

## **ANNE ALEXANDRA BOETTCHER**

### **Director, Undergraduate Research Institute and Honors Program**

Embry-Riddle Aeronautical University

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### **Education**

#### **University of Delaware, College of Marine Studies, Lewes, DE**

- Doctor of Philosophy in Marine Studies, Marine Biology-Biochemistry Program, 1996
- Dissertation: The effect of chemical cues on metamorphosis of queen conch, *Strombus gigas*, larvae.

#### **University of Delaware, College of Marine Studies, Lewes, DE**

- Master of Science in Marine Studies, Marine Biology-Biochemistry Program, 1992
- Thesis: The role of polyphenolic molecular size in the reduction of assimilation efficiency of some marine herbivores.

#### **Bowdoin College, Brunswick, ME**

- *Artium Baccalaureus* in Neurobiology, minor in chemistry, *cum laude*, 1988
- Honors research: The effect of *Solanum nigrum* on the sleep awake cycles in rats.

### **Professional Experience**

- Director: Undergraduate Research Institute and Honors Program, Embry-Riddle Aeronautical University, Prescott, AZ, 2014-present.
- Director: University Undergraduate Research Program, University of South Alabama, Mobile, AL, 2005-2014.
- Professor: Department of Biology, University of South Alabama, Mobile, AL, 2010-2014.
- Associate Professor: Department of Biology, University of South Alabama, Mobile, AL, 2005- 2010.
- Assistant Professor: Department of Biological Sciences, University of South Alabama, Mobile, AL, 1999-2005.
- Adjunct Faculty: Department of Marine Sciences, University of South Alabama, Mobile, AL, 1999-2014
- Research Consultant: Caicos Conch Farm, TWI Ltd. Turks and Caicos, BWI, 1994-2008.
- Post-doctoral Researcher: Neuroscience Research Institute, University of California, Santa Barbara, CA, 1996-1999. Research focus: Subunit associations of ATP sensitive potassium channels.
- Research Assistant: College of Marine Studies, University of Delaware, 1989-1996.
- Marine Scientist I (research technician): College of Marine Studies, University of Delaware, 1988-1989.

## Undergraduate Research Program Focus

### *University Level*

- Expansion of Undergraduate Research Institute (URI), Embry-Riddle Aeronautical University - Prescott, including: re-vamping of undergraduate research office, creation and implementation of professional development workshops, assistance with integration of research into the curriculum, integration of research and information literacy module into freshman year experience course (UNIV101), and development of new assessment processes.
- Coordinate and host Discovery Day (2015-present), co-coordinate and host Arts and Sciences Science Speaker Undergraduate Research Symposium (2015-present), A<sup>3</sup>IRCon Undergraduate Research component planning and organizational committee (2014-2016)
- Development and implementation of leadership and research focus for Embry-Riddle Aeronautical University Prescott's Honors Program including: design of core courses in leadership, research, and ethics; development of research scholarship; expansion of invited speakers' series.
- Manage internal funding and secure and manage external funding directly related to the URI and Honors.
- Co-Lead on petition for and establishment of Embry-Riddle Aeronautical-Prescott Campus Phi Kappa Phi Chapter, Chapter President (2016-present)
- Co-Investigator on **National Science Foundation REU Site: Data Unlimited – Cyber Security and Engineering**, (2015, not funded). Principal Investigators: Jon Haass and Samuel Siewert. Resubmission planned Summer 2017.
- Director of University Committee on Undergraduate Research (UCUR), University of South Alabama (2005-2014).
- Member of committee that developed the University of South Alabama Undergraduate Research Program (1999 – 2014)
- Designed and implemented professional development series for UCUR Program, including workshops on ethics, writing process, resumes, fellowships, and a "practice" symposium. Coordinated efforts with campus writing center, career services, library, and scholarship and fellowship committee.
- Developed and implemented orientation workshop for students and mentors participating in UCUR program.
- Established Volunteer UCUR Intern Program, which targets freshman and sophomore level involvement in undergraduate research and creative activities.
- Developed module for freshman year experience (FYE) courses allowing for the integration of ethics, diversity, and research component into FYE courses. Coordinated efforts with Office of Student Academic Success and Retention.
- Coordinated and hosted Annual Undergraduate Symposium featuring oral presentations, performances, exhibits and a poster session. Open to the university community, board of trustees, university foundation, and the community.
- Coordinated and hosted mini-poster session featuring UCUR students for the university-wide open house, USA Day.

