

CORAL REEF RESEARCH AT UNCW

Dr. Alina Szmant

Dept. of Biological Sciences and Center for Marine Science



Dr. Szmant deploying a net enclosure over dead elkhorn in order to re-seed with lab-raised coral larvae in the Wellwood restoration area



Basic research has led to our ability to predict fairly accurately the timing of spawning of several major reef-building corals. Researchers can now collect the spawn as it is released, culture the larvae until they are ready to settle, and conduct both basic research on the early life history of corals, including chemical cues that induce settlement, larval swimming behavior, post-settlement survivorship, and application of all of the above knowledge to restoring corals to degraded coral reefs.



UNCW Biology undergrads on spring break field trip to Belize coral reefs



Coral encrusted early 1900s wreck in the Dry Tortugas

Current Position

Professor, Department of Biological Sciences, and Center for Marine Science Research
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Education

- BS University of Puerto Rico, Rio Piedras, P.R., 1966 Biology
- MS University of California San Diego La Jolla, CA 1970 Marine Biology
- PhD University of Rhode Island, Kingston, R.I., 1980 Biological Oceanography

Current Research Interests

Ecology and physiology of reef corals, especially reproductive ecology and early life history of corals, nutrition, and stress physiology. Nutrient cycling within coral reefs and tropical coastal systems. Coral reef algal dynamics. Anthropogenic effects on coral reefs. Coral reef restoration.

There are opportunities for undergraduate students to become involved and do DIS or an Honor's Thesis on many aspects of these projects, especially during the summers

EXAMPLES OF RECENT PROJECTS:

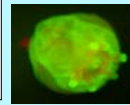
Studies of seasonal and spatial changes in algal community structure in the Florida Keys, and experiments to test the effects of nutrient enrichment on the growth and productivity of coral reef algae

Experiments to transplant and out-plant maricultured *Diadema antillarum* (important reef sea urchin) to document their effects on coral reef substrate quality, and to try to restore this sea urchin to Florida reefs

Collaboration with Dr. Charles Mazel at Physical Sciences, Inc. to develop new tools to detect very small/young coral spat using fluorescence

Collaborative research with Drs. Monica Medina JGI, and Mary Alice Coffroth, SUNY Buffalo, to study the genomics of how coral-algal symbioses are established

Collaboration with researchers from Dalhousie University and Univ of Waterloo to study the dispersal of patches of coral larvae, and the connectivity of coral populations



Photomicrograph of a coral polyp that is newly infected with zooxanthellae (small red specs). The green color of the coral tissue is due to a green fluorescent protein (GFP)



Graduate student, Ben Mason, collecting benthic water and detritus samples as part of his thesis research on nutrient cycling on Key Largo, FL, coral reefs



Crustose coralline algae produce chemical cues that induce coral larvae to settle

CURRENTLY FUNDED PROJECTS:

Recruitment of *Montastraea annularis* (species complex): Where are all the larvae going? EPA and NOAA. \$94,000. 10/01/03 - 12/31/04. Florida Keys.
Recruitment of *Montastraea annularis* (species complex): Factors that affect post-settlement survivorship. EPA and NOAA. \$99,080. 01/01/04 - 12/31/04. Florida Keys. month per year
Recruitment of *Montastraea faveolata* (species complex): Larval dispersal, settlement and post-settlement survivorship. NOAA NURC. \$23,351. 4/01/04 - 6/30/05. Florida Keys
Collaborative Special: Coral Reef Genomics: A genome wide approach to the study of coral symbiosis. NSF Special Announcement. PI \$190,196. 08/01/03 - 06/30/06. Florida Keys.
Fluorescence Imagery for Rapid Estimates of the Distribution and Abundance of Coral Recruits. With Charles Mazel PI, NOAA SBIR Phase II. subcontractor. \$29,995 8/1/04 - 12/31/05. Bonaire
NSF SGER: Exploratory research in the use of neutrally buoyant magnetic beads to track dispersal of planktonic organisms. NSF Biological Oceanography. PI \$23,147 7/01/04 - 6/30/05.

