

Heather N. Page, Ph.D.
Assistant Professor of Oceanography
Specializing in Coral Reef Biological Oceanography
Sea Education Association|SEA Semester
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RESEARCH AND PROFESSIONAL INTERESTS

Anthropogenic effects, particularly environmental change, on coral reefs
Coastal carbon biogeochemistry
Marine science and environmental education

EDUCATION

Scripps Institution of Oceanography (SIO), UC San Diego, PhD Oceanography 2017
Advisor: Dr. Andreas Andersson

SIO, UC San Diego, MS Oceanography 2014
Advisor: Dr. Andreas Andersson

University of North Carolina Wilmington, B.S. Marine Biology & Environmental Science 2011
with University Honors, Honors in Biology, *magna cum laude*
Advisor: Dr. Martin Posey

FACULTY APPOINTMENTS

Assistant Professor of Oceanography, Sea Education Association, 2019-present

PROFESSIONAL EXPERIENCES

Postdoctoral Research Fellow, Mote Marine Laboratory, 2018-2019

Led a research program in the Florida Keys examining the response of coastal ecosystems, particularly coral reefs, to ocean acidification and environmental change. Experimental work studying the effects of ocean acidification on species interactions (e.g., competition, facilitation, herbivory, and settlement). Initiated monthly monitoring program for mangrove lagoon water chemistry.

Graduate Student Research Fellow, Geosciences Research Division, SIO, 2012-2017

Conducted independent and collaborative research, including leading research teams, to study the influence of benthic metabolism on seawater carbonate chemistry. Assisted with variety of field research measuring carbonate chemistry of coastal ecosystems (coral reefs, estuaries, seagrass, and local coasts in San Diego). PI: Dr. Andreas Andersson

Science Technician, GO-SHIP I08S Oceanographic Research Cruise, SIO, 2016

Conducted ship based research measuring total alkalinity of seawater. PI: Dr. Andrew Dickson

Coral Reef Ecology Lab Research Technician, UNC Wilmington Center for Marine Science (UNCW CMS), 2011-2012

Developed techniques to culture dissociated coral cells and to measure pH regulation of these cells using fluorescent microscopy techniques. Mentored undergraduate honors student. PI: Dr. Alina Szmant

Benthic Ecology Lab Research Technician, UNCW CMS, 2011-2012

Coordinated and led laboratory experiments testing the effects of inorganic sediments on oyster feeding physiology. Coordinated and led processing of sediment core samples for analysis of infaunal communities. Assisted with a variety of fieldwork examining the effects of coastal development on oyster reef health. PIs: Dr. Martin Posey and Mr. Troy Alphin.

Directed Independent Study, Department of Biology and Marine Biology, UNCW, 2011

Developed methodologies to study pH homeostasis of coccolithophores using fluorescent microscopy techniques. PI: Dr. Alison Taylor

Hollings Scholars Program Internship, Kodiak Fisheries Research Center, National Oceanic and Atmospheric Administration (NOAA), 2010

Conducted independent research examining the effects of ocean acidification on juvenile Tanner crab survival and growth. PI: Dr. Robert Foy

Honors Thesis Research, UNCW CMS, 2009-2010

Conducted independent research and coordinated research teams to study the effects of inorganic sediments and nitrate on oyster feeding physiology. Advisor: Dr. Martin Posey

NSF Research Experience for Undergraduates Internship, Bodega Marine Laboratory, 2009

Conducted collaborative research studying the effects of ocean acidification on larval oyster growth. Independently examined the metabolic response of larval oysters. Received training in science ethics, scientific writing, and presenting science. PIs: Dr. Brian Gaylord and Dr. Annaliese Hettinger

Directed Independent Study, Benthic Ecology Lab, UNCW CMS, 2009

Conducted collaborative research examining the effects of inorganic sediments on oyster growth. PIs: Dr. Martin Posey and Mr. Troy Alphin

Undergraduate Laboratory Assistant, Benthic Ecology Lab, UNCW CMS, 2008-2011

Assisted with processing sediment samples for infaunal communities and conducting field studies to examine the health of oyster reefs in local estuaries. PIs: Dr. Martin Posey and Mr. Troy Alphin

Aquatic Husbandry Internship, Newport Aquarium, Newport, Kentucky, 2008

Assisted with daily care of animals in the Dangerous and Deadly gallery. Monitored growth of juvenile Amazon turtles. Researched compatibility of fishes to be added to exhibits.

