Fall 2020 Aquatic Community Ecology BIOL 312

Instructor: Isidro Bosch, Professor of Biology
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Office Hours: all by Zoom M 3:00-4:00 PM, W 11:00-Noon, R 10:30-11:30 AM or by appointment

Course Schedule: MW Lecture 1:30-2:20 in ISC 105; F Class Discussions Via Zoom
R Lab 2:00-4:50 in ISC 105 (4 cr: 3-3)

Pre-requisites: Biology 203 or a comparable Ecology course

Course Description

In this course you will study the ecology of communities and ecosystems that dominate streams lakes and marine habitats (e.g. kelp forests, coral reefs). Topics covered in class will enhance your understanding of the organization and dynamics of these systems. You will also learn about the ways that human-related activities such as eutrophication and fishing affect their ecological integrity. The laboratory portion of the course is designed to involve you in a "real-life" study of a local lake. Working in collaborative groups you will engage in two different studies designed to develop your scientific skills, to build your understanding of lake ecology. Ultimately our goal is to generate information that could help local government agencies and citizen groups effectively manage lake water quality.

The success of this course depends greatly on your preparation and contribution to class activities. I will lecture part of the time but my hope is to have an active class in which discussions of readings and research and conversations about relevant events are encouraged.

Laboratory and Project Work

The course has a significant group project component. You'll be immersed ;-) in two studies during the semester. One is a "data mining" activity in which you will ask a question about the ecological history of a lake or lakes or about ecological relationships and analyze data from previous studies to answer your question. The project will culminate in a group oral presentation. A second project will be a scientific investigation of some aspect of lake ecology. This will be an empirical research study that consists of multiple data collection opportunities, sample and data analysis, and the writing of a quality science journal-style report. Your report will ultimately be submitted to stakeholder organizations such as Lake Associations and/or local government agencies.

This year we will be working in Conesus Lake, which is one of the smallest and shallowest of the Finger Lakes. Located about 6 miles east of Geneseo, Conesus Lake serves as the drinking water supply for more than 12,000 residents, and it is the source of the very water you drink if you live or work in Geneseo. Residents refer to Conesus Lake as the jewel of Livingston County. But in recent years the lake has experienced a textbook of problems due to colonization by multiple invasive species, excessive phosphorus and nitrogen runoff from agriculture and residential development in the watershed and climate warming, along with other forces. Your work will likely contribute to a better ecological understanding and possibly to a better future for Conesus Lake.

Textbook: There is no required textbook. Articles to read will be posted on Canvas. See section titled Readings below.

Intended Learning Outcomes:

To achieve minimum competency in this course you should be able to:

● describe and critically evaluate the key physical and biological processes that determine the organization and dynamics of freshwater and marine communities and ecosystems

● identify common patterns in the organization and dynamics of aquatic systems.

● demonstrate an understanding of the ways in which human activities disrupt the balance of aquatic ecosystems, and critically evaluate potential strategies for management and mitigation of such problems

● demonstrate practical competence in carrying out selected analytical procedures and quantitative data analyses that are utilized in aquatic biology

● investigate and synthesize scientific literature, and communicate scientific information orally and in writing in a manner that is effective for the discipline

These learning outcomes will be assessed primarily through three exams and one essay final. The final essay topic will be an integrative theme identified by the class through discussions held during the last week of the semester. Success in meeting the fourth learning outcome will be determined by performance in field and laboratory research activities. Outcome five will be assessed by means of three projects that are described in the next section of the syllabus.

Grading:

The final course grade will be determined by your performance in a variety of activities intended to develop academic and scientific competency in Biology:

Exams: 3 mid-term exams and one take-home final essay.

Data Presentation: Working in groups of 3, you will give an oral presentation of of a biological/ physical/chemical trend based on data from our study lake or the Finger Lakes.

Research Report: This will be a formal written report based on your research activities.

Discussion: Individually you will be asked to lead a class discussion of a selected scientific paper; preparation and effectiveness in leading the class discussion will be evaluated.

Research Presentation: You are asked to give a 15 min oral presentation based on your research topic but providing a more context than you do in your scientific report.

Participation: As your participation is important for the success of this course it will also be important to your final grade. Preparation for and engagement in class discussions of papers, participation and engagement in field and laboratory activities, and contribution to your group's study are factors that will be considered. You will not be graded on attendance.

