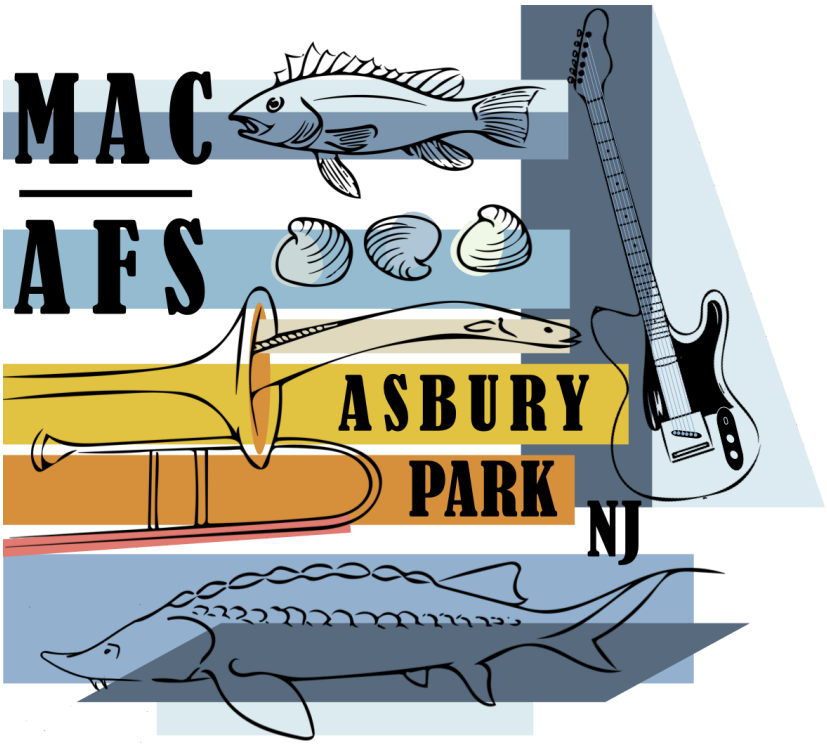

The Mid-Atlantic Chapter of the American Fisheries Society
2022 Annual Meeting

Meeting Program and Abstract Book

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Table of Contents

Welcome!

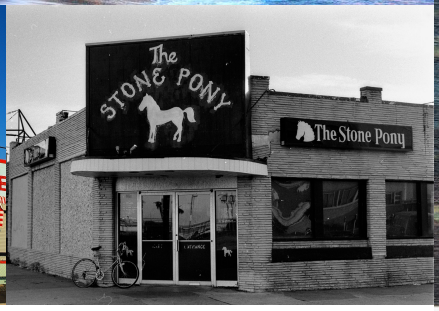
The Mid-Atlantic Chapter of the American Fisheries Society (MAC-AFS) is a professional organization centered around the science and responsible management of fisheries and aquaculture in the Mid-Atlantic region. Our membership is composed of scientists, managers, students, and fishing industry members, who are affiliated with the universities, government agencies, non-profits, and companies of New Jersey, Pennsylvania, and Delaware.

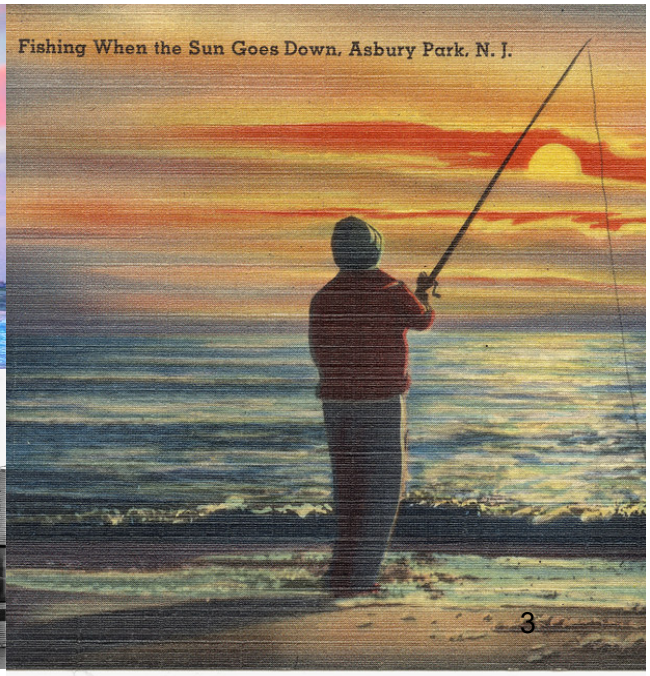
MAC-AFS is one of six geographic chapters within the Northeastern Division of the American Fisheries Society. The mission of the Chapter is to fulfill the parent society's objectives within the Mid-Atlantic Region:

- Promote the conservation, development, and wise use of the fisheries
- Promote and evaluate the development and advancement of fisheries science and practice
- Gather and disseminate scientific, technical, and other information about fisheries science and practice
- Encourage the teaching of fisheries science and practice in regional colleges and universities and the continuing education and development of fisheries professionals.

Each year, MAC-AFS hosts a conference that gathers fisheries professionals from the Mid-Atlantic. This annual meeting provides a platform for sharing information and ideas about the latest advancements in regionally-specific fisheries and aquaculture science and management. Cutting-edge science, new policy perspectives, challenges facing the region, and success stories worth celebrating are all discussed through oral presentations, poster displays, and social events.

This year, the MAC-AFS 2022 Annual Meeting is taking place on November 15-16, 2022 at the House of Independents in Asbury Park, NJ!





Sponsors

This meeting would not be possible without the generous support of our sponsors. These organizations provided material resources to MAC-AFS, which defrayed the costs of the venue, the banquet, and evening social event. These resources were also used to support the attendance of the keynote speaker and to ensure that registration costs were manageable for all attendees. Finally, these sponsors also helped MAC-AFS offer free lodging for students. We are extremely grateful for their donations and their support of our organization.

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Donations to the Silent Auctions

We are also grateful for all the organizations and individuals who donated to our silent auction. All proceeds of the auction go towards supporting student-focused activities throughout the year. This includes supporting our student subunits, contributing to the AFS Hutton Junior Fisheries Biology Program, and covering the costs of student activities at future MAC-AFS Annual Meetings.

Mystery Tackle Box
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NY Jets
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East Coast Escape Room
Grunin Center
LBI Lighthouse Film Festival
Academy of Natural Sciences of Drexel U.
River Lady
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Academy of Natural Sciences of Drexel University
Penn Museum
Philadelphia Museum of Art
Reading Museum and Planetarium
Sigal Museum
Crayola Experience
Historic London Town
Baltimore Museum of Industry
Hudson River Museum
Autobahn Speedway
Intrepid Sea, Air & Space Museum
Boston Swan Boats
Institute of Contemporary Art of Boston
Old Sturbridge Village
Salem Witch Museum
Concord Museum
Harvard Museums of Science and Culture
Wadsworth Atheneum
Mystic Aquarium
Total Wine & More
NJ Ballet
Museum of Illusions - New York
…plus many, many donations from our MAC-AFS members

Venue and Event Information

Meeting Venue:

Tuesday, November 15, 2022, 8:00 – 17:30
Wednesday, November 16, 2022, 8:00 – 13:15

The House of Independents
572 Cookman Ave, Asbury Park, NJ 07712
http://houseofindependents.com/

Banquet and Evening Social Venues:

Tuesday, November 15, 2022, 18:30 – 22:00

The Langosta Lounge
1000 Ocean Ave, Asbury Park, NJ 07712
https://www.langostalounge.com/

The Tommy Allen Band
https://www.facebook.com/TheTommyAllenBand/

Silverball Retro Arcade
(next door to The Langosta Lounge)
https://www.silverballmuseum.com/asbury-park/

Lodging:

Berkeley Oceanfront Hotel
1401 Ocean Ave N, Asbury Park, NJ 07712
Check-in: 16:00 / Check-out: 11:00
https://www.berkeleyhotelnj.com/

Tuesday, November 15, 2022

8:00 – 8:45	Registration*
8:45 – 9:00	Welcome Message (Dr. Jim Vasslides)
9:00 – 10:00	Keynote Address (Dr. Nicola Smith, see page 14)
10:00 – 10:15	BREAK*
10:15 – 11:45	Morning Oral Presentation Sessions: *-Shifting Species Distributions* *-Biogeochemistry* *-Aquaculture I*
11:45 – 13:00	LUNCH**
13:00 – 14:00	Afternoon Oral Presentation Sessions: *-Population Dynamics and Biogeography I*
14:00 – 14:30	BREAK*
14:30 – 15:30	Afternoon Oral Presentation Sessions: *-Population Dynamics and Biogeography I (continued)* *-Wind Energy and Fisheries Interactions I*
15:30 – 16:00	BREAK and Poster Session Set-up
16:00 – 17:30	Poster Session and Silent Auction*
17:30 – 18:30	BREAK and Hotel Check-in
18:30 – 22:00	Banquet and Evening Social -Dinner and live music at the Langosta Lounge, featuring The Tommy Allen Band -Pinball at Silverball Retro Arcade

*Light refreshments will be provided during these blocks

**Lunch will not be provided, but there are many restaurants within a 5-min walk of the venue

Wednesday, November 16, 2022

8:00 – 8:30	Registration*
8:30 – 9:30	MAC-AFS Business Meeting
9:30 – 9:45	BREAK*
9:45 – 11:00	Morning Oral Presentation Sessions: *-Wind Energy and Fisheries Interactions II* *-Aquaculture II*
11:00 – 11:30	BREAK*
11:30 – 13:00	Afternoon Oral Presentation Sessions: *-Crustaceans* *-Population Dynamics and Biogeography II*
13:00 – 13:15	Awards Ceremony for Best Student Presentations

*Light refreshments will be provided during these blocks

Start Time	Tuesday	Wednesday
8:00	Registration	Registration
8:15		
8:30		Business Meeting
8:45	Welcome - President MAC-AFS, Jim Vasslides	
9:00	Keynote - Nicola Smith	
9:15		
9:30		BREAK
9:45		Talk_15
10:00	BREAK	Talk_16
10:15	Talk_1	Talk_17
10:30	Talk_2	Talk_18
10:45	Talk_3	Talk_19
11:00	Talk_4	BREAK
11:15	Talk_5	
11:30	Talk_6	Talk_20
11:45	LUNCH	Talk_21
12:00		Talk_22
12:15		Talk_23
12:30		Talk_24
12:45		Talk_25
13:00	Talk_7	Student Award Ceremony
13:15	Talk_8	End of Meeting
13:30	Talk_9	
13:45	Talk_10	
14:00	BREAK	
14:15		
14:30	Talk_11	
14:45	Talk_12	
15:00	Talk_13	
15:15	Talk_14	
15:30	BREAK & Poster Set-up	
15:45		
16:00	Poster Session and Silent Auction	
16:15		
16:30		
16:45		
17:00		
17:15		
17:30	BREAK & Hotel Check-in	
17:45		
18:00		
18:15		
18:30	Dinner and live music at the Langosta Lounge, featuring The Tommy Allen Band, and pinball at Silverball Retro Arcade	
19:30		
20:30		
21:30		
22:00		