TEACHING & OUTREACH EXPERIENCES

Instructor, Academic Connections Summer Program, UCSD, 2017

Co-taught *Marine Invertebrates* during July for this 3-week college experience for high-achieving high school students.

Teaching Assistant, UCSD, 2017

Led discussion seminars twice a week for an undergraduate course titled *Physics and Chemistry of the Oceans*. Assisted with curriculum design and grading course materials

Instructor, Academic Connections Summer Program, UCSD, 2016

Created and co-taught *Ocean Acidification* during July for this 3-week college experience for high-achieving high school students.

Coordinator, Scripps Community Outreach for Public Education, SIO, 2013-2017

Coordinated over 70 outreach events (e.g. tours of research facilities, classroom visits, career fairs, etc.) per year. Started scholarship program that provides funds for local teachers from Title I schools to bring K-12 students to SIO. Initiated quarterly training for graduate students, staff, and faculty to instill confidence in communicating science through tours of research facilities.

SIO Ecology Seminar Series Organizer, SIO, 2013

Invited speakers and coordinated seminar series for five weeks

Volunteer, Scripps Community Outreach for Public Education, SIO, 2012-2017

Participated in 5-10 outreach events per year ranging from leading tours of research facilities at SIO to presentations at schools and to local organizations

National Science Foundation Teaching Fellowship in K-12 Education, SIO, 2013-2014

Partnered with a high school teacher to develop a curriculum using marine science to address Next Generation Science Standards that is now available online. Assisted in the classroom for the academic year 2013-2014 and taught the curriculum that the teacher and I developed together

Summer Camp Instructor, Cincinnati Zoo, 2012

Taught full-day and half-day zoo camps for kids aged 3-12

Educator, Newport Aquarium, 2006-2007

Taught visitors about marine animals at the aquarium. Monitored guest-animal interactions.

SEA-GOING EXPERIENCE

Chief Scientist, Caribbean Reef Expedition, Sea Education Association, 2019

Deckhand, SEA Expedition, Sea Education Association, 2019

Served as a deckhand for a ten-day high school program

Visiting Scientist, Caribbean Reef Expedition, Sea Education Association, 2018

Joined one leg (1 week) of this expedition to learn about chief scientist role

Science Technician, GO-SHIP I08S Oceanographic Research Cruise, SIO, 2016

Conducted ship based research measuring total alkalinity of seawater. PI: Dr. Andrew Dickson

PUBLICATIONS

- Page, HN**, Courtney, TA, De Carlo, EH, Koester, I, Howins, N, & Andersson, AJ. (In Production). Spatio-temporal dynamics in seawater carbonate chemistry for a coral reef flat in Kaneohe Bay, Hawaii. *Limnology and Oceanography*.
- Cyronak, T, Andersson, AJ, Langdon, C, Albright, R, Bates, NR, Caldeira, K, Carlton, R, Corredor, J, Dunbar, RB, Enochs, I, Erez, J, Eyre, BD, Gattuso, J-P, Gledhill, D, Kayanne, H, Kline, DI, Koweek, DA, Lantz, C, Lazar, B, Manzello, D, McMahon, A, Melendez, M, **Page, H**, Santos, I, Schulz, KG, Shaw, E, Silverman, J, Suzuki, A, Tenenva, L, Watanabe, A, & Yamamoto, S. 2018. Taking the metabolic pulse of the world's coral reefs. *PLoS ONE* 13(1): e0190872.
- Paulsen, M-L, Andersson, AJ, Aluwihare, L, Cyronak, T, D'Angelo, S, Davidson, C, Elwany, H, Giddings, S, Harvey, M, **Page, HN**, Porrachia, M, & Schroeter, S. 2018. Temporal changes in seawater carbonate chemistry and carbon export from a southern California estuary. *Estuaries and Coasts*. doi: 10.1007/s12237-017-0345-8.
- Courtney, TA, De Carlo, EH, **Page, HN**, Bahr, KD, Barro, A, Howins, N, Tabata, R, Terlouw, G, Rodgers, KS & Andersson, AJ. 2017. Recovery of reef-scale calcification following a bleaching event in Kāneʻohe Bay, Hawaiʻi. *Limnology and Oceanography* 3(1): 1-9.
- Page, HN**, Courtney, TA, Collins, A, De Carlo, EH, & Andersson, AJ. 2017. Net community metabolism and seawater carbonate chemistry scale non-intuitively with coral cover. *Frontiers in Marine Science* 4:161. doi: 10.3389/fmars.2017.00161.
- Page, HN**, Andersson, AJ, Jokiel, PL, Rodgers, KS, Lebrato, M, Yeakel, K, Davidson, C, D'Angelo, S, & Bahr, KD. 2016. Differential modification of seawater carbonate chemistry by major coral reef benthic communities. *Coral Reefs* 35(4): 1311-1325.
- Long, WC, Swiney, KM, Harris, C, **Page, HN**, & Foy, RJ. 2013. Effects of ocean acidification on juvenile red king crab and Tanner crab. *PLoS ONE* 8(4): e60959.
- Hettinger, A, Sanford, E, Hill, TM, Russell, AD, Sato, KN, Hoey, J, Forsch, M, **Page, HN**, & Gaylord, B. 2012. Persistent carry-over effects of planktonic exposure to ocean acidification in the Olympia oyster. *Ecology* 93(12): 2758-2768.
- Page, HN**. 2011. Biogeochemical effects on the adult oyster *Crassostrea virginica* feeding efficiency and condition. *University of North Carolina Wilmington Department of Biology and Marine Biology*, Thesis: 59 pp.

