THE SCHOOL FOR FIELD STUDIES

Principles of Marine Resource Management
SFS 3741

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.

www.fieldstudies.org

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

"Principles of Marine Resource Management" is intended to introduce the disciplines and tools required to understand and manage marine resources. This component of the academic program at the Center for Marine Resources Studies (CMRS) makes the link between Marine Ecology and Marine Conservation Governance. Topical areas include but are not limited to: fishery science and fisheries management, marine conservation, ocean pollution management, and marine protected areas.

Learning Objectives

Following this course, students should:

1. Understand the basic concepts of resource management and be able to apply that understanding to marine resources, particularly those important to the TCI.
2. Have a working knowledge of the tools available for assessing the status of marine resources.
3. Understand how MPAs can serve as a valuable management tool for integrated coastal management.
4. Have an appreciation for the complex integration of ecological processes, socioeconomic value, and policy issues that makes managing coastal marine resources a challenge.

Assessment

Students will be assessed in several ways during the course, i.e., stock assessment, data management, 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), spreadsheet software (e.g., Microsoft Excel, Apple Numbers), and data analysis software (e.g., R) is helpful.

Assessment Item	Value (%)
Stock Assessment	10
Invasive Species Field Exercise	10
Conch Assessment	15
Fisheries Management Debate	15
Exam I	25
Exam II	25
TOTAL	**100**

Stock Assessment (10%)

During this desktop exercise you will be conducting a fisheries assessment (using data provided) to obtain hands-on experience with current data analysis. You will use the knowledge and skills gained from the Excel practical and the stock assessment lectures. You will be working individually on provided data and will receive an individual grade.

Invasive Species Field Exercise (10%)

This field exercise introduces you to visual survey methods during scuba or snorkeling. We will use visual survey methods and note lionfish behavior, habitat associations, abundance, etc.. This data, together with historical data, allows for the abundance of an invasive fish species, lionfish, in habitats around South Caicos to be determined. Fieldwork will be conducted in groups.

Furthermore, this exercise introduces you to data management. Each of you will create and enter all the data collected, by all groups, into a spreadsheet and submit. You will receive an individual grade based on the quality of the spreadsheet organization and usability. You will also receive an individual participation grade for the field exercise and data collection.

Conch Assessment (15%)

During this field exercise, the students will work in groups to employ visual survey methods outlined during the lectures to collect data on the size & age structure of the queen conch (Aliger gigas) population according to habitat type both inside and outside a Marine Protected Area (MPA). The second objective of the field exercise is to enhance student ability to analyze data and produce an accurate and coherent scientific poster. You will be working as partners (groups of two).

Students will be assessed based on their ability to create a scientific poster in a coherent and logical way, as well as data entry and management.

Fisheries Management Debate (15%)

This assessment requires no prior preparation. Students will be assigned to represent a different entity. Students will then come up with a position on the implemented discarding ban and represent their view on the matter, representing the perspective from a tourism, fishermen, NGO and fisheries management perspective. A panel (group of students) will have to consider each presentation and establish regulations that meets all parties involved.

Students will be marked on how persuasive they are in pursuing their interests and how they strategize and position themselves with reference to other stakeholders.

Exams (50%)

Exams are given after each case study and are based on all aspects of the course – lectures, readings, field exercises – during that case study.

Grading Scheme

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

Readings – Assigned readings will be available on SharePoint. It is important that you read all materials prior to the associated lecture since the volume of the material in the class requires a brisk pace, and the readings will be discussed during lecture. Anything in the readings is fair game for the exams.

Honor Code and Misconduct – SFS places high expectations on their students and we hold students accountable for their behaviors. SFS students are held to the honor code below. SFS has a zero-tolerance policy towards student cheating, plagiarism, data falsification, and any other form of dishonest academic and/or research practice or behavior. Using the ideas or material of others without giving due credit is

cheating and will not be tolerated. Any SFS student found to have engaged in or facilitated academic and/or research dishonesty will receive no credit (0%) for that activity.

