



S F S THE SCHOOL
FOR FIELD STUDIES

Marine Megafauna Ecology and Conservation

SFS 3131

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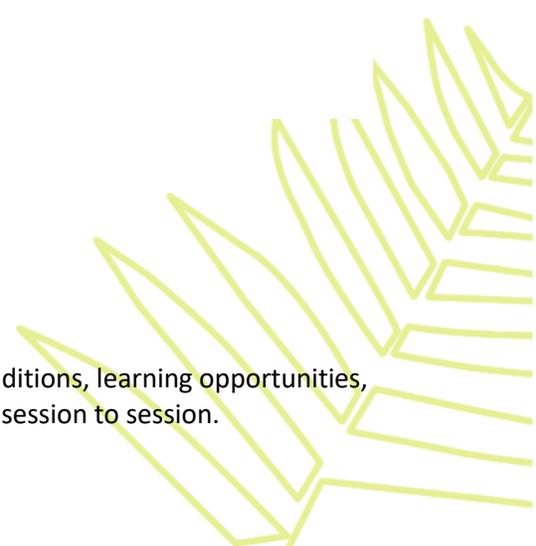
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The School for Field Studies (SFS)
Center for Marine Resource Studies (CMRS)
South Caicos, Turks & Caicos Islands

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

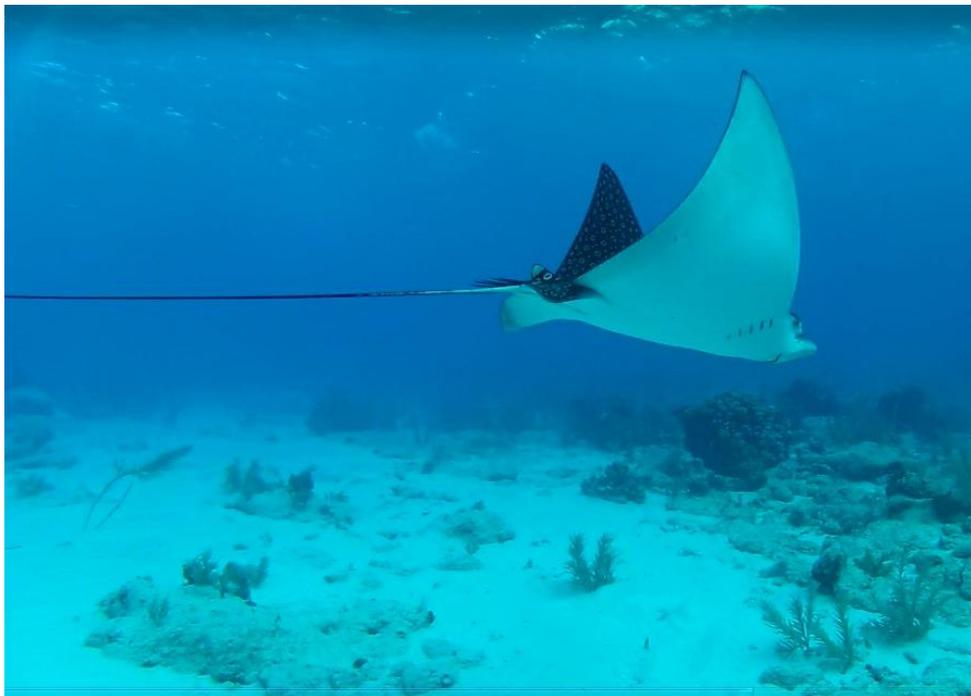


Course Overview

The term 'megafauna' typically refers to large-bodied animals which, in the marine environment, include such animals as dolphins, sharks, rays and turtles, among others. While this is a casual and diverse grouping, megafauna tend to share a number of life-history traits such as relatively slow growth and low reproductive output. Because of these inherent characteristics, their populations can be extremely susceptible to over-exploitation and other anthropogenic disturbances. Consequently, many species have experienced dramatic population declines in recent decades, and some now face an uncertain future.

In this four-week summer course, we will explore the ecological importance and conservation status of 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. 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 megafauna.

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 megafauna 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:

1. Understand the trophic position and ecological niches of marine and coastal megafauna.
2. Understand the inherent biological traits that constrain their populations.
3. Identify ecological importance, major threats, and conservation status of marine and coastal megafauna.
4. Understand the ethical considerations and practicalities of investigating large marine animals.
5. Be able to use the computer based programs to identify individual animals based on their natural markings or sounds.
6. Be able to extract biological information from video surveys and other remote sensing techniques.
7. Understand how different cultures value marine mega fauna and know examples of policies that are in place to protect marine mega fauna

Assessment

Students will be assessed in a number ways during the course, i.e. video, mapping, written report based on practical components, and group presentation . 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.



