

## **Ann M. Tarrant**

Biology Department Mailstop 33  
Woods Hole Oceanographic Institution  
Woods Hole MA 02543-1049 U.S.A.  
phone: (508) 289-3398 email: atarrant@whoi.edu  
website: <http://www.whoi.edu/people/atarrant>

### **APPOINTMENTS:**

- 2011- Associate Scientist, Biology Department, Woods Hole Oceanographic Institution (WHOI).
- 2007-2011 Assistant Scientist, Biology Department, WHOI.
- 2004-2007 NIH Postdoctoral Fellow, Biology Department, WHOI, Dr. Mark Hahn, Supervisor. Characterized nuclear receptor (ERR) action in fishes and molecular regulation of copepod diapause.
- 2002-2004 Postdoctoral Scholar/Investigator, Biology Department, WHOI, Drs. Mark Hahn and John Stegeman, Supervisors. Investigated the distribution and role of nuclear receptors in marine organisms, including corals.
- 1995-2002 Graduate Student, Oceanography Department, University of Hawaii. Used GC-MS and radioimmunoassay to investigate sources, metabolism and biological activity of estrogens in reef-building corals.

### **EDUCATION:**

- 2002 Ph.D., Oceanography, University of Hawaii at Manoa. Dissertation Title: "Estrogen Action in Scleractinian Corals: Uptake, Metabolism and Physiological Effects." Advisor: Dr. Marlin Atkinson
- 1998 M.S., Oceanography, University of Hawaii at Manoa. Thesis Title: "Measurement of Estradiol and Estrone in Tissue of the Scleractinian Coral, *Montipora verrucosa*: Analytical Developments and Indications of Seasonality." Advisor: Dr. Marlin Atkinson
- 1995 B.S., Biology and Marine Science, University of Miami. *Magna cum Laude*

### **PROFESSIONAL HONORS AND AWARDS:**

- George Thibault Early Career Scientist Award (WHOI), 2014
- Richard B. Sellars Innovative Research Award (WHOI), 2011
- Ruth L. Kirschstein National Research Service Award (NRSA) from National Institute of Environmental Health Sciences (NIEHS), within the National Institutes of Health (NIH), 2004-2007.
- WHOI Postdoctoral Scholarship, 2002-2004
- EPA STAR Graduate Fellowship, 2000-2002.
- STAR Graduate Research Symposium, University of Hawaii, Department of Oceanography, Best Presentation, 1999.
- NDSEG Graduate Research Fellowship, 1996-1999.
- NSF Graduate Research Fellowship (awarded 1996, unable to simultaneously accept).
- EPA STAR Graduate Fellowship (awarded 1996, unable to simultaneously accept).

F.G. Walton Smith Award (University of Miami outstanding marine science undergraduate), 1995.

Phi Beta Kappa, University of Miami Chapter, 1995.

Isaac B. Singer, Full academic scholarship, University of Miami, 1991-1995.

## MAJOR RESEARCH INTERESTS:

Cnidarian physiology and stress responses; evolution and diversification of endocrine signaling and circadian regulation in marine animals; nuclear receptor and steroid hormone signaling; molecular regulation of copepod dormancy/diapause.

## PUBLICATIONS (\* denotes student or postdoc from my laboratory; # denotes equal contributions).

**Tarrant AM**<sup>#</sup>, Baumgartner MF<sup>#</sup>, Hansen BH, Altin D, Nordtug T, Olsen AJ. (In press) Transcriptional profiling of reproductive development, lipid storage and molting throughout the last juvenile stage of the marine copepod *Calanus finmarchicus*. Accepted in principle by *Frontiers in Zoology* 1 Dec 2014.

**Tarrant AM**, Gilmore TD, Reitzel AM, Levy O, Technau U, Martindale MQ. (In press) Current directions and future perspectives from the third *Nematostella* research conference. Accepted by *Zoology* 16 June 2014. Corrected proof available online DOI:10.1016/j.zool.2014.06.005

**Tarrant AM**, Reitzel AM\*, Kwok CK\*, Jenny MJ. (2014) Activation of cnidarian oxidative stress response by ultraviolet light, polycyclic aromatic hydrocarbons and crude oil. *Journal of Experimental Biology* 217(9):1444-53. DOI:10.1242/jeb.093690.

Reitzel AM\*, Passamaneck Y, Karchner S, Franks DG, Martindale MQ, **Tarrant AM**, Hahn ME. (2014) Aryl hydrocarbon receptor (AHR) in the cnidarian *Nematostella vectensis*: comparative expression, protein interactions, and ligand binding. *Development Genes and Evolution* 224(1):13-24 DOI: 10.1007/s00427-013-0458-4.

