

AMY APPRILL

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Woods Hole Oceanographic Institution
Marine Chemistry & Geochemistry Department
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DEGREES

Ph.D., Biological Oceanography. University of Hawaii, Honolulu, HI. 2005 – 2009.

M.S., **Biological Oceanography.** University of Hawaii, Honolulu, HI. 2002 – 2004.

B.A., Marine Science, Biology. University of San Diego, San Diego, CA. 1996 – 2001.

ADDITIONAL EDUCATION

- 'Coral Histopathology' course, NOVA Southeastern University, Ft. Lauderdale, FL. 2013.
- 'Microbial Diversity' course. Marine Biological Laboratory, Woods Hole, MA 2005.
- **'Molecular Biology of Corals' course**. 2002 Edwin W. Pauley Summer Program in Marine Biology at the Hawaii Institute of Marine Biology, Kaneohe, HI. 2002.

APPOINTMENTS

Assistant Scientist, Woods Hole Oceanographic Institution, Woods Hole, MA. December, 2011 - present.

Post-doctoral Scholar, Woods Hole Oceanographic Institution, Woods Hole, MA. September 2009 – 2011. Advisors: Dr. Tracy Mincer & Dr. Konrad Hughen.

Post-doctoral Teaching Scholar, Center for Microbial Oceanography: Research and Education (C-MORE), University of Hawaii at Manoa, Honolulu HI. Summer, 2009.

Teaching Fellow, 'Microbial Diversity' course, Marine Biological Laboratory, Woods Hole, MA. Summer, 2008.

Graduate Research Assistant, Hawaii Institute of Marine Biology, Kaneohe HI. 2007 – 2009.

National Science Foundation (NSF) Graduate Research Fellow, University of Hawaii at Manoa, Honolulu HI. 2004 – 2007.

Teaching Assistant, 'Science of the Sea' course, University of Hawaii at Manoa, Honolulu, HI. 2002 – 2003 (3 semesters).

Laboratory Research Assistant, Scripps Institution of Oceanography, San Diego, CA. Supervisor: Dr. B.G. Mitchell. 2001 – 2002.

NSF Research Experience for Undergraduates Fellow, Shoals Marine Laboratory, Appledore Island, ME. Advisor: Dr. Michael Lesser. Summer, 2000.

NSF Research Experience for Undergraduates Fellow, Bermuda Biological Station for Research, St. George, Bermuda. Advisor: Dr. Norman Nelson. Fall, 1999.

Summer Student Fellow, Woods Hole Oceanographic Institution, Woods Hole, MA. Advisor: Dr. Heidi Sosik. Summer, 1999.

Summer Enrichment Fellow, NASA's Global Hydrology and Climate Center, Huntsville, AL, USA. Advisor: Mr. Maury Estes. Summer, 1998.

TEACHING EXPERIENCE

Co-course coordinator & co-instructor, 'Marine Microbiology and Biogeochemistry', MIT-WHOI Joint Program, Fall semester, 2013 & 2015.

Lecturer, 'Strategies and Techniques for Analyzing Microbial Population Structures'. Marine Biological Laboratory, August 3 – 13, 2011.

Instructor & Organizer, 'Workshop on the analysis of microbial sequence data using the software program ARB'. University of Hawaii, June 18 & August 13 - 14, 2009. Woods Hole Oceanographic Institution, July 29 - 30, 2009.

Teaching Fellow, 'Microbial Diversity' course, Marine Biological Laboratory, Woods Hole, MA. June 9 – July 31, 2008.

Community Marine Educator, Hawaii Institute of Marine Biology Community Education Program, Kaneohe, HI. 2007 – 2009.

Teaching Assistant, 'Science of the Sea' lecture and laboratory course, University of Hawaii at Manoa, Honolulu, HI. 2002 – 2003 (3 semesters).

Environmental Educator, Cape Outdoor Discovery, Plymouth, MA. 2001.

Marine Educator, Sea Camp, San Diego, CA. 1998 – 1999.

HONORS

2015	XX Files: Extraordinary Science - Extraordinary Women, <i>Science</i> magazine.
2009 – 2011	Post-doctoral scholar fellowship, WHOI Ocean Life Institute.
2007	Best doctoral student poster presentation, Society of Marine Mammalogy.
2004 - 2007	National Science Foundation Graduate Research Fellowship Award.
2006	Hiatt Student Education Scholarship, Hawaii Institute of Marine Biology.
2004	Watamull Scholarship for Academic Achievement, University of Hawaii, Oceanography Department.