RECENT AND REPRESENTATIVE PUBLICATIONS

- Szmant, A.M. and M.W. Miller. submitted. Settlement preferences and post-settlement mortality of laboratory cultured and settled larvae of the Caribbean hermatypic corals *Montastraea faveolata* and *Acropora palmata* in the Florida Keys, USA. Proceedings of the 10th Internat Coral Reef Symp., Okinawa Japan, June-July 2004.
- Szmant, A.M. and M.G. Meadows. in prep. Ontogenetic Changes in Coral Larval Buoyancy and Vertical Swimming Behavior: Implications for Dispersal and Connectivity. For Coral Reefs
- Swart, P.K., A.M. Szmant, J.W. Porter, R. E. Dodge, and J. I. Tougas. 2004. The Isotopic Composition of Respired Carbon Dioxide in Scleractinian Corals: Implications for Cycling of Organic Carbon in Corals. *Geochim. Cosmochim. Acta.* in press
- Buckley, B.A. and A.M. Szmant. 2004. RNA/DNA ratios as indicators of metabolic activity in several species of Caribbean reef-building corals. *Biol Bull.* in press.
- Baums, I.B., M.W. Miller, A.M. Szmant. 2003. Ecology of a coralivorous gastropod, *Coralliophila abbreviata*, on two scleractinian hosts I: Population structure of snails and corals. *Marine Biology* (in press)
- *ibid.* II: Feeding, respiration, and growth. *Marine Biology* (in press).
- Szmant, A. M. 2002. Nutrient enrichment on coral reefs: Is it a major cause of coral reef decline? *Estuaries* 25: 743-766.
- Miller, M.W., E. Weil and A.M. Szmant. 2000. Recruitment patterns and grazing regime as factors structuring reef benthic communities in Biscayne National Park, USA. *Coral Reefs* 19: 115-123.
- Miller, M.W., M.E. Hay, S.L. Miller, D. Malone, E.E. Sofka, and A.M. Szmant. 1999. A new method for manipulating nutrients on coral reefs: effects of nutrients vs. herbivores on reef algae. *Limnol Oceanogr.* 44: 1847-1861.
- Medina, M., E. Weil and A.M. Szmant. 1999. An examination of the *Montastraea annularis* sibling species complex (Cnidaria: Scleractinia) using ITS and COI sequences. *J Mar. Biotech.* 1: 89-97.
- Szmant, A.M., E. Weil, M.W. Miller and D.E. Colón. 1997. Hybridization within the species complex of scleractinian coral *Montastraea annularis*. *Marine Biology* 129: 561-572.
- Szmant, A.M. 1997. Nutrient effects on coral reefs: the importance of topographic and trophic complexity on nutrient dynamics. *Proc. 8th Int. Coral Reef Symp.*, Panama, June 1996. Vol. 2: 1527-1532.
- Fitzgerald, LM and A.M. Szmant. 1997. Biosynthesis of "essential" amino acids by scleractinian corals. *Biochem. J.* 322: 213-221.

** Italics = undergrad and graduate students

NEW UNCW STUDY ABROAD COURSE

For Marine Biology / Biology Majors
SPRING OF 2005
BIO 585: FIELD RESEARCH IN CORAL REEFS AND ADJACENT ECOSYSTEMS
32 credits for undergrads; 6 credits for grads

Instructors: Drs. Szmant, Clavijo, McCartney and Whitehead from UNCW; Dr. Iglesias-Prieto from UNAM

Application Deadline: August 30, of each year

Limited to 10 students

Partial Scholarships available

Full Details (course description, syllabus, cost and application forms) can be found at:

<http://people.uncw.edu/szmanta>

or call Dr. Alina Szmant (910)962-2362

Highlights:

- ▶ Graduate course that can be taken by seniors with advanced standing;
- ▶ 10 weeks spent in the field working out of a marine laboratory on the tropical island of Curacao (Netherlands Antilles);
- ▶ Team-taught course, small group of students (limited to 10); emphasis on hands-on experience with modern research methods
- ▶ Students will conduct research projects in the field after 2 week introductory session at UNCW. Last three weeks back at UNCW in complete projects & give presentations
- ▶ SEA USA certification required, and there are course pre-requisites; see web site for full details.