**Tarrant AM**, Reitzel AM. (2013) Introduction to the symposium—keeping time during evolution: conservation and innovation of the circadian clock. *Integrative and Comparative Biology* 53(1):89-92. DOI: 10.1093/icb/ict062

Gilmore TD, **Tarrant AM**, Finnerty JR. (2013) A report from the second *Nematostella vectensis* research conference. *Development Genes and Evolution* 223(3):207-11. DOI: 10.1007/s00427-012-0434-4.

Pineda J, Starczak V, **Tarrant AM**, Blythe J, Davis K, Farrar T, Berumen M, and da Silva J. (2013) Two spatial scales in a bleaching event: corals from the mildest and the most extreme thermal environments escape mortality. *Limnology and Oceanography* 58(5): 1531-45. DOI: 10.4319/lo.2013.58.5.1531.

Reitzel AM<sup>#</sup>, **Tarrant AM**<sup>#</sup>, Levy O. (2013) Circadian clocks in the cnidaria: environmental entrainment, molecular regulation, and organismal outputs. *Integrative and Comparative Biology*. 53(1):118-30. DOI: 10.1093/icb/ict024.

Reitzel AM\*, Chu T, Edquist S, Genovese C, Church C, **Tarrant AM**, Finnerty JR. (2013) Physiological and developmental responses to temperature by the estuarine sea anemone *Nematostella vectensis*: evidence for local adaptation to high temperatures. *Marine Ecology Progress Series*. 484: 115-130. DOI: 10.3354/meps10281.

**Tarrant AM**, Franks DG, Verslycke T. (2012) Gene expression in American lobster (*Homarus americanus*) with epizootic shell disease. *Journal of Shellfish Research*. 31(2):505-13. DOI:10.2983/035.031.0200.

Reitzel AM\*, Ryan JR, **Tarrant AM**. (2012) Establishing a model organism: A report from the first annual *Nematostella* meeting. *Bioessays*. 34(2):158-61. DOI: 10.1002/bies.201100145

**Tarrant AM**, Behrendt L\*, Stegeman JJ, Verslycke T. (2011) Ecdysteroid receptor from the American lobster, *Homarus americanus*: EcR/RXR isoform cloning and ligand-binding properties. *General and Comparative Endocrinology*. 173(2):346-55.

**Tarrant AM**, Mindnich M. (2011) Perspectives on steroid metabolism in marine organisms. *Journal of Steroid Biochemistry and Molecular Biology* 127(3-5): 147-9. DOI: 10.1016/j.jsbmb.2011.09.005.

Callard GV, **Tarrant AM**, Novillo A, Yacci P, Ciaccia L, Vajda S, Chuang G-Y, Kozakov D, Greytak SR, Sawyer S, Hoover C, Kotter K. (2011). Evolutionary origins of the estrogen signaling system: insights from amphioxus. *Journal of Steroid Biochemistry and Molecular Biology*. 127(3-5):176-88.

Aruda AM\*, Baumgartner MF, Reitzel AM\*, **Tarrant AM**. (2011). Heat shock protein expression during stress and diapause in the marine copepod *Calanus finmarchicus*. *Journal of Insect Physiology* 57(5):665-75.

Reitzel AM\*, Pang K, Ryan JF, Mullikin JC, Martindale MQ, Baxevas AD, **Tarrant AM**. (2011) Nuclear receptors from the ctenophore *Mnemiopsis leidyi* lack a zinc-finger DNA-binding domain: lineage-specific loss or ancestral condition in the emergence of the nuclear receptor superfamily? *EvoDevo* 2:3.

**Tarrant AM**, Stegeman JJ, Verslycke T (2010) Altered gene expression associated with epizootic shell disease in the American lobster, *Homarus americanus*. *Fish and Shellfish Immunology* 29(6):1003-9.

Reitzel AM\*, **Tarrant AM**. (2010). Correlated evolution of androgen receptor and aromatase revisited. *Molecular Biology and Evolution*. 27(10):2211-5.

Reitzel AM\*, Behrendt L\*, **Tarrant AM** (2010) Light entrained rhythmic gene expression in the sea anemone *Nematostella vectensis*: the evolution of the animal circadian clock. *PLoS ONE* 5(9):e12805.

