

Fisheries Conservation Lab 2020 Annual Report

June 2019 - September 2020



Credit: Jay Fleming/SERC

**Investigating the Ecology, Management, and
Conservation of Marine and Estuarine Fisheries**



Smithsonian
Environmental Research Center

Table of Contents

P.4 Movement of Life

P.5 MarineGEO

P.6-7 Efforts to Understand Oyster Management & Its Effects on Reef Ecology

P.8 Working Land & Seascapes

This report was written, designed, and produced by Julie Luecke

Fisheries
Conservation Lab

NOTES FROM THE FIELD

The first year of the Fisheries Conservation Lab at the Smithsonian Environmental Research Center was exciting, frustrating, unexpected and inspiring.

Summer 2019 started off in a hurry with the arrival of Postdoctoral Fellow Allison Tracy and Graduate Fellow Zofia Knorek launching a 10-week, Chesapeake Bay-wide study of oyster reef ecology and management. The project – part of the new Chesapeake Working Land and Seascapes conservation initiative – took them across the Bay's salinity gradient from the Chester River, MD to the Lynnhaven River, VA, and out to the coastal bays near Willis Wharf, VA. Data collected on oyster condition, oyster reef habitat quality, and associated species are providing insights into how Chesapeake oyster reef communities are structured and how that differs between reefs with and without oyster harvest.

The summer was filled with many other activities. SERC MarineGEO and Tennenbaum Marine Observatory Network technician Mike Goodison led local sampling for the MarineGEO Global Seagrass Survey and conducted other baseline monitoring of Rhode River biodiversity. We launched a new project, led by Keira Heggie and Rob Aguilar, on the distribution, habitat use, and diet of Summer Flounder in collaboration with SERC's Marine Disease Ecology Lab. Postdoc Sarah Donelan and intern Daniella Gavriel conducted experiments on the effects of warming and hypoxia on juvenile oysters. Intern Liana Quinones produced videos highlighting lab research on oyster reefs and shark migrations. Postdoc Chuck Banglely tagged more sharks and rays. And the lab continued SERC's long term surveys of fish and invertebrates of the Rhode River.

What little winter we had shifted too quickly to spring and preparations for the river herring spawning

migration. With three river herring projects planned -- studying responses to the removal of Bloede Dam on the Patapsco River, evaluating the efficiency of fish ladders in Delaware, and advancing the development of environmental DNA methods for studying river herring and shad – we had a lot to prepare for. We also welcomed Nathan Waltham, Queensland Government and Smithsonian Fellow, from Australia to exchange ideas on estuary and fisheries conservation. And then SARS-CoV-2 arrived, Nathan made it safely back to Australia, and most of our spring fieldwork was postponed until 2021.

In major news in April, we assumed leadership of the Atlantic Cooperative Telemetry (ACT) Network, the grassroots community of researchers along the Atlantic coast of North America using acoustic telemetry to study animal migrations. We also led the completion of a new regional telemetry database that is part of a national US Animal Telemetry Network. Kim Richie now serves as the data manager for the network.

As I write this, we are planning for the second year of the Fisheries Conservation Lab with social distancing and masks, virtual internships, and an uncertain future. We are working to address issues of diversity, equity, and inclusion at SERC, in science, and in society. And we are wishing bon voyage to Mike Goodison, Chuck Banglely, and Sarah Donelan as they take the next steps in their careers. I'm inspired by the way the lab has met the challenges we've faced in 2020 and am excited to welcome the new lab members highlighted in the following stories.



Matthew B. Ogburn
Senior Scientist





Fisheries Conservation Lab Members

Principal Investigator: Matt Ogburn
(OgburnM@SI.EDU)

Staff: Rob Aguilar, Mike Goodison, Keira Heggie, Jack Olson, Kim Richie, Carmen Ritter

Graduate Fellows: Zofia Knorek, Sarah Mallette

Queensland-Smithsonian Fellow: Nathan Waltham

Postdoctoral Fellows: Charles Banglely, Sarah Donelan, Henry Legett, Gabriel Ng, Allison Tracy

Interns: Grace Buckley, Alex Delcid, Daniella Gavriel, Liana Quinones, Aiman Raza

Chesapeake Conservation Corps Member: Julie Luecke

Citizen Scientist: Dave Norman

Welcome to year one of the Fisheries Conservation Lab at SERC! Matt Ogburn created this lab in the spring of 2019 to focus conservation efforts specifically on fisheries and the ecosystems that support them.