SCIENTIFIC FELLOWSHIPS AND AWARDS

- 2019 Mote Marine Laboratory Protect Our Reefs Grant (co-PI; \$17,795.11)
- 2019 Mote Marine Laboratory Becker Research Experience for Undergraduate Fund (\$1,200)
- 2019 Phycological Society of America Grant-In-Aid (lead PI; \$2,500)
- 2018 Mote Marine Laboratory Postdoctoral Research Fellowship
- 2016 SIO Department Graduate Student Excellence Travel Award
- 2016 Foundation of Science and Disability Graduate Scholarship

- 2013 National Science Foundation Graduate Research Fellowship
2013 National Science Foundation Graduate STEM Fellowship in K-12 Education
2013 SIO Tegner Research Award
2013 Association of Women in Science, San Diego Chapter Scholarship
2012 UC San Diego Diversity Fellowship
2011 UNCW CMS Undergraduate Research Fellowship Grant
2011 UNC Wilmington, Distinguished Undergraduate Research Scholar
2010 UNC Wilmington J. Marshall Crews Scholarship for Science
2010 UNC Wilmington, Department of Biology and Marine Biology Jay Hensley Endowed Scholarship
2009 NOAA Hollings Scholarship Award
2009 Best Student Poster, Western Society of Naturalists
2009 UNC Wilmington, Department of Biology and Marine Biology Jay Hensley Endowed Scholarship
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INVITED PRESENTATIONS

Page, HN. 2018. *Past, Present, and Future of Coral Reefs in the Florida Keys*. Venture Out Boat Club Meeting. Summerland Key, FL.

Page, HN. 2018. *Coral reefs in a changing ocean*. Reef Relief Annual Meeting. Key West, FL.

Page, HN. 2018. *Corals, seaweeds, and sponges, oh my! Coral reefs in an acidifying ocean*. Science Spotlight Series at Divers Direct, Key West, FL.

Page, HN. 2018. *Corals, seaweeds, and sponges, oh my! Coral reefs in an acidifying ocean*. Science Spotlight Series at Marathon Key Library, Marathon, FL.

Page, HN. 2018. *Corals, seaweeds, and sponges, oh my! Coral reefs in an acidifying ocean*. Mote Marine Laboratory and Aquarium Coffee with a Scientist, Boca Grande, FL.

Page, HN. 2018. *Corals, seaweeds, and sponges, oh my! Coral reefs in an acidifying ocean*. Mote Marine Laboratory and Aquarium Special Lecture Series, Sarasota, FL.

Page, HN. 2016. *Ocean acidification on coral reefs: Importance of benthic communities to seawater carbonate chemistry*. Birch Aquarium Brown Bag Seminar Series, La Jolla, CA.

Page, HN. 2014. *The effects of ocean acidification on biological controls of seawater pH*. Hawaii Institute of Marine Biology Special Seminar, Kaneohe, HI.