- Member of University of South Alabama Honors Program Committee and Biology Department Senior Thesis and Honors Program Committee (1999 – 2014)
- Principal investigator on **NASA-Alabama Space Grant Outreach Program funding for UCUR (\$500,000; \$20,000/yr)**, oversaw student selection, program activities, and funding.
- Principal investigator on **National Science Foundation REU Site on Protein Structure and Function (2012-2015, \$297,740)**, oversaw student and mentor selection, program activities, funding, and served as research mentor.
- Principal Investigator on **Merck-AAAS Joint Chemistry-Biology Undergraduate Research Program (2001-2004, \$60,000)**, oversaw coordination of research teams across disciplines, funding, and served as research mentor.
- Member of University of South Alabama Scholarship and Fellowship Committee.
- Developed and presented workshops on undergraduate research and creative activities for freshman year experience courses, honors research courses, faculty development series, and departmental workshops.

### ***National Level***

- Council on Undergraduate Research, Councilor, Undergraduate Research Program Director Division (2007-present), Secretary (2010-2012), Chair and E-Board Representative (2013-2016), President-Elect (2016-present).
- Prescott-Regional SciTechFest, Committee Member (2014-2015), Co-Chair (2015-present)
- Council on Undergraduate Research, CUR/NCUR Initiating and Sustaining Undergraduate Research Program Institute, University of North Carolina, Greensboro; Facilitator, Presenter – *Working with Others: How to Get Everyone to “Buy-in”*. (2008)
- *Mentoring the Mentors’ Mentor: Developing a Mentoring Program for Undergraduate Research Program Directors*. CUR 2008 Workshop, Collegeville, MN. Co-presenter: Naomi Yavenah. (2008)
- *UR as a recruitment tool: USA-UCUR and USA Day*. Spotlight in Kinkead, J. *Advancing Undergraduate Research: Marketing, Communications, and Fundraising*, p. 40.
- Council on Undergraduate Research, CUR/NCUR Initiating and Sustaining Undergraduate Research Program Institute, University of South Alabama; Host and Facilitator, Presenter – *Structure and Function of Undergraduate Research Offices: Reporting Lines, Budgets, Program Offerings*. (2010)
- *Integration of Service-Learning and Research Across Disciplines*. CUR 2010 Workshop, Ogden, UT. Co-presenters: Sandra Gregerman and Dawn McKinney. (2010)
- *What next? Positioning Established Undergraduate Research Programs for the Future*. CUR 2010 Workshop, Ogden, UT. Co-presenters: Laura Damuth, Julio Turrens, and Stephanie Wallach. (2010)
- *Professionalism and Ethics Across the Disciplines*. Workshop at Council on Undergraduate Research Gateways to Best Practices for Undergraduate Research Program Directors. St. Louis, MO. Co-presenters: Kathleen Cargill and S. McCray. (2011)
- Council on Undergraduate Research, CUR beginning a Research Program in the Natural Sciences at a Predominantly Undergraduate Institution Institute, University of South Alabama; Host. (2012)