With our research, we hope to directly inform management practices that rebuild populations of species impacted by historical fisheries and maintain sustainable harvests of species that support today's fisheries. We study species ranging from oysters and crabs to migratory fish, sharks, and rays, which are critical to sustaining vibrant coastal communities and human health. We apply field and laboratory experiments, animal tracking technologies, models, long-term observational studies, and historical perspectives to address fisheries issues including sustainability of fished populations, altered food webs and trophic interactions, linkages between habitat and fisheries, invasive species, and climate change.

Credit: SERC



Movement of Life Initiative

Graduate fellow Sarah Mallette has joined the Fisheries Conservation Lab for Phase 1 of her Ph.D. research. Sarah's research will investigate how patterns in cetacean distribution have changed over time using long-term datasets [e.g. stranding (beach cast carcasses for which basic spatio-temporal, and life history data have been collected), visual survey, telemetry, and acoustic data] from nine different hotspots across the world's oceans.

As climate change leads to increases in ocean temperatures across the planet, patterns of migration are shifting, in terms of both geography and phenology across taxa, on a global scale. Cetaceans (whales, dolphins, and porpoises) are a keystone species in food chains, as indicators of ocean health, and for local economies through ecotourism. Understanding how marine megafauna, such as cetaceans, are responding to increasing ocean temperatures (e.g. a proxy for prey distribution and availability) is important to guide conservation action in a changing marine environment. Cetacean distributions overlap with areas of human use (e.g. commercial fishing, shipping, Wind Energy Areas, Navy training and testing areas) posing threats to conservation. Understanding where, geographically, these shifts are most prominent and what species may be most at risk helps ecologists to investigate the impacts of climate change in different regions of the world's oceans. Additionally, effective conservation and management of cetaceans and other megafauna depends on accurate knowledge of migration patterns.



Graduate Fellow Sarah Mallette

"The results of this study will be essential to assess risk and vulnerability of species and for strategically managing dynamic marine ecosystems in a changing climate."

Sarah Mallette responding to an Unusual Mortality Event of a humpback whale in 2016

Credit: Sarah Mallette/SERC



The Marine Global Earth Observatory (MarineGEO) is a worldwide network of sites where researchers are using standard methods to study coastal environments (eg oyster reefs, seagrasses, salt marshes, etc.) and mitigate climate change in these fragile environments. Five years after its inception, MarineGEO has seamlessly integrated into SERC's tradition of long-term research (thanks in no small part to Mike Goodison, who spearheaded MarineGEO projects in the lab before recently moving on to his next career step). While MarineGEO is a Smithsonian-led global partnership, SERC has benefitted from the coalition to pursue new ways of understanding our local marine ecosystem.

SERC has been monitoring the Rhode River for species diversity and water quality since the 1970s, but MarineGEO has provided the opportunity to expand the breadth of this monitoring. Starting in 2015, we have collaborated with Dennis Whigham and Pat Megonigal to conduct sampling of three Rhode River marshes. This work complements data collection at the Global Change Research Wetland and is adding context to a new analysis of changes in plant species composition observed in both the experimental plots and MarineGEO marsh transects.

MarineGEO has also brought brand new projects to SERC. For the first time, our lab is collecting data on submerged aquatic vegetation (SAV) in the Rhode River. These SAV data are part of a global synthesis of seagrass/SAV ecosystems that will contribute to knowledge about the Rhode River and put our backyard study system into context with other findings from across the globe. We are also expanding monitoring of larger species at the top of the food chain. For example, we are using a hydrophone to record the presence of Atlantic bottlenose dolphins. Using these bioacoustic data, we are even able to track individual dolphins using their signature whistles including several individuals that have also been detected in the Atlantic Ocean at the Maryland Offshore Wind Energy Area. DIDSON sonar data has also allowed us to increase the size distribution of species studied compared to trawl and seine surveys, since it readily detects individuals large enough to escape our nets.

The Fisheries Conservation Lab and MarineGEO share the same goals of understanding human impacts on marine ecosystems and the effects of different management practices. Being a part of this larger coalition has increased the impact of our intensive study of the Rhode River.



MarineGEO Technician
Jack Olson

The Fisheries Conservation Lab is excited to introduce our new MarineGEO lab technician, Jack Olson! Jack grew up in Albuquerque, NM and received his BS in Ecology and Evolutionary Biology from the University of Colorado.

