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# Department of Marine Sciences

## Spring 2021 Newsletter

### GREETINGS FROM THE DEPARTMENT HEAD

As spring unfolds along coastal Connecticut, we reflect on the past year and the challenges that the Department and University has overcome. Weathering the COVID-19 storm was certainly not easy, but the dedication of faculty, staff and students allowed us to maintain high quality teaching, research and service during this period. Highlights of the department's activities during the past winter and spring can be found in this newsletter, including: an alumni interview with Dr. Lisa Milke (MSc, 2001), a popular-science piece on the research of Drs. Emily Seelen (PhD, 2018) and Rob Mason (faculty), an article highlighting the work of diving safety officer Jeff Godfrey, and an article about unlearning racism in geosciences (URGE). Additional information about the Department and its activities can be found on our website at marinesciences.uconn.edu. If you have not done so already, consider joining the Partners of Marine Sciences by signing up at marinesciences.uconn.edu/partners-of-marine-sciences. Doing so will keep you informed of the activities and events ongoing in Marine Sciences, and allow us to reach out to you with special initiatives. As members of the Department become vaccinated, we hope the worst is behind us and look forward to a near-normal summer season. I wish everyone a healthy, happy and productive summer.

**J. Evan Ward**

PROFESSOR AND HEAD, DEPARTMENT OF MARINE SCIENCES

WHERE ARE THEY NOW?

# Alumni Spotlight – Lisa Milke

Dr. Lisa Milke is a Marine Sciences alumna who received her Master's in Oceanography from UConn in 2001 and her PhD in Biology from Dalhousie University in Canada in 2006. This interview was carried out by Patricia Myer, a current graduate student, on April 20th, 2021. We discussed her current job at NOAA, her path there from UConn, and advice for current graduate students.

**Q: WHAT IS YOUR CURRENT POSITION?**

**A:** I am Chief of the Aquaculture Systems and Ecology Branch at the NOAA Milford lab in Connecticut.

**Q: WHAT DOES THE TYPICAL DAY LOOK LIKE AT YOUR JOB?**

**A:** I think there's no such thing as the typical day. Things are cyclical; you have seasonal activities that come and go. And at this point, I spend a lot more time leading a group of scientists than doing my own research. I consider myself the bureaucracy facilitator and problem solver for the group so that they can focus on the science. So, for me it depends what deadline or problem arises on any particular day.

**Q: COULD YOU EXPAND A BIT ON HOW YOUR WORK DIFFERS DURING COVID AND BEFORE, AND WHAT KIND OF WORK YOU DO AT THE MILFORD LAB?**

**A:** The Milford lab was started in 1931, and we focus on aquaculture research, shellfish research and the interactions between aquaculture and the environment.

Usually, this time of year we have experiments running, people out in the field, and the hatchery up and running. We would be doing research on effects of ocean acidification on different shellfish species. We would have oyster cages in the water, using cameras to identify at fish assemblages and how the cages can create habitat. There's also ongoing work developing and testing probiotics for oysters in commercial hatcheries. This is just a bit of the work we usually do. There's usually a wide variety going on research-wise.

During Covid, some research has continued, but in a very restricted way. Staff are only allowed to be in the facility if you're deemed 'essential'. There are protocols in place to make sure that two people aren't in the same room at the same time and activities are being conducted safely. So, while we've been getting some lab work done, there is also a lot of writing being done by folks at home. I personally haven't been to the lab in over a year.

Much of what I do, which doesn't change whether I'm home or in the lab, is getting people what they need to get their work done. This could be managing budgets, trying to get approval for

someone to be in the lab, finding money to get our research vessel repaired, putting a signature on some form, reviewing proposals and manuscripts or making connections among different groups inside and outside NOAA.

**Q: WHAT PATH DID YOU TAKE TO GET FROM UCONN TO YOUR CURRENT POSITION AT NOAA?**

**A:** I did my masters with Evan Ward on, of course, shellfish feeding. I really enjoyed the work I was doing, but I wanted to do something a bit more applied. I tried to get a technician position when I was finishing and couldn't find something. I knew I wanted to do my PhD anyway, so I ended up going directly into that after graduation.

I moved to Canada, where they had a national program at the time focused on applied aquaculture research. My work focused on identifying the nutritional requirements of postlarval sea scallops in an aquaculture setting. As I was getting close to finishing, a job posted at the Milford lab for a shellfish physiologist, and it had been brought to my attention. I was like, no, no, I'm going to move to New Zealand and I'm going to do a post doc, that's my plan. And the director of research at the National Research Council, where I was conducting my work, walked across the hall, and said, "you're a shellfish physiologist, and there's a job for a shellfish physiologist, so, if you don't apply for that job you're crazy."

