THE SCHOOL FOR FIELD STUDIES

Principles of Marine Resource Management
SFS 3740

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

This course 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 fisheries management, marine conservation, ocean pollution management, marine protected areas, coastal zone management, and strategies for sustainable development.

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 (%)
Participation	10
Stock Assessment	10
Invasive Species Field Exercise	10
Midterm Exam	25
Conch Assessment Paper	20
Zoning Presentation	15
Stakeholder Reflection Paper	10
TOTAL	**100**

Participation (10%)

Active participation in the entire course is crucial to a successful learning experience. A participation grade will be given assessing students' active participation in class discussions, lectures, and field work.

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 (15%)

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.

Midterm Exam (25%)

The midterm exam is based on all aspects of the course up to this point – lectures, readings, discussions, and field exercises.

Conch Assessment Paper (20%)

During this field exercise, you 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 and protection status around South Caicos.

You will analyze data and produce an accurate and coherent scientific paper in collaboration with your group. Each group will produce a written report, and each member of the group will be required to write a part of the report. You will be assessed based on your ability to write the introduction, methods, results, and discussion of a scientific report in a coherent and logical way, as well as on data management.

Zoning Presentation and Stakeholder Reflection Paper (15% + 10%)

During this desktop exercise you will review the current marine spatial planning in place around South Caicos and suggest a newly designed system, based on the specific objectives of your stakeholder groups (such as Government Fisheries Dept., Ecotourism Consultants, Mass Tourism Consultants, and Mariculture). You will work in groups and will present your proposed plans as a group. In addition, you will be assigned the role of a stakeholder (i.e., Hotel Owner, DECR representative, Belonger, etc.) and write a **Stakeholder Reflection paper** from your assigned perspective to provide feedback and further suggestions to the zoning proposal. The reflection paper is an individual assignment.

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.

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

Peer Evaluation – A major part of research, be it the humanities or science, requires collaborative work. In this course, you will be required to evaluate your classmates on all collaborative work. This peer evaluation will form part of your final grade for group assignments. Acquiring the ability to evaluate project partners honestly and constructively is essential to your future career paths.

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.

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). All assignments unless specifically stated should be individual pieces of work. Use of AI is prohibited.

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. Cellphones are not permitted in lectures.

Deadlines – Deadlines for written and oral assignments are instated to promote equity among students and to allow faculty ample time to review and return assignments before others are due. As such, deadlines are firm; extensions will only be considered under 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.

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*
MRM 01	**Principles of Marine Resource Management** An introduction to the course where we will define resource management and identify marine resources.	L	1.0	
MRM 02	**Marine Resource Use Overview and History** The history of fishing & humanity's association with the sea where traditional and modern fishing techniques and gears will be discussed. We will also discuss a paper defining and investigating the impacts of "Shifting Baseline Syndrome."	L	1.0	**Plumeridge, A. A., & Roberts, C. M. (2017).**

No	*Title and outline*	*Type*	*Hours*	*Readings*
MRM 03	**Ecosystems, Populations, & Stocks** What are fisheries populations and stocks? We will learn about 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.	FEX	4.0	Milner-Gulland and Rowcliffe 2007. Secor 2014. Chapter Two
MRM 04	**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 05	**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.	FEX	2.0	**Ramesh, N., Rising, J. A., & Oremus, K. L. (2019).**
MRM 06	**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.	DEX	1.0	**https://www.youtube.com/watch?v=7DNhqtYf47E** Roberts, C. (2007).
MRM 07	**Stock Assessment Briefing & Calculations Review** A review of population dynamics calculations with an explanation of applications used in resource management.	L	1.0	
MRM 08	**Stock Assessment Exercise** Practical application of the techniques covered in stock assessment discussions.	L	1.0	
MRM 09	**TCI Conch Fisheries** An overview on TCI conch fishery status, regulations, and management strategies.	L	1.0	**Ulman et al., 2016.** Lockhart et al., 2007.
MRM 10	**TCI Lobster Fishery** An overview on TCI Lobster fishery status, regulations, and management strategies.	L	1.0	
MRM 11	**Global Fisheries Status & Overfishing** 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.	T	1.0	**Stoner et al., 2018.**
MRM 12	**A Plastic Ocean** A viewing and discussion of the documentary "A Plastic Ocean". Summary of film: https://plasticoceans.org/about-a-plastic-ocean/	L	2.0	

