

Angela Boysen
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EDUCATION

Present	PhD Candidate in Chemical Oceanography University of Washington. Advised by Dr. Anitra Ingalls. Thesis: Metabolites and marine microbial activity
2017	Masters in Chemical Oceanography. University of Washington. Advised by Dr. Anitra Ingalls. Thesis: Marine metabolomics: overcoming analytical challenges to reveal microbial community dynamics.
2011	Bachelor of Science in Chemistry with Distinction. Stanford University. Advised by Dr. Chris Chidsey.

RESEARCH EXPERIENCE

2014 – Present	Graduate Research Fellow , <i>School of Oceanography, University of Washington, Seattle, WA.</i> Advised by Dr. Anitra Ingalls.
2011	Intern , <i>Nutritional Ecology Lab, Smithsonian Environmental Research Center.</i> Advised by Dr. Olav Oftedal.
2010	Summer Student Fellow , <i>Department of Marine Chemistry and Geochemistry, Woods Hole Oceanographic Institution.</i> Advised by Dr. Elizabeth Kujawinski.
2009	Undergraduate Research Fellow , <i>Energy Resources Engineering Department, Stanford University.</i> Advised by Dr. Jennifer Wilcox.

TEACHING EXPERIENCE

2020	Instructor , Ocean 295: Marine Organic Chemistry, <i>University of Washington</i>
2019	Guest Lecture , Ocean 520: Marine Chemistry, <i>University of Washington</i>
2019	Instructor , Environmental Science. Math Science Upward Bound, <i>University of Washington.</i> (Course development and implementation)
2018	Curriculum development , Ocean 330: Biogeochemical Cycles, <i>University of Washington</i>
2016 – 2018	Curriculum development and implementation , <i>Jane Addams Middle School, Seattle, WA,</i> Units on: ocean sensor building and data analysis, harmful algal blooms and climate change, fish kills in hood canal.
2017	Teaching Assistant , Ocean 330: Biogeochemical Cycles, <i>University of Washington</i>
2016	Teaching Assistant , Ocean 295: Marine Organic Chemistry, <i>University of Washington</i>
2012 – 2013	Outdoor Science Instructor , <i>Oregon Museum of Science and Industry</i>
2009 – 2011	Teaching Assistant , <i>Athletic Department, Stanford University</i>

AWARDS AND FELLOWSHIPS

2016 – Present	National Science Foundation Graduate Research Fellow (3 years of full funding)
2019	Meeting & Travel Award , UW College of the Environment
2019	Best Student Poster , 2019 Marine Particles and Phycospheres Conference
2017	McManus Teaching Award Honorable Mention , UW Oceanography

2015 Center for Microbial Oceanography: Research and Education
Summer Course Student
2014 – 2016 National Science Foundation IGERT Fellow. *Program on Ocean Change*,
University of Washington (2 years of full funding)
2014 – 2017 ARCS Foundation Graduate Fellow (\$17,500 over three years)
2011 Phi Beta Kappa

PUBLICATIONS (* INDICATES EQUAL CONTRIBUTION)

IN PREPARATION (DRAFTS AVAILABLE ON REQUEST)

Daniel Muratore*; **Angela K. Boysen***; Matthew Harke*; Becker, K.; Casey, J.; Coesel, S.; Mende, D.; Wilson, S.; Aylward, F.O.; Eppley, J.M.; Vislova, A.; Peng, S.; Rodriguez, R.; Beckett, S.J.; Armbrust, E.V.; DeLong, E.; Karl, D.M.; White, A.; Zehr, J.; Van Mooy, B.; Dyhrman, S.; Ingalls, A.E.; Weitz, J., Diel Cycling in Marine Microbial Metabolism From Taxa to Community Scales. Submitted to *Nature*. Preprint on bioRxiv. doi: 10.1101/2020.05.15.098020

IN REVIEW

Angela K. Boysen; Carlson, L.T.; Aylward, F.; Durham, B.P.; Groussman, R.; Ribalet, F.; K.R. Heal; DeLong, E.; Armbrust, E.V.; Ingalls, A.E., Diel Oscillations of Particulate Metabolites Reflect Synchronized Microbial Activity in the North Pacific Subtropical Gyre. Submitted to *ISME Journal*. Preprint on bioRxiv. doi: 10.1101/2020.05.09.086173

PUBLISHED

Hannah M. Dawson; Heal, K.R.; **Boysen, A.K.**; Carlson, L.T.; Ingalls, A.E.; Young, J.N., Potential of temperature and salinity-driven shifts in diatom compatible solute concentrations to impact biogeochemical cycling within sea ice. *Elementa: Science of the Anthropocene*, 8:25.

