



THE SCHOOL
FOR FIELD STUDIES

Marine Fauna: Ecology and Conservation

SFS 3131

Syllabus

4 credits

The School for Field Studies (SFS)
Center for Marine Resource Studies (CMRS)
South Caicos, Turks and Caicos Islands

This syllabus may develop or change over time based on local conditions, learning opportunities, and faculty expertise. Course content may vary from semester to semester.

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COURSE CONTENT SUBJECT TO CHANGE

Please note that this is a copy of a recent syllabus. A final syllabus will be provided to students on the first day of academic programming.

SFS programs are different from other travel or study abroad programs. Each iteration of a program is unique and often cannot be implemented exactly as planned for a variety of reasons. There are factors which, although monitored closely, are beyond our control. For example:

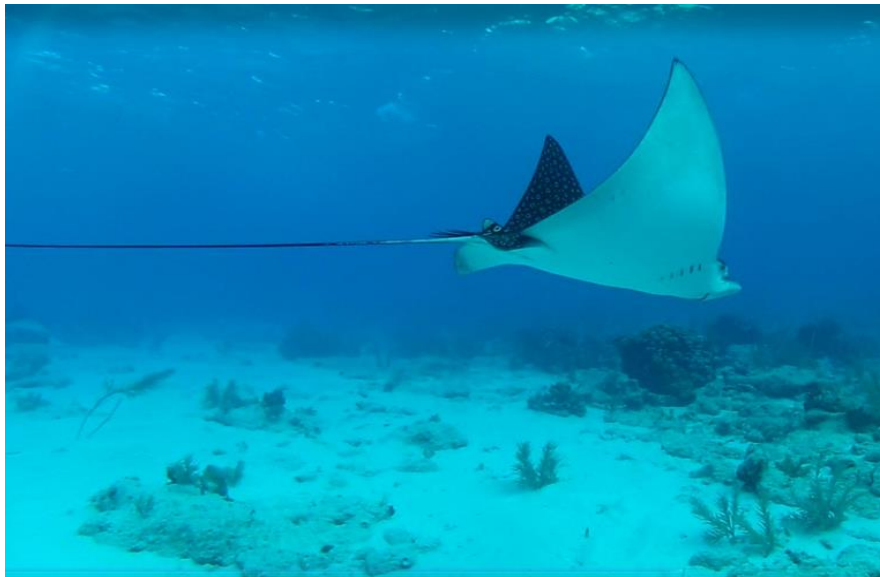
- Changes in access to or expiration or change in terms of permits to the highly regulated and sensitive environments in which we work;
- Changes in social/political conditions or tenuous weather situations/natural disasters may require changes to sites or plans, often with little notice;
- Some aspects of programs depend on the current faculty team as well as the goodwill and generosity of individuals, communities, and institutions which lend support.

Please be advised that these or other variables may require changes before or during the program. Part of the SFS experience is adapting to changing conditions and overcoming the obstacles that they may present. In other words, this is a field program, and the field can change.

Course Overview

In this four-week summer course, we will explore the ecological importance and conservation status of macro- and megafauna that are prominent in the coastal waters of the tropics, namely elasmobranchs (sharks and rays), large oceanic and reef fishes, marine and coastal reptiles (sea turtles, island iguanas), and marine mammals and octopuses. The course will consist of lectures, workshops and field-based activities that provide students with an understanding of the diversity and ecological characteristics of these animals. Furthermore, the workshops and field activities will introduce students to the practical techniques that are commonly employed to study and assess marine fauna.

The course will take place on the island of South Caicos, which is at a pivotal time in its development. Until recently, the island's economy centered around small-scale local fisheries, but a growing tourism industry and recent devastation from Hurricanes Irma and Maria have meant major changes to the community and marine ecosystem. As climate events continue to perturb the marine environment and the economy and the population grow and diversify, so too do the demands on the marine environment. Marine fauna play important roles in the TCI, both ecologically and economically, making this the perfect place to take a deep dive into their characteristics, threats, and conservation.



A spotted eagle ray (*Aetobatus narinari*) near shallow reefs of South Caicos Island

Learning Objectives

After completing this course, students should:

- Understand the trophic position and ecological niches of marine and coastal fauna.
- Understand the inherent biological traits that constrain their populations.
- Identify ecological importance, major threats, and conservation status of marine and coastal fauna.
- Understand the ethical considerations and practicalities of investigating large marine animals.

- Be able to use computer-based programs to identify individual animals based on their natural markings or sounds.
- Be able to extract biological information from video surveys and other remote sensing techniques.
- Understand how different cultures value marine fauna and know examples of policies that are in place to protect marine fauna

Assessment

Students will be assessed via written reports, a group presentation and participation. Written reports will be technical in nature and will require students to present information in a clear and concise manner. Familiarity with word processing software (e.g. Microsoft Word, Apple Pages) and spreadsheet software (e.g. Microsoft Excel, Apple Numbers) is helpful.