- *Wear Two Hats: The Dual Roles of Many Undergraduate Research Program Directors*. CUR 2012 Workshop, Ewing, NJ. Co-presenters: Janice DeCosmo, Lydia Fox, and Patricia Pukkila. (2012)
- *Research Compliance Issues in Undergraduate Research*. CUR 2012 Workshop, Ewing, NJ. Co-presenters: Suma Datta, Duncan MacKenzie, and Jennifer Harris. (2012)
- Council on Undergraduate Research, Conference of Research Experiences for Undergraduate Student Scholarship; Organizing Committee. (2012, 2013, 2014)
- 10<sup>th</sup> Annual Mississippi College-Tougaloo College Undergraduate Research Symposium, Clinton, MS. Keynote - *Undergraduate Research: Opening Windows and Doors*. (2013)
- Council on Undergraduate Research, Windows of Opportunity For Undergraduate Research Program Directors Conference, Chapman University; Co-Chair with Korine Wawrzynski. (2013)
- *Igniting a FYRE: Integrating Diversity, Ethics, and Research into First Year Experience Classes and Learning Communities*. CUR 2014 Flipped Session, Washington DC. Co-presenter: Nicole Carr. (2014)
- Council on Undergraduate Research, Proposal Writing Institute, University of South Alabama; Host. (2014)
- Council on Undergraduate Research, Building, Enhancing, Sustaining, University of Oklahoma-Norman; Conference Planning Committee. (2015)
- *Council on Undergraduate Research Professional Development Programs*. Poster at Council on Undergraduate Research, Building, Enhancing, Sustaining, University of Oklahoma-Norman; Co-presenter: Elizabeth Ambos. (2015)
- Council on Undergraduate Research, CUR Institute Initiating and Sustaining Undergraduate Research Program, University of Missouri at Columbia; Co-Lead and Facilitator, Presenter – *Models of Undergraduate Research, Integration of Research into the Curriculum and Entrepreneurial Activities, and Teaching Research Ethics*. (2015)
- *Collaboration Across Programs: How Do We Help Our Students Develop Competitive Scholarship and Fellowship Applications?* CUR 2016 Panel Presentation, University of South Florida. Co-presenters: Tim Parshall, Meredith Wooten, Joanna Dickert, Adelia Rose Humme, and Karen Havholm. (2016)
- *Leveraging an Institutional Re-Accreditation Process to Enhance Undergraduate Research as a High-Impact Practice at Your Institution*. CUR 2016 Panel Presentation, University of South Florida. Co-presenters: Donna Chamley-Wiik and Bethany Usher. (2016)
- *From Research to Innovation: Undergraduate Research to Address Societal Needs*. CUR 2016 Panel Presentation, University of South Florida. Co-presenters: Janice DeCosmo, Patrick Killion, and Sean Ma. (2016)
- Battaglia, D., Sampigethaya, K., Almagambetov, A., Andalibi, M., Groh, T., Martin, K., Pavlina, M., Siewert, S., and Boettcher, A., J. M., *Integrating Research into Undergraduate Courses: Experiences from a Multi-Disciplinary Faculty Learning Community*. Paper, ASEE Rocky Mountain Section Conference, Cedar City, UT, Sept. 30 - Oct. 1, 2016.
- *Integrating Undergraduate Research into the Curriculum: Scaffolded Approach*. New Faculty Orientation, Embry-Riddle Aeronautical University, Prescott, AZ. (2016)

- *Characteristics of Excellence in Undergraduate Research: Applications to Honors Programming.* Invited Panel Presentation 51<sup>st</sup> Annual Conference of the National Collegiate Honors Council, Seattle, WA. Co-presenters: Vanessa McRae, Suzanne Rocheleau, Jill granger, and Kate Hanson. (2016)
- Council on Undergraduate Research, CUR Institute Initiating and Sustaining Undergraduate Research Program, Carleton University, Ottawa, Canada; Lead and Facilitator, Presenter – *Initiating and Sustaining a Culture of Undergraduate Research and Integrating Undergraduate Research into the Curriculum: Scaffolded Approach.* (2016)

## **Research Focus**

My research focuses on the influence of environmental factors on aquatic plant and animal systems. The common theme, on topics that range from fish reproduction to seagrass pathogen resistance, is a focus on the physiological mechanisms involved in an organism's response to normal and stressful environmental conditions. Study areas include:

- Impact of environmental contaminants on marine organisms
- Abiotic stress in marine invertebrates
- Reproductive physiology of estuarine fishes
- Biotic and abiotic impacts on seagrasses and marsh grasses
- Marine larval settlement and metamorphosis

Within the context of these research interests, one of my major goals has been to mentor undergraduate and graduate students in all phases of research. While at the University of South Alabama, more than 40 undergraduates and 13 graduate students participated in funded and directed research in my laboratory. Their work has been highlighted in more than 50 presentations at regional and national meetings, and in 13 peer-reviewed publications (including 7 undergraduate co-authors).

Research in my laboratory expanded from internal grants supporting summer research in my first years at University of South Alabama, to a sustained level of external support driving multiple interdisciplinary research projects. To date, I have received over \$1,000,000 from external federal and private agencies. Internal grants (>\$10,000) have provided for seminar programs and the enhancement of lab facility infrastructure at the University of South Alabama.

In addition to my focus on research mentorship, my internal and external funding successes facilitated collaborations between my lab and researchers at Dickinson College, St. Mary's College of Maryland, U. of Mississippi, U. of North Florida, Texas A&M., U. of Washington's Friday Harbor Labs, Purdue University, both Grand Bay and Weeks Bay National Estuarine Research Reserves, Rocky Mountain Biological Lab, and Germany's IFM-GEOMAR.