Tuesday, November 15th			
Session	Talk_#	Est. Start Time	Title (Presenting Author's Last Name)
Welcome	NA	8:45	Welcome (Vasslides)
Keynote	Talk_0	9:00	Climate change effects on marine invasive species globally (Smith)
	BREAK	10:00	
Shifting Species Distributions	Talk_1	10:15	Multi-Decadal Declines and Species Assemblage Shifts in the Fish Community of a Northeast US Temperate Estuary (Olson)
	Talk_2	10:30	Please don't go! The impact of shifting distributions on the stock assessment and management of marine fisheries. (Wiedenmann)
	Talk_3	10:45	Distinct patterns in historical mobility and catch flexibility underscore intra-port variation in potential adaptive capacity to climate change (‡Kitchel)
Biogeochemistry	Talk_4	11:00	Is fish "blue" carbon actually "brown"? Initial laboratory-based approaches in quantifying fish metabolic waste products for a highly abundant, commercially harvested North Atlantic forage fish, Atlantic menhaden (*Brevoortia tyrannus*) (‡Cook)
Aquaculture I	Talk_5	11:15	Effect of Stocking Density on the Growth and Nutrient Utilization of Sea Beans (*Salicornia bigelovii*) in a Simulated Integrated Multi-Trophic Aquaculture (IMTA) System (†Price)
	Talk_6	11:30	Off-shore aquaculture potential for the Atlantic surfclam *Spisula solidissima*: in situ observations and multi-stressor laboratory experiments (Steeves)
	LUNCH	11:45	
Population Dynamics and Biogeography I	Talk_7	13:00	How Much Data is needed to Detect Environmental Selection in Marine Predators? (Pinti)
	Talk_8	13:15	Movement Patterns of the Sicklefin Lemon Shark, *Negaprion acutidens*, around Tahiti and Moorea, French Polynesia, South Pacific (‡Marsaly)

Population Dynamics and Biogeography I	Talk_9	13:30	Deep Dwellers: The Patterns of Residency and Space Use of Arctic Skates (*Amblyraja hyperborea*) Across a Developing Arctic Fishery Ground (‡Bradley)
	Talk_10	13:45	Evaluating the efficacy of pelagic sharks and CTD tag technology for ocean observing applications in the Mid-Atlantic Bight (‡Wiernicki)
	BREAK	14:00	
	Talk_11	14:30	Striped Bass Predation may Control Alosid Abundance in Major Rivers (Kahn)
Wind Energy and Fisheries Interactions I	Talk_12	14:45	Establishing a Research Program for New Jersey's Marine Resources during Offshore Wind Development (C. Brust)
	Talk_13	15:00	Integration of Environmental DNA Surveys in Fisheries Monitoring Plans for Offshore Wind (Adolf)
	Talk_14	15:15	Modeling Interactions Among Commercial Shellfish Fishing and Wind Energy (Munroe)
	BREAK & Poster Set-up	15:30	
Poster Session and Silent Auction	NA	16:00	24 Poster Presentations (‡Ambrose, Archer, Craft, †Gerosa, Gius, Grothues, †Handelman, Horwitz, ‡Iwicki, Keller, Klotz, †Maguire, Morrill, Munroe, O'Brien, Rohrback, Sakowicz, Scully, Sheehan, Sultana, †Wagner, †Wisner, †Yang-†Kumar-†Lee-†Sivaram, Zemeckis)
			Thousands of dollars worth of auction items
	BREAK & Hotel Check-in	17:30	
Banquet and Evening Social	NA	18:30	Dinner and live music at the Langosta Lounge
			Pinball at Silverball Retro Arcade

Key	‡ = graduate student presenting author † = undergraduate student presenting author ß = high school student presenting author

Wednesday, November 16th			
Session	Talk_#	Est. Start Time	Title (Presenting Author's Last Name)
Business Meeting	NA	8:30	Business Meeting
	BREAK	9:30	
Wind Energy and Fisheries Interactions II	Talk_15	9:45	An Introduction to Community Offshore Wind (Robins)
	Talk_16	10:00	Environmentally-driven Oyster Microbiome Dynamics in the Delaware Bay (‡Yeh)
Aquaculture II	Talk_17	10:15	Effect of Oyster Farms on the Distribution of Horseshoe Crab Eggs and Other Rufa Red Knot Foraging Resources (‡Bouchard)
	Talk_18	10:30	Shellfish Growth and Seasonal Water Factors (ßGuerriero)
	Talk_19	10:45	Assessing habitat enhancement on a subtidal oyster restoration site in Barnegat Bay (Thompson)
	BREAK	11:00	
Crustaceans	Talk_20	11:30	Blue crab population dynamics in northern estuaries (Molina)
	Talk_21	11:45	Examining the impact of derelict pots and active fishing on Blue Crab (*Callinectes sapidus*) catch and harvest within a recreational fishery (‡Feris)
	Talk_22	12:00	Length-based assessment of lenok (*Brachymystax lenok*), burbot (*Lota lota*), and Hovsgol grayling (*Thymallus nigrescens*) population status in Lake Hovsgol, Mongolia (‡Shaw)
Population Dynamics and Biogeography II	Talk_23	12:15	Raritan – Sandy Hook Bay Complex Fishery Resource Inventory (VanMorter)
	Talk_24	12:30	Selective distribution of summer flounder, *Paralichthys dentatus,* off New Jersey, and its implication for management (J. Brust)
	Talk_25	12:45	Population dynamics of common nearshore forage fishes in the Delaware Inland Bays, USA (McGowan)
	STUDENT AWARDS	13:00	

Key	‡ = graduate student presenting author † = undergraduate student presenting author ß = high school student presenting author

Keynote Speaker

Nicola Smith, PhD

Climate change effects on marine invasive species globally

Humans are changing Earth's climate and ecological systems at unprecedented rates. Global drivers of change include overexploitation, habitat loss and fragmentation, pollution, invasive species, and human-driven climate change. The traditional approach to addressing these widespread stressors is to tackle each factor singularly. But this overly simplified yet practical way of doing things can lead to false conclusions about the nature of change in our oceans. Marine systems are frequently confronted with multiple stressors simultaneously that can potentially interact, resulting in effects that are not predictable from single stressor impacts. In my talk, I explore the interactions between climate change and invasive species in our oceans. I consider climate change effects on all stages of the invasion process, from initial transport to spread and impacts. Also, I question whether current strategies to manage marine invasive species will remain effective given a rapidly changing climate.

Biography: Dr. Nicola S. Smith is a Liber Ero Postdoctoral Research Fellow at the Institute for the Oceans and Fisheries, University of British Columbia, Canada, and an Associate Editor for NeoBiota, a peer-reviewed, open access, online journal on biological invasions. Her current research focuses on climate change effects on marine invasive species, and its implications for ocean sustainability. She is also working with academia, governmental and non-governmental organizations, and Indigenous coastal communities to provide a framework for the Canadian ocean economy to contribute to net zero. Previously, she was a Bullitt Environmental Fellow and Postdoctoral Researcher at Simon Fraser University where she conducted marine invasive species risk analyses for the Caribbean.

Dr. Smith obtained a Hons. B.Sc. with High Distinction from the University of Toronto in 2006, where she double majored in English and Zoology. In 2010, she received a M.Sc. in Zoology from the University of British Columbia while in 2020 she obtained a Ph.D. in Biology from Simon Fraser University.

She has over a decade of experience researching various aspects of biological invasions, coral reef ecology, and tropical fisheries. She has published several studies on the Indo-Pacific lionfish invasion of the Caribbean and on unreported fisheries catches, particularly as it pertains to recreational fishing in the Global South. She has received numerous awards, including the 2018 Bullitt Environmental Prize, a graduate scholarship from the Organization of American States, and a professional development grant from the Society for Conservation Biology, Latin America and Caribbean Section. Dr Smith has headed two Global Environment Facility/United Nations Environment Programme (GEF/UNEP) funded projects on marine invasive species in the Caribbean.

Oral Presentations

Listed in chronological order

Key:
* = presenting author
‡* = graduate student presenting author
†* = undergraduate student presenting author
ß* = high school student presenting author

Shifting Species Distributions

Multi-Decadal Declines and Species Assemblage Shifts in the Fish Community of a Northeast US Temperate Estuary

*Emily Olson, Barnegat Bay Partnership
emolson@udel.edu
James Vasslides, Barnegat Bay Partnership

Understanding the causes of and quantifying the impacts of ecosystem shifts over time in marine and estuarine environments is critical to the effective management of coastal resources. Fishes are a crucial resource and the abundance and diversity of species can indicate the productivity and health of an environment. Two series of juvenile fish surveys separated by 50 years were conducted along Barnegat Bay, New Jersey, to compare the historical composition and abundance of the Bay's fish species to those of the present-day. Two sites were sampled by beach seine in both series and assessed for changes in species abundance, diversity, and composition over time. Differences in physical parameters (temperature, salinity) and habitat characteristics between the surveys were characterized. Principal component analysis indicated changes in the community structure of one of the two sites from its historical state, driven by significant shifts in the abundance of several key species. A shift in the ranks of species common to both data sets was documented at both sites, as was the loss of northern-associated species and introduction of southern-associated species. Change in habitats from seagrass beds and natural shorelines to sandy, unvegetated environments, combined with increases in temperature and salinity, were identified as drivers of the shifts in species between the datasets. Continued loss of habitat and environmental changes could further exacerbate the declines in important taxa already seen across 50 years of climate change and urbanization of this significant estuary.

Please don’t go! The impact of shifting distributions on the stock assessment and management of marine fisheries

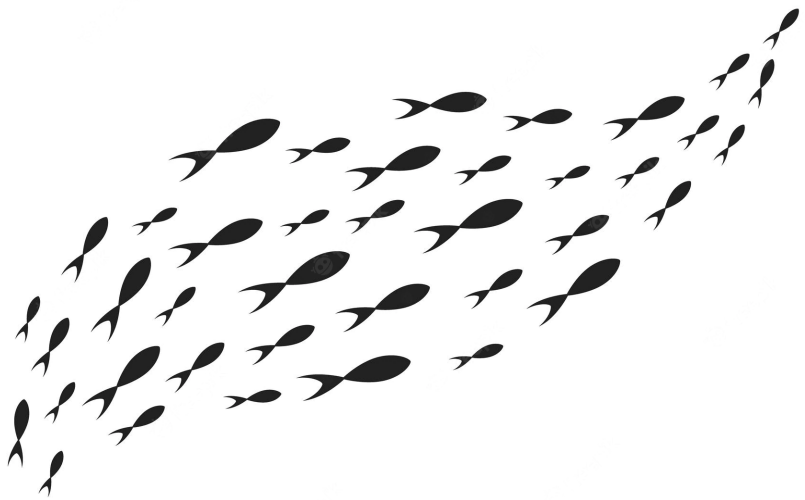
*John Wiedenmann, Rutgers University
john.wiedenmann@gmail.com

One of the most well-documented responses to ocean warming is a change in the spatial distribution of fish and invertebrates, with species moving poleward and / or into deeper waters. Effective management of fisheries under shifting distributions requires accurate estimates of population size through stock assessment models, and dynamic harvest policies that are robust to uncertainty. Here I review the ways in which spatial shifts may impact the ability to accurately assess and effectively manage marine fish stocks. First, I discuss the different pathways for shifting distributions to introduce problems in stock assessment models. I then describe the ways in which shifts in species distributions may hamper the ability to meet a range of fisheries management objectives. For both topics I will provide a number of case studies, with a particular emphasis on populations of the Northeast U.S.

Distinct patterns in historical mobility and catch flexibility underscore intra-port variation in potential adaptive capacity to climate change

‡*Zoë Kitchel, Rutgers University
zoe.kitchel@rutgers.edu
Kaycee Coleman, Rutgers University
Rebecca Selden, Wellesley College
Leonardo Calzada, Rutgers University
Borja Nogué Algueró, Universitat Autònoma de Barcelona
Kevin St. Martin, Rutgers University

Climate change, fishing, and offshore development have led to changes in the abundance and distribution of marine resources. These changes have large consequences for the economically and culturally valuable commercial fisheries of the Northeast US. Trends in the variability of catch composition (flexibility) and of fishing grounds (mobility) over time can provide insight to the capacity of fishing communities to adapt to future changes in resource availability. Using Vessel Trip Report data, we described the variability in these dimensions of adaptive capacity for fishing communities defined by both port and gear type. We found high variability across ports and across fishing gear groups within a port for both indicators. Gear groups tended to exhibit similar levels of flexibility and mobility. Communities using gear with high selectivity demonstrated lower diversity in catch across years in comparison to communities using less discriminatory gear under multispecies permits. The level of fishing ground variability across years varied with vessel type and size, with larger multispecies vessels demonstrating higher mobility. There were multiple communities that strayed from the dominant strategies across gear groups, possibly due to port level constraints or regulations. Additionally, we tested whether paired mobility and flexibility strategies could be linked to the wellbeing of a community. These novel indicators illustrate the diversity of demonstrated adaptive capacity across and within port communities and complement port level social indicators, and aim to guide stakeholders in improving risk assessment and community resilience.