I ended up applying for it that evening and ultimately was offered the position. I moved to CT before I was done with my dissertation, and it took me about a year and a half after starting at Milford Lab to finish. NOAA was really accommodating, largely because my dissertation research was the exact type work they wanted me to be doing. There was a lot of kindness from NOAA and the university as I was wrapping up.

I spent 10 years as a research fishery biologist at the Milford lab, where I really was in the lab doing hands on work. About 6 years ago, my supervisor retired. I offered to take over the branch chief position in an acting capacity with no intent to do it forever. However, once I was doing the job I realized that I didn't hate it and I was kind of good at it, and so I switched positions. It was a very conscious move to leave the lab work side of things. My current position is never where I aspired to be, but is a good fit.

**Q: WHAT ABOUT YOUR GRADUATE SCHOOL EXPERIENCE, EITHER MASTERS OR PHD, WOULD YOU SAY BEST HELPED PREPARE YOU FOR YOUR CAREER?**

**A:** I would say that there were two big pieces. One was learning very practical and broad problem solving. Some days you're fixing plumbing, some days you're growing algal cultures, some days you're spawning animals, and some days you're doing spreadsheets. Just being able to solve all those different problems and jump from thing to thing is great. I no longer feel like I'm an expert in anything since I am more removed from day-to-day research, but there is a broad portfolio of things that I've done that informs my ability to participate productively in lots of different activities. I think that's true to much of marine science; there's a lot of interdisciplinary pieces to getting work done, and that backgrounds is a plus.

The other thing that really prepared me was just, the people. I think you have a tendency to make really long-lasting relationships when you're in grad school, and those are people that I'm still in touch with. And even people you don't keep in contact with you are still connected to. Last week actually, I was invited to participate in a review panel by a fellow UConn marine sciences alum who I haven't seen in 15 years. It's a small community, so having those people and building those relationships is helpful.

**Q: WHAT KIND OF ADVICE WOULD YOU HAVE FOR CURRENT GRAD STUDENTS?**

**A:** First, is to remember to breathe. Grad school is really hard. I think it's this really weird time where you, in some ways, have a lot of freedom in your time and how you structure your day. But otherwise, you have a lot riding on something that you don't have complete control over. A lot of different people are influencing your journey. I think that this dynamic can be really hard, and research is hard, and classes are hard. I think it's okay to feel overwhelmed. To breathe and just move forward I think is a big piece of advice. I probably didn't do that enough.

I would also say, do what feels right to you. I never had a career path or an end goal in mind, but I've always done what felt like the right thing to me. It might not have been what my advisor thought I should do, or my parents thought I should do, or a fellow grad student thought I should do, but I've been true to myself and I think that has worked out really well.

And the other thing is kind of getting back to that people part of it. It's such a small community. So, spend time getting to know people as people, because those relationships can be really helpful in starting your career, really helpful in continuing your career, and it's just really lovely to have people to rely on when you come against bumps in the road.

BY PATRICIA MYER

# Investigating Mercury Cycling in Uncontaminated Versus Contaminated Estuaries

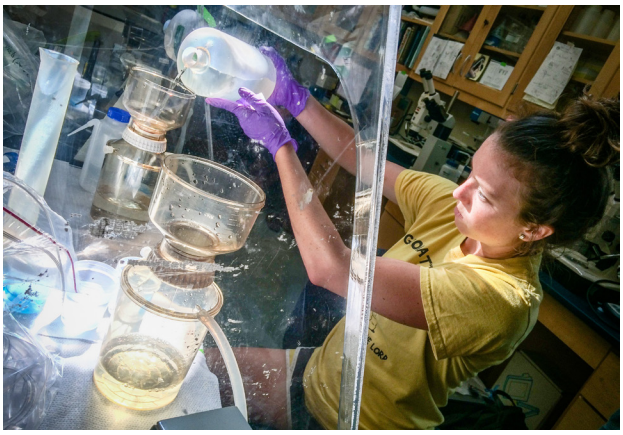
The element mercury (Hg) enters the environment by natural and human sources, transforms in complex ways, and often ends up in the fish we eat. Mercury can be methylated (addition of a CH3 group) in the environment to form methylmercury, which builds up in fish tissues and can reach high concentrations in large fish. This is a concern because methylmercury is a toxin which can lead to negative neurological, developmental, and even cardiovascular effects. Because of these impacts, it is important to understand how mercury and methylmercury cycle in the environment, so that ultimately, we can develop effective management techniques.