After working as a research technician on several marine research projects, Jack was employed as a NOAA fisheries observer in the Aleutian Islands. He then completed a Master's degree at the University of Puerto Rico, writing his thesis on fish population and assemblage-level effects of marine reserve protection at an oceanic island in the Mona Passage. Following completion of his degree, Jack took a position with the Florida Fish and Wildlife Conservation Commission in Marathon, FL. There, he led projects examining the habitat use and population dynamics of resident reef fishes. We are thrilled to have him as part of our team!

Efforts to Understand Oyster Management & Its Effects on Reef Ecology

As natural water filterers and habitat for over 300 species, oysters play a key role in the Chesapeake Bay ecosystem. The quantity and quality of the habitat they build affects not only other bay species, but also watermen whose livelihoods depend on healthy oyster populations. Clearly, proper oyster management is vital to the long-term sustainability of reef-dwelling species as well as the humans who depend on the bay for income and recreation.

Spearheaded by postdoctoral fellow, Allison Tracy, the Fisheries Conservation Lab has been investigating how oyster management practices affect habitat and overall oyster health. Over the past year, we have monitored sixteen different sites across Maryland and Virginia with the assistance of several major collaborators. These large scale studies allow us to collect data from the entire salinity gradient of the bay and its tributaries as well as to compare management strategies between oyster reefs that are harvested, restored (sanctuary) -- like the reef in the background photo from Harris Creek -- and unrestored (sanctuary). In particular, Allison's oyster work has had three main components: 1) a historical data project, 2) current field work, and 3) long term monitoring.

1) Historical Data Project

The states of Maryland and Virginia have collected data over the past several decades on rates of oyster disease. Using those data, Allison is looking for trends in oyster disease and whether those trends align with other historical records, such as management strategies, storm action, and water temperature.

2) Current Field Work

During summer 2019, graduate fellow Zofia Knorek, a Ph.D. student at the University of North Carolina, joined Allison in studying the effects of different kinds of oyster management. She investigated oyster abundance and biomass, as well as bioeroder (species of sponge and polychaete worms that invade oyster shell) presence on oyster reefs in nine tributaries throughout the bay. Then she looked for links between these traits and management strategy, the environmental gradient of the bay (shifts in salinity, species, water quality, etc. with latitude change), and the diversity of species living on each reef. In summer 2020, Aiman Raza joined the lab for a virtual internship to study how well two different methods (DIDSON and GoPro monitoring) ascertain species diversity on a reef. Otherwise, Allison has been monitoring reefs in eight different tributaries, examining if microparasites (like the species that cause MSX and Dermo diseases in oysters) and bioeroders interact when present together.

3) Long-Term Monitoring of the World's Largest Oyster Restoration Project

Oyster reefs in five tributaries each in Maryland and Virginia will continue to be monitored to compare reef health (in terms of especially height and diversity of species) across the three different kinds of management. These tributaries were chosen on account of their prioritization for restoration work by the Chesapeake Bay Program. This initiative, which aims to be completed by 2025, represents the largest-scale experiment in oyster restoration in the world. Our long-term monitoring will allow researchers to evaluate the effectiveness of the restoration work being done, making the impact clearer and the goals of the restoration more easily achievable.



Summer 2020 Intern Aiman Raza

"This project provides evidence that fish and crustacean species benefit from creating no-harvesting areas and highlights the importance of oyster reefs for healthy ecosystems."

"This work will provide a novel perspective on the working land and seascapes of the Chesapeake Bay with the dual aims of improving the health of ecosystems and the resilience of local economies."



Postdoctoral Fellow Allison Tracy



Graduate Fellow Zofia Knorek

"Understanding the relationship between bioeroders and oysters will inform the future of oyster restoration and management throughout the Bay."

Working Land & Seascapes Initiative

River herring, the collective name for alewife (*Alosa pseudoharengus*) and blueback herring (*Alosa aestivalis*), are anadromous fish that annually migrate between marine and freshwater habitats. Climate change linked shifts in environmental conditions and resource levels can alter river herring migration patterns. Since river herring are prey to many other fish, seabirds, and marine mammals, disruption of their migrations can impact the entire coastal ecosystem, contributing to biodiversity loss.

In conjunction with the Rappahannock Working Land and Seascapes project, part of the greater Smithsonian Working Land and Seascapes Initiative, postdoctoral fellow Henry Legett is investigating how environmental factors are driving daily, seasonal, and annual river herring migration patterns in the Choptank, Patapsco, and Rappahannock rivers of Maryland and Virginia. Additionally, he plans to examine how land use and human activity impact water temperature dynamics and river herring movement within each river.



