

Katie Howe, PhD
khowe@disl.org

RESEARCH FOCUS

Bioinformatics, marine microbial ecology, microbial hydrocarbon degradation, metagenomics, metatranscriptomics, biological oceanography

CURRENT POSITION

Postdoctoral Scholar

Dauphin Island Sea Lab
University of South Alabama

January 2024 – present

I work with Dr. Jeffrey Krause and Dr. Brandi Kiel Reese on two NSF-funded projects investigating microbial effects on reverse weathering in the Mississippi River plume and microbial methane cycling in Ross Sea sediments using a variety of laboratory (radioactive isotopes, culturing, gene amplification, etc.) and bioinformatics (16S rRNA gene amplicons, metagenomics, metatranscriptomics, etc.) analyses.

ACADEMIC PREPARATION

2023 PhD, Florida State University, Biological Oceanography

Dissertation: Using ‘omics’ methodologies to identify active, novel hydrocarbon degrading microorganisms in the northern Gulf of Mexico and in the global ocean

2017 MSc, Nova Southeastern University, Coastal Zone Management

Thesis: DNA analysis of surfactant-associated bacteria in a natural sea slick in the Gulf of Mexico observed by TerraSAR-X

2012 BSc, The University of Tampa, Marine Science and Biology, minor in Environmental Science

PUBLICATIONS

Howe, K.L. and Mason, O.U. (in prep). *An active, latent microbial hydrocarbon cycle in the photic zone revealed through metatranscriptomic analyses.*

Howe, K.L., Zaugg, J., Mason, O.U. (submitted to AEM Jan 2024). *Novel, active, and uncultured hydrocarbon degrading microbes in the ocean.* Preprint: doi.org/10.1101/2024.01.20.576437

Howe, K.L., Seitz, K.W., Campbell, L.G., Baker, B.J., Thrash, J.C., Rabalais, N.N., Rogener, M.K., Joye, S.M., Mason, O.U. (2023). Metagenomics and metatranscriptomics reveal broadly distributed, active, novel methanotrophs in the Gulf of Mexico hypoxic zone and in the marine water column. *FEMS Microbiology Ecology*, 99(2), DOI: 10.1093/femsec/fiac153

Parks, G., Dean, C.W., Kluge, J.A., Soloviev, A.V., Shivji, M., Tartar, A., Howe, K.L., Lehner, S., Schwarz, E., Shen, H., Perrie, W., and Schuler, P. (2020) Analysis of surfactant-associated bacteria in the sea surface microlayer using deoxyribonucleic acid sequencing and synthetic aperture radar, *International Journal of Remote Sensing*, 41:10, 3886-3901, DOI: 10.1080/01431161.2019.1708508

Howe, K.L., Dean, C.W., Kluge, J., Soloviev, A.V., Tartar, A., Shivji, M., Lehner, S. and Perrie, W. (2018) Relative abundance of *Bacillus* spp., surfactant-associated bacterium present in a natural sea slick observed by satellite SAR imagery over the Gulf of Mexico. *Elementa Science of the Anthropocene*, 6(1), p.8. DOI: <http://doi.org/10.1525/elementa.268>

RESEARCH

Florida State University

Advisor: Olivia Mason

Dissertation chapters

August 2017 – August 2023

Marine Microbial Ecology Lab

- Metagenomics and metatranscriptomics reveal broadly distributed, active, novel methanotrophs in the Gulf of Mexico hypoxic zone and in the marine water column
- Novel, active hydrocarbon degrading microbes in the marine environment
- An active, latent microbial hydrocarbon cycle in the photic zone revealed through metatranscriptomic analyses

Research overview: These projects utilize combined sequencing (metagenomics, metatranscriptomics, 16S rRNA gene amplicons) and bioinformatics analysis techniques (read mapping, assembling genomes from metagenomes, pangenomics, metabolic reconstruction) to investigate the presence and activity of hydrocarbon-degrading microbes in the Gulf of Mexico and global ocean. Field work included three weeks in Namibia for a course and research cruise in the low-oxygen Benguela Upwelling System.

Research grants: Gulf of Mexico Research Initiative (GoMRI) - Consortium for Simulation of Oil-Microbial Interactions in the Ocean (CSOMIO), National Science Foundation (2113936), Winchester grant

Committee members: Angie Knapp, Markus Huettel, Sven Kranz, Michelle Arbeitman

Nova Southeastern University

August 2015 - August 2017

Advisor: Alexander Soloviev Physical Oceanography Lab

Thesis: DNA analysis of surfactant-associated bacteria in a natural sea slick in the Gulf of Mexico observed by TerraSAR-X

Research overview: Field work included two field campaigns, one of which was two weeks on the *R/V Walton Smith* in the northern Gulf of Mexico collecting samples with coordinated satellite overpasses. Performed lab work, such as DNA extractions and purifications, qPCR, gel electrophoresis, as well as statistical analysis using MatLab and QIIME, to determine microbial community composition of the sea-surface microlayer in the northern Gulf of Mexico.

Additional research projects

- Lab and model analysis of oil droplet propagation on the sea surface
- Hurricane trajectory and rapid intensification in the open ocean

Research grant: Gulf of Mexico Research Initiative (GoMRI) - Consortium for Advanced Research on Transport of Hydrocarbon in the Environment (CARTHE)

Committee members: Brian Haus, Aurelian Tartar, Mahmood Shivji

HONORS AND AWARDS

Winchester Travel and Research Award: 2017-2020, 2022

Congress of Graduate Students Travel Award: 2018, 2022

National Science Foundation Student Travel Grant, 34th Scientific Committee on Antarctic Research Biennial Meetings, Kuala Lumpur, Malaysia: 2016

TEACHING ASSISTANTSHIPS

Introduction to Environmental Science – Fall 2020, 2021, 2022; Summer 2021, 2022; Spring 2023

Principles of Oceanography – Spring 2022

Concepts of Physical Oceanography – Fall 2015, 2016; Spring 2016, 2017

PROFESSIONAL DEVELOPMENT

African Ocean Research Discovery Camp

Walvis Bay, Namibia April - May 2022

Participant in the 7th African Discovery Camp for Research-Based Training on the Sustainable Use and Scientific Management of Marine Ecosystems Regional Graduate Network in Oceanography (RGNO) course and research cruise on the biogeochemical oceanography of upwelling systems, focusing on the Benguela Upwelling System off the coast of Namibia.

