007). "Coral reefs under rapid climate change and ocean acidification." *Science*, 318(5857), 1737–1742. <https://www.science.org/doi/10.1126/science.1152509>

#### **Week 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.

#### **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:**

- Agardy, T., et al. (2003). "Dangerous targets? Unresolved issues and ideological clashes around marine protected areas." *Aquatic Conservation: Marine and Freshwater Ecosystems*, 13(4), 353–367. [https://daytonlab.ucsd.edu/Publications/Agardy\\_et\\_al\\_2003.pdf](https://daytonlab.ucsd.edu/Publications/Agardy_et_al_2003.pdf)
- Punwong, P., Promplin, S., Lomchantrasilp, C., Soonthornampaipong, P., Englong, A., Marchant, R., Selby, K., & Chirawatkul, P. (2023). "Documenting a thousand years of environmental and anthropogenic changes on mangroves on the Bangkok coast, the upper Gulf of Thailand." *Vegetation History and Archaeobotany*, 32(1), 17–34. <https://link.springer.com/article/10.1007/s00334-022-00876-z>
- Kareiva, P., & Marvier, M. (2012). "What Is Conservation Science?" *BioScience*, 62(11), 962–969. <https://academic.oup.com/bioscience/article/62/11/962/263056>
- McClanahan, T. R., et al. (2006). "A comparison of marine protected areas and alternative approaches to coral-reef management." *Current Biology*, 16(14), 1408–1413. <https://www.sciencedirect.com/science/article/pii/S0960982206017015>
- Cinner, J. E., et al. (2012). "Comanagement of coral reef social-ecological systems." *Proceedings of the National Academy of Sciences*, 109(14), 5219–5222. <https://www.pnas.org/doi/10.1073/pnas.1121215109>
- Ban, N. C., et al. (2011). "Designing, implementing and managing marine protected areas: emerging trends and opportunities for coral reef nations." *Journal of Experimental Marine Biology and Ecology*, 408(1-2), 21–31. <https://www.sciencedirect.com/science/article/abs/pii/S0022098111003467>

## Course Policies

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### **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**

<b>Letter grade</b>	<b>Score or percentage</b>	<b>Description</b>
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.