In a recent publication, Professor Robert Mason and former graduate student Dr. Emily Seelen (now a postdoctoral scholar at USC) investigated the differences in mercury cycling between contaminated and uncontaminated sites within 10 estuaries along the coast of the US Northeast. Contaminated sites are areas where mercury was directly released into waterways many years ago, usually as industrial waste. Uncontaminated sites contain less mercury, but it is still present in lower concentrations. Samples and measurements were taken throughout 2012-2016, which produced a data set containing mercury, methylmercury, and chemical and physical properties of the water and sediment. Watershed land use data was also applied. Seelen explains the data analysis, “We used different statistical approaches to look for trends between the variables. The main findings were derived from a multiple linear regression analysis, which we used to evaluate which variables best described the concentrations of mercury and methylmercury in surface waters.”

“We found that historically contaminated sites retain and recycle their mercury, which makes external signals such as riverine input less detectable. The longevity of mercury in such systems suggests that remediation by removal of the contaminated sediments is key.” On the other hand, in uncontaminated estuaries, mercury likely enters from via runoff, and is then gradually buried into the sediment. In both cases, methylmercury does not seem to come from the sediment or runoff. “We therefore suggest that the concentration of methylmercury in surface waters is determined by the amount of mercury released into the estuarine system, whether that be from the watershed or the sediments.” Seelen explains.

These findings show that mercury cycling is very different in historically contaminated sites than uncontaminated sites. For uncontaminated sites, the mercury comes from the entire watershed, which does not leave us with an easy way to carry out remediation projects. Seelen states that ultimately, “to lower mercury concentrations in fish, we need to emit less mercury.” According to the EPA, present-day emissions come from a variety of sources including artisanal and small-scale gold mining, coal combustion, metal production, cement production, and many others. The path to regulating and decreasing these emissions begins with studies such as this one.

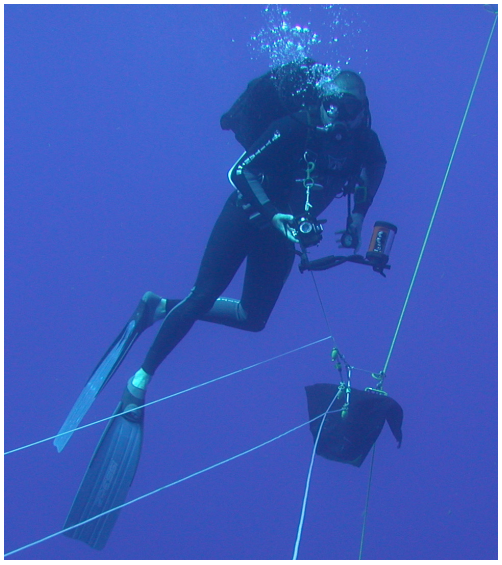
BY PATRICIA MYER



Citation:

Seelen, E.A. et al. (2021). Historic contamination alters mercury sources and cycling in temperate estuaries relative to uncontaminated sites. Water Research.
DOI: 10.1016/j.watres.2020.116684

# Meet Jeff Godfrey, Diving Safety Officer



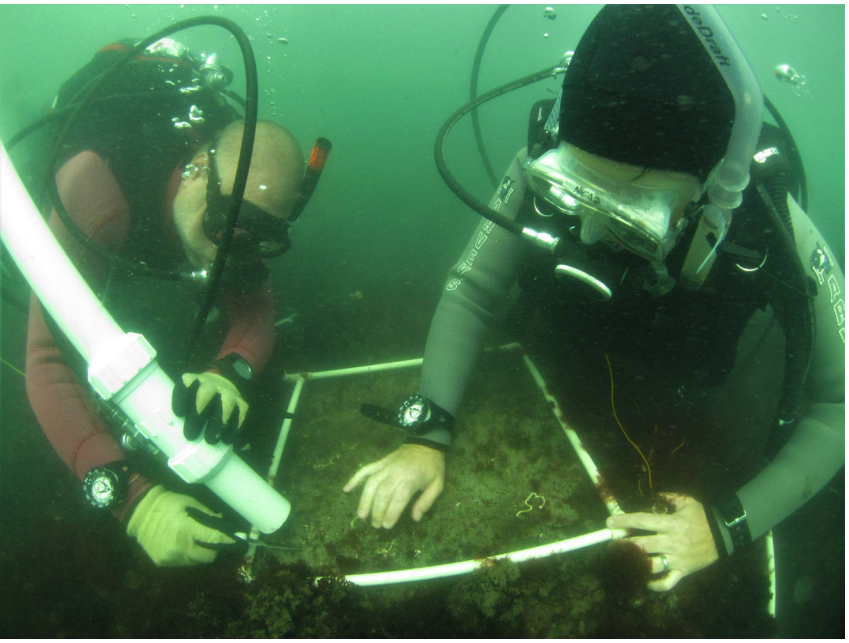
Jeff Godfrey has been providing diving support for the Department of Marine Sciences (DMS) since 1999, on projects ranging from studying salps in frigid Antarctic waters to studying fish in the Great Barrier Reef. Before his time at UConn, Jeff worked in the sunny Florida Keys. The news of the diving officer job ad was mentioned to him by a friend who started working at the UConn library. DMS flew him up to not-as-sunny Connecticut for the interview, and he was offered the job. Though it doesn't compare to the Keys, Jeff says CT is growing on him.