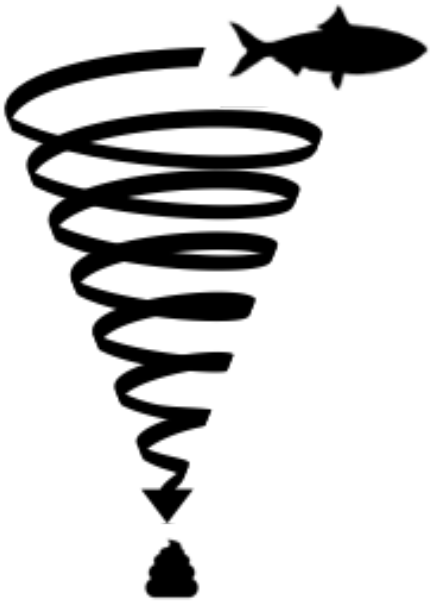


Biogeochemistry

Is fish “blue” carbon actually “brown”? Initial laboratory-based approaches in quantifying fish metabolic waste products for a highly abundant, commercially harvested North Atlantic forage fish, Atlantic menhaden (*Brevoortia tyrannus*)

‡*Lauren Cook, Rutgers University
lcook@marine.rutgers.edu
Grace Saba, Rutgers University

Small pelagic fish (“forage fish”) are potentially significant contributors to coastal carbon flux given their abundance and seasonal cross-shelf migratory behavior. Understanding their biogeochemical role in coastal regions is a growing informational need for ecosystem-based fisheries management, especially as fishing companies prepare to meet net-zero carbon emissions goals. Even though marine fish are thought to contribute to approx. 16% of carbon flux out of the euphotic zone, the uncertainty on this estimate is large, and carbon release data for forage fish are practically nonexistent. In order to constrain this estimate and better understand relative contributions of fish metabolic byproducts to carbon cycling and flux, regional estimates are required, but no full carbon production suite (fecal pellet, calcium carbonate, excretion, and respiratory CO2 release) exists for any fish species. I conducted preliminary laboratory trials with a highly abundant and commercially harvested forage fish on the US Northeast Shelf, Atlantic menhaden (*Brevoortia tyrannus*). Results suggest Atlantic menhaden fecal material sinks rapidly (>3000 m d-1) and could reach coastal benthos in less than a day. I discuss achievements and limitations to this approach, and future plans to better constrain these estimates.



Aquaculture I

Effect of Stocking Density on the Growth and Nutrient Utilization of Sea Beans (*Salicornia bigelovii*) in a Simulated Integrated Multi-Trophic Aquaculture (IMTA) System

†*Jiyahna Price, Bethune-Cookman University
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Sam Norton, Heron Farms
Michael Acquafredda, NOAA NEFSC James J. Howard Marine Sciences Laboratory

Finfish aquaculture contributes significantly to global seafood production, yet waste management remains a challenge to its sustainability and expansion. Integrated multi-trophic aquaculture (IMTA), the practice of cultivating multiple aquatic species of different trophic levels in close proximity to one another, is one strategy for mitigating farmed finfish wastes. In this study, we examined the capacity of the sea vegetable, *Salicornia bigelovii*, to function as a lower trophic level species in a simulated IMTA system. *S. bigelovii* (commonly known as sea beans, pickleweed, and sea asparagus) is a native, edible, salt-tolerant marsh plant with demonstrated potential as a high-value biofuel crop and food for human consumption. Specifically, we tested the effect of stocking density on the growth and nutrient utilization of *S. bigelovii* when exclusively fertilized with marine finfish wastewater. Three treatments (1-2, 4-5, and 7-10 plants per 17-sq cm plug) and a no-plant control were compared. Plants were started from seed and grown indoors using hydroponic methods. Plugs were embedded in polystyrene floats, suspended in tubs containing 10-11 L of wastewater, and situated underneath 330 W wideband LED grow lights. Water changes occurred twice weekly, and two harvests occurred within the three-month study. Preliminary results suggest that all stocking densities could produce substantial harvests (>0.40 lb/sq ft), despite low nutrient concentrations in the wastewater relative to conventional hydroponic fertilizers. While individual plant biomass decreased with increasing stocking density, the mean marketable yield was statistically similar across stocking densities. Stem woodiness, which negatively impacts palatability, decreased with increasing stocking density. Within 24-72 hours of each water change, all *S. bigelovii* treatments were capable of reducing nitrogenous wastes to undetectable levels. This study suggests that *S. bigelovii* may be a commercially viable candidate for co-culture with aquacultured marine finfish and potentially also with low-waste producing organisms like bivalves during their larval and broodstock conditioning phases.

Off-shore aquaculture potential for the Atlantic surfclam *Spisula solidissima*: in situ observations and multi-stressor laboratory experiments

*Laura Steeves, Rutgers University Haskin Shellfish Research Laboratory
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Daphne Munroe, Rutgers University Haskin Shellfish Research Laboratory

The Atlantic surfclam (*Spisula solidissima*) is a widely distributed and economically important species, being found in waters along the Atlantic coast north of Cape Hatteras and the most fished clam species by weight in the United States. Growing surfclams in aquaculture farms presents an opportunity to support surfclam production with a unique product that would not compete with fished surfclam (i.e., a steamer sized clam ~55mm). Surfclam aquaculture has been explored with promising potential in predominately shallow-backbay farms. Although aquaculture farms are often established in protected coastal areas, farming in the open ocean presents an opportunity to farm shellfish where space is less competitive, water quality is often higher, and where species naturally occur. However, strategic site selection of aquaculture farms in the open ocean requires consideration of both current and predicted future environmental conditions that will promote the successful growth and survival of targeted species. For this research, we are collaborating with fishing industry partners to provide information about the potential for the surfclam to be cultivated at commercial scales in the open ocean. Further, to examine how changing ocean conditions in potential aquaculture areas may impact surfclam survival and growth rates, we will use laboratory experiments to observe surfclam performance at ambient and stressful levels of temperature and carbonate chemistry (reflective of ocean acidification). This research will provide information about the potential to produce surfclams in offshore aquaculture farms, and the ability surfclam to survive and grow in changing oceanographic conditions.

Population Dynamics and Biogeography I

How Much Data is needed to Detect Environmental Selection in Marine Predators?

*Jerome Pinti, University of Delaware
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Matthew Shatley, University of Delaware
Aaron Carlisle, University of Delaware
Barbara Block, Stanford University
Matthew Oliver, University of Delaware

Understanding the selection of environmental conditions by marine predators requires knowledge of where they are, but also of where they are not. Tracking marine organisms is challenging because animals can only be detected when they are at the surface. Further, the accuracy of such detections depends on the tag used and on the time that the animal spends at the surface, with uncertainties ranging as large as several tens of kilometers for ARGOS tags. However, absence data are even harder to determine because they are hard to measure in an uncontrolled setting. To address this problem, “pseudo-absence” data are simulated. Pseudo-absences represent the movement of environmentally naive individuals, creating a set of locations that animals could have been, but likely were not if animals perform environmental selection. Here, we present a method relying on presence data from tagged marine organisms and simulated pseudo-absence data to investigate environmental selection in marine organisms. Using a dataset of simulated tracks biased towards high sea surface temperatures, and a dataset of real marine organisms of unknown sea surface temperature selection, we show how we can test whether animals select for specific environmental conditions. Presence - pseudo-absence data is a valid approach to test for environmental selection in marine organisms, but results must be interpreted with caution – this method can suffer from high false positive rates, especially if the sample size is too limited, the track uncertainty too large, or the selection strength too weak.

Movement Patterns of the Sicklefin Lemon Shark, *Negaprion acutidens*, around Tahiti and Moorea, French Polynesia, South Pacific

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Pierpaolo Brena
Aaron Carlisle, University of Delaware
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The sicklefin lemon shark, *Negaprion acutidens*, is globally understudied compared to its sister species the Atlantic lemon shark, *N. brevirostris*. Although it has been heavily targeted by artificial provisioning activities until 2017, its movements are still unknown in the Society Islands, French Polynesia. Here, we used acoustic telemetry to study the residency and movement patterns of the sicklefin lemon shark between June 2014 and July 2015. We deployed 21 receivers on the outer reefs of Tahiti (n=11), Moorea (n=7), and Tetiaroa (n=3), an atoll located approximately 50 km north of Tahiti and Moorea. A total of 17 mature individuals were tagged internally by ingestion or externally using a speargun. Lemon sharks were essentially detected close to their tagging locations around Moorea and in the northeast of Tahiti, while no individuals were detected in the southeast of the study area and Tetiaroa. Activity temporal patterns matched shark-feeding activities timing in the area, suggesting a strong influence of artificial provisioning on their behavior. Globally, the detections mostly occurred during the day, indicating that adult sicklefin lemon sharks use the outer reef during the day and probably move to deeper waters at night. Therefore, the sicklefin lemon shark seems to be highly resident and seems to be impacted by artificial provisioning activities at a small spatial scale. Considering that artificial provisioning is now forbidden in French Polynesia waters, such data is crucial to understand the long-term impacts of this activity on sharks movements and could pave the way for further studies focusing on dishabituation process regarding artificial provisioning in shark species.

Deep Dwellers: The Patterns of Residency and Space Use of Arctic Skates (*Amblyraja hyperborea*) Across a Developing Arctic Fishery Ground

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Understanding residency patterns and space use of a species is key to implementation of sustainable and productive conservation management practices. Characterization of movement patterns of species within an ecosystem can provide insight into why animals use particular habitats, such as for feeding or reproduction, or how movements are regulated by various biotic or abiotic factors. Furthermore, by describing the fine scale movements of a species within an ecosystem, patterns of habitat use, movement corridors, and focal areas can be identified, at both the population or individual levels. Due to the logistical challenges of working in the Arctic, these types of studies have historically been limited compared to temperate or tropical climates. The Arctic Skate (*Amblyraja hyperborea*) is a high latitude, deep water species that is commonly caught as bycatch in both Canadian commercial and indigenous community fisheries. The life history characteristics of skates makes them vulnerable to overexploitation, and careful management is required. In this study, we used acoustic telemetry consisting of 83 receivers to study patterns of movement and residency of Arctic skates in Scott Inlet, Canada, the location of a developing community fishery for Greenland halibut. Our goal is to characterize residency patterns and space utilization of 52 skates across 6 years throughout the community fishing ground. The intent is to elucidate both how the skates distribute themselves within the region as well as identify how sex, size, and reproduction may impact these dynamics. Through understanding these movement metrics, bycatch of Arctic skate can be reduced and appropriate management formulated.

Evaluating the efficacy of pelagic sharks and CTD tag technology for ocean observing applications in the Mid-Atlantic Bight

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Storm forecasting methods rely on accurate, timely oceanographic data and are critical for protecting communities like those along the Mid-Atlantic Bight. However, the efficacy of these methods is limited by the ability to acquire spatiotemporally accurate conductivity, temperature, and depth (CTD) profiles. This project seeks to increase the amount of ocean temperature data available for storm predictions by using sharks for the first time as ocean observing platforms (OOPs), equipped with a powerful new type of biologging CTD tag (Sea Mammal Research Unit [SMRU], University of St. Andrews). The specific objectives of this study are: 1) to develop an algorithm quantifying the effectiveness of different pelagic shark species to serve as OOPs using this new tag; and 2) to validate the mechanical ability of the tag to collect real-time oceanographic data in the MAB for hurricane prediction applications prior to deployment on animals. Initial results of OOP species selection suggest that mobile shark species that employ vertical behavioral thermoregulatory strategies meet candidate platform requirements of time spent at surface and surfacing frequency. Initial results of sensor validation analyses suggest that tag CTD performance is comparable to that of an autonomous glider CTD when sampling a homogenous water column.