No	*Title and outline*	*Type*	*Hours*	*Readings*
MRM 13	**Ocean Pollution Management** An in-depth analysis of marine pollution, the causes, and concepts and strategies to manage pollution. We will then discuss the "controversy" of plastic pollution and its status as a global concern.	L	1.0	**Stafford, R., & Jones, P. J. (2019). Lavers et al. (2022).**
MRM 14	**Introduction to Pollution Field Exercise + Dry Run** Introduction and preparation to the Pollution FEX. What factors impact anthropogenic marine debris amount and composition? How do we collect and analyze data the answer that question?	FEX	4.0	
MRM 15	**Pollution FEX** Field data collection.	DEX	1.0	
MRM 16	**Pollution DEX – R Activity** Experimental design, meta data and data management, figure making, and statistics on collected data.	L	1.0	
MRM 17	**Persistent Organic Pollutants (POPs) in Seafood** An overview of what POPs are and why they're problematic, especially with regards to seafood. We will also learn how to perform risk assessments and calculate hazard quotients.	L	1.0	Mwakalapa et al. (2017).
MRM 18	**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.	FEX	2.0	Ahmed, N., & Thompson, S. (2019).
MRM 19	**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.	DEX	1.0	Green et al., (2012). Smith et al. (2017).
MRM 20	**Lionfish Field Exercise** Collection of lionfish in the field.	L	2.0	
MRM 21	**Lionfish Dissections** Dissections of caught lionfish.	L	1.0	
MRM 22	**Invasive Species Data Management Exercise** Excel data management of collected lionfish data.	L	1.0	
MRM 23	**Climate Change & Fisheries** An overview on climate change and ocean acidification effects on fisheries.	FEX	2.0	Lam, V. W., et al. (2020). Sumaila et al., (2011).
MRM 24	**Hurricanes & Fisheries** An overview on hurricane effects on fisheries.	DEX	1.0	Solís et al., (2013).
MRM 25	**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	1.0	

No	*Title and outline*	*Type*	*Hours*	*Readings*
MRM 26	**Exam Review** Review of material covered thus far and exam preparation.	T	1.0	
MRM 27	**Exam**	L	1.0	
MRM 28	**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**	1.0	Gell and Roberts. (2003). Angulo-Valdés and Hatcher. (2010).
MRM 29	**Introduction to Conch Field Exercise** An introduction to methods for conch abundance estimation. Collection and analysis of conch abundance data from South Caicos waters, and interpretation of abundance data with regard to MPA effectiveness.	L	1.0	
MRM 30	**Conch Field Exercise** Data collection in water of Protected Area verse Non-Protected Area.	L	2.0	
MRM 31	**Conch Exercise – Write Up** Perform data analyses and report findings in a full scientific report (Introduction, Methods, Results, Discussion).	L	2.0	
MRM 32	**Exam Debrief**	FEX	2.0	
MRM 33	**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	1.0	
MRM 34	**Marine Spatial Planning** Overview of coastal management strategies, obstacles, and coastal MPA zoning methods.	L	2.0	
MRM 35	**Intro to MSP Exercise**	FEX	6.0	
MRM 36	**MSP Exercise** A desktop exercise where students will design plans for management of marine resources in TCI to reflect the interests of various stakeholder groups.	L	1.0	**Useful for Assignment** Halpern et al., 2010. Heck et al., 2017. David et al., 2010.
MRM 37	**MSP Presentations** Present new plans for MSP/zoning and management of marine resources in the TCI based on stakeholder groups.	DEX	1.0	
Total Hours		**61**		

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. David et al., 2010. Integrated coastal zone management perspectives to ensure the sustainability of coral reefs in New Caledonia. Marine Pollution Bulletin 61: 323-334.
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. Halpern et al., 2010. Placing marine protected areas onto the ecosystem-based management seascape. Proceedings of the National Academy of Sciences 107(43):18312–18317.
7. Heck et al., 2017. Management priorities for seawater desalination plants in a marine protected area: A multi-criteria analysis. Marine Policy 86:64–71.
8. Khan and Khan. 2014. Importance of age and growth studies in fisheries management. Conference proceedings document.
9. 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.
10. **Lavers et al. (2022).** Far from a distraction: Plastic pollution and the planetary emergency, Biological Conservation, Volume 272, 2022, 109655.
11. Lockhart et al., 2007. Fisheries of the Turks and Caicos Islands: Status and Threats. GCFI 58: 67-72.
12. 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.
13. Mwakalapa et al. (2017). Occurrence and levels of persistent organic pollutants (POPs) in farmed and wild marine fish from Tanzania. A pilot study, Chemosphere, doi: 10.1016/j.chemosphere.2017.09.121.
14. **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.
15. **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.
16. **Roberts, C. (2007).** Barbequed Jellyfish or Swordfish Steak? The unnatural history of the sea. Island Press.
17. Secor 2014. Chapter Two - 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 (Second Edition).

Academic Press, San Diego.

18. Smith et al. 2017. Density-dependent colonization and natural disturbance limit the effectiveness of invasive lionfish culling efforts. Biological Invasions 19(8):2385–2399.
19. 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.
20. **Stafford, R., & Jones, P. J. (2019).** Viewpoint–Ocean plastic pollution: A convenient but distracting truth? Marine policy, 103, 187-191.
21. **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.
22. Sumaila et al., 2011. Climate change impacts on the biophysics and economics of world fisheries. Nature Climate Change 1(9):449–456.
23. **Ulman et al., 2016.** Conched out: Total reconstructed fisheries catches for the Turks and Caicos Islands uncover unsustainable resource usage. Frontiers in marine Science 3:71