Gone-Fishin', a Genome-Resolved Metagenomics Workshop

Jena, Germany

August 2018

Two-day workshop by Dr. A Murat Eren at the Friedrich Schiller University in Jena, Germany
Reconstructing microbial genomes from metagenomes, screening the quality of the metagenome-assembled genomes (MAGs), studying their environmental heterogeneity through single-nucleotide variances (SNVs), de-convoluting sub-population genomes using SNV patters, pangenomics, phylogenomics, and other analyses and visualization strategies to implement comprehensive workflows.

Ansys Fluent QuickStart Training Seminar

Evanstow, IL October 2016

Two-day hands-on computation fluid dynamics software training workshop at the Ansys Fluent Training Center in Evanston, IL.

FIELD WORK

Research Cruises: total of 19 days at sea

2022: R/V Mirabilis, Walvis Bay, Namibia

Benguela Upwelling Oceanographic Monitoring and Regional Graduate Network in Oceanography (RGNO) Research and Training Cruise, National Marine Information and Research Centre; 7 days at sea

2016: R/V F.G. Walton Smith, Miami, FL

LAGrangian Submesoscale ExpeRiment (LASER) with GoMRI and CARTHE; 12 days at sea

Other field work

2017: Land-based in Venice, LA and Grand Isle, LA with daily small boat excursion Taylor platform oil spill; Submesoscale Processes and Lagrangian Analysis on the Shelf (SPLASH) with GoMRI and CARTHE

SKILLS

- Computer skills: R, python, perl, bash, Microsoft Office, Adobe programs, MatLab, OceanDataViewer
- Laboratory skills: DNA extraction, purification, and amplification (PCR and qPCR), bacterial plating and media preparation, cleaning and calibrating equipment, sample preparation for Illumina sequencing, training new lab members
- Analyzing big data (metagenomics, metatranscriptomics, 16S rRNA genes)
- Assembling genomes from metagenomes
- Microbial metabolism reconstruction
- Manuscript and presentation preparation
- Research cruise planning and execution
- Teaching assistant (lecturing and grading)
- Writing laboratory protocols and maintaining records

PRESENTATIONS

Metagenome and metatranscriptome data analyses reveal hydrocarbon degradation capabilities of marine microbes; International Society of Microbial Ecology, 2022; Lausanne, Switzerland – poster

- Active, novel and unexpected methanotrophs play a key role in methane oxidation in the Gulf of Mexico hypoxic zone; Ocean Sciences Meeting, 2020; San Diego, CA – poster
- Expanding What Is Known About the Marine Methane Biofilter in the Gulf of Mexico Using Combined Sequencing Techniques; Gulf of Mexico Oil Spill and Ecosystem Conference, 2020; Tampa, FL – poster
- Gulf of Mexico hypoxic zone ‘omics data elucidate active, non-canonical methanotrophs that have the potential to impact hydrocarbon fate in the coastal zone; Gulf of Mexico Oil Spill and Ecosystem Conference, 2019; New Orleans, LA – poster
- *DNA analysis of oil-associated bacteria from the sea surface microlayer sampled during LASER and SPLASH; 2018, German Aerospace Center, Berlin– oral
- Revealing previously unrecognized microbes involved in methane oxidation along an oxygen gradient in the northern Gulf of Mexico; International Society of Microbial Ecology, 2018; Leipzig, Germany- poster
- *DNA analysis of surfactant-associated bacteria in the sea slicks observed with SAR satellites over the Gulf of Mexico; 2017, University of Oldenburg - oral
- *DNA analysis of surfactant-associated bacteria in the sea slicks observed with SAR satellites over the Gulf of Mexico; German Aerospace Center, Neustrelitz 2017- oral
- Microbial analysis of the sea surface microlayer with a focus on surfactant-associated bacteria and applications to satellite oceanography; Gulf of Mexico Oil Spill and Ecosystem Conference, 2017; New Orleans, LA– oral
- Surfactant-associated bacteria and natural sea slicks in application to satellite oceanography; American Geophysical Union Fall Meeting, 2016; San Francisco, CA- poster
- Satellite oceanography in application to natural sea slicks and the presence of surfactant-associated bacteria; Pan-Ocean Remote Sensing Conference, 2016; Fortaleza, Brazil – oral
- DNA analysis of surfactant associated bacteria in the sea surface microlayer in application to satellite oceanography; Scientific Committee on Antarctic Research Biennial Meetings & Open Science Conference, 2016; Kuala Lumpur, Malaysia– poster

* indicates an informal presentation/seminar

RELATED PROFESSIONAL EXPERIENCE

Proof Brewing Company

Tallahassee, FL

Quality Assurance Technician

October 2020-February 2023

- Tested all steps of the brewing process to ensure the final product met in-house and national standards for safe consumption
 - Milled grain proportions, pH and dissolved oxygen, microbial testing (plating and qPCR), international bitterness units (IBU), diacetyl levels, alcohol by volume (ABV)
- Helped develop written protocols and trained new lab members
- Produced weekly beer quiz content for Instagram to engage and educate the community