2000 Outstanding Research in Marine Science, University of San Diego.

1999 Outstanding Oral Research Presentation, University of San Diego.

PUBLICATIONS

denotes student or post-doc in my laboratory; * denotes co-first authorship; + denotes corresponding author(s)

Apprill A⁺, McNally SP, Parsons R & Weber L[#]. 2015. Minor revision to V4 region SSU rRNA 806R gene primer greatly increases detection of SAR11 bacterioplankton. Aquatic Microbial Ecology. 75:129-137.

Nelson TM, **Apprill A**, Mann J, Rogers TL, Brown MV. 2015. The marine mammal microbiome: current knowledge and future directions. Microbiology Australia 1:8-13.

Neave MJ[#], Michell CT, **Apprill A**⁺, Voolstra CR⁺. 2014. Whole-genome sequencing of three symbiotic *Endozoicomonas* Bacteria. Genome Announcements. 2(4):e00802-14.

Furby KA*, **Apprill A***, Cervino JM, Ossolinski, JE, Hughen KA+. 2014. Incidence of lesions on Fungiidae corals in the eastern Red Sea related to water temperature and coastal pollution. Marine Environmental Research. 98: 39-48.

Apprill A⁺, Robbins J, Eren, AM, Pack AA, Reveillaud J, Mattila D, Moore M, Niemeyer M, Moore KMT, Mincer TJ⁺. 2014. Humpback whale populations share a core skin bacterial community: towards a health index for marine mammals? PLoS One, e90785.

Reveillaud J⁺, Maignien L, Eren AM, Huber JA, **Apprill A**, Sogin ML, Vanreusel A. 2014. Host-specificity among abundant and rare taxa in the sponge microbiome. International Society of Microbial Ecology (ISME) Journal. doi: 10.1038/ismej.2013.227

Apprill A⁺, Hughen K, Mincer T. 2013. Major similarities in the bacterial communities associated with lesioned and healthy Fungiidae corals, Environmental Microbiology. 15: 2063-2072.

Bayer T, Neave M[#], Alsheikh-Hussain A, Aranda M, Yum L, Mincer T, Hughen K, **Apprill A**⁺, Voolstra C⁺. 2013. The microbiome of the Red Sea coral *Stylophora pistillata* is dominated by tissue-associated *Endozoicomonas* bacteria, Applied and Environmental Microbiology. 79:4759-4762.

Measures CI⁺, Brown MT, Selph KE, **Apprill A**, Zhou M, Hatta M, Hiscock MT. 2013. The Influence of Shelf Processes in Delivering Dissolved Iron to the HNLC waters of the Drake Passage, Antarctica. Deep Sea Research II. 90: 77-88.

Selph KE⁺, **Apprill A**, Measures CI, Hatta M, Hiscock WT, Brown MT. 2013. Phytoplankton distributions in the Shackleton Fracture Zone/Elephant Island Region of the Drake Passage in February-March 2004. Deep Sea Research II. 90: 55-67.

Apprill A, Marlow HQ, Martindale MQ, Rappé MS⁺. 2012. Specificity of bacteria associated with the coral *Pocillopora meandrina* during early development. *Applied and Environmental Microbiology*. 78: 7467-7475.

Kahng S⁺, Hochberg EJ, **Apprill A**, Wagner D, Luck DG, Perez D, Bidigare RR. 2012. Efficient light harvesting in deep-water, zooxanthellate corals. *Marine Ecology Progress Series*. 455: 65 - 77.

Apprill A, and Rappé MS⁺. 2011. Response of the microbial community to coral spawning in lagoon and reef flat environments of Hawaii, USA. *Aquatic Microbial Ecology*, 62: 251–266.

Apprill A⁺, Mooney TA, Lyman E, Stimpert AK, Rappé MS. 2010. Humpback whales harbor a combination of specific and variable skin bacteria. *Environmental Microbiology Reports*, 3: 223-323.

Apprill A, Marlow HQ, Martindale MQ, Rappé MS⁺. 2009. The onset of microbial associations in the coral *Pocillopora meandrina*. *The International Society for Microbial Ecology (ISME) Journal*. 3: 685-699.