At DMS, Jeff is a vital part of our department, providing diving support as part of our marine operations, and helping students, staff, and faculty that utilize diving as a research tool. He also provides training for beginner scuba divers, through the course Intro to Scientific Diving, as well as offering various advanced certifications.

Jeff's favorite part of the job is interacting with the students, he says "they make the job fun and sometimes they remind me of how old I am, but sometimes they keep me young too." Several of the students that were scuba certified through Jeff's class went on to careers that utilize diving, including an instructor at NOAA diving facility and a diving safety officer at URI.

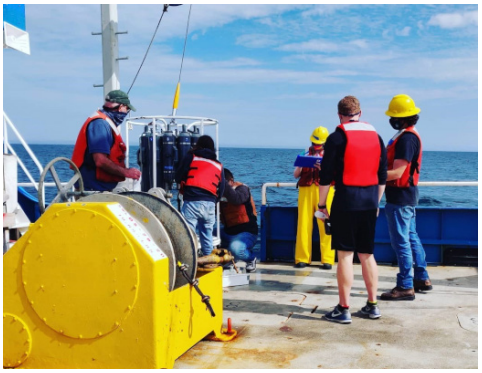
For Jeff, diving is not just a job, but also a passion. He spends many weekends diving, exploring a lot of local wrecks. "When I retire, I don't plan on changing much."

BY PATRICIA MYER



# Success of The Oceanographic Expedition Course

BY SAMANTHA SIEDLECKI


In the spirit of Jacques Cousteau's sentiment: "The future is in the hands of those who explore...," nine graduate students, two faculty, and the crew of the R/V Connecticut ventured out into the Long Island Sound and offshore waters of the Mid-Atlantic Bight on two separate occasions in October, 2020. The Expedition Course entitled: Connecting urban estuaries to the sea: Coastal oceanography of Long Island Sound and the shelf of the Mid-Atlantic Bight is offered to the graduate students every other year.

This past fall, the course was offered amidst the pandemic, but ship operations had already designed protocols to safely continue operations aboard the R/V Connecticut, and the University agreed to support testing of the students to participate in the course. As a result, the course proceeded, albeit with some adjustments for safety amidst the pandemic. The students were excited and eager to have their first at-sea research experience and the faculty were eager to revisit the transect they had observed in the class two years before. The 2018 class found that conditions improved with distance from shore – it was actually warmer sampling out there because the ocean water was so warm – consistent with the increased influence of the Gulf Stream waters in the region that has been observed. Sure enough, when the 2020 course embarked onto the outer shelf, they encountered similar warm conditions.  When the students lowered sensors on the outer shelf to measure temperature, salinity, chlorophyll, oxygen, and pH throughout the water column, they discovered a salty subsurface intrusion that brought with it higher pH, nutrient rich water and completely different species than further inshore.

Back at the lab, the samples were analyzed and the results plotted and mapped. Inspired by their exploration of the coastal waters nearby, the students wrote proposals in small groups about what they would like to investigate further in the future with this experience and ended up generating some very interesting hypotheses about the nearby coastal ocean. They ranged from questions about the influence of the outflow from Long Island Sound

on the phytoplankton composition on the shelf, to mechanisms driving the pH variability associated with the salinity intrusion on the outer shelf, and the influence of temperature on the cross-shelf trends in the biological pump characteristics. Many faculty and staff contributed to the success of the class, and the crew went above and beyond to ensure we got what we needed at sea. The future is in good, grateful hands.

BY DR. SAMANTHA SIEDLECKI



# Unlearning Racism in Geoscience in the Marine Sciences Department

The Summer of 2020 was a difficult time. Covid was raging, and tensions were rising as a spotlight was placed on one case of racial injustice after another. It was difficult to believe that there was still such blatant racism in our country – difficult to believe only for those of us who weren't facing it daily. It's a privilege to only hear about injustice on the news.