Assessment Item	Value (%)
Participation/Fieldwork/Peer Evaluations	10
Iguana Popular Science Article	15
Turtle and Ray Short Scientific Poster	25
Protection Policies Presentations	15
Octopus Behavior	25
Reading Quizzes	10
TOTAL	100

Participation/Fieldwork/Peer Evaluations (10%)

Being prepared for fieldwork and actively participating in it is key for successful fieldwork days. Students are expected to arrive on time for fieldwork and be prepared. Furthermore, they should focus on the fieldwork task during fieldwork. This grade assesses the preparedness, timeliness and active participation of the student in the fieldwork components of the course and the course in general.

Iguana Popular Science Article (15%)

Iguana interaction has become a tourist attraction on Long Cay. The status and habitat preference of iguanas will be studied at a site where tourists often feed iguanas and a site where iguanas are not fed. Students will then write about their findings in a popular science article (e.g., Times of the Island).

Turtle and Ray Short Scientific Poster (25%)

Writing up research results in the form of a scientific paper is a key skill required in all sciences. Students will report their findings from the turtle and ray field exercise in a short report (maximum 6 pages) consisting of a methods and results section. This report will be graded both on the quality of results reported as well as students' ability to follow writing style guidelines for each section.

Protection Policies Presentations (15%)

An important component of the scientific process involves the communication and dissemination of information. Although writing documents is the norm in many disciplines, scientific meetings of all kinds are widely used to disseminate information to colleagues and other stakeholders. To practice and learn how to give good presentations, students will present their findings on policies that are in place to protect marine fauna.

Octopus Activity Budget Report (25%)

While foraging, octopus (*Octopus briareus* and *Callistoctopus furvus*) engage in a variety of bodily movements, including crawling, jetting and arm exploration. Students will examine these behaviors while learning the fundamentals of underwater video collection and behavioral analysis. After collecting footage of octopuses foraging at nighttime, students will analyze them second-by-second and compile their data into a group data sheet. These data will then be used to compose a results and discussion section with graphs reporting their findings.

Reading Quizzes (10%)

Assigned readings will be available on SharePoint. You are expected to be familiar with these readings during the associated lecture; the readings are designed to supplement the lecture content and reading quizzes will be given for all of the readings.

Grading Scheme

Grade corrections in any of the above items should be requested in writing at least 24 hours after assignments are returned. No corrections will be considered afterwards.

A	95.00 - 100.00%	B+	86.00 - 89.99%	C+	76.00 - 79.99%	D	60.00 - 69.99%
A-	90.00 - 94.99%	B	83.00 - 85.99%	C	73.00 - 75.99%	F	0.00 - 59.99%
		B-	80.00 - 82.99%	C-	70.00 - 72.99%		

General Reminders

Lectures, Workshops & Field Briefings – are held at the Center. It is mandatory to attend all lectures, workshops and briefings. PDFs of presentation slideshows will be provided to students via a shared drive; however, it is important to note that these slides only contain key points and illustrations; it is essential that students also take notes during lectures. Students are permitted to make audio recordings of lectures with permission from the lecturer on the understanding that any such recordings are for personal use only (i.e., they cannot be shared or distributed).

Readings – Assigned readings will be available on the student server. You are expected to be familiar with these readings prior to the associated lecture. The readings will be discussed during the lecture.

Plagiarism and Cheating – Using ideas and materials of others without giving due credit is cheating and will not be tolerated. Plagiarism/cheating includes not citing information properly, misattributing information and utilizing AI to write reports. A grade of zero will be assigned to anyone caught plagiarizing, cheating or aiding another person to cheat, either actively or passively (e.g., allowing someone to look at your exam or report, using text or information without proper attribution). Unless specifically stated otherwise, all assignments should be individual pieces of work.

Deadlines – Deadlines for written and oral assignments are instated for several reasons:

1. Deadlines are a part of working and academic life to which students need to become accustomed.
2. Deadlines promote equity among students.
3. Deadlines allow faculty ample time to review and return assignments before others are due.

As such, deadlines are *firm* and extensions will only be considered under the most extreme circumstances. Late assignments will incur at least a 10% penalty (depending on how late it is). Assignments will be handed back to students after a one-week grading period.

Appropriate use of technology – SFS has worked hard to provide internet access to all its staff and students but is limited in capacity, so there can be no inappropriate uses (gaming or video/music downloading). Screens (laptops and tablets) are permitted during lessons for taking notes, however inappropriate use will result in the loss of this privilege. Phones are not permitted in class.