> *"SFS does not tolerate cheating or plagiarism in any form. While participating in an SFS program, students are expected to refrain from cheating, plagiarism and any other behavior which would result in a student receiving credit for work which they did not accomplish on their own. Students are expected to report any instance of cheating or plagiarism by others."*

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, gaming etc.) will result in this privilege being withdrawn.

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 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.

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. Within our teaching environment, there is no reason to miss classes. 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.

Content Statement – Every student comes to SFS with unique life experiences, which contribute to the way various information is processed. Some of the content in this course may be intellectually or emotionally challenging but has been intentionally selected to achieve certain learning goals and/or showcase the complexity of many modern issues. If you anticipate a challenge engaging with a certain topic or find that you are struggling with certain discussions, we encourage you to talk about it with faculty, friends, family, the HWM, or access available mental health resources.

Course Content

Type- L: Lecture, **FL:** Field Lecture, **FEX:** Field Exercise, **DEX:** Desk Exercise, **P:** Student Presentation, **W:** Workshop, **D:** Discussion, **E:** Exam

***Required readings are in bold**

No	*Title and outline*	*Type*	*Hours*	*Readings*
RM 01	**Principles of Marine Resource Management** An introduction to the course where we will define resource management and identify marine resources.	L	1.0	
RM 02	**Marine Resource Use Overview and History** The history of fishing & humanity's association with the sea where traditional and modern fishing	L	1.0	**Plumeridge & Roberts (2017).**

No	Title and outline	Type	Hours	Readings
	techniques and gears will be discussed. We will also discuss a paper defining and investigating the impacts of "Shifting Baseline Syndrome."			Pinnegar & Engelhard (2008).
MRM 03	**Methods of exploitation** Artisanal fishing techniques Industrial fishing techniques Fishing techniques in the TCI Habitat impacts	L	1.0	
MRM 04	**Ecosystems, Populations, & Stocks** What are fisheries populations and stocks? We will learn here briefly what are stock identification techniques: morphological, markers, tagging as well as how to estimate stock abundance using varying sampling methods, all of which have assumptions, advantages, and disadvantages.	L	1.0	Milner-Gulland and Rowcliffe (2007).
MRM 05	**Population Dynamics: Age, Growth, and Reproduction** Determining and using age data, assessing growth patterns, reproductive effort, and maturity, and why these metrics matter for sustainable resource use.	L	1.0	**https://www.youtube.com/watch?v=uYGiFX7Cw0g** Khan and Khan (2014).
MRM 06	**Population Dynamics: Recruitment, Survival, & Mortality** Assessing recruitment curves , estimating mortality, factors affecting recruitment & survival, and survival/mortality calculations. We will additionally discuss the connectivity of oceans and what that means regarding stocks.	L	1.0	**Ramesh, N., et al. (2019).**
MRM 07	**Population dynamics: Surplus Models, Maximum Sustainable Yield (MSY), and Maximum Economic Yield (MEY)** Defining and calculating MSY and MEY with a discussion of the concept of MSY as a management tool.	L	1.0	**https://www.youtube.com/watch?v=7DNhqtYf47E** Roberts, C. (2007).
MRM 08	**Management of conch** Fishery regulation in the TCI and other countries Management strategies	L	1.0	**Medley and Nimmes (1999).**
MRM 09	**Stock Assessment Briefing & Calculations Review** A review of population dynamics calculations with an explanation of exercise and applications used in resource management.	L	1.5	
MRM 10	**Stock Assessment Exercise** Practical application of the techniques covered in stock assessment discussions.	DEX		
MRM 11	**Management of lobster** Fishery regulations in TCI and other countries Management strategies	L	1.0	**Bene and Tewfik (2001).**