DOI: <https://doi.org/10.1525/elementa.421>

McLachlan, R.; Bolden, I.; **Boysen, A.**; Baker, C. “Harmful Algal Blooms” *Climate Science for the Classroom* edited by Bertram and Biyani, 2019. <https://uw.pressbooks.pub/climate/>.

Samuel T. Wilson*; Nicholas J. Hawco*; Armbrust, E.V.; Barone, B.; Björkman, K.M.; **Boysen, A K.**; Burgos, M.; Burrell, T.J.; Casey, J.R.; DeLong, E.F.; Dugenne, M.; Dutkiewicz, S.; Dyhrman, S.T.; Ferrón, S.; Follows, M.J.; Foreman, R.K.; Funkey, C.P.; Harke, M.J.; Henke, B.A.; Hill, C.N.; Hynes, A.M.; Ingalls, A E.; Jahn, O.; Kelly, R.L.; Knapp, A N.; Letelier, R M.; Ribalet, F.; Shimabukuro, E M.; Tabata, R.K.S.; Turk-Kubo, K.A.; White, A.E.; Zehr, J.P.; John, S.; Karl, D.M. (2019) Kīlauea lava fuels phytoplankton bloom in the North Pacific Ocean. *Science*, 365(6457), 1040-1044.

Bryndan Durham; **Boysen, A.K.**; Carlson, L.T.; Groussman, R.; Heal, K.R.; Cain, K.; Morales, R.; Coesel, S.; Morris, R.; Ingalls, A.; Armbrust, E.V. (2019) Sulfonate-based networks between eukaryotic phytoplankton and heterotrophic bacteria in the surface ocean. *Nature Microbiology*, 1-10.

Angela K. Boysen*; Katherine Heal*; Carlson, L.T.; Ingalls, A.E. (2018) Best-Matched Internal Standard Normalization in Liquid Chromatography–Mass Spectrometry Metabolomics Applied to Environmental Samples. *Analytical chemistry*, 90 (2), 1363-1369.

Elizabeth B. Kujawinski; Kido Soule, M.C.; Valentine, D.L.; **Boysen, A.K.**; Longnecker, K.; Redmond, M.C. (2011) Fate of Dispersants Associated with the Deepwater Horizon Oil Spill, *Environ. Sci. Technol.*, 45 (4), 1298-1306.

PRESENTATIONS (PRESENTING AUTHOR IN BOLD)

Angela K. Boysen, K.R. Heal, M.R. Gradoville, N. Hawco, B.P. Durham, R.D. Groussman, L.T. Carlson, P. Pinedo-Gonzalez, F. Ribalet, J.P. Zehr, R.M. Bundy, S. John, E.V. Armbrust, and A.E. Ingalls. Assessing community metabolism and flexibility: metabolomics and microbial diversity across the North

Pacific Transition Zone and in response to nutrient amendments. Talk presented at the 2020 Ocean Sciences Meeting, February 17-21; San Diego, CA.

Katherine Heal, A.K. Boysen, B.P. Durham, L.T. Carlson, E.V. Armbrust, A.E. Ingalls, R.M. Bundy. Chemical and genetic evidence point to arseno-metabolites underpinning the marine arsenic cycle. Talk presented at the 2020 Ocean Sciences Meeting, February 17-21; San Diego, CA.

Sarah Ellen Johnston, J. Collins, A.K. Boysen, C. Soued, D.E. Butman, K. Wickland, S. Sadro, A.E. Ingalls, B. Bergamaschi, L. Windham-Myers, M. Bogard. Planktonic respiration and organic matter cycling using short-term in situ measurements. Poster presented at American Geophysical Union 2019 Fall Meeting, December 9-13; San Francisco, CA.

Angela K. Boysen, Microbial community metabolism in the North Pacific Transition Zone: insights from metabolomics and nutrient amendment experiments. *University of Washington*. Chemical oceanography seminar. Nov 22, 2019.

Angela K. Boysen; Bolden, I.W.; Baker, C.; McLachlan, R. A phenomenon based climate science curriculum for middle-school classrooms: Harmful Algal Blooms, Society, and Climate Change. Poster presented at the Earth Educators' Rendezvous. July 15-19, 2019; Nashville, TN.

Angela K. Boysen; Heal, K. R.; Carlson, L. T.; Ingalls, A. Clues into microbial community and activity: particulate metabolites change over the diel cycle and across a natural oceanographic gradient in the North Pacific. Poster presented at the Marine Particles and Phycospheres Conference. May 19-23, 2019; Ascona, Switzerland.