Striped Bass Predation may Control Alosid Abundance in Major Rivers (Kahn)

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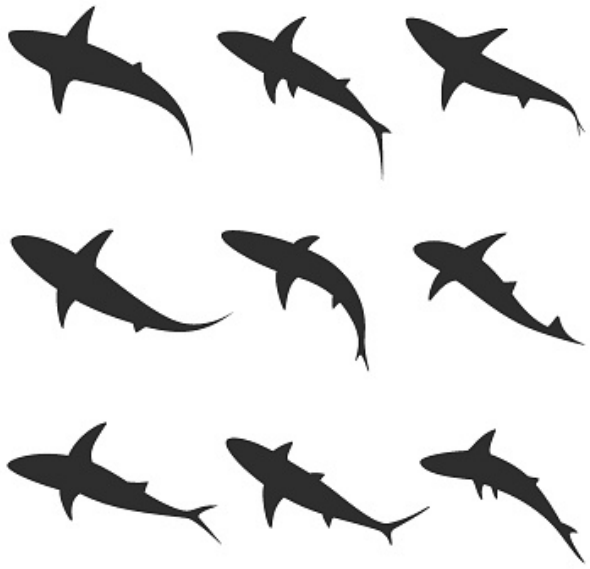
Striped Bass are large anadromous serranids that ascend rivers in the spring on spawning and feeding migrations, simultaneously with spawning migrations of Blueback Herring and American Shad. Several diet studies found that the preferred prey of Striped Bass are members of the Clupeidae, including the genus Alosa. Because the science of ecology has found that primary predators can affect the survival and abundance of important prey, Striped Bass can potentially affect or control the abundance of these alosids. The minimum size regulation for striped bass in coastal jurisdictions is roughly 711 mm. Consequently, the size structure of Striped Bass populations consists of relatively large fish. A spring diet study on the Connecticut River found that the primary diet item for the smallest 90% of Striped Bass was blueback herring, while the largest 10% of Striped Bass fed on adult shad. Two studies on the Hudson estimated Striped Bass predation may control alosid abundance. I tested the hypothesis that striped bass predation controls the abundance of American shad in the Delaware River. An index of relative abundance of Striped Bass in waters of the state of Delaware is highly significantly negatively correlated with an index of relative abundance of the American shad spawning run in the Delaware River. So the hypothesis that striped bass predation currently controls abundance of American Shad was not rejected by this test. If Striped Bass management continues to protect larger fish, and also is able to maintain high abundance of Striped Bass, this hypothesis suggests that restoration of American Shad to high abundance may be difficult to achieve.



Wind Energy and Fisheries Interactions I

Establishing a Research Program for New Jersey's Marine Resources during Offshore Wind Development

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The New Jersey Research and Monitoring Initiative is a new regional research program developed to detect and mitigate potential impacts of offshore wind on wildlife and fisheries. New Jersey is on track to produce 11,000 megawatts (MW) of electricity from offshore wind by 2040, with construction slated to begin in 2024. Certain resources, like commercial and recreational fisheries, marine mammals, and benthic habitats may be particularly vulnerable to effects of construction and operation of the turbines, substations, and transmission cables. Administered by the Department of Environmental Protection in collaboration with our partners at the Board of Public Utilities (BPU), the RMI is developing and funding research projects that are regional in scope, address critical gaps in knowledge, and rigorously designed. Research priorities were established by considering which of New Jersey's marine resources are most vulnerable to offshore wind and stakeholdered with our state working group, state and federal agencies, and regional research organizations. Initial funding has been dedicated to research that requires pre-construction data. Project concepts were designed to answer particular scientific questions using available methods. Research programs with expertise in the resources and methods were identified and encouraged to submit proposals for 2-year, preconstruction work. Proposals were internally and externally reviewed and revised. Extensive engagement and coordination with stakeholders including industry representatives, academic institutions, state and regional entities, and developers has been challenging but has also improved our projects and advanced regional coordination. As we enter the second year of this Initiative, we'll be focused on streamlining our process, developing studies for unaddressed research priorities, adapting research priorities as needed, and continuing to identify partners and build regional connections.

Integration of Environmental DNA Surveys in Fisheries Monitoring Plans for Offshore Wind

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The fish community composition of New Jersey coastal waters and the economic benefits provided by the fisheries they support are the direct result of the current state of the regional continental shelf ecosystem. A concern shared by commercial and recreational fishers, as well as resource managers, is that alterations of the physical habitat of this ecosystem by offshore wind development will change fish community composition, fishing opportunities, and the economy. Well-designed and resilient survey methods built on data collected consistently before, during, and after construction of wind farms are essential to understanding any such impacts of offshore wind development on marine fish community composition. Here, we assess the utility of environmental DNA (eDNA) metabarcoding to collect information on species presence, abundance, and overall biodiversity of fish communities using water samples collected alongside oceanographic conditions before, during, and after construction of a wind farm off southern New Jersey. Environmental DNA sampling is non-extractive, thus minimizing stress to the organisms that are captured, and eliminating sampling related mortality. Further, unlike bottom-tending mobile sampling gear, eDNA sampling can be performed without causing any damage to the benthic habitat, and eDNA does not necessitate the use of fixed vertical lines that can lead to marine mammal entanglements. Finally, eDNA samples can be taken in areas with hard-bottom benthic habitats that cannot be sampled using a trawl or other mobile bottom-tending sampling gear. In conclusion, the continued integration of eDNA alongside ongoing capture surveys will continue to improve efficacy of sampling and processing protocols leading to increasingly reliable results and avenues for including eDNA as a standalone metric in future surveys. We will present initial results and discuss advantages of eDNA monitoring compared to traditional sampling techniques such as trawling while yielding similarly reliable results.

Modeling Interactions Among Commercial Shellfish Fishing and Wind Energy

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The lucrative shellfish fisheries operating on the Northeast U.S. continental shelf are highly vulnerable to impacts from offshore wind energy development because of the overlap of large areas proposed for wind energy and fishing grounds, limitations to access for bottom-tending gear towed by large vessels, and the high value of the landed product. The economic impacts of future offshore wind farms on these fisheries are evaluated using a modeling framework that integrates spatial dynamics in stock biology, fishery captain and fleet behavior, federal management decisions, and fishery economics. The simulations implemented with the model consider the impacts of proposed wind array configurations on the fisheries that result from anticipated vessel responses to array and turbine locations and responses of stock population dynamics to changing environmental conditions. The simulations are constrained by stock assessment data and detailed input from industry advisory teams about fleet and captain behavior. The model will also be implemented to project responses and consequent impacts on the fishery resulting from stock range shifts, as may occur with climate warming, rotational closures, and management changes. The simulation results provide understanding and identification of the costs to these shellfish fisheries and their surveys produced by displacement or changes in fishing activity due to wind energy and a warming climate. This information is critical for industry and fishery managers to assess approaches for mitigating interactions between commercial fisheries, the growing offshore wind industry, and changing environmental conditions.

Wind Energy and Fisheries Interactions II

An Introduction to Community Offshore Wind (Robins)

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Community Offshore Wind, a joint venture between RWE Renewables and National Grid Ventures, is in the early stages of site investigation work in lease area OCS-A 0539, located 32 nautical miles east of New Jersey and 56 nautical miles south of Long Island, New York. The project's fisheries team is actively engaged in fisheries outreach and planning for the development of its fisheries monitoring and mitigation plans.

Aquaculture II

Environmentally-driven Oyster Microbiome Dynamics in the Delaware Bay

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Oysters living in the Delaware Bay can be found along salinity and nutrient gradients that may be correlated with microbiome dynamics. This community of bacteria is consequential for the humans who consume oysters, and likely plays a role in the health of the oyster itself. To study temporal and spatial patterns in the oyster microbiome, we applied next-generation sequencing techniques to characterize the bacterial communities present in oysters and the ambient water. From April to October 2021, bi-monthly samples of oyster mantle tissue and surface water were collected from three subtidal oyster beds in the Delaware Bay. The 16S rRNA operon was sequenced using the Oxford Nanopore Technologies MinION to yield strain-level resolution of the bacterial community. Additionally, these subtidal oysters were compared to intertidal aquacultured oysters that were sampled with the same methods as part of another study. Oysters maintain a microbiome that is distinct and more diverse than the surrounding water, although they are constantly exposed to seawater bacteria through filter-feeding. Seasonallydriven trends in the microbiota of both water and oyster samples were evident in the dataset. Geospatial differences were not statistically significant, reflecting the thorough mixing of water masses in this tidal estuary. These subtidal oysters were significantly different from the intertidal oysters found on the Rutgers farm at Cape Shore, but had a fair amount of overlap in the early summer and late fall. Although pathogens of human concern such as vibrios often receive much attention in oyster microbiome studies, these species were relatively rare within the dataset. Strain-specific microbiome studies like this will greatly expand our understanding of the environmental drivers of oyster microbiome dynamics, as well as its consequences for both oyster and human health.

Effect of Oyster Farms on the Distribution of Horseshoe Crab Eggs and Other Rufa Red Knot Foraging Resources

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Delaware Bay hosts the world's largest spawning population of horseshoe crabs (*Limulus polyphemus*, HSC) and is therefore the primary migratory stopover site for the federally threatened rufa red knot (*Calidris canutus rufa*). Red knots time their spring circumpolar migration to capitalize on the abundant HSC eggs in Delaware Bay. The resurgent eastern oyster (*Crassostrea virginica*) aquaculture industry in this region may alter this trophic interaction by influencing access to foraging resources (i.e. farm avoidance, change in prey distribution). Research shows that foraging behavior is not impacted by the presence of farms, although the probability of shorebird presence is reduced by 2-7% while farms are tended. Oyster farms do not impact HSC access to spawning beaches; however, it is unknown how they may impact the distribution of eggs or other red knot prey. In Spring 2021, benthic sediment surveys were conducted in four paired farm-control plots (90 m x 180 m) across a 3.5-km stretch of tidal flats in Delaware Bay. Sediment cores determined the relative abundance of surficial eggs and other potential prey across each plot. Preliminary analysis (AIC model selection with generalized linear mixed effects models) indicated that HSC eggs and potential alternative prey resources vary across the intertidal zone. Horseshoe crab eggs were the most abundant prey, but they were concentrated on the beach. Bivalves, gastropods, and polychaete worms were often more abundant on the tidal flats than the beach. Red knots foraging on tidal flats may be consuming these other prey types that were more abundant than HSC eggs on the flats. Potential prey abundances were similar in farm and control plots, regardless of intertidal zone and prey type. These findings suggest that oyster farms do not affect the distribution and abundance of rufa red knot prey resources.

Shellfish Growth and Seasonal Water Factors

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Shellfish growth in our local Barnegat Bay region is confined to a short season ranging from mid May through early November. Chlorophyll abundance and the type of plankton species available are key factors in shellfish growth as filter-feeding bivalves thrive with abundant and widely available food sources. This study focused on tracking shellfish growth, chlorophyll abundance, water temperature, salinity, and speciating plankton at each ReClam the Bay upweller site in an effort to better understand seasonal effects on shellfish during peak growth season. Each of the eleven total sites were sampled weekly with temperature, salinity and growth data taken on site, while phytoplankton and chlorophyll abundance samples were taken and preserved for analysis later in the day. Results indicated that both oyster and clam growth displayed a correlation to chlorophyll abundance levels ($p<0.05$ two-factor ANOVA). Between sites, sites with higher chlorophyll abundance also displayed higher growth rates than those with lower abundance. Rising seasonal temperatures correlated with the increase in chlorophyll abundance and diversity of plankton species, with dinoflagellate presence in early to mid August in multiple sites. Salinity varied by a maximum of six parts per thousand at each site based on various rainfall and tidal events, and had little effect on the other observed parameters. Overall, chlorophyll abundance can be used as an effective indicator for which sites will have higher shellfish growth when paired with other seasonal factors like water temperature and salinity to explain discrepancies.