Hiscock MR, Lance VP, **Apprill A**, Bidigare RR, Johnson ZI, Mitchell BG, Smith, Jr. WO, Barber RT. 2008. Photosynthetic maximum quantum yield increases are an essential component of the Southern Ocean phytoplankton response to iron. *Proceedings of the National Academy of Sciences of the USA*. 105: 4775-4780.

Apprill A⁺, Bidigare RR, Gates RD. 2007. Visibly healthy corals exhibit variable pigment concentrations and symbiont phenotypes. *Coral Reefs*. 26: 387-397.

Apprill A⁺, and Gates RD. 2007. Recognizing diversity in coral symbiotic dinoflagellate communities. *Molecular Ecology* 16: 1127-1134. ***featured article**

Hochberg EJ⁺, **Apprill A**, Bidigare RR, Atkinson MJ. 2006. Bio-optical modeling of photosynthetic pigments in corals. *Coral Reefs* 25: 99-109.

Hochberg EJ⁺, Atkinson MJ, **Apprill A**, Andréfouët S. 2004. Spectral reflectance of coral. *Coral Reefs* 23: 84-95.

Apprill A, Lesser MP⁺. 2003. Effects of ultraviolet radiation on *Laminaria saccharina* in relation to depth and tidal height in the Gulf of Maine. *Marine Ecology Progress Series*. 256: 75-85.

NATIONAL AND INTERNATIONAL PRESENTATIONS

Apprill A. The marine mammal skin microbiome: a 'non-model' symbiotic system that may advance our knowledge of animal health. Gordon Research Conference on Animal-Microbe Symbiosis, Waterville, NH. June 21 - 26, 2015.

Rachmawati R, **Apprill A**, Barber P. Coral symbionts and the host susceptibility to bleaching. Yosemite Symbiosis Workshop, Yosemite National Park, CA. May 2-3, 2015. ***Oral presentation**

Brighi C, Diaz JM, **Apprill A**, Hansel CM. Temperature and light effects on extracellular superoxide production by algal and bacterial symbionts in corals: Implications for coral bleaching. ASLO Aquatic Sciences Meeting, Granada, Spain. February 22 – 27, 2015.

Brighi C, Diaz JM, **Apprill A**, Hansel CM. Temperature and light effects on extracellular superoxide production by algal and bacterial symbionts in corals: Implications for coral bleaching. AGU Fall Meeting, San Francisco, CA. December 14 – 19, 2014.

Neave M, **Apprill A**, Voolstra CR. An integrated approach to examining a globally abundant coral symbiont. ISME-15 Meeting, Seoul, Korea. August 25-29, 2014.

- Neave MJ, **Apprill A**, Voolstra CR. Comparative Genomics of *Endozoicomonas*, a dominant coral-associated bacteria. ASLO Ocean Sciences Meeting, Honolulu, HI. February 23-28, 2014.
- Weber LG, **Apprill A**, Repeta, D. Coral Snot: Exploring the chemical interplay between coral mucus and microbes. ASLO Ocean Sciences Meeting, Honolulu, HI. February 23-28, 2014.
- **Apprill A**, Weber LG, Santoro AE. Constraining microbial communities to micro-niches within the coral holobiont. ASLO Ocean Sciences Meeting, Honolulu, HI. February 23-28, 2014. *Oral presentation
- McNally S, Parsons RJ, **Apprill A**. *Porites astreoides* corals influence reef water bacterioplankton communities. ASLO Ocean Sciences Meeting, Honolulu, HI. February 23-28, 2014.
- Hansel CM, Zhang T, Diaz JM, **Apprill A**, Parsons R. Unraveling the role of the coral holobiont in superoxide production. ASLO Ocean Sciences Meeting, Honolulu, HI. February 23-28, 2014.
- Neave M, Alsheikh-Hussain A, Aranda M, Bayer T, **Apprill A**, Voolstra CR. *Endozoicomonas* prevail the microbiome of the coral *Stylophora pistillata*. International Symposium on Microbial Ecology. Copenhagen, Denmark, August 19-24, 2012.
- **Apprill A.** Using microorganisms as sensors for detecting stress and health-related alterations in marine mammals. Marine Mammals and Stress Workshop at the 19th Biennial Conference on the Biology of Marine Mammals. Tampa, FL. November 27, 2011. *Oral presentation
- **Apprill A**, Robbins J, Mincer T, Pack AA, Mattila DK. Specificity of the humpback whale microbiome across geographically distinct populations. 19th Biennial Conference on the Biology of Marine Mammals. Tampa, FL. Nov. 28 Dec. 2, 2011. *Oral presentation
- **Apprill A**, Hughen K, Mincer T. Bacterial communities associated with healthy and lesioned corals in comparison to reef water biogeochemistry. ASLO Meeting, San Juan, Puerto Rico. February 14 18, 2011. *Oral presentation
- **Apprill A**, Miller T, Hughen K, Mincer T. Quantification of SSU rRNA gene copies from Archaea, Bacteria and Eukarya in mixed templates of nucleic acids from marine environments. Marine Microbes Gordon Research Conference, Tilton, NH, July 4 9, 2010.
- **Apprill A**, Mooney TA, Lyman E, Stimpert AK, Rappé MS. Specific Bacterial Communities Associate with the Skin of Free-Ranging Humpback Whales. American Society for Microbiology General Meeting, Boston, MA, June 1 5, 2010.
- **Apprill A**, Mincer T, Moore M. Epithelial microbial communities: a useful health diagnostic tool for right whales? North Atlantic Right Whale Constortium, New Bedford, MA. November 17 18, 2009. *Oral presentation
- **Apprill A,** Marlow H, Martindale M, Rappé MS. Microbial associations during development of the coral *Pocillopora meandrina*. 12th Biennial Symposium on Microbial Ecology (ISME-12), Cairns, Australia. August 17 22, 2008. *Oral presentation
- **Apprill A,** Marlow H, Martindale M, Rappé MS. The Onset of Microbial Associations in the Developing Coral *Pocillopora meandrina*. American Society for Microbiology General Meeting, Boston, MA. June 1 5, 2008.