A marine sea turtle being examined by an SFS student

Assessment Item	Type	Value (%)
Iguana Habitat Preference	Report	25
Turtle and Ray Mapping Exercise	Map	25
Social Media Outreach Video	Video	25
Participation/Fieldwork	Engagement	25
TOTAL		100

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 lecturer on the understanding that any such recordings are for personal use only (i.e. they cannot be shared or distributed).

Iguana Habitat Preference Report (25%): Iguana interaction has become a tourist attraction on Long Cay. The habitat preference of iguanas will be studied at a site where tourists often feed iguanas and a site where iguanas are not fed. The habitat preference of iguanas will then be compared between the two sites and the students will write a report about the comparison.

Turtle and Ray Mapping Exercise (25%): Individuals of many marine animals can be identified based on natural markings, such as spot patterns, stripes, fin outlines etc., which are quite often just as unique as a person's fingerprint. In this exercise, students will use the Interactive Individual Identification Software (I³S) suite of programs to identify and catalogue individual eagle rays (based on spot pattern), and sea turtles (based on scale pattern). They then will use ArcGIS to produce maps of eagle ray and sea turtle populations and/or movement around South Caicos. Eagle ray and turtle photos will be collected by students in the field and become part of on going research in TCI and around the Caribbean.

Social Media Outreach Video (25%): Students will produce a video tailored to informing the general public on conservation and research of marine megafauna. With the increased used of social media and many research groups using social media to disseminate their science, video production and editing are nowadays well sought after skills. Students can choose one (or a combination of several) field techniques they conducted during the course and produce a video that explains the methods used and results in an engaging and creative way.

Participation/Fieldwork (25%): 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.

Grading Scheme

A	95.00 - 100.00%	B+	86.00 - 89.99%	C+	76.00 - 79.99%	D	60.00 - 65.99%
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

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. A grade of zero will be assigned to anyone caught cheating or aiding another person to cheat, either actively or passively (e.g., allowing someone to look at your exam or report). Unless specifically stated otherwise, all assignments should be individual pieces of work.

Appropriate use of technology: SFS has worked hard to provide internet access to all its staff and students. Inappropriate uses include gaming or video/music downloading. **Laptops/tablets are permitted in lectures for the sole purpose of note taking.** Any inappropriate use (e.g. accessing the internet, working on assignments etc) will result in this privilege being withdrawn. **Cellphones are not permitted in lectures.**

Deadlines: For written and oral assignments, deadlines 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 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 a 10% penalty for every day that they are late. This means an assignment that is five minutes late will have 10% removed, an assignment that is one day and five minutes late will have 20% removed, and so on. Assignments will be handed back to students after a one-week grading period.

Naming assignments:

1. Word documents, Excel documents, and PDFs for all individual assignments, exams, reports should be saved as...

FirstName_LastName_Assignment

Example... John_Smith_Literature Review

3. Group assignments should be named...

Group#_Assignment

Example... Group1_DataAnalysis

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.

Lectures, Activities, Readings, Exams

Type- L: Lecture, **FEX:** Field Exercise, **T:** Test, **DEX:** Desk Exercise

No.	Title and Description	Type	Time (hours)	Readings
MM01	Course Introduction Course components Assessments and dates Expectations Academic guidelines	L	1.0	
MM02	Fundamental Concepts of Ecology The organization of life Taxonomic nomenclature Ecological entities Ecological processes	L	1.0	Burkholder, D. A. <i>et al.</i> (2013). Hays 2016
MM03	Marine Megafauna Ecological importance Apex predators Trophic cascades Nutrient distribution	L	1.0	McCauley et al (2012)
MM04	Evolution of marine forms and characteristics	L	1	
MM05	Marine Reptiles Reptile taxonomy Turtle anatomy Global distributions of sea turtle species Life-histories Trophic ecology	L	1.0	Bechhofer, J. & Henderson, A. C. (2018).
MM06	Iguana Habitat Assessment FEX briefing Overview of Iguana habitat around South Caicos and Long Cay. Explanation of iguana habitat assessment fieldwork methods	L	1.0	
MM07	Iguana habitat Assessment FEX Assessment of iguana habitat at two locations: Horse Cay and Long Cay.	FEX	5.0	