Assessing habitat enhancement on a subtidal oyster restoration site in Barnegat Bay

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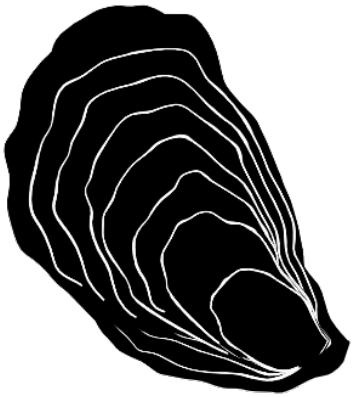
Loss of oyster reefs and their associated ecosystem functions has been a critical issue for many US estuaries, including Barnegat Bay. In 2016, the Tuckerton Reef was created in lower Barnegat Bay by planting spat-on-shell oysters on the bottom to create habitat and restore ecosystem function. From 2019-20, nekton and associated macrofauna were surveyed using traps and substrate baskets to assess habitat enhancement. Unbaited mesh traps were deployed in June, July and September both years at different locations within the reef and a mud bottom control area. There was a 40-60% increase in nekton species and abundance on the oyster reefs compared to the control site for all fish trap samples during this study, however, no significant results were seen between species richness and abundance mostly likely due to changes in community structure throughout the sampling period. Substrate baskets were deployed to test how three different reef substrates (natural shell clusters, whelk-only and oyster-only) support a mobile reef-dependent community. Overall, oyster shell and natural shell clusters, supported more species, having the most shells per unit area, but any type of hard substrate capable of sustaining live oyster clusters should be considered in subtidal restoration projects in Barnegat Bay. The Tuckerton Reef has shown promise for enhancing fish and macrofaunal habitat, though differences with reef location and seasonal patterns obscured significant findings during the study period.



Crustaceans

Blue crab population dynamics in northern estuaries

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Climate change is altering species' distributions and abundances, underscoring the importance of modelling and forecasting population-level responses, especially for heavily exploited fisheries. For species constrained by minimum temperature in habitats near the poleward edges of their range, warmer waters may confer opportunities for enhance population growth. Blue crab (*Callinectes sapidus*) populations in New York estuaries are near their northern range edge and are limited by winter severity. As northeast US winters become warmer, shorter, and milder, it has been hypothesized that these populations may experience elevated growth rates due to lower winter mortality, higher growth rates and the synergistic relationship between these physiological processes, suggesting that warming can lead to range expansion and/or higher abundances in northern habitats. Using fisheries independent trawl survey data from two New York State (NYS) estuaries, the Peconic Bay (PB) and Great South Bay (GSB), and Narragansett Bay (NB) in Rhode Island, we observed some evidence of synchronous patterns in relative abundance. Although the GSB time series is shorter than PB and NB, catch-per-unit-effort (CPUE), increased, which was likely driven by higher numbers of new recruits in the later years. We also derived seasonal von Bertalanffy growth parameters and computed mortality using a length converted catch curve in GSB. From these and empirical estimates of natural mortality (M), we computed a range of probable fishing mortality (F). From 2014-2020, mortality increased due to either elevated M or greater exploitation, although uncertainty in natural mortality can produce biased F. Recruitment in GSB increased since the inception of the trawl survey, but whether this is ubiquitous in the region is unclear because neither of the other two surveys sample young-of-the year reliably.

Examining the impact of derelict pots and active fishing on Blue Crab (*Callinectes sapidus*) catch and harvest within a recreational fishery

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The commercial Blue Crab (*Callinectes sapidus*) fishery is the highest yielding and most profitable fishery in the state of Delaware, with crab pots representing one of the most frequently used gear types. However, the abandonment or loss of crab pots or similar pot-style, fishing gears is an all-pervasive problem that occurs throughout the US in commercial and recreational fisheries alike. Derelict pots were found to induce a variety of unfavorable ecological and economic impacts, including a reduction in commercial Blue Crab harvest in a Mid-Atlantic estuary (DelBene et al. 2019, 2021). In response to these concerns, we set out to identify how actively fished and derelict crab pots from an exclusively recreational Blue Crab fishery affect the catch rates of Blue Crabs in Indian River Bay, DE over a thirty-day period for two years. Three spatial regions were chosen as representative study sites with four relative states of habitat degradation (no active or derelict gear present, active gear present-derelict gear absent, active gear absent-derelict gear present, active and derelict gear present, each area approximately 20 m in size) in two tributaries (Collins Creek, and White Creek) of Indian River Bay, DE. Preliminary results from both years suggest that the average CPUE of Blue Crab varied among the different relative states of habitat impairment, as well as between tributaries and regions. Our results suggest that the presence of derelict crab pots impacts the catch and harvest of Blue Crabs within a recreational fishery by removing the possibility of some crabs from being harvested and may have unique spatial effects when combined with the relative concentration of crabs in a particular tributary.

Population Dynamics and Biogeography II

Length-based assessment of lenok (*Brachymystax lenok*), burbot (*Lota lota*), and Hovsgol grayling (*Thymallus nigrescens*) population status in Lake Hovsgol, Mongolia

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Olaf Jensen, University of Wisconsin-Madison

Despite the global importance of inland fisheries for food security and recreation, there is often limited data available to assess their status. In the absence of formal stock assessments, managers have limited scientific guidance with which to set regulations or develop conservation strategies. Data-limited stock assessment methods which use length frequency data offer a potential approach to expanding the application of stock assessments to inland fisheries. We used one of these methods, length-based spawning potential ratio (LBSPR), along with life history parameters from published literature and five years of fisheries-independent survey data, to assess the status of three threatened species in Lake Hovsgol, Mongolia, including Hovsgol grayling (*Thymallus nigrescens*): an endangered, endemic species. Data-limited models have proven to be useful tools for estimating the population size and structure of inland fish populations. When used with time-series data, they can both inform estimates of current stock status and aid predictions about future changes to populations.

Raritan–Sandy Hook Bay Complex Fishery Resource Inventory

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New Jersey Fish and Wildlife has not routinely sampled the Raritan – Sandy Hook Bay Complex since the 1980s and has never performed long term fisheries monitoring in the system, despite it being one of New Jersey's major estuaries. In 2022, the Bureau of Marine Fisheries initiated a multi-gear (otter trawl, gillnet, seine) inventory project in the Raritan Bay – Sandy Hook Bay Complex to identify and quantify estuarine-dependent finfish, crustaceans, and their forage items. From March to October, sampling consists of 16 otter trawl samples, 16 seine samples and 12 gillnet samples each month. All sites are randomly selected, stratified by longitude and depth. In 2022, over 88,000 individuals were caught, representing multiple life stages from over 70 different species. Among the three gear types, Atlantic Menhaden was, by far, the most abundantly encountered species. Environmental DNA (eDNA) samples were collected alongside trawl (n = 72) and seine (n = 47) samples for catch-composition comparison. The survey is currently funded through 2025, but is anticipated to continue beyond that, allowing for multi-year comparisons and integration into stock assessments and management decision making.

Selective distribution of summer flounder, *Paralichthys dentatus*, off New Jersey, and its implication for management

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Summer flounder, *Paralichthys dentatus*, is one of the most sought after species for marine recreational anglers in New Jersey. In recent years, however, angler satisfaction has been low. A high minimum size limit makes it difficult for anglers in many areas to find legal sized fish and results in a large number of released fish, leading to frustration and concerns with discard mortality. Further, many anglers are also under the misconception that all fish over 18” are females, creating a concern that regulations are negatively affecting reproductive potential by focusing effort on breeding females. Anglers and industry advisors consistently request regulations that reduce discards, increase angler success, and reduce harvest pressure on breeding females. I analyzed data from three ocean trawl surveys that occur offshore of New Jersey, from shore out to over 250 meters depth, to evaluate summer flounder distribution by size, sex, and depth. Preliminary results indicate that during the peak recreational season, large males do occur, but generally at depths outside the traditional fishery. These findings suggest it will be difficult to both increase trip success and moderate the sex ratio of the harvest.

Population dynamics of common nearshore forage fishes in the Delaware Inland Bays, USA

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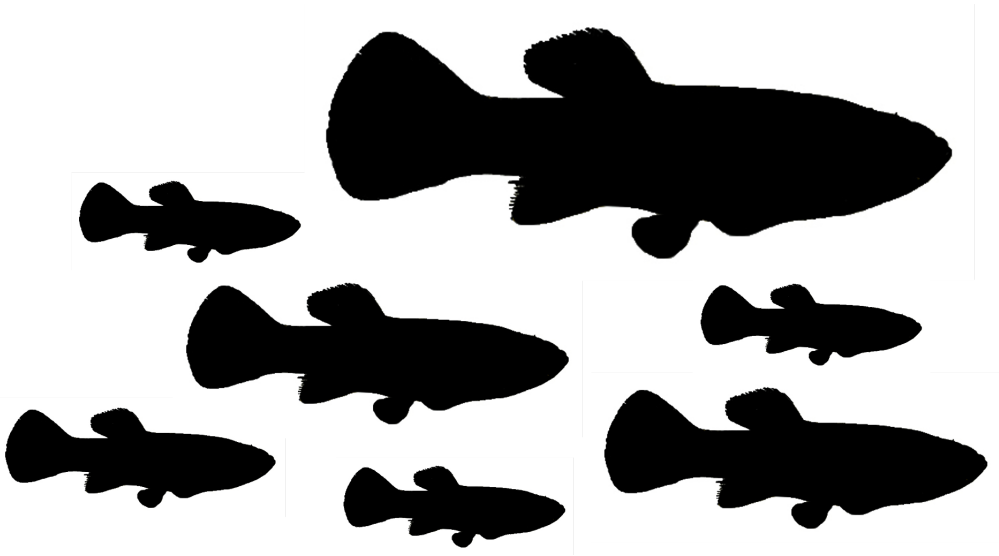
In the Mid-Atlantic, four species of forage fish, *Menidia menidia* (Atlantic Silverside), *Fundulus heteroclitus* (Mummichog), *Fundulus majalis* (Striped Killifish), and *Cyprinodon variegatus* (Sheepshead Minnow) account for a large proportion of nearshore fish abundance in estuarine environments, and are important food sources for state and federally managed predatory species. The population dynamics of these species are poorly understood and factors affecting their populations are largely unclear or unknown. Beach seine samples were collected in the Delaware Inland Bays over nine years (2011-2019), with indices and trends in abundance, as well as climatic and biotic drivers of population changes investigated at both combined estuary and individual bay scales. Results show extreme variability in species abundances between years, and long-term (9 years) declines in abundance of Mummichog and Sheepshead Minnow at both the combined estuary and individual bay scales. Spring river discharge affected Mummichog and Sheepshead Minnow abundance, and Sheepshead Minnow showed a strong negative correlation with Summer Flounder abundance. These data quantify the variability in abundance for an important portion of the forage base in Mid-Atlantic estuaries, and should be considered as fisheries management shifts away from single-species approaches and recognizes the forage needs of managed species. Results indicate that even commonly encountered species can consistently vary through time, and emphasize the need to examine other important but poorly studied forage species.