Page, HN, Hettinger, A, Gaylord, B. 2009. Symposium: *The Effects of Ocean Acidification on the Respiration Rates and Protein Synthesis of Olympia Oyster Ostrea lurida larvae*. Bay Area-Symposium of Undergraduate Research Experiences, San Francisco, CA.

SCIENTIFIC PRESENTATIONS

*Students mentored

Considine, M*, Hewett, C*, Lankes, D*, Nowicki, R, & **Page, H**. 2019. *Effects of ocean acidification on herbivore-macroalgae interactions*. Benthic Ecology Meeting. St. Johns, Newfoundland.

Page, HN, Gravinese, P, Hall, ER, Nowicki, R, Spadaro, J, & Butler, C. 2019. *Coral reef species interactions under ocean acidification*. Benthic Ecology Meeting. St. Johns, Newfoundland.

De Carlo, EH, Knor, L, Howins, N, Mackenzie, FT, Sabine, CL, Muscielewicz, S, Sutton, A, Courtney, TA, **Page, HN**, & Andersson, AJ. 2019. *A decade of CO₂ system observations at the coastal ocean Hawaii acidification network (COHAN): What have we learned?* The 4th Global Ocean Acidification Observing Network (GOA-ON) International Workshop. Hangzhou, China.

Page, HN, Andersson, A, Courtney, T, De Carlo, EH, Koester, I, Howins, N, Lebrato, M, Rodgers, K, & Bahr, K. 2018. *Importance of coral reef community composition and benthic metabolism to seawater carbonate chemistry: Implications for ocean acidification*. Ocean Sciences Meeting. Portland, OR.

Page, HN, Nagarkar, M, Jones-Cervantes, SA, Nesbit, K, & Wolfe, W. 2018. *SCOPE: Scripps Community Outreach in Public Education*. Ocean Sciences Meeting. Portland, OR. Poster.

Cyronak, T, Andersson, AJ, Courtney, T, De Carlo, EH, Eyre, B, Kline, DI, Martz, TR, **Page, H**, Price, N, Smith, J, Stoltenberg, L, Takeshita, Y, Tresguerres, M, & Kekuwa, S. 2018. *Variability of seawater carbonate chemistry within diverse coastal habitats across different spatiotemporal scales*. Ocean Sciences Meeting. Portland, OR.

Cyronak, T, Andersson, AJ, Courtney, T, DeCarlo, E, Eyre, BD, Kline, DI, Martz, T, **Page, H**, Price, N, Smith, JE, Stoltenberg, L, Takeshita, Y, & Tresguerres, M. 2017. *Synthesizing the spatiotemporal variability of seawater temperature and pH across diverse reef zones*. Chemical Oceanography Gordon Research Conference. New London, NH. Poster.

Courtney, TA, Andersson, AJ, DeCarlo, EH, **Page, HN**, Koester, I, Terlow, G, Tabata, R, Bahr, KD, & Rodgers, KS. 2017. *Coral bleaching impacts on reef-scale net calcification and net community production in Kaneohe Bay, HI*. ASLO Aquatic Sciences Meeting. Honolulu, HI.

Page, HN, Andersson, AJ, Courtney, TA, DeCarlo, EH, Koester, I, & Howins, N. 2017. *Importance of coral reef community composition and benthic metabolism to seawater pH: implications for ocean acidification*. Benthic Ecology Meeting. Myrtle Beach, SC.