A marine sea turtle being examined by an SFS student

Participation – Participation in all components of the program is mandatory, as there will be no spare time to catch up on any missed classes. Missing even one lecture or discussion can significantly affect the experience you and your classmates have while at CMRS. You will get as much out of this course as you put into it, so please dive in. In all circumstances, we expect you to respect yourself and your fellow students. Dissent and discord are expected, but disrespect will not be tolerated.

Course Content

Type- L: Lecture, **FEX:** Field Exercise, **DEX:** Desk Exercise, **P:** Presentations

No	Title and outline	Type	Time (hrs)	Readings
1	Course Overview An overview of course components, assignment and assessment dates, expectations, and general guidelines.	L	1.0	
2	Marine Reptiles General overview of marine reptile biology and taxonomy, with particular emphasis on sea turtles and iguanas.	L	1.0	Bechhofer, J. & Henderson, A.C. (2018).
3	Human Impact on Marine Animal Behavior Examination of humanity's impact on the behavior of marine fauna (e.g., whale watching tours, swimming with dolphins, underwater sound pollution, etc.).	L	1.0	
4	Scientific Communication Brief intro to science communication and disseminating scientific findings to the non-scientific public.	L	1.0	
5	Iguana Habitat Assessment FEX Briefing Overview of iguana habitat around South Caicos and Long Cay. Explanation of iguana habitat assessment methods.	L	1.0	

No	Title and outline	Type	Time (hrs)	Readings
6	Iguana habitat Assessment FEX Assessment of iguana status at a site frequented by tourists versus an infrequently visited site.	FEX	4.0	Iverson, J.B., (1979). Mitchell, N., et al. (2002).
7	Threats and Conservation Issues Small developing island nations have found it difficult to protect marine ecosystems, while coastal development can offer economic security. Students will explore the multiple anthropogenic threats that these ecosystems face, including overfishing, coastal development, pollution, and climate change.	L	1.0	
8	Management Approaches Ecosystem management often falls on the shoulders of the country of domain. Introduced to the advisory and management bodies that drive research and conservation of tropical marine ecosystems, as well as why Marine Protected Areas are necessary, how prohibited activities are managed and regulated, and relative effectiveness.	L	1.0	Grorud-Colvert, K., et al. (2021).
9	Marine Fauna Ecological Importance Overview of ecological concepts and processes relevant to the study of marine fauna, including trophic cascades, apex predators, and nutrient distribution.	L	1.0	Burkholder, D. A., et al. (2013). McCauley, D. J., et al. (2012).
10	Evolution of Marine Forms and Characteristics An evolutionary history of marine body forms and the adaptations that characterize life in the seas.	L	1.0	
11	DEX Popular science article Time designated for composing an article geared towards a non-scientific audience based on the findings of the iguana habitat assessment FEX.	DEX	1.0	
12	The Elasmobranch Fishes An in-depth overview of fish taxonomy, with particular focus on shark and ray anatomy, their reproductive strategies, growth, aging, and their importance to the local trophic ecology.	L	1.0	Barker, M. J., & Schluessel, V. (2005).
13	Sharks of the TCI An in-class discussion of the shark species that occur in the Turks and Caicos.	L	1.0	
14	Photo Annotation Intro & Data Management Workshop Background on photo annotation and an excel exercise on managing data with an emphasis on long term data sets and their analysis.	L	1.0	
15	Photo Annotation FEX Briefing A review of in-water picture taking and FEX logistics.	L	1.0	
16	Photo Annotation FEX	FEX	8.0	

No	Title and outline	Type	Time (hrs)	Readings
	In-water photo acquisition of spotted eagle rays and turtles for later annotation.			
17	Photo Annotation Workshop Introduction to methods of individual photo identification.	L	2.0	
18	Photo annotation DEX Time designated for using eagle ray spot patterns and turtle scale patterns to identify individuals, write up a scientific report, and to consult with course instructors.	DEX	1.0	
19	Marine Mammals Marine mammals are the quintessential charismatic megafauna but have a complex and complex life history. Students will dive(!) into an overview of cetacean, pinniped, and sirenian biology, behavior, and ecology.	L	1.0	Brakes, P., & Dall, S. R. (2016). McClenachan, L., & Cooper, A. B. (2008).
20	Charismatic Species Students will examine how charismatic species are used as symbols for protection efforts and fundraising.	L	1.0	Gordon, E.R., et al. (2019).
21	Animal Personality Studies An introduction into the emerging field of animal personality research.	L	1.0	
22	Octopus Biology and Ecology An in-depth overview of octopus anatomy, biology, behavior, and ecology.	L	1.0	
23	Octopus Behavior FEX Briefing Students will be instructed on safety protocols, data collection and proper wildlife etiquette for filming octopus in the field at night.	L	1.0	Leite, T.S., Haimovici, M. and Mather, J., (2009).
24	Policy Impacts on Food Web Dynamics	L	2.0	
25	Marine Animal Behavior An overview of reproduction, predation, and defense in marine organisms.	L	2.0	
26	Octopus Behavior FEX Students will film nocturnal octopuses while they forage via snorkel and scuba diving.	FEX	4.0	
27	Protection Policies for Marine Fauna Students will examine policies used for protecting marine fauna and the values associated with these animals.	L	2.0	Bisack K.D. and Magnusson G.M. (2016). Roman, J., et al. (2013).
28	Protection Policies DEX Time designated for working on the protection policy presentation and consulting with course instructors.	DEX	1.0	
29	Octopus Video Analysis Workshop Students will learn how to properly analyze video footage from the Octopus Behavior FEX.	L	1.0	