Poster Presentations

Listed in alphabetical order by presenting author's last name

Key:
* = presenting author
‡* = graduate student presenting author
†* = undergraduate student presenting author

Video Documentation of the Marine Community Using as Oyster Farm as Habitat Near Barnegat Bay, NJ

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Shellfish growers routinely observe fish and invertebrates interacting with their aquaculture gear. To quantitatively assess these observed interactions, point-of-view (GoPro) cameras were used to document fish activity in and around oyster cages, floating bags, and a natural marsh habitat on an oyster farm in the Little Egg Harbor region of Barnegat Bay, New Jersey in 2019. At least 30 species from 4 phyla were observed across all days and sites. Nekton abundance was determined using MaxN, defined as maximum number of individuals of a given species present within each 1-minute segment of video. Species of both ecological and economic importance in the local ecosystem utilized the farm gear as habitat. Young of the year and juveniles of a given species were observed, suggesting that the oyster farm may support the natural nursery function of the marshes. Atlantic Silverside (*Menidia menidia*), mummichog (*Fundulus heteroclitus*), and grass shrimp (*Palaemonetes* spp.) had the highest number of individuals observed among the 12 sampling days. Then MaxN was lower when there was farm activity occurring compared to observations collected when there was no farmers present. On average it took 2.25 minutes for fish to return to the gear after a human disturbance. This collaborative work is part of an ongoing effort initiated in Long Island Sound by the NOAA Milford Lab and is working towards a comprehensive regional network characterizing and evaluating fish habitat provisioning on off-bottom oyster farms. This research is being used to help inform decision making in the permitting process of shellfish aquaculture leases, as the gear has the potential to mimic the function of natural surrounding habitats.

Strengthening New Jersey's Commercial Fishing Ports through Climate Resilience Planning

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Lisa Auermuller, Jacques Cousteau NERR

Fisheries science and management often focus on addressing biological objectives related to climate change impacts, but there are also many important socio-economic issues including the resiliency of shoreside infrastructure and businesses. Commercial fishing ports in New Jersey have considerable variability in both their fishery dynamics and shoreside infrastructure, which has been exposed to increasing frequency of flooding from storms and sea level rise. Additionally, in response to climate change and other factors, the productivity and distribution of many fisheries resources have been shifting, which impacts commercial fisheries dynamics. The objective of this project was to assess and improve the resiliency of New Jersey's commercial fishing industry to climate change impacts. A fisheries resilience checklist was adapted to New Jersey's commercial fisheries based on others developed for the Gulf of Mexico and Alaska. This checklist was intended to help commercial fishing industry stakeholders to assess the resiliency of commercial fishing communities and businesses to storms and other coastal hazards, as well as changes in the productivity and distribution of fish populations. The resilience checklist focuses on hazard assessment, disaster preparedness, disaster recovery, and fisheries dynamics. It also provides online resources that can be used to learn more and develop solutions to improve resilience. This checklist has been developed and refined in collaboration with resource managers and commercial fishing industry stakeholders from the ports of Belford, Barnegat Light, Cape May, and Port Norris. Products from this work will continue to help improve the resiliency of New Jersey's commercial fishing ports to climate change impacts and to identify ways to increasingly consider these issues in fisheries management decision-making for New Jersey and other northeast states.

Spatial and temporal occurrence of the Endangered Atlantic Sturgeon (*Acipenser oxyrinchus*) at Naval Weapons Station Earle

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Sandy Hook Bay (SHB) and Raritan Bay (RB) are highly urbanized waterbodies located within close proximity of known Atlantic sturgeon coastal aggregation and freshwater spawning sites in the Hudson River. While Atlantic sturgeon have been historically documented to occur in SHB and RB, no formal surveys have been conducted to identify their presence or occurrence within the bays. The purpose of this project was to determine the presence and seasonality of Atlantic sturgeon within this area through the use of acoustic telemetry. Working cooperatively with Naval Weapons Station Earle, six acoustic receivers were deployed in spring of 2016 in SHB and expanded to RB in 2018 to monitor for previously tagged Atlantic Sturgeon. A total of 304 uniquely tagged individual Atlantic sturgeon were detected (n=240,033 detections). Detections showed a presence of Atlantic Sturgeon in both Sandy Hook and Raritan bays with strong temporal and spatial patterns with some fish displaying high residency times. Atlantic sturgeon largely came from the NYB Distinct Population segment but some came as far as south as Chesapeake Bay (MD) and Edisto River (SC), indicating that multiple DPSs utilize the area. This acoustic detection data indicates that the region may represent an important late spring – early summer habitat, therefore spatial and temporal management may be needed to protect this region against localized threats within this shallow urbanized bay (e.g. commercial fishing, high speed ferries, and large ship traffic) during these periods.

Impact of Rising Sea Surface Temperature on Length Frequency Distribution in *Gobiosoma ginsburgi* Over a 16 Year Time Period

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Increased water temperatures affect larval growth in Gobiosoma (gobies) by increased yolk sac absorption. By reducing the food source, larvae are less likely to grow as large and survive as long. With reduced lifespans, a species is less likely to reach spawning age and sustain a steady population growth rate. NOAA indicates an increase in the global average of sea surface temperature from 1991-2007, doubling from 0.192F to 0.426F. Dr. Christensen's research, collected in the Great Bay Mullica River Estuary, NJ, contains data for five species of Gobiosoma. Her data was collected in a process of three tows per night, with measurements on fork, standard, and total length. This report focuses solely on the *ginsburgi* species. *Ginsburgi* populate the East coast of the US, commonly from Massachusetts to Florida. Dr. Christensen's data on *ginsburgi*'s total lengths (TL in mm) (1991-2007) is used to investigate a possible observable change in TL, and if it could be attributed to rising sea temperatures due to climate change. Using RStudio, three figures were produced to showcase the distribution of TL for each relative year, the frequency of TL, and the yearly average TL correlation to average temperature.

Evaluating if a Modification to Commercial Sea Scallop Dredges can Reduce Bycatch and Increase Catch Efficiency

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Atlantic sea scallops (*Placopecten magellanicus*) represent a valuable commercial fishery in the northeast US. Although current scallop dredge configurations allow some bycatch to escape, non-target species are still retained. In this study, a modification was made to the current legal dredge to allow changing the angle of the cutting bar relative to the seafloor. This modification was intended to create greater turbulence behind the cutting bar and lead to small sea scallops and some bycatch being ejected from the twine top before entering the chain bag. To evaluate how adjustments made to the angle of the modified cutting bar impacted bycatch and catch efficiency, paired tows (n=149) were conducted with the modified dredge and a standard commercial dredge in the US Mid-Atlantic (Summer and Fall 2019, Spring 2022) and on Georges Bank (Summer 2021). Four angles were tested: 15-, 30-, 45-, and 60-degrees. Results from the first trip in August 2019 indicated that tows (n=32) conducted at 15- and 30-degrees resulted in little to no reduction in bycatch. Remaining tows (n=117) were therefore split between 45- and 60-degree angles. With the cutting bar set at either 45- or 60-degrees, there was a statistically significant reduction (up to 87%) in bycatch of almost every commonly caught bycatch species, including economically important species like summer flounder and monkfish. There was also a significant reduction (up to 61%) in the amount of debris (shell, sponge, sand dollars) in the modified dredge compared to the standard dredge. In addition, there was a small (~10%) but statistically significant reduction in scallop catch. However, some fraction of these unretained scallops were small (<100mm) and would have been discarded anyway. While preliminary, these results suggest the modified scallop dredge could significantly reduce bycatch and catch sorting time.

Fish and crab assemblage in an urban shallow water habitat enhancement area as sampled by traps

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Shallow oyster reefs and shoreline waters provide important nursery and growth habitat to fish and crabs by virtue of structural predation refuge, shoreline subsidies, solar illumination, warmth, and decreased turbulence relative to deep water. Urban shorelines frequently lose habitat function by cutting off subsidies, dredging, deepening and shading bottom, and modifying sediment deposition and transport. Enhancement along the west side of New York City/Tribeca in waters of the Hudson River Park Trust seeks to renew functionality. Ecological analogues of shallow water oyster reefs – gabions and reef balls with settled oyster spat -were placed on otherwise soft sediment shallows in mesohaline water. Fish and crab response (assemblage and abundance) will be assessed over 5 years in a Before-After-Control-Impact design. Traps of two types target recently settled and small adult taxa that would use shallow shoreline habitat. Two lines of eight traps each were deployed in a control area and three similar lines in the enhancement area. In the first year, 529 fish and crabs were collected over 12 weekly trap recoveries between July and September. *Centropristis striata* (n = 217), *Opsanus tau* (n = 162), *Callinectes sapidus* (n =102) and *Libinia* spp (n = 56) were the most abundant species, while 13 of 21 taxa were represented by only three or fewer individuals. Catch was similar in both areas with 1.19 individual per trap per week in the Control and 1.26 individual per trap per week in the Enhancement area. Further analysis will examine the effect of trap proximity to individual reef elements.

Stock Origins, Micro-Habitat Preference, and Population Health of *Morone Saxatilis*

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Striped bass are the most sought-after inshore game fish on the east coast, generating tourism, business, and industry for New Jersey. However, there is ambiguity around the micro-habitat preference, migrational behavior, and stock origins of an important recreational, commercial, and ecological marine resource. Though the general migration patterns of spawning size striped bass are somewhat understood, there are nuances across fish size and age. The behavior of smaller bass is very different from the larger spawning size bass, and the former's behavior will vary across different areas. Striped bass have high fidelity to the spawning grounds in which they were hatched. The Jersey shore is not a major spawning ground, but rather a highway of mixed-migratory groups of stripers during spring and fall. The derived proportions from the major (and minor local) spawning grounds of this migratory stock are unclear. With the use of tagging instrumentation, catch logs, and scale and tissue sampling followed by DNA sequence comparisons, clarity maybe gained on 1) changes in migration and location preference and 2) the extent to which each spawning ground contributes to our local mixed-migratory stocks, and possibly illuminate differences between that of the fall and spring groups.

Investigating the Overlap Between the Mid-Atlantic Bight Cold Pool and Offshore Wind Lease Areas

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The Mid-Atlantic Cold Pool is a seasonal mass of cold bottom water that extends throughout the Mid-Atlantic Bight (MAB). The Cold Pool forms from rapid surface warming in the spring and dissipates in the fall due to mixing events such as storms. The Cold Pool supports coastal ecosystems and economically valuable commercial and recreational fisheries along the MAB. Offshore wind energy has been rapidly developing within the MAB in recent years. Studies in Europe demonstrate that existing wind lease areas can impact seasonal stratification; however, there is limited information on how MAB wind development will affect the Cold Pool. Seasonal overlap between the Cold Pool and wind lease areas in the Southern New York Bight along coastal New Jersey was evaluated using a data assimilative ocean model. Results highlight overlap periods as well as a thermal gradient that persists after bottom temperatures warm above the threshold typically used to identify the Cold Pool. These results also support cross-shelf variability in Cold Pool evolution. This work highlights the need for more focused ocean modeling studies and observations of the Cold Pool and MAB wind lease area overlap.

Optimizing regulations for New Jersey's multi-species recreational bottomfish fishery: a discrete choice-based approach

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Marine recreational fishing is a popular activity that provides significant socioeconomic benefits to coastal communities in New Jersey. Following the establishment of catch targets by regional fisheries management councils for most species, many different regulatory options could be used to achieve these target harvests. While these options are equivalent in terms of their impact on the fish populations, their economic and social implications may be quite different. The goal of this research is to improve our understanding of the preferences, behaviors, and motivations of recreational anglers in New Jersey in order to inform the development of management measures which meet conservation objectives and maximize the socioeconomic benefits of recreational fishing. Here, we seek to distribute a combined discrete choice experiment (DCE) and questionnaire survey to recreational anglers in the New Jersey Saltwater Angler Registry to document anglers' regulation preferences in the multi-species bottomfish fishery targeting summer flounder (*Paralichthys dentatus*), black sea bass (*Centropristis striata*), tautog (*Tautoga onitis*), and scup (*Stenotomus chrysops*). The DCE will help to analyze anglers' regulation preferences when forced to make trade-offs between different regulation options. The DCE choice sets present anglers with two fishing trip options that differ in terms of regulation levels, along with options to either fish for a non-bottomfish species or not go fishing at all. A multinomial logistic model will be used to quantify anglers' utility given tradeoffs in regulation attributes, i.e. a larger minimum length limit but an increased bag limit for black sea bass.