Matt Bogard; Collins, J.; Boysen, A.K.; Wickland, K.; Sadro, S.; Johnston, S.E.; Ingalls, A.E.; Windham-Myers, L.; Bergamaschi, B.; Striegl, R.G.; Dornblaser, M.; Spencer, R.; Butman, D.E. Exploring planktonic respiration using short-term in situ measurements. Talk presented at the 2019 Society for Freshwater Society annual meeting. May 19-23; Salt Lake City, UT.

Bryndan P. Durham; Boysen, A.K.; Carlson, L.T.; Groussman, R.D.; Heal, K.R.; Cain, K.R.; Morales, R.L.; Morris, R.M.; Ingalls, A.E.; Armbrust, E.V. The sulfonate cycle; a new trophic link between ocean plankton. Poster presented at the 2018 Marine Microbes Gordon Research Conference, July 1-6; Lucca, Italy.

Angela K. Boysen; Heal, K.R.; Durham, B.P.; Carlson, L.T.; Armbrust, E.V.; Ingalls, A. A metabolomic survey of marine microbes. Poster presented at the 2018 Annual Conference of the Metabolomics Society. June 24-28; Seattle, WA.

Katherine R. Heal; Carlson, L.T.; Boysen, A.K.; Durham, B.P.; Armbrust, E.V.; Ingalls, A.E. Metabolite pools in the marine microbiome across a basin-wide oceanographic gradient in the North Pacific. Poster presented at the 2018 Annual Conference of the Metabolomics Society. June 24-28; Seattle, WA.

Hannah M. Dawson; Boysen, A.K.; Heal, K.R.; Carlson, L.T.; Ingalls, A.E.; Young, J.N., Metabolic response of sea-ice diatoms to shifting temperature and salinity. Poster presented at the Polar 2018 Conference. June 15-26; Davos, Switzerland.

Angela K. Boysen; Aylward, F.; Durham, B.P.; Carlson, L.T.; Armbrust, E.V.; DeLong, E.; Ingalls, A.E. Diel Patterns in Intracellular Metabolite Pools of the North Pacific Subtropical Gyre Microbial Community Show Linkages Between Gene Expression and Community Activity. Talk presented at the 2018 Ocean Sciences Meeting. February 12-16; Portland, OR.

Hannah M. Dawson; Boysen, A.K.; Heal, K.R.; Carlson, L.T.; Ingalls, A.E.; Young, J.N. Characterization of compatible solute use in a cultured sea-ice alga, *Nitzschia lecontei*, and in the environmental algal community of Utqiagvik [Barrow], AK using a metabolomics approach. Poster presented at the 2018 Ocean Sciences Meeting. February 12-16; Portland, OR.

Bryndan P. Durham; Groussman, R.; Boysen, A.K.; Heal, K.R.; Carlson, L. T.; Morales, R.; Coesel, S.; Ingalls, A. E.; Armbrust, E. V. Trophic exchange between eukaryotic phytoplankton and bacterial taxa revealed through metabolomics and transcriptomics. Poster presented at the 2018 Ocean Sciences Meeting. February 12-16; Portland, OR.

Bryndan P. Durham; Carlson, L. T.; Boysen, A.K.; Heal, K.R.; Groussman, R.; Morales, R.; Ingalls, A. E.; Armbrust, E. V. Novel organosulfur metabolism in eukaryotic phytoplankton revealed through combined 'omics approaches. Talk presented at the 2018 Ocean Sciences Meeting. February 12-16; Portland, OR.

Katherine R. Heal; Carlson, L.T.; Boysen, A.K.; Durham, B.P.; Kellogg, N.A.; Lionheart, R.; Armbrust, E.V.; Ingalls, A.E. Metabolite pools across a basin-wide oceanographic gradient in the North Pacific. Poster presented at the 2018 Ocean Sciences Meeting. February 12-16; Portland, OR.

Angela K. Boysen; Carlson, L.; Aylward, F.; Durham, B.; Delong, E.; Armbrust, E.V.; Ingalls, A. Integrating metabolite and transcript data to study diel cycles of activity in the North Pacific Subtropical Gyre. Poster presented at the 2017 Chemical Oceanography Gordon Research Conference. July 23-28; New London, NH.