Apprill A, Rappé MS. Water quality and microbial dynamics in reef waters following nutrient loading due to coral spawning events. ASLO Ocean Sciences Meeting, Orlando, FL. March 2 – 7, 2008. ***Oral presentation**

Selph KE, Measures CI, **Apprill A**, Brown MT, Hiscock WT, Hatta M, Yang JJ. Winter and summer comparisons of phytoplankton and trace metal distributions around the South Shetland Islands, Antarctica. ASLO Ocean Sciences Meeting, Orlando, FL. March 2 – 7, 2008.

Apprill A, Mooney TA, Stimpert AK, Lammers MO, Rappé, MS. A Novel Approach to Examine Environmental and Health-Related Characteristics of Humpback Whales using the Bacterial Composition of Epithelial Skin. 17th Biennial Conference on the Biology of Marine Mammal, Cape Town, South Africa. November 29 – December 3, 2007. *Best doctoral student poster presentation award

Selph KE, Measures CI, Brown M, **Apprill A**. The influence of shelf-derived iron on phytoplankton growth dynamics in the Drake Passage, Antarctica. AGU Meeting, San Francisco, CA. December 11 - 15, 2006.

Apprill A, Gates RD. Assessing the Diversity of Symbiotic Dinoflagellates in Corals. ASLO Ocean Sciences Meeting, Honolulu, HI. Februrary 19 – 24, 2006. *Oral presentation

Salerno JL, Hambleton EA, **Apprill A**, Rappé MS. Assessing the Composition of Microbial Communities Associated with Colonies of Diverse Coral Species in the Main and Northwestern Hawaiian Islands. ASLO Ocean Sciences Meeting, Honolulu, HI. February 19 – 24, 2006.

Selph KE, **Apprill A**, Measures CI, Brown M. Phytoplankton distributions in the Shackleton Fracture Zone/Elephant Island Region of the Drake Passage in February-March 2004. ASLO Summer Meeting, Santiago de Compostela, Spain. May 19 – 24, 2005.

Hiscock MR, Lance VP, **Apprill A**, Bidigare RR, Mitchell BG, Barber RT. 2004. Iron elevates photosynthetic efficiency of most, but not all, phytoplankton: implications for Southern Ocean iron enrichment and primary production algorithms. ASLO Ocean Sciences, Honolulu, HI. February 15-20, 2004.

Apprill A, Bidigare R, Gates R. Variability of pigmentation in lobate *Porites* sp. corals. 10th International Coral Reef Symposium, Okinawa, Japan. June 28 – July 2, 2004. *Oral presentation

Hochberg EJ, **Apprill A**, Atkinson MJ, Bidigare RR. Bio-optical Modeling of Pigments in Coral. 10th International Coral Reef Symposium, Okinawa, Japan. June 28 – July 2, 2004.