Although I continue to collaborate with researchers on studies related to ecological physiology, my transition to an administrative position at Embry-Riddle Aeronautical University has led to a transition in my research mentorship. Increasingly I am mentoring multidisciplinary groups of students, assisting them with their grantsmanship and research skills. I am working with the Undergraduate Research Institute Advisory Board, Honors Advisory Board, and Study Abroad Program at Embry-Riddle to increase research opportunities for our students fostering faculty lead grants and external student fellowships and scholarships, as well as increasing the integration of research into the curriculum.

## **External Research Funding**

- Virginia Department of Transportation (2012-2014) Standardized Test Method for Quantifying the Environmental Impacts of Stormwater Infrastructure Rehabilitation Materials. *Co-Investigator*. (PI: Andrew Welton, Co-PIs: Kevin White and Eric Steward). \$147,515. Funded.
- British Petroleum, Task Order via Dauphin Island Sea Lab (2011) Gulf of Mexico Ecosystem Recovery: Sentinel Macrofauna. *Principal Investigator*. \$33,672. Funded.
- British Petroleum, Task Order via Dauphin Island Sea Lab (2011) Gulf of Mexico Ecosystem Integrity: Resilience of Seagrass Beds to Oil Contamination. *Principal Investigator* (Co-PIs: Dr. Kelly Major and Dr. Ashley Morris). \$77,060. Funded.
- National Institute for Undersea Science and Technology, Sub-contract through University of Mississippi (2010) Impacts of Oil Contamination to Seagrass Beds: Proteomic Responses. *Principal Investigator*. \$19,470. Funded.
- SeaDoc Society, UC Davis Wildlife Health Center (2010) The Role of Disease in San Juan Archipelago Eelgrass Decline: An Untested but Potentially Serious Problem. *Principal Investigator*. \$44,837. Funded.
- National Aeronautics and Space Administration, Sub-contract through University of Mississippi (2007-2008) Modeling Seagrass Community Change Using Remote Sensing and Real-time Instrument Packages. *Principal Investigator*. \$61,004. Funded.
- Environmental Protection Agency, Alabama Center for Estuarine Studies (2005-2007) Impacts of Hurricanes on the Natural and Restored Recovery of *Juncus roemerianus* in Alabama's Critical Salt Marsh Habitat. *Principal Investigator* (Co-PI: Dr. Just Cebrian). \$57,961. Funded.
- National Marine Fisheries Service, Alabama Oyster Reef Restoration Program (2003-2005) Environmental Impacts on Oyster Larvae and Spat: Use of Heat Shock Proteins as Biomarkers. *Principal Investigator*. \$89,909. Funded.
- Environmental Protection Agency, Alabama Center for Estuarine Studies (2003-2004) Characterization of glycoprotein cues used by the parasitic rhizocephalan barnacle, *Loxothylacus texanus* to identify its blue crab host, *Callinectes sapidus* *Principal Investigator* (Co-PIs: Dr. Timothy Sherman and Dr. Jack O'Brien). \$23,460. Funded.
- National Science Foundation (2001-2004) RUI Collaborative Proposal: Mechanisms of Induced Pathogen Resistance in Seagrasses. *Principal Investigator* (Co-PIs: Dr. Thomas Arnold and Dr. Christopher Tanner). \$97,886. Funded.
- Environmental Protection Agency-Alabama Center for Estuarine Studies. (2001-2002) Role of Invasive Species in Shaping Diversity of Aquatic Vegetation in the Mobile-Tensaw River Delta. *Principal Investigator* (Co-PI: Dr. Timothy Sherman) \$33,162. Funded.
- Environmental Protection Agency-Alabama Center for Estuarine Studies. (2001-2002) Effects of Estrogen Pollution on the Reproductive Fitness of the Gulf Pipefish. *Principal Investigator* (Co-PIs: Dr. Judith Shardo and Dr. John Hemming). \$30,056. Funded.
- Environmental Protection Agency-Alabama Center for Estuarine Studies (2000-2001) Role of Invasive Species in Shaping Plant-Animal Interactions in the Delta. *Principal Investigator* (Co-PIs: Dr. Timothy Sherman and Dr. John Valentine). \$34,113. Funded.