Cantin NE\*, Cohen AL, Karnauskas KB, **Tarrant AM**, McCorkle DC (2010) Ocean warming slows coral growth in the central Red Sea. *Science* 329:322-5. (note \* co-advised).

Greytak SR, **Tarrant AM**, Nacci D, Hahn ME, Callard GV (2010) Estrogen responses in killifish (*Fundulus heteroclitus*) from polluted and unpolluted environments are site- and gene-specific. *Aquatic Toxicology* 99:291-9.

Karchner SI, Jenny MJ, **Tarrant AM**, Evans BR, Kang HR, Bae I, Sherr DH, Hahn ME. (2009) The active form of human aryl hydrocarbon receptor (AHR) repressor lacks exon 8, and its Pro 185 and Ala 185 variants repress both AHR and hypoxia-inducible factor. *Molecular and Cellular Biology* 29(13): 3465-77.

Reitzel AM\*, **Tarrant AM**. (2009) Nuclear receptor complement of the cnidarian *Nematostella vectensis*: phylogenetic relationships and developmental expression patterns. *BMC Evolutionary Biology*. 9:230.

**Tarrant AM**, Reitzel AM\*, Blomquist CH, Haller F, Tokarz J, Adamski J. (2009) Steroid metabolism in cnidarians: Insights from *Nematostella vectensis*. *Molecular and Cellular Endocrinology* 301(1-2):27-36 doi:10.1016/j.mce.2008.09.037.

**Tarrant AM**, Cortés J, Atkinson M, Atkinson S, Johanning K, Chiang T-C, Vargas JA, McLachlan JA. (2008) Three orphan nuclear receptors in the scleractinian coral *Pocillopora damicornis*. *Revista de Biología Tropical* 56(Suppl. 4): 39-48.

**Tarrant AM**<sup>#</sup>, Baumgartner MF<sup>#</sup>, Verslycke T, Johnson CL. (2008) Differential gene expression in diapausing and active *Calanus finmarchicus* (Copepoda). *Marine Ecology Progress Series* 355:193-207.

Goldstone JV, Goldstone HMH, Morrison AM, **Tarrant AM**, Kern SE, Woodin BR, Stegeman JJ. (2007) Cytochrome P450 1 genes in early deuterostomes (tunicates and sea urchins) and vertebrates (chicken and frog): Origin and diversification of the CYP1 gene family. *Molecular Biology and Evolution* 24(12): 2619-31.

**Tarrant AM**. (2007) Hormonal signaling in cnidarians: do we understand the pathways well enough to know whether they are being disrupted? *Ecotoxicology* 16:5-13.

**Tarrant AM**, Greytak SR, Callard GV, Hahn ME. (2006) Estrogen receptor-related receptors in the killifish *Fundulus heteroclitus*, diversity, expression, and estrogen responsiveness. *Journal of Molecular Endocrinology*, 37: 1-17.

Blomquist C, Lima P, **Tarrant AM**, Atkinson MJ, Atkinson SK. (2006) 17 $\beta$ -hydroxysteroid dehydrogenase (17 $\beta$ -HSD) in scleractinian corals, *Comparative Biochemistry and Physiology B. Biochemistry* 143: 397-403.

**Tarrant AM**. (2005) Endocrine-like signaling in cnidarians: Current understanding and implications for ecophysiology, *Integrative and Comparative Biology* 45(1): 201-214.

**Tarrant AM**, Atkinson MJ, Atkinson S. (2004) Effects of steroidal estrogens on coral growth and reproduction. *Marine Ecology Progress Series*, 269: 121-129, 2004 doi:10.3354/meps269121.

**Tarrant AM**, Blomquist C, Lima P, Atkinson S, Atkinson MJ. (2003) Metabolism of androgens and estrogens by reef building corals *Comparative Biochemistry and Physiology B. Biochemistry* 136(3): 473-485.

Atkinson S, Atkinson MJ, **Tarrant AM**. (2003) Estrogens from sewage in the coastal marine environment. *Environmental Health Perspectives* 111(4): 531-535.

**Tarrant AM**, Atkinson MJ, Atkinson S. (2001) Uptake of estrone from the water column by a coral community. *Marine Biology* 139:321-325.

**Tarrant AM**, Atkinson S, Atkinson MJ. (1999) Estrone and estradiol-17 $\beta$  concentration in tissue of the scleractinian coral, *Montipora verrucosa*. *Comparative Biochemistry and Physiology A. Physiology* 122: 85-92.