Hiscock MR, Lance VP, Barber RT, **Apprill A**, Bidigare RR, Lindley S, Mitchell BG. Maximum quantum yield responses of phytoplankton in the Southern Ocean and eastern equatorial Pacific. JGOFS Open Science Conference, Washington, D.C. May 4 – 9, 2003

Apprill A, Nelson N. Multivariate classification of the Bermuda platform using satellite imagery. 9th International Coral Reef Symposium, Bali, Indonesia. October 23 – 27, 2000.

INVITED PRESENTATIONS

Apprill A. The influence of corals on reef water microbial biogeochemistry. Biogeochemistry seminar, Woods Hole Oceanographic Institution, Woods Hole, MA. December 18, 2014.

- **Apprill A**. Coral Reef Microbiology. Sippican Philosophical Society. Marion, MA. May 6, 2013.
- **Apprill A.** Humpback Whale Skin Associated Bacteria: Freeloaders or Friends? Marine Biological Laboratory, Bay Paul Center Seminar. Woods Hole, MA. March 3, 2013.
- **Apprill A.** The Microbiomes of Reef-building Corals. University of North Carolina, Wilmington, Wilmington, NC. January 25, 2013.
- **Apprill A.** What Microorganisms Can Tell Us About the Health and Ecology of Corals and Whales. 46th Annual Northeast Regional I Meeting of the American Society for Microbiology. Randolph, MA. Oct. 26, 2011.
- **Apprill A.** The microbiomes of reef-building corals. Woods Hole Oceanographic Institution, Woods Hole, MA. February 22, 2010.
- **Apprill A.** Reef water microbiology, coral-associated microbes and the health of corals. North Carolina State University, Raleigh, NC. January 24, 2011.
- **Apprill A.** What microorganisms can tell us about the health and ecology of corals and whales. University of Rhode Island, Narragansett, RI. November 17, 2010.
- **Apprill A**. What microorganisms can tell us about the health and ecology of corals and whales, University of Massachusetts, Dartmouth, Dartmouth, MA. March 29, 2010.
- **Apprill A.** Coral-microbial associations: the onset of association in developing corals. Biogeochemistry seminar, Woods Hole Oceanographic Institution, Woods Hole, MA. August 5, 2009.
- **Apprill A.** Microbial Oceanography. Hawaii Institute of Marine Biology Volunteer Educator Training, Kaneohe, HI. October 18, 2007.
- **Apprill A**. Coral-associated microorganisms: helpful, harmful, or somewhere in between? Hanauma Bay Education Program, Honolulu, HI. July 26, 2007.
- **Apprill A**. Microbial communities associated with corals and reef waters. UH Oceanography Microbial Grand Rounds, Honolulu, HI. December 6, 2006.

MEDIA COVERAGE

- 'Drones give whales a breathalyzer test' Science magazine, August 4, 2015.
- **'Whale research takes flight'** WHOI press release, July 31, 2015. Featured on hundreds of news websites and print, including CNN, NBC, *Wired* magazine
- **'Cuba: A society of engineers'** NPR radio interview, June 17, 2015. Interview online: http://capeandislands.org/post/cuba-society-engineers
- **'Cuba's Coral Eden'** *Science* magazine, May 15, 2015. Featured our fieldwork on the Cuban coral reefs.
- 'Scientists Identify Core Skin Bacterial Community in Humpback Whales' WHOI press release, March 26, 2014. Featured on hundreds of news and science websites, including Smithsonian Institution feature blog; over 8,000 article views.

'Corals Cozy up with Bacterial Buddies'. WHOI press release, July 8, 2013. Featured on hundreds of news and science websites, including the Middle Eastern versions of *Nature* and *The New York Times*.

PROFESSIONAL SERVICE

Reviewer for the journals Applied and Environmental Microbiology, Aquatic Biology, Coral Reefs, Diseases of Aquatic Organisms, Environmental Microbiology, FEMS Microbiology Ecology, ISME Journal, Limnology and Oceanography, Marine Biology, Marine Ecology Progress Series, Microbial Ecology, Molecular Ecology and Nature Communications.

Review editor for the journal *Frontiers in Microbial Symbiosis* and *Frontiers in Systems Biology*.