A sonar fish counting station in the Patapsco River with fencing to funnel herring past the counter



Postdoctoral Fellow
Henry Legett

"This work will allow for more focused management of river herring and habitat restoration efforts in the Chesapeake Bay."

Interested in donating to Fisheries Conservation projects?

- Go to <https://serc.si.edu/> and click on the DONATE button. Type "Fisheries Conservation Lab" in the designation box.

- Make out a check to SERC and mail it to Smithsonian Environmental Research Center, 647 Contees Wharf Road, Edgewater, MD 21037. Please add "Fisheries Conservation Lab" on the memo line.

Thank you for your support of our work!

Publications

Bangley CW, Whoriskey FG, Young JM, Ogburn MB (2020) Networked animal telemetry in the Northwest Atlantic and Caribbean waters. *Marine and Coastal Fisheries* 12:339-347.

Bangley CW, Curtis TH, Secor DH, Latour RJ, Ogburn MB (2020) Identifying important juvenile Dusky Shark habitat in the Northwest Atlantic Ocean using acoustic telemetry and spatial modeling. *Marine and Coastal Fisheries* 12:348-363.

Donelan, Sarah C., Hellmann, Jennifer K., Bell, Allison M., Luttbeg, Barney, Orrock, John L., Sheriff, Michael J. and Sih, Andrew. (2020). Transgenerational plasticity in human-altered environments. *Trends in Ecology & Evolution*, 35 (2) , 115-124.

Edwards ML, Balazik MT, Bangley CW, Aguilar R, Ogburn MB (In Press) Detection of a mature Atlantic Sturgeon in the Patuxent River, Maryland using passive acoustic telemetry. *Northeastern Naturalist*.

Fuchs, Lauren D., Tupper, Todd A., Aguilar, Robert, Lorentz, Eva B., Bozarth, Christine A., Fernandez, David J. and Lawlor, David M. (2020). Detection of *Ophidiomyces ophiodiicola* at two mid-Atlantic natural areas in Anne Arundel County, Maryland and Fairfax County, Virginia, USA. *Amphibian & Reptile Conservation*, 14 (1) , 22-28.

Ogburn MB (2019) The effects of sex-biased fisheries on crustacean sex ratios and reproductive output. *Invertebrate Reproduction & Development* 63(3):200-207

Ogburn MB, Richie KD, Jones MA, and Hines AH (2019) Sperm acquisition and storage dynamics facilitate sperm limitation in the selectively harvested blue crab *Callinectes sapidus*. *Marine Ecology Progress Series* 629:87-101

Staaterman E, Gallagher AJ, Holder PE, Reid CH, Altieri AH, Ogburn MB, Rummer JL, Cooke SJ (2020) Exposure to boat noise in the field yields minimal stress response in wild reef fish. *Aquatic Biology* 29:93-103

Tupper TA, Fuchs LD, Aguilar R (2019) Molecular confirmation of *Ophidiomyces ophiodiicola* in *Crotalus horridus* and *Agkistrodon contortrix*. *Catesbeiana* 39(1):35-37

Waltham NJ, Elliot M, Lee SY, Lovelock C, Duarte CM, Buelow C, Simenstad C, Nagelkerken I, Claassens L, Wen CCK, Barletta M, Connolly RM, Gillies C, Mitsch WJ, Ogburn MB, Purandare J, Possingham H, Sheaves M (2020) UN Decade on Ecosystem Restoration 2021-2030 – What Chance for Success in Restoring Coastal Ecosystems? *Frontiers in Marine Science* 7:71

Grants Awarded

Ogburn MB, Plough LV. River herring response to dam removal in the Patapsco River (MD). National Fish and Wildlife Foundation. 2020-2021. \$173,388.

Komatsu K, Ogburn MB, Lacher I, Johnson A, Hruska A, Tracy A. Bridging the land-sea interface: Chesapeake Bay as a model ecosystem for conservation science, partnerships, and actions. Smithsonian Working Land and Seascapes. 2020-2021. \$96,219.

Plough LV, Ogburn MB. Advancing monitoring and management of mid-Atlantic alosine fishes with eDNA analysis. Maryland Sea Grant. 2020-2022. \$210,393.

Ogburn MB, Lohan KP, Tracy AL. Complex threats to ecosystem restoration: Interactive effects of parasites and bioeroders on oyster reefs. Smithsonian Institution Scholarly Studies. 2020. \$73,849.