## **PROFESSIONAL ACTIVITIES AT WHOI (OTHER THAN EDUCATION):**

### *Institutional committees and service*

- Dive control board member (2010-Present)
- SciSEC representative (2009-2011)
- Proposal reviewer for WHOI funding opportunity (2008, 2011, 2014)

### *Departmental committees and service*

- Biology seminar co-coordinator (2008-2009)
- Participated in Biology Department annual staff review (2009, 2010)

## **PROFESSIONAL ACTIVITIES OUTSIDE WHOI:**

### *Meetings/Symposia Hosted or Organized*

- Nematostella Community Meeting December 2013, Eilat, Israel (organized).
- Keeping time during animal evolution: Conservation and innovation of the circadian clock, Symposium within SICB annual meeting January 2013, San Francisco, CA (Tarrant & Reitzel co-organized).

Nematostella Community Meeting August 2012, Boston, MA (Gilmore, Tarrant & Finnerty co-organized).

Nematostella Community Meeting June 2011, Woods Hole MA (Tarrant & Reitzel co-organized).  
Physiology and ecology of crustacean diapause, Session within ALSO Summer Meeting June 2008, St. Johns, Newfoundland (Tarrant, Baumgartner & Johnson co-organized).

#### *Journal Reviews*

Aquatic Toxicology, Brazilian Journal of Oceanography, Chemosphere, Comparative Biochemistry and Physiology, Ecotoxicology, Ecotoxicology and Environmental Safety, Environmental Health Perspectives, FEBS Letters, General and Comparative Endocrinology, Journal of Experimental Marine Biology and Ecology, Journal of Foraminiferal Research, Journal of Steroid Biochemistry and Molecular Biology, Marine Biotechnology, Marine Pollution Bulletin, Molecular and Cellular Endocrinology, Symbiosis, PLoS ONE, Tissue & Cell, Toxicological Sciences, Zebrafish.

#### *Proposal Reviews*

National Science Foundation (Biology, Ocean Sciences), Hudson River Foundation, Israeli Science Foundation, Sigma Delta Epsilon – Graduate Women in Science (SDE-GWIS), US-Israel Binalational Science Foundation, NOAA/CSCOR (Center for Sponsored Coastal Ocean Research)

#### *Panel Service*

National Science Foundation, Integrative Organismal Systems (2011)

#### *KAUST (King Abdullah University of Science and Technology, Saudi Arabia)*

Participated in interview process for 4 faculty members

#### *University of Hawaii at Manoa*

Faculty search committee (2002), Academic grievance committee (2000)

#### *Invited participation in expert workshops*

Earth Cube Domain End User Workshop: Developing a Community Vision of Cyberinfrastructure Needs for Coral Reef Systems Science, October 23-24 2013. Santa Barbara, California  
KAUST Computations Bioscience Collaborative Research Workshop. March 11-13 2009. London, England.  
Lobster Health Coalition. February 6 2009. Hyannis, Massachusetts.  
Ocean Acidification: The carbonation of the ocean under rising atmospheric CO<sub>2</sub>. November 2008. Academia Sinica, Taipei, Taiwan.

#### *Other external service*

Expert consultant (pro bono) for *Coral Reefs*, a children's book by Jason Chin.

## **PARTICIPATION IN EDUCATIONAL PROGRAMS, MENTORING AND TRAINING:**

### COMMITTEES AND OTHER SERVICE

#### *MIT-WHOI Joint Program in Biological Oceanography*

Joint Committee for Biological Oceanography (2012-Present)

#### *WHOI Institution-wide Committees and Other Service*

Joint Program Admissions Advisory Committee (2008-2010)  
Panelist, WHOI postdoctoral women's mentoring lunch (April 2011)  
Discussion leader, WHOI Academic Programs workshop on scientific ethics (August 6 2008)

#### *WHOI Biology Department Committee and Other Service*

Biology Postdoctoral mentoring committee (2010-2012)  
Biology General Exam committee (2009, 2010)

Provided Material for Biology General Exam (2008, 2009, 2010, 2011)

*External*

Invited panelist, "Maximizing the postdoctoral experience." Department of Molecular and Cellular Biology, Tulane University, New Orleans, 2004.