Conservation of Ironcolor Shiner: an imperiled minnow in the mid-Atlantic

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The Ironcolor Shiner (*Notropis chalybaeus*) is a freshwater minnow that is native to North America. They are distributed along the lowlands of the Mississippi River, and the coastal plain regions of the Atlantic and gulf slopes. Ironcolor Shiner are of conservation concern throughout much of their range, and their decline has been attributed to habitat loss, predation by non-native fishes, and water quality degradation. In New Jersey, Ironcolor Shiner have been proposed for listing as an endangered species. To inform restoration and conservation planning, we are assessing the feasibility of environmental DNA (eDNA) for detecting populations of Ironcolor Shiner, and using traditional methods such as electrofishing, seining, dip netting, and visual surveys to confirm eDNA detections and identify populations. In 2022, we compiled museum and historical records from the Academy of Natural Sciences and New Jersey Division of Fish and Wildlife. These records indicated that Ironcolor Shiner were restricted to two watersheds in the state of NJ: the Maurice and Pequest Rivers. Using these data as a guide, eight locations in the Maurice River drainage were surveyed to identify Ironcolor Shiner populations (i.e., known locations) using traditional methods. We identified populations at two locations in the Maurice River drainage, and found visual surveys combined with seining and/or dip netting were the most effective traditional methods for identifying populations. Environmental DNA samples were collected at the two known locations in the Maurice River, one known location in the Pequest River, one known location in Pennsylvania, and at one negative control location. Environmental DNA results are pending and will be discussed. Traditional survey and eDNA results will be used to guide a more comprehensive survey of Ironcolor Shiner distribution in 2023.

New Jersey Recreational Fisheries Surveys and the Challenges Brought About by Covid-19.

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New Jersey Fish and Wildlife's Marine Fisheries Bureau conducts several recreational fisheries surveys throughout the calendar year. The Access Point Angler Intercept Survey (APAIS) and the For-Hire Telephone Survey (FHTS) are two surveys New Jersey conducts under NOAA's Marine Recreational Information Program (MRIP). Valuable data is collected and used for the management of numerous fisheries. Each survey has their own obstacles to overcome during any given year but 2020 was far from a normal sampling time period. The COVID-19 pandemic came swift and changed the landscape of work environments as well as social interactions. Health and safety concerns caused unique procedures to be put in place for New Jersey's workforce which changed how we collect the data. The design of these recreational surveys requires constant interaction with thousands of stakeholders every year. These exchanges are crucial for the success of the surveys and were put in jeopardy by the challenges brought about by COVID-19. New Jersey was able to overcome many of these obstacles and successfully conducted both the APAIS an FHTS during this time.

Occurrence of the Atlantic Angel Shark, *Squatina dumeril*, along the coast of New Jersey

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Globally, Angel sharks (*Squatina* spp.), are one of the most threatened genus of sharks with more than half of the 22 extant species current classified as Threatened on the IUCN red list. Atlantic angel shark (*Squatina dumeril*) is a “data deficient” species that ranges along the east coast of the US and is currently federally prohibited from being harvested. Distribution of this species along the east coast has been found to vary with depth and season. The objective of this study was to evaluate the spatial and temporal distribution of Atlantic angel shark in NJ waters, through analysis of a long-term coast wide offshore bottom trawl survey conducted by the NJDEP. From 1988-2022, 101 Atlantic angel sharks were captured within 6,022 bottom trawls that were conducted along the coast of NJ from Sandy Hook to Cape May. The highest Angel shark captures occurred off southern New Jersey in the summer season (n=94), in water depths less than 30 m. Atlantic angel sharks size distribution ranged from 71- 210 cm TL, with a mean size of 108.5 (±25.2 S.D), indicating that most sharks caught were mature. A small subset of sharks (n=5) were surgically implanted with Vemco acoustic transmitters to evaluate long-term movements within this region. Sharks were detected at 22 different sites (n=1,388 unique detections) along the coast with majority of the detections occurring off of MD and NC. This information shows a strong seasonal distribution of Angel sharks within our region. Since Atlantic angel shark populations with the US are “data deficient”, this information can is important in the understanding and conservation of this species.

Changes in Fish Assemblage Structure in Headwater Streams Along a Gradient of Forest Cover

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Headwater fish assemblages in the Mid-Atlantic region can be susceptible to small changes in land use. Our objective was to determine a threshold at which these assemblages change in response to decreasing amounts of forest cover. We found three distinct assemblage structures in this region: eurythermal, warmwater, and coldwater. These assemblages were associated with different landscape and local variables. We also found that brook trout abundance significantly decreased when forest cover fell below 95%. Brown trout displayed an inverse relationship with forest cover compared to brook trout with the highest abundances occurring between 45-60% forest cover. High IBI scores were observed in all forest cover increments ranging from 45-97%; however, below 95% forest cover IBI scores displayed higher amounts of variability.

Shell Hash Cover as a Deterrent of Ray Predation on Hard Clam Farms

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Environmental change has presented new challenges for hard clam farmers, while a growing demand for limited shellfish leases creates a pressing need to use idle farm leases. The objective of this project was to use farm-scale, collaborative experiments to assess shell hash as a deterrent of cownose ray predation. If successful, this strategy would support methods to use hundreds of idle New Jersey deep-water clam leases, while reducing labor costs. It will also provide background information about potential increases in natural clam recruitment at sites planted with shell. In this experiment, we evaluated hard clam seed survival and growth at three replicate plots of each of three treatments (9 plots total): unshelled bottom, shelled bottom, and predator screens. Results showed that the shell planted on the shelled treatment plots remained stable in terms of fragment distribution over the 20 months of the experiment. Further, the shelled treatments supported twice the survival of planted seed, and twice the recruitment of new clams. Clam seed on shelled plots grew at the same rate as that observed at control and netted plots. Finally, rays were tagged and observed using telemetry within and around the experimental plots, providing evidence that this technique for observing predator behavior is feasible in back bay habitats and on clam farms.

Fisheries monitoring of an offshore windfarm: surveying structure-associated species off southern New Jersey

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Fishery monitoring plans (FMP) are critical for evaluating potential impacts of offshore wind development on natural resources. A comprehensive FMP for Ørsted's Ocean Wind 1 windfarm off New Jersey has been developed using several different extractive (bottom trawl, trap, hook-and-line, surfclam dredge, acoustic tagging) and non-extractive (eDNA, baited remote underwater video, towed camera, autonomous gliders) fisheries surveying methods. Surveying will occur for six years (2022-2028) with two years of surveying planned for before, during, and after windfarm construction. Our Structured Habitat Survey (SHS) was designed to evaluate the impact of windfarm construction on species typically associated with structured habitats. This survey simultaneously deploys two extractive gears, Chevron traps and hook-and-line, and one non-extractive gear, that includes both benthic and pelagic baited remote underwater videos (BRUVs). Survey stations include impact sites within the windfarm at locations where turbines will be constructed, control "phantom" turbine sites which will remain sand habitat, and control shipwreck sites which will remain structured habitat. Seasonal surveying (six days/season: winter, spring, summer, and fall) will permit evaluation of seasonal variability.
Catch-per-unit-effort data will be calculated from the trap and hook-and-line sampling to investigate changes in relative abundance of species important to commercial and recreational fisheries. Similarly, video footage from BRUV deployments will be analyzed to derive measures of relative abundance and efforts are ongoing to develop statistically robust subsampling methods of video footage. Results from this survey will permit evaluation of the impacts of windfarm construction on fisheries resources off southern New Jersey and inform surveying methods employed for FMPs at other windfarms.

Notes on the occurrence of Northern Snakehead in a mid-Atlantic lake system: 15 years of monitoring

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Northern Snakehead (*Channa argus*) are voracious predators capable of disrupting aquatic ecosystems. Northern Snakehead were first introduced to Pennsylvania and the Delaware River watershed in 2004. The population located within Franklin Delano Roosevelt Park (FDR), Philadelphia, PA, has been monitored by boat and backpack electrofishing from 2004-2021 excluding years 2018-2020. Our objective was to summarize common population characteristics and compare these with other non-native Northern Snakehead populations. We found seven year-classes based on otolith interpretations and aged fish to 8 years old. Size ranges 14-22 cm and 34-42 cm were the most abundant, with 40 % and 26 %, respectively, of individuals collected (N=160) falling into these ranges. Length-at-age and relative weight data, indicated that the FDR population was slower growing and lacked larger individuals relative to other populations. Backpack electrofishing in 2005 and 2008 indicated decreased densities of all fish species (N=11) except Northern Snakehead, over this time-period. Stomach contents were evaluated by dissection and documented feeding on American Eel (*Anguilla rostrata*), Bluegill (*Lepomis macrochirus*), Pumpkinseed (*Lepomis gibbosus*), Banded killifish (*Fundulus diaphanus*), and Largemouth Bass (*Micropterus salmoides*), suggesting impacts to these fish populations.

E3: eDNA, Estuaries and End Users: Standardized eDNA sampling to support resource management in the National Estuarine Research Reserves

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We are conducting a collaborative eDNA (environmental DNA) monitoring program at ten estuaries in the National Estuarine Research Reserve System (NERRS) to directly address needs identified by local resource managers. The NERRS is a network of 30 coastal systems with a mission to conduct both research and outreach. Supported by NOAA and local agencies, they are closely connected to local resource managers. Water samples are collected quarterly at 5 locations within each reserve. DNA extracted from the samples are analyzed to detect fish species, as well as a range of marine plankton, birds and other species of interest. Reserve staff at each site collect water samples, interpret results, and work with their local end users to determine how/if the eDNA information is useful. We are working together to refine protocols to collect, analyze, and present eDNA data that are practical, streamlined, but effective. Questions include: What aquatic species can we detect? How does eDNA-based monitoring compare to traditional fish surveys? What is the relative cost of these methods? In the first quarter, 290 samples yielded positive tests for 181 species. Detected species are compared to NERR staff survey results to determine which species are missing and help identify optimal target primers. Initial sample efficacy varied with between 0-43 fish species detected per sample. Zero results are probably due to systematic issues related to substrate binding in mesohaline saltmarshes, inhibition from organic compounds, and off target analyses. Additional sample cleanup and analyses are expected to improve these results.

Analysis of New Jersey Migrant Fishes and Shelf-Estuary Connectivity using Acoustic Telemetry

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Much of the New Jersey continental shelf consists of unconsolidated sediments that provide seasonal habitat to many migratory fish species. A prominent structural feature is the connection with numerous estuarine inlets. These provide highly productive and seasonally warm growth habitats. The relative contribution of these estuaries and shelf habitat to residence period in this region has not been quantified. Stakeholders are concerned that these connections may be impacted by infrastructure from planned offshore wind farms. We are telemetering estuarine-dependent or facultative fish species and horseshoe crabs to examine life history patterns of ocean-estuary connection. Fixed hydrophones (VR2W) monitor all estuarine inlets from Belmar to Cape May. Mobile hydrophones on vessels, deployed traps, and submersible gliders episodically monitor coastal waters. All hydrophones have detected fish passage, including those tagged by our own program (primarily summer flounder *Paralichthys dentatus* and smooth dogfish *Mustelus canis*) and many tagged by other researchers and programs. Summary data on the distribution and timing of passage will be shown. Collaboration with other telemetry efforts through the Mid-Atlantic Acoustic Telemetry Observation System (MATOS) and The Atlantic Cooperative Telemetry Network (ACT) is important to a thorough understanding of this connection. To date 60,755 tag detections have been made on 16 receivers. 104 independent acoustic tags have been identified. The Little Egg Inlet hydrophone location has had the most detections. The hydrophone array shows multiple estuary use among tagged fish. Further sampling and analyses of hydrophone detections will help clarify migration patterns between inlets and continental shelf habitats.