No.	Title and Description	Type	Time (hours)	Readings
	Horse Cay is not often visited by tourists while tourists feed iguanas on Long Cay as part of a tour.			
MM08	Iguana habitat Assessment FEX report write up Comparison of Iguana habitat between Horse Cay and Long Cay. Students learn how to write a report based on data they collected in the field.	DEX	4.0	
MM09	The Elasmobranch Fishes Fish taxonomy Shark and ray anatomy Reproductive strategies Growth and ageing Trophic ecology	L	1.0	Barker, M. J. & Schluessel, V. (2005).
MM10	Photo annotation FEX briefing Background on photo annotation Explanation of in water picture taking for photo annotation	L	1.0	
MM11	Photo Annotation FEX In water acquisition of pictures of spotted eagle rays and turtles for photo annotation	FEX	5.5	
MM12	Photo Annotation Workshop Introduction to the I ³ S programs Annotating and matching spot patterns with I ³ S Spot Annotating and matching body patterns with I ³ S Pattern Annotating and matching body outlines with I ³ S Outline	DEX	2	Flowers 2017
MM13	Photo annotation DEX	DEX	3	

No.	Title and Description	Type	Time (hours)	Readings
	Annotating and matching eagle ray spot patterns and turtle scale patterns with I³S Spot			
MM14	GIS workshop DEX Introduction to Geographic Information Systems Introduction to QGIS software Creating a basemap Importing and displaying spatial data	L	2	
MM15	Mapping exercise DEX Connecting photo identification to spatial analysis.	L	3.0	
MM16	Large Oceanic Fishes The billfishes The tunas The grouper	L	1.0	Allen, R. (2010).
MM17	Management Approaches Fishery controls Marine Protected Areas Public awareness Intergovernmental organizations Non-governmental organizations	L	2.0	Henderson, A. C. <i>et al.</i> (2016).
MM18	Baited Remote Underwater Video (BRUV) FEX briefing	L	1.0	
MM19	BRUV FEX	FEX	3.0	
MM20	Fishers perception of megafauna: focus group methodology Traditional ecological knowledge	L	2.0	
MM21	Size changes of oceanic fish caught over time DEX	DEX	1.0	
MM22	Video Analysis Workshop Abundance estimate techniques Cataloguing observed behaviors	DEX	1.0	
MM23	BRUV video analysis DEX	DEX	4.0	
MM24	Assessing biodiversity	L	1.0	

No.	Title and Description	Type	Time (hours)	Readings
MM25	BRUV biodiversity data analysis	DEX	1.5	
MM26	Marine Mammals: Taxonomy Cetaceans Pinnipeds Sirenians	L	1.0	McClenachan, L. & Cooper, A. B. (2008).
MM27	Marine Mammals: Behavioral ecology	L	1.0	
MM28	Whale Song DEX Introduction to Rave Software	DEX	1.0	
MM29	Threats and Conservation Issues Fisheries Habitat loss Pollution Climate change	L	1.0	Hawkes, L. A. <i>et al.</i> (2009).
MM30	Valuation of Marine Megafauna across Cultures: Examine ethics and values relating to marine megafauna from different cultural perspectives, including hunting and consumption.	L	1.0	
MM31	Scientific outreach through social media/video	L	1.0	
MM32	Environmental Non- Governmental Organizations (ENGOS) and Charismatic Species: Examine how ENGOS use charismatic marine megafauna as symbols for protection efforts, fundraising, etc.	L	1.0	
MM33	Human Impact on Behavior: Examine how humans impact the behavior of marine megafauna. For example, whale watching	L	1.0	

No.	Title and Description	Type	Time (hours)	Readings
	tours, swimming with dolphins, etc.			
MM34	Screening of outreach videos	L	2.0	
Total Hours			60	



A reef shark caught on camera from a BRUV (baited remote underwater video)

Reading List

Allen, R. (2010). International Management of Tuna Fisheries. Chapter 3 (pp 7 – 30).

Barker, M. J. & Schluessel, V. (2005). Managing global shark fisheries: suggestions for prioritizing management strategies. *Aquatic Conservation: Marine and Freshwater Ecosystems* 15: 325 – 347.

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: 44 – 54.

Burkholder, D. A. *et al.* (2013). Patterns of top-down control in a seagrass ecosystem: could a roving apex predator induce a behavior-mediated trophic cascade? *Journal of Animal Ecology* 82: 1192 – 1202

Flowers, K. I. *et al.* (2017). Site affinity of whitespotted eagle rays *Aetobatus narinari* assessed using photographic identification. *Journal of Fish Biology* 91: 1337 – 1349.

Hawkes, L. A. *et al.* (2009). Climate change and marine turtles. *Endangered Species Research* 7: 137 – 154.

Hays, G. C. *et al.* (2016). Key questions in marine megafauna movement ecology. *Trends in Ecology and Evolution* 31: 463 - 475

Henderson, A. C. *et al.* (2016). Assessing the incidental value of a marine reserve to a lemon shark *Negaprion brevirostris* nursery. *Aquatic Conservation: Marine and Freshwater Ecosystems* 26: 482 – 491.

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* 275: 1351 – 1358.

McCauley *et al.* (2012) From wing to wing: the persistence of long ecological interaction chains in less-disturbed ecosystems *Scientific Reports* 2: 409