The events of that summer led to changes in our communities and our department. The graduate student officers started an anti-racism journal club to become more educated about racism in our field and how to address it. This club developed into the Marine Science Pod of the Unlearning Racism in Geoscience (URGE) (https://urgeoscience.org/) program in January 2021. URGE was put together by NSF and WHOI as a curriculum for addressing and unlearning racism in geosciences, which notably has very low racial diversity in the field (https://www.nature.com/articles/s41561-018-0116-6). This lack of diversity, which has not increased in 40 years, limits the quality of research potential in the community. The URGE program features multiple two-week long sessions which contain readings and interviews featuring expert opinions and personal experiences. Pod meetings involve discussing these materials and working on assignments (deliverables) as a group. These deliverables are then posted on the pod website publicly (https://urgeoscience.org/pods/uconn-marine-science/). Graduate student Kelly McGarry reflects on the importance and value of this program, "We're trying to become experts in the ocean, but we're not experts in racism. That's not what we spend all day thinking about and studying and reading and writing about. But there are people who do that, it's their full-time job to understand these different aspects of racism."

Members of the DMS URGE Pod joined to better understand racism in geosciences, help develop anti-racist strategies, and make use of the resources offered. Graduate student Hannah Collins shares, "I decided to join because I wanted to continue the education and discussion process the graduate students began over the summer in the wake of George Floyd's murder. I thought that, since one of the objectives of the pod was to develop deliverable action statements and items, we would translate our own educational discussions into tangible goals that we could propose to the department, which I felt was really necessary to combat systemic racism within academia."

So far there have been 8 sessions which have all covered different aspects of racism, including the history, justice, accessibility, inclusivity, and others. Graduate students in the pod share their experiences on the readings, discussions, and deliverables:

"I feel like a lot of people don't realize how hard it is to break into geosciences as a whole, but what has been enlightening for me has been thinking about and discussing all of the barriers

both big and small that work together to prevent people from underrepresented minorities from advancing in the field. For example, the nature of geosciences means that often field work is a necessary experience to develop skills to be a good scientist and researcher, however fieldwork can be expensive and it's often easier for oppressive actions and behaviors to occur without repercussions when you're out in the field." – Hannah Collins

"One thing that has stood out to me as we discussed specific topics is how similar the experiences are across different topics. Whether we discuss issues of accessibility or inclusivity, much of the literature describes the same trans-disciplinary problems that result in institutional barriers for people of color in STEM." – James deMayo

"It is through the session deliverables that I have been able to learn about the many resources out there that UConn offers to tackle or handle matters of racism." – Michael Mathuri

Addressing racism in our field does not stop with the end of the URGE program. After the program ends, pod members aim to continue to hold the anti-racism journal club from last summer, and plan on actively working with the department as a whole to become more inclusive. Jimmy deMayo shares, "The group has plans to help draft new, prominently displayed, codes of conduct for the department that communicate the department positions on matters of diversity, equity, and inclusion. We are also exploring new ways of advertising available studentships and job positions that help reduce the barrier to entry for students of color interested in marine science." The department and university support this goal and has signed an agreement signifying support.

BY PATRICIA MYER



# A New Partner for DMS

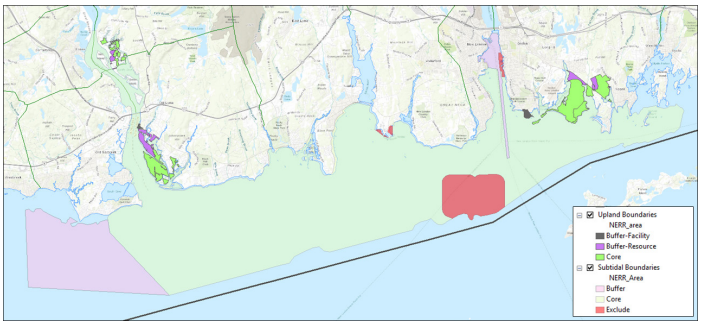
A new Center will soon be joining the Avery Point campus, occupying space in the Weicker Building and elsewhere on campus – the proposed Connecticut National Estuarine Research Reserve (NERR), the 30th in the nationwide system (https://portal.ct.gov/DEEP/Coastal-Resources/NERR/NERR-Home-Page). As a partnership between NOAA, UConn, and the CT Department of Energy and Environmental Protection (DEEP), the proposed reserve will protect and enhance Connecticut's coastal environments by leveraging system-wide programs to provide additional opportunities, capacity, and funds for research, training, stewardship, and education. The NERR will be headquartered on the Avery Point campus and, in the years to come, may bring a new building to campus.