Angela K. Boysen; Carlson, L.; Aylward, F.; Durham, B.; Delong, E.; Armbrust, E.V.; Ingalls, A.E. Integrating metabolite and transcript data to study diel cycles of activity in the North Pacific Subtropical Gyre. Talk presented at the 2017 Chemical Oceanography Gordon Research Seminar. July 22-23; New London, NH.

Angela K. Boysen, Marine metabolomics: overcoming analytical challenges to reveal microbial community dynamics. *University of Washington*. Special chemical oceanography seminar. May 10, 2017.

Angela K. Boysen; Carlson, L.; Wied, A.; Lionheart, R.; Ingalls, A. Diel Patterns in Cellular Metabolites Reflect Marine Microbial Interactions. Poster presented at the 2017 American Society of Limnology and Oceanography Aquatic Sciences Meeting. Feb 26-March 3; Honolulu, HI.

Bryndan P. Durham; Boysen, A.K.; Carlson, L. T.; Ingalls, A. E.; Armbrust, E. V.; Sulfonate Cycling and Signaling Between Marine Phytoplankton and Heterotrophic Bacteria. Talk presented at the 2017 American Society of Limnology and Oceanography Aquatic Sciences Meeting. Feb 26-March 3; Honolulu, HI.

Katherine R. Heal; Carlson, L. T.; Boysen, A. K.; Lionheart, R. M.; Kellogg, N. A.; Ingalls, A. E.; Metabolic Consequences of Cobalamin Starvation in Marine Microbes Revealed Through Metabolomics. Talk presented at the 2017 American Society of Limnology and Oceanography Aquatic Sciences Meeting. Feb 26-March 3; Honolulu, HI.

Angela K. Boysen; Carlson, L.; Ingalls, A. Insights into the diel cycles of marine microbes through metabolomics. Poster presented at the 2016 Graduate Climate Conference. Oct 28- 30; Pack Forest, WA.

Angela K. Boysen; Carlson, L.; Hmelo, L.; Ingalls, A. Analysis of Particulate and Dissolved Metabolite Pools at Station ALOHA. Poster presented at the 2016 Ocean Sciences Meeting. Feb 22-26; New Orleans, LA.

Yina Liu; Boysen, A.K.; Kujawinski, E.B. Characterization and fate of crude oil derived water-soluble polar organic components in seawater. Poster presented at the 2014 Gulf of Mexico Oil Spill & Ecosystem Science Conference. January 26-29; Mobile, AL.

Olav Oftedal; **Ralls, K.**; Tinker, T.; Staedler, M.; Boysen, A.K. Can Fatty Acids Be Used to Determine Diet in Seat Otters? Talk presented at the Southern Sea Otter Research Update Meeting, Feb 9, 2012. Santa Cruz, CA.

Angela K. Boysen; Kujawinski, E. B. Mass Spectral Analysis of Water Column Samples from a Single Depth Profile Near the Deepwater Horizon Oil Spill. Poster presented at the American Geophysical Union, Fall Meeting 2010. Dec 13-17; San Francisco, CA.

Angela K. Boysen; Carlson, L.; Wied, A.; Lionheart, R.; Ingalls, A.E. Diel Patterns in Cellular Metabolites Reflect Marine Microbial Interactions. Poster presented at the 2017 American Society of Limnology and Oceanography Aquatic Sciences Meeting. Feb 26-March 3; Honolulu, HI.

Ariel Atkins; Angela K. Boysen; Wilcox, J. On the Prevention of Trace Metal Emissions from Coal Combustion. Poster presented at the Student Poster Session. American Institute of Chemical Engineers 2009 Annual Meeting. Nov 7-13; Nashville, TN.

RESEARCH CRUISE EXPERIENCE

2019 **Gradients 3.0 Cruise**, Honolulu, HI on R/V Kilo Moana, 21 days
2018 **HOT-LAVA Cruise**, Hilo, HI to Honolulu, HI on R/V Ka'imikai-O-Kanaloa, 5 days
2017 **Gradients 2.0 Cruise**, Honolulu, HI on R/V M.G. Langseth, 18 days
2015 **SCOPE/C-MORE HOE Legacy Cruise**, Honolulu, HI on R/V Kilo Moana, 13 days
2015 **C-MORE Summer Course Cruise**, Honolulu, HI on R/V Kilo Moana, 8 days
2014 Hood Canal, WA on R/V *Barnes*, 1 day
2012 **Cascadia Initiative Cruise, Leg 6**, Newport, OR on R/V *Oceanus*, 11 days

PROFESSIONAL MEMBERSHIP

2018 – Present Member of the National Association of Geoscience Teachers.
2015 – Present Member of the American Society for Limnology and Oceanography.
2018 Member of the Metabolomics Society.