## **Selected Publications** (*undergraduate students indicated by \*, graduate students by \*\**)

- Tindle, S.\*, E. Boone, J.\*\*\*, O'Brien, and **A. Boettcher**. 2004. Effects of salinity on larval stages of the rhizocephalan barnacle *Loxothylacus texanus*: Survival and metamorphosis in response to the host, *Callinectes sapidus*. *Journal of Experimental Marine Biology and Ecology* **302**:165-176.

- Bolland, J.\* and **A. Boettcher**. 2005. Population structure and reproductive characteristics of the gulf pipefish, *Syngnathus scovelli* in Mobile Bay, Alabama. *Estuaries* **28**:957-965.
- Steele, L.\*, M. C. Caldwell\*\*, **A.A. Boettcher**, T. Arnold. 2005. Seagrass–pathogen interactions: ‘pseudo-induction’ of turtlegrass phenolics near wasting disease lesions. *Marine Ecology Progress Series* **303**:123-131.
- Ueda N.\*, C. Partridge\*\*, J. Bolland\*, J. Hemming, T. Sherman, and **A. Boettcher**. 2005. Effects of environmental estrogens on male gulf pipefish, *Syngnathus scovelli*. *Bulletin of Environmental Contamination and Toxicology* **74**:1207-1212.
- Ueda, N.\*\* and **A. Boettcher**. 2009. Differences in heat shock protein 70 expression during larval and early spat development in the Eastern oyster *Crassostrea virginica* (Gmelin, 1791). *Cell Stress and Chaperones* **14**:439-443.
- Bergmann, N. B., M.C. Fricke, V. Schmidt, K. Tams, H. Beining, A. Schwitte, **A. Boettcher**, D.L. Martin, A-C. Bockelmann, T.B.H. Reusch, and G. Rauch. 2011. A quantitative real-time PCR assay for the seagrass pathogen *Labyrinthula zosterae*. *Molecular Ecology Resources* **11**:1076-1081.
- Partridge, C., **A. Boettcher**, and A.G. Jones. 2013. The role of courtship behavior and size in mate preference in the sex-role-reversed Gulf pipefish, *Syngnathus scovelli*. *Ethology* **119**:692-701.
- Patterson, H.K.\*\* , **A. Boettcher**, and R.H. Carmichael. 2014. Biomarkers of dissolved oxygen stress in oysters: A tool for restoration and management efforts. *PLOS One* **9**:e104440.
- Martin, D.L., Y. Chiari, E. Boone, T.D. Sherman, S. Wyllie-Echeverria, J.K. Gaydos, and **A.A. Boettcher**. 2016. Functional, phylogenetic and host-geographic signatures of *Labyrinthula* spp. Provide for putative species delimitation and a global-scale view of seagrass wasting disease. *Estuaries and Coasts* **39**:1403-1421.

## Honors and Awards

- Unsung Eagle Award, Embry-Riddle Aeronautical University, Student Engagement, 2017
- Outstanding Staff Award, Embry-Riddle Aeronautical University, Student Engagement, 2017
- Service Excellence Award, Embry-Riddle Aeronautical University, October 2015, February 2017
- Faculty Senate’s 50 Outstanding Faculty Members of University South Alabama, 1963-2013
- Mortar Board, Top Prof Award, University South Alabama 2009, 2010, 2012
- American Heart Association, California Affiliate Postdoctoral Fellowship, 1997
- E. Sam Fitz Award for Academic Excellence, University of Delaware, 1995
- International Women’s Fisheries Association Scholarship Trust, 1995
- Marian R. Okie Fellowship, 1992-1993
- Grass Fellowship, Molecular Neurobiology Course, Friday Harbor Laboratories, 1992
- Marine Biology-Biochemistry Program Fellowship, 1989-1990
- James Bowdoin Scholar, 1986

## Teaching

- University Student Success, Embry-Riddle Aeronautical University (2015-present), co-development and instruction of research and information literary module and assistance with re-design of course.
- Senior Cooperative Internship, Embry-Riddle Aeronautical University (2014-present), co-instructor, instructor of record: Karen Meunier
- Freshman Year Experience, University of South Alabama (2013-2014)
- Graduate Seminar, University of South Alabama (2012-2014)
- Animal Physiology Lecture and Laboratory, University of South Alabama (1999-2014)

- Chemical Ecology, University of South Alabama (1999-2014)
- General Biology 1 Laboratory, University of South Alabama (Honors and Regular, 1999-2014)