Score	Grade
93-100 %	A
89 - 93	A-
86 - 89	B+
82 - 86	B
79 - 82	B-
76 - 79	C+
71 - 76	C
66 - 71	C-
61 - 66	D
< 61	E

Assignments, Grading and Due Dates	% of Final Grade
3 MT exams (9-28,10-26,11/23)	12,15,15
Data Presentation (10/15)	10
Discussion Leadership (TBD)	3
Lake Research Report (12/11)	15
Research Presentation (12/14-16	10
Final Exam Essay (12-18)	5
Participation (all the time!)	15

Our Health and Safety

In this course we will primarily meet in person. To do that successfully and to protect our collective health and safety we will have to take very seriously all of the guidance advocated/required by public health organizations and by SUNY Geneseo. Remember that nearly 40% of people infected with COVID-19 may have no symptoms but still could very easily infect others. Please be responsible by wearing a face mask and practicing physical distancing in class, lab and in the field. You must wear masks when class is in session. If you are unable or unwilling to comply with this safety measure you will be asked to excuse yourself from the group. Under those circumstances I would be willing to accommodate the student's needs by posting recorded lectures on line and by making available projects and even exams that could be completed individually and remotely.

The lecture has been moved to ISC 105 , which is a laboratory space that has better air circulation than a small classroom. Labs will also be held in ISC 105. Friday meetings will take place remotely. We will use that time primarily for student-lead discussions of assigned papers or possibly for "lightning presentations" and discussions with former students who have gone on to work in marine or lake biology.

Field work will be a challenge. The school 12 passenger vans have a safety capacity of 5 passengers and a driver. We will need to shuttle the class to the field site, which is why this year we'll be working primarily in nearby Conesus Lake. Different groups may be asked to work in the lake at times outside of the normal lab hours, for example on a Saturday. College policy stipulates that students must not drive their own vehicles for any official college activity. Masks and social distancing guidelines will be adhered to even when we work on the Biology department's pontoon boat, in which only 4 students are allowed at a time.

Above all, we want you to take care of yourselves. **It is essential that if you are feeling unwell you should stay home from in-person classes to protect both yourself and others in our community.** There is a participation grade in the class but that will not be linked to attendance. All PowerPoints from lecture will be posted on Canvas. If you are unable to attend class Dr. Bosch will narrate any power point presentation you miss. These are challenging times that require extraordinary measures, but if we are mindful of safety measures and we work together I truly believe the semester will go very well.

About the Instructor

I am passionate about lake and marine science and about teaching undergraduates. This course offers me an opportunity to do both, and I promise you that I will do my utmost to provide you with the best experience possible. Quite a few students who have taken this class have gone on to study lake and marine biology professionally. It is not my goal to convert you into aquatic biologists, but rather to engage you on the subject no matter what interests and career goals you may have.

Readings:

No single textbook provides adequate coverage of both freshwater and marine community ecology. For that and other reasons, our readings for lectures/discussions will be from the scientific literature. Articles will be made available primarily in digital format through Canvas. Reading assignments listed by first author are included in the syllabus. I have pre-selected a list of articles that go with the progression of the material we will cover in lecture. However, this list can be changed if one of us finds a more interesting or more contemporary article on the subject that we wish to share with the class.

Fall 2020: Tentative Reference List of Readings for Aquatic Community Ecology
(copies of all these articles will be posted in our Canvas web site)

1. Cummins, K.W. 1974. Structure and Function of Stream Ecosystems. BioScience 24: 631-641

2. Zhu, B. et al. 2006*. Alteration of ecosystem function by zebra mussels in Oneida Lake: impacts on submerged macrophytes. Ecosystems 9:1017-1028.

3. Michalak, A.M. et al. 2013*. Record-setting algal bloom in Lake Erie caused by agricultural & meteorological trends consistent with expected future conditions. PNAS 110: 6448-52

4a. Hilt, S. et al. 2017*. Translating regime shifts in shallow lakes into changes in ecosystem functions and services. Bioscience Vol 67: 928-936

4b. Jeziorski, A. et al. 2015*. The jellification of north temperate lakes. Proc. R. Soc. Vol. 282:20142449

5. Sanderson, M. 2015. Conesus Lake Fish Stock Assessments 2001-2012. NYS Department of Environmental Conservation. 56 pp

6. Lathrop, RC. 2002*. Stocking piscivores to improve fishing and water clarity: a synthesis of the Lake Mendota manipulation project. Freshwater Biol. 47: 2410-2424

7. Walsh et. al. 2016*. Invasive species triggers a massive loss of ecosystems services through a trophic cascade. PNAS 113:4081-4085

8. Mumby, P.J. et al. 2004*. Mangroves enhance the biomass of coral reef fish communities in the Caribbean. Nature 427: 533-536.