Reserve staff (numbering about 15 people) will conduct and provide support for research, education, training, and stewardship within Reserve boundaries and in neighboring communities. A long-term monitoring program forms a cornerstone of the system and the NERR staff will seek input in 2022 on where we'd like to see that monitoring occurring. Are you interested in research in Long Island Sound and the neighboring upland properties? Collaborating with Reserve staff on science, education, or stewardship projects opens a path to National Science Collaborative funds, a competitive grant program awarding ~$3 million annually (https://coast.noaa.gov/nerrs/research/science-collaborative.html). The Davidson Fellowship provides graduate student support, and additional internship and research opportunities are available for undergraduate and graduate students.

The Biden Administration is interested in including the designation of the CT Reserve in their year one accomplishments, so the Reserve should be "official" by January 2022 and hiring staff by July 2022. The Designation Steering Committee, including DMS members J.E. Ward, I. Babb, C. Tobias and J. Vaudrey, and CT Sea Grant Director S. De Guise, is working with an

advisory committee (including DMS member P. Vlahos) on a draft management plan and draft environmental impact statement; these will be available for public review in late summer 2021 with public hearings in September 2021.

BY DR. JAMIE VAUDREY




Potential aquatic and terrestrial properties of the proposed CT NERR, this is one option of four being proposed as part of the draft environmental impact statement.

Be on the lookout for more info on the proposed CT NERR! (Barred Owl - the Silent, Ever-watchful Sentinel, by Corey Leamy. https://www.flickr.com/photos/ctnerr/50583594498/ (CC BY-NC 2.0))

# DEPARTMENT ACHIEVEMENTS

## Awards

**Prof. Senjie Lin**

Elected as an AAAS (American Association for the Advancement of Science) Fellow and joined the 2020 ASLO (Association for the Sciences of Limnology and Oceanography) Fellows. These honors recognize his work in dinoflagellate biology and biological oceanography as a whole.

**Prof. Ann Bucklin**

Received the 2020 UConn Faculty Excellence in Research and Creativity Award in the Sciences.

**Allison Staniec (graduate student, Prof. Penny Vlahos)**

Chosen in the National Science Foundation's (NSF) Dissertations in Chemical Oceanography (DISCO) Fellowship.

**Hannah Collins (graduate student, Prof. Evan Ward)**

Awarded a grant from the Lerner-Gray Memorial Fund for Marine Research.

**Tyler Griffin (graduate student, Prof. Evan Ward)**

Awarded the Melbourne R. Carriker Award from The National Shellfisheries Association.

**Melissa Sanchez (undergraduate student)**

Awarded Sea Grant Summer 2021 Undergraduate Research Fellowship. She will examine the influence of selenium on the accumulation of methylmercury in phytoplankton with Prof. Robert Mason.

## Grants

**Prof. Samantha Siedlecki and Prof. Catherine Matassa**

NOAA OAP: *Assessing vulnerability of the Atlantic Sea Scallop social- ecological system in the northeast waters of the US* (2020-2023), $1,034,822. PIs Siedlecki, Meseck, Colburn, Matassa, Curchitser, Bethoney. This grant is for a collaboration between UConn, NOAA's Northeast Fisheries Science Center (NEFSC), Commercial Fisheries Research Foundation (CFRF), and Rutgers University to study the impact of ocean acidification on Atlantic Sea Scallops in the US northeast

and the development of management tools.

**Prof. Samantha Siedlecki**

NOAA MAPP: *The predictability of oxygen and its metabolic consequences for fisheries on decadal time scales* (2020-2013), $439,315. PIs Siedlecki, Long, Petrik.

NOAA MAPP: *Modeling Climate Impacts on Predictability of Fisheries and Other LMRs* (2020-2023), $511,452. PIs Long, Siedlecki, Petrik.

NOAA MAPP: *Towards the prediction of fisheries on seasonal to multi-annual time scales* (2020-2023), $510,000. PIs Petrik, Long, Siedlecki.

NOAA MAPP: *Building capacity for predictability of climate impacts on living marine resources in US coastal systems using the NOAA MOM6 ocean model.* (2021-2024), $1,513,782. PIs Curchitser, Alexander, Resplendy, Siedlecki, Stock.

**Prof. Heidi Dierssen**

NASA Ocean Biology and Biogeochemistry: *Advancing Remote Sensing of Microplastics on the Surface Ocean* (2021-2024), $401,914. PIs. Dierssen, Chowdhary, Ottaviani, Ibrahim, Knobelspiesse

NASA Ocean Biology and Biogeochemistry: *Quantifying linkages between sea ice, phytoplankton community composition, and air-sea carbon fluxes west of Antarctic Penninsula through field, airborne and satellite* (2020-2023), $1,095,330. PIs. Dierssen, Schofield, Stammerjohn, Munro.