No	*Title and outline*	*Type*	*Hours*	*Readings*
MRM 12	**Policy Impacts to Food Web Dynamics** How do fishing policy decisions impact food web dynamics? We will assess diet vs energy requirements and trophic cascade effects.	L	2.0	
RM 13	**TCI invasive species** Sources of biotic pollution for the Caribbean region Ecosystem threats Strategies to manage invasive species	L	2.0	**Ruiz-Carus, et al. (2006).**
RM 14	**Invasive Species and FEX PREP** An overview of invasive species on South Caicos, with a specific focus on lionfish. We will look at the effects of the lionfish invasion, assessment and management lionfish, and preparation for lionfish field exercise.	L	2.0	Green, et al. (2012). Smith, et al. (2017).
RM 15	**Lionfish Field Exercise** Collection of lionfish in the field.	FEX	2.0	
RM 16	**Lionfish Dissections** Dissections of caught lionfish.	FEX	2.0	
RM 17	**Invasive Species DEX time** Excel data management and analysis of collected lionfish data.	DEX		
RM 18	**Global Fisheries Status & Overfishing** A look at how sustainable and non- sustainable stocks are determined, overfishing trends around the world and over time, and how to analyze stock recovery (or lack thereof!). We will use the Queen Conch case study in The Bahamas as an example.	L	2.0	**Stoner, et al. (2018).**
RM 19	**Aquaculture** Insight into the aquaculture industry: the good, the bad, and the ugly. Global contribution of aquaculture to food production, environmental issues with aquaculture, and a success story of a self-sustaining aquaculture practice.	L	2.0	Ahmed and Thompson (2019).
RM 20	**EXAM Review**	L	1.0	
RM 21	**RM Exam I**			
RM 22	**Exam Debrief**	L	1.0	
RM 23	**Introduction to Marine Protected Areas & Effects on Fisheries** Here we will defining marine protected areas (MPAs) and discuss how protected Areas are used as tools for coastal resource management. We will discuss the pros and cons of MPAs for fisheries and criteria for MPA success.	L	2.0	Gell and Roberts (2003). Angulo-Valdés and Hatcher (2010).

No	*Title and outline*	*Type*	*Hours*	*Readings*
RM 24	**Introduction to Conch Field Exercise**	L	2.0	
RM 25	**Conch Field Exercise** Data collection in water of Protected Area verse Non-Protected Area.	FEX	8.0	
RM 26	**Conch Exercise – Write Up** Students will perform data analyses and report findings in a full scientific poster (Introduction, Methods, Results, Discussion).	DEX		
RM 27	**Introduction to Fisheries Management** This is a desktop exercise where we will explore fisheries management practices and policy effectiveness on fisheries and stock health.	DEX		
RM 28	**Stock identification methods I** Morphological techniques	L	1.0	
RM 29	**Stock identification methods II** Natural marks Applied marks	L	1.0	
RM 30	**Stock identification methods III** Molecular techniques	L	1.0	
RM 31	**Large marine ecosystems** Moving beyond the population-level approach of resource management	L	1.0	**Sherman and Duda (1999).**
RM 32	**Discarding in fisheries (Debate)**	D	2.5	
RM 33	**Climate Change & Fisheries** An overview on climate change and ocean acidification effects on fisheries.	L	1.0	Lam, et al. (2020). Sumaila, et al. (2011).
RM 34	**Plastic Pollution** A Plastic Ocean A viewing and discussion of the documentary "A Plastic Ocean". Summary of film: https://plasticoceans.org/about-a-plastic-ocean/ **https://aplasticocean.movie/**	D	2.0	
RM 35	**Hurricanes & Fisheries** An overview on hurricane effects on fisheries.	L	1.0	**Solís, et al. (2013).**
RM 36	**EXAM Review**	L	1.0	
RM 37	**RM Exam II**			
	Exam Debrief and Course Wrap-up	L	1.0	
	Total		50	
	UMN Instructional Hours		60	

