

Advanced Field Methods

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Office hours: by appointment on Tuesday and Thursday

Dates: 10-day Spring Break field course from **March 8-16th 2008**.

Location: UGA's Marine lab on Sapelo Island, GA.

***We will also meet a few times informally to discuss project proposals before departure to Sapelo Island, GA.

Course Objectives:

1. Teach graduate students through hands-on learning, intensive field experiments, and lectures the importance of Creativity, Motivation, Patience, Persistence, and Observation in Science and Ecology.
2. Give graduate students critical field experience at the beginning of their education.
3. Empower graduate students to do science and think independently in any field over a short period of time.
4. Produce 1-3 publications per year through group projects.
3. Encourage collaborations between Zoology graduate students across different labs.
4. Teach graduate students to be synthesizers and critical thinkers.
5. Teach graduate students to do science from the beginning to the end.
7. Teach students to convey effectively their scientific thoughts and analyses in writing and oral presentations.
8. Teach graduate students how to do Science and Ecology *based on original observations in nature*.

Course Overview and Schedule:

The first 4 days of the course will include lecturing (2-3hours/ day) and then learning field methods and organisms in the coastal environment, including the intertidal zone (marshes and mangroves) and maritime scrub and forest habitat.

Day 1: will be set aside to identify as many organisms as possible across all habitats.

Day 2: will focus on Biogeochemistry and stoichiometry- students will learn how to assess and evaluate soil nutrients, salinity, redox, and plant and animal nutrient and isotopic content.

Day 3: will focus on the latest and old fashioned methods of assessing distribution and abundance of a variety of organisms including mussels, plants, microalgae, fish, alligators, snails, small mammals, birds etc.

Day 4: will focus on DNA sampling and analysis techniques.

Days 5-10 will focus on small group projects with the goal of each group having publishable data at the end of those 5 days. Groups can be from 1-4 students in size. Each group will put together a proposal of research before departure to Sapelo. In the field, students will receive immediate feedback as instructors will be in the field and helping set-up and carry out the experiments.

Assignments:

1. A 2-page project proposal will be due at the end of February along with an annotated bibliography of the readings listed below. In the annotated bibliography, for each paper, summarize the questions, methods, results and major findings in one half page or less. These papers will help you formulate a topic for your project.
2. A formal project report in the form of a manuscript submission will be due 6 weeks after the field trip is over.

How to start your Project: You can begin to formulate your project topic by either focusing on a conceptual question; e.g. How does biogenic structure impact predation rates? or focusing on an organism. After completing the readings, begin to think about questions that interest you and can be answered over a 5-day field period. I will help you iron out the details and you will go into

the field component with a solid research proposal in hand. Of course, it may change when you get there and see the ecosystem in person, but research always does!

Organisms that are amenable to experimentation include:

Salt marsh plants – 9-15 species

Fiddler crabs

Predatory mud crabs

Omnivorous square back crabs

Blue crabs

Periwinkle snails

Mud Snails

Oysters,

Ribbed Mussels

Clams

Beach isopods

Marsh Fish

Readings:

The Salt Marsh Chapter in Bertness, M.D. 2006. Atlantic Shoreline Ecology: A Natural History. Princeton University Press.

Pennings, S. C. and M. D. Bertness. 2001. Salt marsh communities. In, M. D. Bertness, S. D. Gaines and M. E. Hay (editors), Marine Community Ecology, Sinauer Associates.

Bertness, M.D. 1984. Fiddler crab regulation of *Spartina alterniflora* production on a New England salt marsh. *Ecology* 66: 1042-1055.

Bertness, M.D. and T. Grosholz*. 1985. Population dynamics of the ribbed mussel, *Geukensia demissa*: the costs and benefits of a clumped distribution. *Oecologia* 67:192-204.

Bertness, M.D. and A.M. Ellison. 1987. Determinants of pattern in a New England salt marsh plant community. *Ecological Monographs* 57(2):129-147.

Bertness, M.D. 1984. Ribbed mussels and the productivity of *Spartina alterniflora* in a New England salt marsh. *Ecology* 65:1794-1807.

Bertness, M.D. 1992. The ecology of New England salt marsh plant communities. *American Scientist* 80:260-268.

Bertness, M. D., B. R. Silliman and R. Jefferies. 2004. North American salt marshes under siege. ***American Scientist*** 92: 54-61.

Silliman, B. R. and S. Y. Newell. Fungal-farming in a snail. 2003. *Proceedings of the National Academy of Sciences (USA)* 100:15643-15648.

Silliman, B. R. and M. D. Bertness. 2002. A Trophic Cascade Regulates Salt Marsh Primary Production. *Proceedings of the National Academy of Sciences (USA)* 99: 10500-10505.

Silliman, B. R. and J. C. Zieman. 2001. Top-down control of *Spartina alterniflora* growth by periwinkle grazing in a Virginia salt marsh. *Ecology* 82: 2830-2845.

Silliman, B. R., J. van de Koppel, M. D. Bertness, L. Stanton, and I. Mendelsohn. 2005 Drought, snails, and large-scale die-off of southern U.S. salt marshes. *Science* 310:1803-1806.

Silliman, B. R. and M. D. Bertness. 2004. Shoreline development drives invasion of *Phragmites australis* and the loss of New England salt marsh plant diversity. *Conservation Biology* 18:1424-1434.

Mullan, C., B. R. Silliman, S. Bertness and M. D. Bertness. 2004. Spatial segregation of New England salt marsh plants across an estuarine salinity gradient. *Ecology* 85:2539-2549.

Haney, R., B. R. Silliman, A. Fry, C. Layman and D. Rand. 2006. The Pleistocene history of the sheepshead minnow (*Cyprinodon variegatus*): non-equilibrium evolutionary dynamics within a diversifying species complex. *Molecular Phylogenetics and Evolution*.

Callaway, R. M., K. O. Reinhart, G. W. Moore, D. J. Moore and S. C. Pennings. 2002. Epiphyte host preferences and host traits: mechanisms for species-specific interactions. *Oecologia* 132:221-230.

Pennings, S. C., Grant, M. B., Bertness, M. D. 2005. Plant zonation in low-latitude salt marshes: disentangling the roles of flooding, salinity and competition. *Journal of Ecology* 93: 159-167.

Callaway, R. M. and S. C. Pennings. 2000. Facilitation may buffer competitive effects: indirect and diffuse interactions among salt marsh plants. *American Naturalist* 156:416-424.

Pennings, S. C. and R. M. Callaway. 2000. The advantages of clonal integration

under different ecological conditions: a community-wide test. *Ecology* 81: 709-716.

Pennings, S. C., T. H. Carefoot, E. L. Siska, M. E. Chase and T. A. Page. 1998. Feeding preferences of a generalist salt marsh crab: relative importance of multiple plant traits. *Ecology* 79:1968-1979.

Trussell, G.C., P.J. Ewanchuk, and M.D. Bertness. 2003. Trait-mediated effects in rocky intertidal food chains: predator risk cues alter prey feeding rates. *Ecology* 84: 629-640.

Mendelssohn and Morris (1999) pages 59-80 in *Concepts and Controversies in tidal marsh ecology* (Einstein and Kreeger as editors).

Silliman, B. R., C. A. Layman, K. Geyer and J. C. Zieman. 2004. Predation by the black-clawed mud crab, *Panopeus herbstii*, in mid-Atlantic salt marshes: Further evidence for top-down control of community structure. ***Estuaries*** 27:188-196.