**Prof. Penny Vlahos**

EPA/NYSG/CTSG: *Alkalinity in Long Island Sound Embayments (ALISE)* (03/01/2021-02/28/2023), $131,088. We are investigating the range of alkalinity and carbonate saturation in several LIS embayments to identify areas where conditions may be of concern for aquatic species.

NIH-RO1: *Chronic Kidney Disease of Unknown Etiology: Applying a Multidisciplinary Approach to Investigate the World's Most Common Tubulointerstitial Kidney Disease* (09/01/2021-08/31/2026), $528,717. This project is a continuation of our original R21 grant to conduct water quality testing in endemic and non-endemic regions to identify possible causative elements.

NSF: *Carbonate system dynamics and biogeochemistry in a changing Arctic* (05/01/2021- 04/30/2023), $272,619. We will be performing a suite of biogeochemical measurements in the marginal ice zone to understand the unique chemistry of this receding region.

**Prof. Evan Ward and Prof. Sandra Shumway**

*Establishing robust bioindicators of microplastics in Long Island Sound: Implications for reliable estimates of concentration, distribution, and impacts.* Awarded by the Long Island Sound Study Research Grant Program, a cooperative program of the EPA Long Island Sound Office, Connecticut Sea Grant (CTSG), and New York Sea Grant (NYSG).

# Publications

**Prof. Peter Auster**

Prof. Auster presents a publication describing a rarely observed feeding frenzy of deep-sea sharks feeding on an Atlantic swordfish recently settled to the seafloor, including predation on a small shark by a wreckfish. *(Auster, P.J., K. Cantwell, R.D. Grubbs, S. Hoy. (2020). Observations of deep-sea sharks and associated species at a large food fall on the continental margin off South Carolina, USA (NW Atlantic). J. Ocean Sci. Found., 35 (2020), pp. 48-53, 10.5281/zenodo.3932138)*

Prof. Auster and Marine Science Major Lissa Giacalone pioneered a new approach for using 360-degree camera technology for analyzing the interactions of single and mixed species groups of predators and their prey in Gray's Reef National Marine Sanctuary. *(Auster, P.J. and Giacalone, L. (2021). Virtual Reality Camera Technology Facilitates Sampling of Interactions Between Reef Piscivores and Prey. Marine Technology Society Journal 55(2):54-63)*

**Prof. Zofia Baumann**

Prof. Baumann and colleagues present research explaining how the kidneys and liver of water birds detoxify methylmercury. *(Poulin, B. A., Janssen, S. E., Rosera, T. J., Krabbenhoft, D. P., Eagles-Smith, C. A., Ackerman, J. T., ... & Manceau, A. (2021). Isotope Fractionation from In Vivo Methylmercury Detoxification in Waterbirds. ACS Earth and Space Chemistry.)*

**Prof. Penny Vlahos**

Prof. Vlahos contributed to the United Nations Second World Ocean Assessment (WOA II), the newest outcome of the only integrated assessment of the world's ocean at the global level covering all three pillars of sustainable development. *(https://www.un.org/regularprocess/)*

**Prof. Michael Whitney and Prof. Penny Vlahos**

Profs. Vlahos and Whitney show that mitigation efforts have reduced hypoxia in Long Island Sound, but also that warming waters are working against these trends. *(Whitney, M. M., & Vlahos, P. (2021). Reducing Hypoxia in an Urban Estuary Despite Climate Warming. Environmental Science & Technology, 55(2), 941-951.)*

**Prof. Sandra Shumway**

Prof. Shumway was part of an international team of researchers reviewing the developments in global aquaculture over the past two decades highlighting its integration in the global food system. *(Naylor, R. L., Hardy, R. W., Buschmann, A. H., Bush, S. R., Cao, L., Klinger, D. H., ... & Troell, M. (2021). A 20-year retrospective review of global aquaculture. Nature, 591(7851), 551-563.)*

**Prof. Heidi Dierssen**

NASA has a proposed mission called the Surface Biology and Geology (SBG) mission as recommended by the 2018 Decadal Survey. Dierssen recently participated in a large collaborative effort to review existing hyperspectral and thermal algorithms relevant to the SBG mission across the following categories: snow/ice, aquatic environments, geology, and terrestrial vegetation, and summarize the community-state-of-practice in each category. *(Cawse-Nicholson, K. et al. (2021). NASA's surface biology and geology designated observable: A perspective on surface imaging algorithms. Remote Sensing of the Environment. 257: 112349. https://doi.org/10.1016/j.rse.2021.112349)*

Red and green algae growing on snow in the Antarctic Peninsula causes significant extra snowmelt that is on par with melt from dust on snow in the Rocky