UNIVERSITY AND ACADEMIC SERVICE

2019 – Present UW School of Oceanography Committee on Diversity, Equity, and Inclusion.
2017 – 2019 UW College of the Environment Committee on Diversity, Equity, and Inclusion.
2016 – 2019 Organizing Committee for the Hedges Visiting Scholar Program, University of Washington
2018 Search Committee for the Director of the UW Marine Biology Major.
2016 Organizing Committee Member of the Graduate Climate Conference. Fundraising Chair.
2016 Chair of Biogeochemistry Session at the Graduate Climate Conference. Pack Forest, WA.
2016 Co-chair of the University of Washington's School of Oceanography All Student Educational Retreat
2015 Organizing Committee for the IGERT speaker series, Winter quarter, University of Washington, Seattle, WA.
Ad hoc Reviewer for *Limnology and Oceanography*, *Limnology and Oceanography: Methods, Applied and Environmental Microbiology*

WORKSHOPS AND ACTIVITIES

Dec 9-12, 2019 Simons Collaboration on Ocean Processes and Ecology Annual Meeting, Panel discussion participant, Poster presenter. New York, NY.
Oct 15-17, 2019 Simons Collaboration Gradients Program Workshop, Participant. Seattle, WA.

<i>Jul 18-19, 2019</i>	Broadening Participation in the Geosciences, Earth Educators' Rendezvous, Participant. TSU, Nashville, KY.
<i>Jul 15-17, 2019</i>	Preparing for an Academic Career. Earth Educators' Rendezvous, Participant. TSU, Nashville, KY.
<i>Jun 10, 2019</i>	Microaggressions Workshop. UW College of the Environment, Participant. Seattle, WA.
<i>Jun 13-15, 2018</i>	Modeling ALOHA with Hierarchical Analysis of the Light-driven Ocean workshops, Participant. Georgia Tech, Atlanta, GA.
<i>Oct 29-31, 2018</i>	Modeling ALOHA with Hierarchical Analysis of the Light-driven Ocean workshops, Participant. University of Washington, Seattle, WA.
<i>Dec 4-6, 2017</i>	Simons Collaboration on Ocean Processes and Ecology Annual Meeting, Poster presenter. New York, NY.
<i>Sep 13-15, 2017</i>	UW Program on Climate Change Summer Institute, "Climate Change and Population Health", Participant. Friday Harbor Labs, WA.
<i>Apr 4, 2017</i>	UW Research Computing eScience Institute Cloud 101 Workshop, Participant. Seattle, WA.
<i>Dec 5-7, 2016</i>	Simons Collaboration on Ocean Processes and Ecology Annual Meeting, Poster presenter. New York, NY.
<i>Nov 18, 2016</i>	UW College of the Environment Science Communication Workshop, Participant. Seattle, WA.
<i>Sep 14-16, 2016</i>	UW Program on Climate Change Summer Institute, "The Climate of Antarctica and the Southern Ocean", Participant. Friday Harbor Labs, WA.
<i>Jul 11-15, 2016</i>	Summer Institute in Statistics for Big Data. Participant. UW Department of Biostatistics, Seattle, WA.
<i>Oct 16-18, 2015</i>	UW IGERT Program on Ocean Change Workshop, Participant. Friday Harbor Labs, WA.
<i>May 26 – Jun 26, 2015</i>	Center for Microbial Oceanography: Research and Education Summer Course, "Microbial Oceanography: Genomes to Biomes", Student. Honolulu, HI.
<i>Jan 15-16, 2015</i>	UW eScience Software Carpentry Workshop, Participant. Seattle, WA.
<i>Oct 10-12, 2014</i>	UW IGERT Program on Ocean Change Workshop, Participant. Pack Forest, WA.

OUTREACH

<i>2014 – present</i>	Team lead and volunteer trip leader, Sierra Club Inspiring Connections Outdoors
<i>2018</i>	Mentor for a high school intern from the Pacific Science Center Discovery Corps
<i>2018</i>	Guest judge for AP Environmental Science geoengineering project presentations. Lake Sammamish High School.
<i>2017 - 2018</i>	Science Communication Fellow at the Pacific Science Center, Seattle, WA.
<i>2017</i>	Guest Instructor at Launch Learning at Highland Park Elementary School
<i>2015</i>	Volunteer instructor, Ocean Inquiry Project
<i>2015</i>	Volunteer instructor, HiveBIO Community Labs
<i>2015</i>	Regional ORCA Bowl Volunteer, National Ocean Science Bowl