- Page, HN**, Andersson, AJ, Jokiel, P, Rodgers, KS, Lebrato, M, Yeakel, K, Davidson, C, D'Angelo, S, & Bahr, K. 2016. *Differential modifications of seawater carbonate chemistry by major coral reef benthic communities*. International Coral Reef Symposium. Honolulu, HI.
- Page, HN**, Andersson, AJ, Jokiel, P, Rodgers, KS, Lebrato, M, Yeakel, K, Davidson, C, D'Angelo, S, & Bahr, K. 2015. *Differential effects of reef benthic communities on seawater carbonate chemistry*. Western Society of Naturalists Meeting. Sacramento, CA.
- Page, HN**, Patin, N, & Wilson, S. 2014. *Scripps Community Outreach in Public Education*. Ocean Sciences Meeting. Honolulu, HI. Poster.
- Page, HN**, Yeakel, K, Jokiel, P, Rodgers, K, Lebrato, M, Davidson, C, Bahr, K, & Andersson, AJ. 2014. *Diel trends in net community calcification and production rates for different benthic communities exposed to ambient and acidified seawater*. Ocean Sciences Meeting. Honolulu, HI. Poster.
- Page, HN**, Posey, M, & Alphin, TD. 2013. *Particle overload! The Eastern oyster's role in biogeochemical cycling under chronic exposure of sediment and nitrate*. CERF Conference. San Diego, CA. Poster.
- Page, HN**, & Taylor, A. 2011. *Effect of extracellular pH on intracellular pH homeostasis in calcifying Scyphosphaera apsteinii: Development of methods to study intracellular pH in coccolithophores*. University of North Carolina Wilmington Research Showcase. Wilmington, NC. Poster.
- Page, HN**, Posey, M, & Alphin, TD. 2011. *Biogeochemical effects on the adult oyster Crassostrea virginica feeding efficiency and condition*. University of North Carolina Wilmington Research Showcase. Wilmington, NC. Poster.
- Page, HN**, Posey, M, & Alphin, TD. 2011. *Impact of elevated total suspended solids and nitrate load on feeding efficiency and condition of the Eastern oyster Crassostrea virginica*. Colonial Academic Alliance Conference. Hampstead, NY. Poster.
- Page, HN**. 2010. *Effect of ocean acidification on juvenile Tanner crab, Chionoecetes bairdi, survival and growth*. NOAA Symposium. Silver Springs, MD.
- Page, HN**, Hettinger, A, Gaylord, B, Sanford, E, Hill, T, Russell, A, Forsch, M, & Sato, K. 2010. *The effects of ocean acidification on the respiration rates and growth of Olympia Oyster Ostrea lurida larvae*. Benthic Ecology Meeting, Wilmington, NC. Poster.
- Page, HN**, Hettinger, A, Gaylord, B, Sanford, E, Hill, T, Russell, A, Forsch, M, & Sato, K. 2009. *The effects of ocean acidification on the respiration rates and growth of Olympia Oyster Ostrea lurida larvae*. Western Society of Naturalists Conference, Monterey, CA. Poster. Best Poster Award.

Page, HN, Hettinger, A, & Gaylord, B. 2009. Symposium: *The effects of ocean acidification on the respiration rates and protein synthesis of Olympia Oyster Ostrea lurida larvae*. Research Experience for Undergraduates.

MENTORSHIP

Mote Marine Laboratory College Program Intern, Katherine Miller	2019
Mote Marine Laboratory College Program Intern, David Lankes	2018-2019
Mote Marine Laboratory College Program Intern, Clay Hewett	2018-2019
Mote Marine Laboratory College Program Intern, Megan Considine	2018
Mote Marine Laboratory College Program Intern, Hayden Thompkins	2018
Mote Marine Laboratory College Program Intern, Amanda Kirkland	2018
UC San Diego Undergraduate Student, Hanyu Wang	2017
UNCW Undergraduate Student, Brenda Quebec	2012
UNCW Undergraduate Honors Student, Kea Payton	2011-2012

CERTIFICATIONS

AAUS Scientific Diver, NAUI Rescue Diver, NAUI Nitrox Diver, DAN Oxygen, CPR/AED/First Aid, NSF Responsible Conduct of Research, PADI Advanced Open Water Diver, PADI Open Water Diver

INVITED WORKSHOPS

2017 Science Communication Workshop at the Benthic Ecology Meeting
2016 ComSciCon in San Diego

SERVICE

- **Representative for:** International Coral Reef Society Education Committee (2016-present)
 - **Reviewer for:** PeerJ, Journal of Experimental Marine Biology and Ecology, PLOS ONE, Frontiers in Marine Science, Biology Letters, Proceedings of the Royal Society B
 - **Session Chair for:** International Coral Reef Symposium 2020 (“Beyond single-species experiments: how do marine populations, communities, and ecosystems respond to climate change?”)
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MEDIA

- Here We Are Podcast, November 2018

- Sarasota Herald Tribune Article “Study May Result in a Model of the Ocean in the Future”, November 2018
- Two Sea Fans Podcast with Mote Marine Laboratory, March 2018
- Boca Beacon Article “Coffee with a Scientist”, March 2018