Mountains, according to a first-of-its-kind scientific research study that Dierssen worked on. *(Khan, A. L., H. Dierssen, T. Scambos, J. Höfer, and R. R. Cordero. (2021). Spectral Characterization, Radiative Forcing, and Pigment Content of Coastal Antarctic Snow Algae: Approaches to Spectrally Discriminate Red and Green Communities and Their Impact on Snowmelt. The Cryosphere. 15, 133-148.)*

**Prof. Julie Granger**

From seasonal surveys, we show that nutrients inshore are persistently higher than in source waters offshore in the Southern Benguela Upwelling System (eastern Arctic Ocean), due to benthic-pelagic coupling of production and regeneration on the broad and shallow shelf. The incidence of "nutrient trapping" inshore explains the high productivity of system and explains hypoxic events. *(Flynn, R. F., Granger, J., Veitch, J. A., Siedlecki, S., Burger, J. M., Pillay, K., & Fawcett, S. E. (2020). On shelf nutrient trapping enhances the fertility of the southern Benguela upwelling system. Journal of Geophysical Research: Oceans, 125(6), e2019JC015948.)*

**Prof. Robert Mason**

Prof. Mason and past graduate student Emily Seelen investigated differences in mercury cycling in contaminated versus uncontaminated estuaries in the US northeast. *(Seelen, E. A., Chen, C. Y., Balcom, P. H., Buckman, K. L., Taylor, V. F., & Mason, R. P. (2021). Historic contamination alters mercury sources and cycling in temperate estuaries relative to uncontaminated sites. Water Research. DOI: 10.1016/j.watres.2020.116684)*

Prof. Mason and colleagues examined how factors such as mercury concentration in water and sediment, and the watershed land use, influenced the concentrations of mercury in mummichogs and silversides in estuaries from the Chesapeake Bay to northern Maine. (*Buckman, K.B., Mason, R.P., Seelen, E.A., Buckman, K.B., Taylor, V.F., Balcom, P.H., Chipman, J., Chen, C.Y. (2020). Patterns in forage fish mercury concentrations across Northeast US estuaries. Environ. Res. 194, Art. # 110629.)*

**Prof. Ann Bucklin**

This review is a collaborative effort of the Scientific Committee for Ocean Research (SCOR) Working Group WG157: MetaZooGene. The MetaZooGene Barcode Atlas and Database (MZGdb, https://metazoogene.org/MZGdb) includes >150,000 mitochondrial cytochrome oxidase I (COI) sequences for ~5,600 described species of marine zooplankton. The MZGdb is a reference database for identification of species from DNA barcoding and metabarcoding of pelagic biodiversity, with advanced search functions by ocean region and taxonomic group. *(Bucklin et al. (2021) Toward a global reference database of COI barcodes for marine zooplankton. Marine Biology.)*

**Gihong Park (postdoc, Prof. Hans Dam)**

Prof. Dam and Park present a novel framework to incorporate the cost of defense in toxin-producing prey/predator relationship models. This paper was selected in Faculty Opinions as one of special significance in its field, considered as highly important emerging research (https://facultyopinions.com/prime/739530812?r=mra). *(Park, G., & Dam, H. G. (2021). Cell-growth gene expression reveals a direct fitness cost of grazer-induced toxin production in red tide dinoflagellate prey. Proceedings of the Royal Society B, 288(1944), 20202480.)*

**Kelly McGarry (graduate student, Prof. Samantha Siedlecki)**

McGarry and colleagues developed equations to estimate highly variable carbonate system properties in northeast US shelf waters from other variables - temperature, salinity, oxygen, and nitrate - that are affected by the same processes that drive carbonate system variability but are measured more frequently with better spatial coverage. *(McGarry, K., Siedlecki, S. A., Salisbury, J., & Alin, S. R. (2021). Multiple linear regression models for reconstructing and exploring processes controlling the carbonate system of the northeast US from basic hydrographic data. Journal of Geophysical Research: Oceans, 126(2), e2020JC016480.)*

**Veronica Rollinson (research assistant, Prof. Julie Granger)**

Rollinson and colleagues measured nutrients and the naturally occurring nitrogen (N) and oxygen (O) stable isotope ratios of nitrate discharged from the Pawcatuck River over an annual cycle and uncovered a seasonality to loading and sources of N from the watershed. Seasonality in the nitrate isotope ratios also informed on N cycling. *(Veronica R. Rollinson, Julie Granger, Sydney C. Clark, Mackenzie L. Blanusa, Claudia P. Koerting, Jamie M. P. Vaudrey, Lija A. Treibergs, Holly C. Westbrook, Catherine M. Matassa, Meredith K. Hastings, and Craig R. Tobias (2021). Seasonality of nitrogen sources, cycling and loading in a New England river discerned from nitrate isotope ratios. Biogeosciences discussion.*