Developing Open-Source Analysis Pipeline for a Glider-Based Acoustic Zooplankton Fish Profiler (AZFP)

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Multi-frequency acoustic sensors such as the Acoustic Zooplankton Fish Profiler (AZFP) simultaneously observe marine species of various sizes and trophic levels. As such, they are now routinely being used to augment or replace traditional vessel-based sampling. When acoustic sensors are integrated into underwater autonomous vehicles such as gliders, large pelagic ecosystems can be observed while producing high-resolution data at greater depths than ship-borne echosounders or surface moorings. Data generated by an AZFP require specialized processing and software packages that can be expensive to purchase or subscribe to. Additionally, available software packages are typically designed for vessel hull-mounted acoustic sensors, and therefore are limited in application to vertically profiling platforms such as gliders. This study utilized free open-source software, originally developed for vessel-based acoustic sampling (Echopype), and developed a pipeline to extend Echopype for processing novel glider-based AZFP acoustic data. Echopype is a free acoustic processing package that, with alterations, can be used as an alternative to other packages such as Echoview, the proprietary software that is frequently used for processing these types of datasets. Using a case study focused on Antarctic krill biomass, we compared processed data outputs from Echopype and Echoview. The adapted Echopype calculation and plotting of acoustic backscatter strength recorded by a glider-mounted AZFP reproduce results produced by Echoview. As the data processing stream increased in complexity, the correlation between the two softwares became weaker particularly after applying seafloor masking and krill swarm detection. Future efforts to address these more complex analysis features would further improve the ability of Echopype to process glider-based acoustic data.

Post-harvest fish losses in small-scale fisheries in Bangladesh

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As multi-species resources are involved in open water capture fisheries, consequently targeted not counting non-targeted aquatic species are harvested from the Bay of Bengal in Bangladesh through small and large-scale fisheries. Due to low commercial value, insufficient storage and preservation facilities, fish discarded from the boats, landing centers or sea causes a huge biodiversity loss along with monetary forfeiture. This study was designed to explore the overall quantitative and qualitative including nutrition and economic loss through bycatch while emphasizing state of fisherman and fishing techniques in small-scale fisheries (SSF). To provide the overall scenario, 401 fishermen were considered with a semi-structured questionnaire-based survey using KoboToolbox. Of the survey's participants, 64.8% had no formal education, 80.72% were temporary fisher and 36.6% had fishing experience for less than ten years. We found that “Shampan”, a special kind of fishing craft, were used by 89.52% of fishermen, followed by trawler (7.98%) and corksheet (non-mechanized) boat (2.50%) where 77.55% of crafts were mechanized but not more than 36.07% crafts used block ice for the storage of fish. Typically, three types of gears like gill net, set-bag net and cast net were used for maximum fishing operations. The most common fish species caught were shrimp, chapila (*Gudusia chapra*), kechki (*Corica soborna*), and churri (*Trichiurus lepturus*), where mostly discarded species were potka (*Dichotomyctere nigroviridis*) (95%), followed by jelly fish, crab, and star fish, of which 98.8% were discarded in the land. During peak-season 2.49±1.80 kg fishes were discarded whereas last year 2.53±3.19 kg fish were discarded off-season. These discarded fish are often ended in the feed industry. Based on this finding, improving fishermen's knowledge, ice storage, infrastructure, and market information flow may assist them in reducing post-harvest fish loss and also support them to utilize large amount of discarded fish will minimize potential commercial drawback.

Investigating the influence of environmental factors on American eel (*Anguilla rostrata*) abundance throughout the Barnegat Bay Watershed

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American eels, Anguilla rostrata, are currently listed as endangered under the International Union for Conservation of Nature's Red List of Threatened Species. In the past several decades, the IUCN has reported a 50 percent drop in the population of American eels. This study aims to perform analysis on data provided by Dr. Jim Vasslides and the research team at the Barnegat Bay Partnership to examine through R programming which environmental factors correlate with higher American eel abundance and what the implications of climate change are on American eel populations. Using the data collected from the Barnegat Bay Watershed, abundance plotted against salinity (ppt), dissolved oxygen (%), pH, and temperature (℃) using RStudio. An interactive map was also created to depict the relationship between abundance and temperature. Analysis results show that 0.17 ppt salinity, 91.6% DO, 6.68 pH, and 13.30℃ correlates with the highest American eel abundance, 91.6% dissolved oxygen correlates with the highest eel count. Climate change continues to affect these and other environmental factors. NOAA released an Anguilla rostrata Overall Vulnerability Ranking in which experts classified the species overall vulnerability ranking as high and also gave it a very high climate exposure score. Three exposure factors contributed to this score: Ocean Surface Temperature, Ocean Acidification and Air Temperature. The species received a very high sensitivity score for sea surface temperature and ocean acidification and a low sensitivity score for salinity. Understanding ideal environments for Anguilla rostrata is essential to the conservation of the species and sustainability of the fisheries market. It also gives insight into possible future habitable environments to which the species may migrate in order mitigate the negative effects of climate change.

Genetics, age demographics, and shell size of Atlantic surfclams

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The Atlantic surfclam (*Spisula solidissima solidissima*) is an economically valuable cold-water clam species that supports one of the largest bivalve fisheries in the United States. Until recently, the federal fishery had not fished for surfclams on the southern edge of the surfclam range due to low population numbers resulting from mortalities in the 1990s. Recent large catches of surfclams off Virginia have raised the question of whether the surfclam population has returned to the region or if a single large cohort survived the warmer temperatures. Southern Atlantic surfclam (*Spisula solidissima similis*) is a warm shallow water cryptic subspecies of the Atlantic surfclam. The two subspecies are morphologically indistinguishable; however, *S. s. similis* grows to a smaller overall size and is genetically distinct. Questions have also been raised about the possibility of *S. s. similis* being part of the population fished off the coast of Virginia, and whether the clams being fished there are from a population that derives from regular recruitment. A sample of surfclams was taken off the coast of Virginia. Surfclams were aged, genetic samples were taken and compared to both Atlantic and southern Atlantic surfclam genetic sequences, and length and weight were recorded for each clam. Size and weight were then compared to a New Jersey population of the same ages. Results found surfclams aged 3 to 9 years of age within the sample as well as genetic results suggest there is a southern Atlantic surfclam or a hybrid within the sample population, and the southernmost surclams were distinctly smaller than New Jersey clams of the same age.

Evaluating the Feasibility of Finfish and Macroalgae Mariculture for New Jersey

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Mariculture is a growing field of interest considering today's growing climate crisis and food demand. Farming of finfish and macroalgae have the potential to diversify New Jersey's mariculture industry which currently focuses on shellfish production. Based on New Jersey's water quality parameters (e.g., temperature, salinity, pH) and ecosystem dynamics, we compiled a list of finfish and macroalgae species in various niches that demonstrate potential for mariculture in New Jersey. In total, 16 native marine finfish, 8 native macroalgae, and 2 invasive macroalgae species were researched and characterized based on their habitat preferences and candidacy for commercial production. Information for the finfish included general parameters (e.g., habitat, region), water quality parameters (e.g., optimal temperature, depth), and life history parameters (e.g., adult weight, fecundity). Information for the macroalgae included water quality parameters, commercial uses, and ecological role/habitat. Compatible species of finfish and macroalgae can also be combined into systems via technologies such as aquaponics and Integrated Multi-Trophic Aquaculture (IMTA). We plan to evaluate compatibility further when growing these species in similar environments. Additionally, future steps of this research include generalizing the various genus types, identifying gaps in current research, determining local applications for native species in New Jersey, and exploring alternative production systems that reduce the impact of production on local ecosystems while generating economic viability.

Fisheries Monitoring of an Offshore Windfarm off New Jersey, Northeast U.S.

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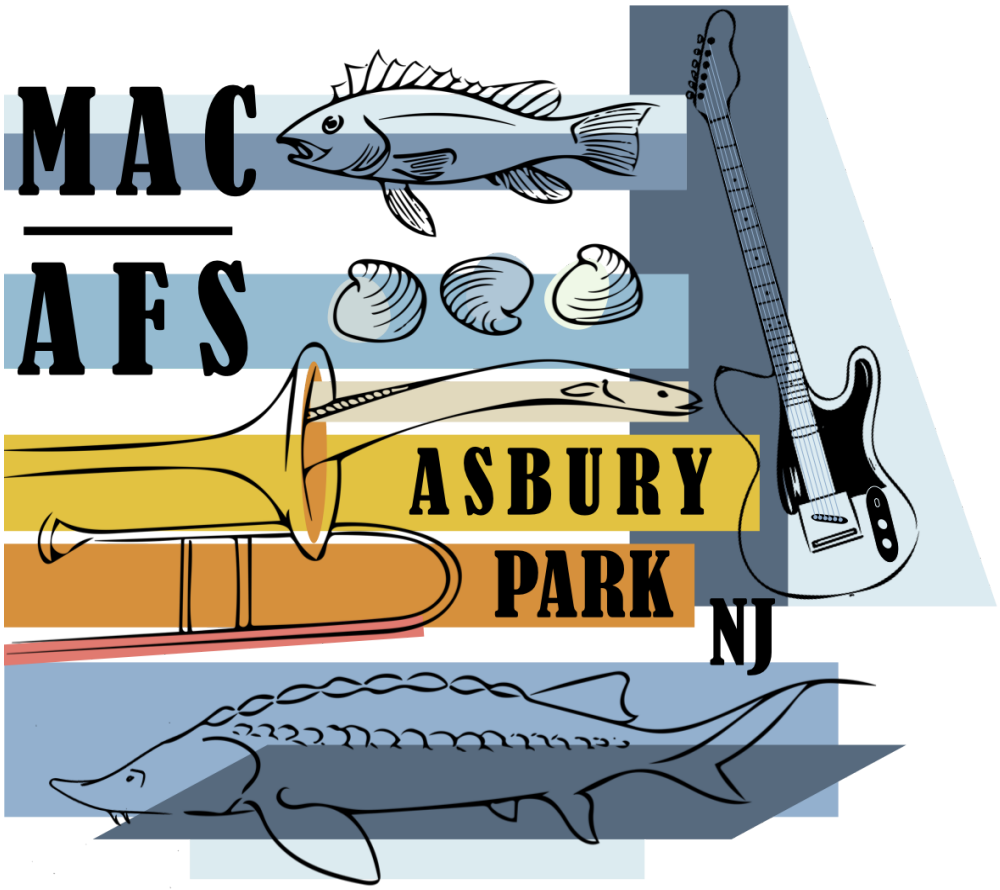
Rapid development of offshore wind is occurring off the northeast U.S. in response to demands for renewable energy. Fisheries monitoring of offshore windfarms is critical for evaluating the impacts of offshore wind development. Our team is implementing a comprehensive fisheries monitoring plan (FMP) for the Ocean Wind 1 windfarm off New Jersey, northeast U.S., which is an area that supports valuable commercial and recreational fisheries. Our FMP includes several different extractive and non-extractive fisheries surveying methods designed to evaluate the potential impacts of windfarm construction on fisheries resources. Surveying will occur for six years (2022–2028) with two-years of surveying before, during, and after construction of the windfarm (n=98 turbines). Several seasonal surveys will monitor finfish species, including a bottom trawl survey to sample species across the local assemblage, a Structured Habitat Survey using multiple fixed gears (Chevron traps, rod-and-reel, baited remote underwater videos) to sample structure-associated species, and towed pelagic cameras and mobile hydroacoustic surveying to sample pelagic fishes. An annual dredge survey will be conducted to sample benthic shellfish species. Additionally, an acoustic telemetry study will investigate the spatial ecology of several species important to commercial and recreational fisheries, environmental DNA monitoring will be conducted in conjunction with multiple surveys, and autonomous gliders will be deployed for oceanographic and acoustic monitoring. Results will permit evaluation of the impacts of windfarm construction on fisheries resources. In addition, efforts were made to standardize methods and gears across all surveys to allow for better integration with long-term fishery-independent monitoring programs and for investigations into cumulative impacts from regional offshore wind development. This comprehensive FMP provides a valuable model for developing FMPs for other windfarms because it utilizes multiple complimentary and standardized surveying approaches, including survey designs for accessing windfarms that would have application at other windfarms.



Thank you for coming! See you in 2023!

American Fisheries Society

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