No	Title and outline	Type	Time (hrs)	Readings
30	Octopus Behavior DEX Students will use ethograms to analyze octopus foraging videos and compile an activity budget for each species.	DEX	1.0	
31	Symbiosis and Competition A broad overview of mutualism, commensalism, parasitism, and competition among marine organisms.	L	2.0	Bshary, R., et al. (2006).
32	Protection Policy Presentations	P	4.0	
	TOTAL		53	

Reading List

1. Barker, M. J., & Schluessel, V. 2005. Managing global shark fisheries: suggestions for prioritizing management strategies. *Aquatic Conservation: Marine and Freshwater Ecosystems*, 15(4), 325-347.
2. Bechhofer, J. & Henderson, A.C. 2018. Transient nocturnal site fidelity in juvenile green (*Chelonia mydas*) and hawksbill (*Eretmochelys imbricata*) sea turtles on the shallow nearshore coral reefs of South Caicos, Turks and Caicos Islands. *Tropical Zoology*, 31:1, 44-54.
3. Bisack KD and Magnusson GM (2016) Measuring Management Success for Protected Species: Looking beyond Biological Outcomes. *Front. Mar. Sci.* 3:61. doi: 10.3389/fmars.2016.00061
4. Brakes, P., & Dall, S. R. 2016. Marine mammal behavior: a review of conservation implications. *Frontiers in Marine Science*, 3, 87.
5. Bshary, R., Hohner, A., Ait-el-Djoudi, K. and Fricke, H., 2006. Interspecific communicative and coordinated hunting between groupers and giant moray eels in the Red Sea. *PLoS biology*, 4(12), p.e431.
6. Burkholder, D. A., Heithaus, M. R., Fourqurean, J. W., Wirsing, A., & Dill, L. M. 2013. Patterns of top-down control in a seagrass ecosystem: could a roving apex predator induce a behaviour-mediated trophic cascade?. *Journal of animal ecology*, 82(6), 1192-1202.
7. Gordon, E.R., Butt, N., Rosner-Katz, H., Binley, A.D. and Bennett, J.R., 2019. Relative costs of conserving threatened species across taxonomic groups. *Conservation Biology*, 34(1), pp.276-281.
8. Grorud-Colvert, K., Sullivan-Stack, J., Roberts, C., Constant, V., Horta e Costa, B., Pike, E. P., ... & Lubchenco, J. (2021). The MPA Guide: A framework to achieve global goals for the ocean. *Science*, 373(6560), eabf0861.
9. Iverson, J.B., 1979. Behavior and ecology of the rock iguana, *Cyclura carinata*. *Bulletin of the Florida State Museum Biological Sciences* 24:176-358.
10. Leite, T.S., Haimovici, M. and Mather, J., 2009. Octopus insularis (Octopodidae), evidences of a specialized predator and a time-minimizing hunter. *Marine Biology*, 156(11), pp.2355-2367.
11. McCauley, D. J., Young, H. S., Dunbar, R. B., Estes, J. A., Semmens, B. X., & Micheli, F. 2012. Assessing the effects of large mobile predators on ecosystem connectivity. *Ecological Applications*, 22(6), 1711-1717.
12. McClenachan, L., & Cooper, A. B. 2008. Extinction rate, historical population structure and ecological role of the Caribbean monk seal. *Proceedings of the Royal Society B: Biological Sciences*, 275(1641), 1351-1358.
13. Mitchell, N., Haeffner, R., Veer, V., Fulford-Gardner, M., Clerveaux, W., Veitch, C. R., & Mitchell, G. 2002. Cat eradication and the restoration of endangered iguanas (*Cyclura carinata*) on Long Cay, Caicos bank, Turks and Caicos Islands, British West Indies. *Turning the Tide: The Eradication of Invasive Species* (eds Veitch CR, Clout MN), 206-212.

14. Roman, J., Altman, I., Dunphy-Daly, M. M., Campbell, C., Jasny, M., & Read, A. J. 2013. The Marine Mammal Protection Act at 40: status, recovery, and future of US marine mammals. *Annals of the New York Academy of Sciences*, 1286(1), 29-49.