Grant reviewer for the National Science Foundation and NOAA Sea Grant.

Member: American Society of Limnology and Oceanography, American Society of Microbiology, International Society of Microbial Ecology, Society for Marine Mammal Biology.

WHOI Committee Service: Women's Committee, Jan. 2015 – present; MC&G Hiring Selection Committee, 2015.

Project node leader for EarthCube CReSCyNT: Coral Reef Science and Cyberinfrastructure Network, August 2015 – present.

MENTORING

Ph.D. advisor to Laura Weber, MIT-WHOI Joint Program, Summer 2014 - present.

Research advisor to UCLA graduate student Rita Rachmawati, Fall 2014 - present.

Post-graduate advisor to post-doc scholar Carolyn Miller, Fall 2013 – present.

Summer advisor to KC Bierlich (Duke University) and Luci Keleman (high school student), Summer 2015.

Post-graduate advisor to post-doctoral scholar Matthew Neave (Joint post-doc at WHOI and KAUST, co-advised by Chris Voolstra). Fall 2012 – 2015.

Undergraduate advisor for WHOI Summer Student Fellow Caterina Brighi and Guest Student Evan Denmark. Summer, 2014.

Undergraduate advisor for WHOI guest students Sean McNally and Laura Weber and volunteer Lauren Goodwin. Spring-Summer, 2013.

Theses examiner and co-advisor for for King Abdullah University of Science and Technology guest student conducting her Master's thesis research, Woods Hole Oceanographic Institution, Summer-Fall, 2011.

Mentor for Falmouth Academy science fair student, Woods Hole Oceanographic Institution, 2010 – 2011.

Mentor and supervisor for high school students, Summer, 2007.

Mentor and supervisor for undergraduate students, Summer, 2006.

EDUCATION AND OUTREACH

Outreach to Ocean Science Journalism Fellow program. 2013 and 2015.

Outreach to pre-school, elementary students and the public on 'Coral Reef Science' and 'Coral Reef Microbiology', showcasing 3-D videos of coral reefs. Spring 2013 – present.

Contributor to, 'A Postdoc's Guide to Pregnancy and Maternity Leave', National Postdoctoral Association, 2010.

Co-organizer of mentoring event to support women in academia. 2010.

Community educator for the Hawaii Institute of Marine Biology Community Education Program, 2007 – 2009.

Science fair judge for middle school and high school projects, Hawaii Association of Independent Schools Science Fair, 2007.

Community educator for the UH School of Earth Science and Technology public open house, 2005 & 2007.

FIELD AND CRUISE EXPERIENCE

R/V Eugenie Clark, Florida Keys, Florida, May 10 – 14, 2015

R/V Felipe Poey, Gulf of Batabano coral reefs, Cuba, April 22 – May 2, 2015.

La Reina, Gulf of Ana Maria, Jardines de la Reina coral reefs, Cuba, February 7 – 13, 2015.

Kaneohe Bay, Hawaii coral reefs, October 21 - 30, 2014.

Curacao coral reefs (CARMABI laboratory), September 9 – 24, 2014.

Vavvaru Island coral reefs (Korallion laboratory), Maldives, January 12 – 21, 2014.

Tutuila Island coral reefs, American Samoa, November 21-23, 2013.

Ningaloo coral reefs, Western Australia, November 15-17, 2013.

Magnetic Island coral reefs, Eastern Australia, November 11, 2013.

R/V Eugenie Clark, Florida Keys coral reefs, FL, April 27 – May 4, 2013.

M/V Alucia, Micronesian coral reefs, October 18 – November 15, 2012.

Small boats (100+ hours), Kaneohe Bay coral reefs, Hawaii, 2002 – 2009.

R/V Revelle, South Pacific, CLIVAR Program, January 9 – February 20, 2005.

R/V Gould, Drake Passage, February 12 – March 24, 2004.

R/V Melville, Southern Ocean, Southern Ocean Iron Fertilization Experiment (SOFeX) January 15 – February 28, 2002.

R/V Endeavor, Sargasso Sea, October 1 – 16, 2001.

R/V Sproul, Southern California, October, 2000.

R/V Weatherbird, Sargasso Sea, Hydrostation S, November, 1999.

CERTIFICATIONS

United States Coast Guard Small Boat Operator.

AAUS Scientific Diver Certification.

American Red Cross First Aid and CPR.