9. Ruff and Mumby 2012*. Global disparity in the resilience of coral reefs. TREE #27: 404-13

10. Hoegh-Guldberg, O. et al. 2007*. Coral reefs under rapid climate change and ocean acidification. Science 318:1737

11. Menge, B.A. et al. 2003*. Coastal oceanography sets the pace of the rocky intertidal community dynamics. PNAS 100:12229-12234

12. Estes J.A. et al. 2011*. Trophic downgrading of planet Earth. Science 333: 301-306

13. Trick, C.G. et al. 2010*. Iron enrichment stimulates toxic diatom production in high-nitrate, low chlorophyll areas. PNAS 107:5887-92

* indicates papers that are available to be presented by students

Tentative Schedule for Aquatic Community Ecology Course — Fall 2020

Week		Mon	Wed	Thurs	Fri	Week		Mon	Wed	Thurs	Fri
1	Lecture	Course Overview	Lec 1. Stream Ecology	LAB	Remote	9	Lecture	**Exam II**	14. Coral Reefs	LAB	Remote
Aug 31-Sep 4	Reading	None			Read 1. Cumins	Oct 26-30	Reading	Lec 7-13			9. Ruff-Mumby*
	Due						Due				due Report Methods
	Lab			Field Equipment Use			Lab			Project Work	
2	Lecture	LABOR DAY	Lec 2. Lake Macrophytes	Field Survey/Macrophytes	Remote	10	Lecture	15. Coral Reefs	16. Coral Reefs	LAB	Remote
Sep 7-11	Reading				2. Read Zhu *	Nov 2 -6	Reading				10. Hoegh-Guldberg*
	Due		Lake Association Meeting	Read State of the Lake			Due				due Report Introduction
	Lab			Conesus Lake			Lab			Project Work	
3	Lecture	3. Stratification & Chemistry	4. Nutrients	Field Survey/stratification	Remote	11	Lecture	17. Rocky Shores	18. Rocky Shores	LAB	Remote
Sep 14-18	Reading				3. Read Michalak*	Nov 9-13	Reading				11. Menge*
	Due						Due				due Report Data Analysis
	Lab			Conesus Lake			Lab			Bacterial Counts	
4	Lecture	5. Phytoplankton	6. Primary Production	Field Survey/Chlorophyll	Remote	12	Lecture	19. Kelp Forests	20. Kelp forests	LAB	Remote
Sep 21-25	Reading				4. Read Hilt*	Nov 16-20	Reading				12. Estes*
	Due				or Jeziorski		Due				Report Consultations
	Lab			Streams			Lab			Data Analysis	
5	Lecture	**Exam I**	Rejuvenation	Field Survey	Remote Lecture	13	Lecture	**EXAM III**	*Thanksgiving*	*Thanksgiving*	*Thanksgiving*
Sep 28-Oct 2	Reading	Lec 1-6	**Day**		7. Zooplankton	Nov 23-27	Reading	Lec 14-20	*Break*	*Break*	*Break*
	Due						Due				
	Lab			Projects/Collect Zooplankton			Lab				
6	Lecture	8. Herbivory	9. Lake Dynamics	Field Survey	Remote	14	Lecture	21. Water Column	22. Water Column		Remote
Oct 5-9	Reading				5. Lathrop*	Nov 30-Dec 4	Reading				13. Trick*
	Due						Due				due Report Results
	Lab			Zooplankton			Lab			Writing	
7	Lecture	10. Lake Dynamics	11. Invasive Species		Remote	15	Lecture	23. Deep Sea	24. Deep Sea	Project Work	Integration
Oct 12-16	Reading	6. Read Sanderson			7. Walsh *	Dec 7-11	Reading				
	Due						Due				
	Lab			Data Analysis Presentations			Lab			Reports Final prep	Reports Due
8	Lecture	12. Estuaries/Mangroves	13. Seagrasses	LAB	Remote	16	Lecture	**Presentations**	**Presentations**		Final Exam Essay Due
Oct. 19-23	Reading				8. Mumby*	Dec. 14-18	Reading				
	Due						Due				
	Lab			Project Work/Field Work			Lab				