ADVISING AND MENTORING

Postdoctoral Researchers:

Amy Maas (co-advisor), Postdoctoral Scholar/Investigator (2011-2014)

Adam Reitzel (advisor), Postdoctoral Scholar/Fellow (2007-2012)

Neal Cantin (co-advisor), Postdoctoral Investigator (2008-2010)

Graduate Students:

*Advisor (MIT-WHOI Joint Program):*

Maja Edenius (2012-present)

Amalia Aruda Almada (Ph.D. 2014)

*Research Advisor*

Ali Thabet, Al-Azhar University, Egypt (2013-present)

*Committee Member (MIT-WHOI Joint Program):*

Eleanor Bors (2013-Present), Patricia Tcaciuc (2012-Present), Santiago Herrera (Ph.D. 2014),  
Meredith White (Ph.D. 2013), Michael Holcomb (Ph.D. 2009)

*Committee Member (Boston University, Cellular and Molecular Biology Department)*

Kellie Cotter, (Ph.D. 2014), Rebecca Meyer (2012-present).

*Supervisor (Short-term Guest Students)*

Imke Podbielski, GEOMAR Inst. Kiel, Germany (Fall 2012)

Jana Deppermann, University of Oldenberg, Germany (2010, 2011)

Chun Kit (Jacky) Kwok, Chinese University of Hong Kong (2011)

Lars Behrendt, University of Hamburg, Germany (2009)

Undergraduate Students:

Ian Jones, University of Maine (WHOI Summer Student Fellow 2014)

Amy Streets, University of Maryland (WHOI Summer Student Fellow 2012)

Caitlin Church, University of San Diego (Guest student 2012)

Javar Henry, Savannah State University (Guest student 2012)

Alexis Fischer, Wellesley College (WHOI Summer Student Fellow 2010)

Abigail Labella, American University (WHOI Summer Student Fellow 2009)

Amalia Aruda, Georgetown University (WHOI Summer Student Fellow 2008, guest student 2006)

Michael Oats, Stonehill College (Guest student 2010)

Allison Tracy, Princeton University (Guest student 2008)

Natasha Rabinowitz, Mount Holyoke College (Guest student 2007)

Suzanne Kern, Colorado College (Guest student 2003), co-mentor

Michele Weber, University of California Berkeley (Guest student 2001)

*High School*

Jessica Morgan, Plymouth North High School (Summer 2011)

TEACHING

*Courses Taught*

7.431/7.433 Biology and Ecology of Coral Reefs (MIT-WHOI Joint Program). Lead instructor (with Jesús Pineda and Simon Thorrold). Fall 2008, Fall 2012, Fall 2014.

7.421 Problems in Biological Oceanography- Chronobiology (MIT-WHOI Joint Program, equal co-instructor with Mike Neubert). Fall 2013.

(Non-credit) Tropical Ecology field course (Panama, Liquid Jungle Lab), a course that I co-developed (with Jesús Pineda) for WHOI-MIT Joint Program Students, January 2011, January 2013.

7.431 Biology and Ecology of Coastal Ecosystems in Tropical Oceans (MIT-WHOI Joint Program), Lead Instructor (with Jesús Pineda and Simon Thorrold). Fall 2010.

#### *Guest Lectures*

Biological Oceanography Course (MIT-WHOI Joint Program), Lecture on Coral Reefs. 2009, 2008, 2007, 2005.

#### *Other Educational Experience*

Software developer, Lightcone, Inc. Developed modules for interactive, electronic supplements to introductory genetics and biology textbooks using Flash software. 2001-2002.

Instructor, The Princeton Review, Taught GRE and SAT preparation courses. 2001.

Field Instructor, San Francisco State University and Institute for Cultural Ecology. 1996-8.

Teaching Assistant, Introduction to Oceanography, University of Hawaii at Manoa. 1996-7

### **RECENT INVITED PRESENTATIONS:**

**Tarrant AM.** 2014. Transcriptomic fingerprints of development and circadian cycles in marine invertebrates. Evolution 2014. Invited platform presentation within a Symposium titled "Phylogenomics, transcriptomics and the evolution of gene expression" (sponsored by the Society of Systematic Biologists). Raleigh, NC June 23, 2014.

**Tarrant AM.** 2013. Nuclear receptors in Early-diverging marine animals. ENDO 2013 Conference (Annual meeting of The Endocrine Society). June 15-18 2013, San Francisco CA. Invited speaker in "Evolution of Nuclear Receptors" symposium, oral presentation, Abstract S13-2.

**Tarrant AM.** Reitzel AM, Jenny MJ. 2012. Cellular stress responses in the sea anemone, *Nematostella vectensis*. 9<sup>th</sup> Okazaki Biology Conference Marine Biology II. Okazaki and Okinawa, Japan. October 2012. (Invited speaker at closed international workshop).