**UMN defines an instructional hour as a 50-minute block. SFS syllabi are written in full 60-minute hours for programming purposes. Therefore 50 full hours = 60 UMN instructional hours (for four credit courses) and 25 full hours = 30 UMN instructional hours (for two credit courses).*

Reading List

***Required readings are in bold**

1. Ahmed, N., & Thompson, S. (2019). The blue dimensions of aquaculture: A global synthesis. Science of the Total Environment, 652, 851-861.
2. Angulo-Valdés and Hatcher. (2010). A new typology of benefits derived from marine protected areas. Marine Policy 34(3):635–644.
3. **Bene, C. and Tewfik, A. (2001).** Fishing effort allocation and fishermen's decision making process in a multi-species small-scale fishery.
4. Gell and Roberts. (2003). Benefits beyond boundaries: the fishery effects of marine reserves. Trends in Ecology & Evolution 18.
5. Green et al., (2012). Invasive Lionfish Drive Atlantic Coral Reef Fish Declines. PLOS ONE 7(3):e32596.
6. Khan and Khan. (2014). Importance of age and growth studies in fisheries management. Conference proceedings document.
7. Lam, V. W., Allison, E. H., Bell, J. D., Blythe, J., Cheung, W. W., Frölicher, T. L., ... & Sumaila, U. R. (2020). Climate change, tropical fisheries and prospects for sustainable development. Nature Reviews Earth & Environment, 1(9), 440-454.
8. **Medley, P. A. H. and Nimmes, C. H. (1999).** A stock assessment for the conch (Strombus gigas L.) fishery in the Turks and Caicos Islands.
9. Milner-Gulland and Rowcliffe (2007). Conservation and sustainable use: a handbook of techniques, Chapter 1, Sections 1.2-1.3 (book pgs 2-11). Oxford University Press, Oxford.
10. Pinnegar, J. K., & Engelhard, G. H. (2008). The 'shifting baseline 'phenomenon: a global perspective. Reviews in Fish Biology and Fisheries, 18, 1-16.
11. **Plumeridge, A. A., & Roberts, C. M. (2017).** Conservation targets in marine protected area management suffer from shifting baseline syndrome: A case study on the Dogger Bank. Marine pollution bulletin, 116(1-2), 395-404.
12. **Ramesh, N., Rising, J. A., & Oremus, K. L. (2019).** The small world of global marine fisheries: The cross-boundary consequences of larval dispersal. Science, 364(6446), 1192-1196.
13. **Roberts, C. (2007).** Barbequed Jellyfish or Swordfish Steak? The unnatural history of the sea. Island Press.
14. **Ruiz-Carus et al. (2006).** The western Pacific lionfish, Pterois volitans (Scorpaenidae), in Florida.
15. Secor (2014). Chapter 2 - The Unit Stock Concept: Bounded Fish and Fisheries. Pages 7–16 in S. X. Cadrin, L. A. Kerr, and S. Mariani, editors. Stock Identification Methods (2nd Edition). Academic Press, San Diego.
16. **Sherman, K. and Duda, A. M. (1999).** Large marine ecosystems: an emerging paradigm for fishery sustainability.
17. Smith et al. (2017). Density-dependent colonization and natural disturbance limit the effectiveness of invasive lionfish culling efforts. Biological Invasions 19(8):2385–2399.
18. Solís et al., (2013). Measuring the initial economic effects of hurricanes on commercial fish production: the US Gulf of Mexico grouper (Serranidae) fishery. Natural Hazards 66(2):271–289.
19. **Stoner et al., (2018).** Relationships between fishing pressure and stock structure in queen conch (Lobatus gigas) populations: Synthesis of long-term surveys and evidence for overfishing in The Bahamas. Reviews in Fisheries Science & Aquaculture, 27(1), 51-71.
20. Sumaila et al., (2011). Climate change impacts on the biophysics and economics of world fisheries. Nature Climate Change 1(9):449–456.