**Tarrant AM.** 2012. Responses of cnidarians to environmental signals and stressors. Seminar series, Bermuda Institute of Ocean Sciences. July 30, 2012.

**Tarrant AM.** 2012. "Simple" animals in a complicated world: Responses of sea anemones to environmental signals and stressors. Sigma Xi Induction Ceremony (Keynote speaker), North Shore Chapter, Endicott College, April 26, 2012.

**Tarrant AM.** 2011. Lobster ecdysteroid signaling as a target of endocrine disruption. Seminar Series, Massachusetts Institute of Technology Sea Grant Program, May 31, 2011.

**Tarrant AM.** 2011. Coral ecology and physiology in the Red Sea. Red Sea Center Research Symposium. King Abdullah University of Science and Technology (KAUST), Thuwal, Saudi Arabia, April 9-11 2011.

**Tarrant AM.** 2011. Insight into the evolution of the nuclear receptor superfamily and circadian regulation from the sea anemone, *Nematostella vectensis*. Boston University, Biology Department Seminar Series, March 28, 2011.

**Tarrant AM.** 2010. What sea anemones can teach us about salt marshes, corals and toxicology. Wellesley College, Tropical Ecology Class. December 7, 2010.

Aruda AM, Baumgartner MF, **Tarrant AM**<sup>#</sup>. 2010. Gene expression profiles associated with dormancy in the copepod *Calanus finmarchicus*. International Conference on Invertebrate Reproduction and Development. Prague, Czech Republic. August 2010 <sup>#</sup> presenting/senior author.

### **SELECTED OTHER OUTREACH ACTIVITIES:**

Presentation to Children's School of Science, "Cnidarians" (July 2013)  
Falmouth Public Schools Science Fair Judge (2011)  
Falmouth Bioblitz Executive Committee (2010)  
Woods Hole Bioblitz Group Leader (summer 2010)

### **SELECTED CRUISES AND FIELD EXPEDITIONS:**

January 2013. 11 day field expedition to Liquid Jungle Lab, Isla Canales de Tierra, Panama. Co-taught field course for MIT-WHOI Joint Program Students and recovered instrumentation. Led diving and coral reef components.

January 2011. 11 day field expedition to Liquid Jungle Lab, Isla Canales de Tierra, Panama. Co-taught field course for MIT-WHOI Joint Program Students and recovered instrumentation.

November 2010. 3 day field expedition to Liquid Jungle Lab, Isla Canales de Tierra, Panama. Preliminary studies to assess coral growth rates and the presence of internal waves.

April 2010. 14 day field expedition in Red Sea of Saudi Arabia using liveaboard dive vessel (Dream Island). SCUBA-based collection of coral samples for analysis of coral skeletal growth and tissue composition. Expedition leader.

August 2009. 14 day field expedition in Red Sea of Saudi Arabia using liveaboard dive vessel (Dream Island). SCUBA-based collection of coral samples for analysis of coral skeletal growth and tissue composition. Expedition leader.

February 2009. 14 day field expedition in Red Sea of Saudi Arabia using liveaboard dive vessel (Dream Island). SCUBA-based collection of coral samples for analysis of coral skeletal growth and tissue composition. Expedition leader.

August-September 2008. 14 day field expedition (full trip dates August 19-September 7, 2008) in Red Sea of Saudi Arabia using liveaboard dive vessel (Dream Island). SCUBA-based collection of coral samples for analysis of coral skeletal growth and tissue composition. Expedition leader.

June-July 2008, 20 day field expedition (June 26-July 16) to Hawaii Institute of Marine Biology, Kaneohe, Hawaii. Field work associated with retinoid signaling in reef-building corals.

### **CERTIFICATIONS AND ADDITIONAL TRAINING:**

#### *Current Certifications*

AAUS SCUBA Diver, 130 ft certification, WHOI dive program  
CPR, First Aid, DAN Oxygen Provider  
NAUI Master Diver, Nitrox Certification,  
Diving proficiency with drysuits and diver propulsion vehicles (WHOI dive program).

#### *Additional Training*

Diseases of Corals and Other Reef Organisms (Mote Marine Laboratory's Pigeon Key Marine Research Center), 1996

Reproduction in Coral Reefs (Edwin W. Pauley Summer Program in Marine Biology, Hawaii Institute of Marine Biology), 1997

Coral Reef Biogeochemistry (Edwin W. Pauley Summer Program in Marine Biology, Hawaii Institute of Marine Biology), 1995.