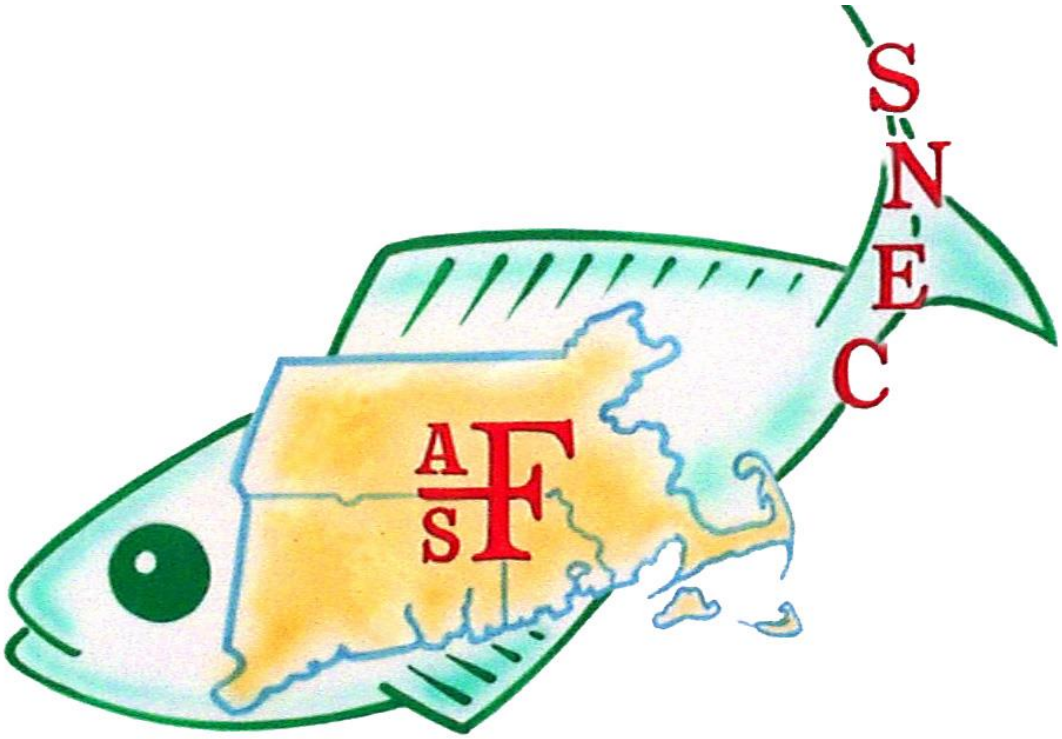
2024 Winter Science Meeting



Southern New England Chapter

American Fisheries Society

January 9, 2024

Biology-Physics Building
University of Connecticut
Storrs, CT

SCHEDULE

8:30 – 9:00	***Registration and Coffee***
9:00 – 9:10	**Opening Comments.** Corinne Truesdale, President
9:10-9:25	**Ontogeny of schooling in larval Atlantic Silversides reared under ocean acidification conditions.*** Mouland, Matthew E.P., Max D. Zavell, Jacqueline F. Webb, and Hannes Baumann.
9:25-9:40	**Diet and maternal investment affect larval rockfish condition and survival.*** Walsh, Kamran A., Andrew R.Thompson, Garfield Kwan, Brice X. Semmens, H. Will. Fennie, and Rasmus Swalethorp.
9:40-9:55	**Variation in fecundity of Winter Flounder, *Pseudopleuronectes americanus*, and Yellowtail Flounder, *Limanda ferruginea*: patterns across stocks over ten years.** Wuenschel, Mark J., Emilee Tholke, Yvonna Press, W. David McElroy, and Richard S. McBride.
9:55-10:10	**Where did the Smallmouth Bass go?** Bade, Andrew P., Spencer M. Mallette, and Christopher P. McDowell.
10:10-10:25	**CT-DEEP update on Candlewood Lake Grass Carp and vegetation management efforts.** Cassone, Joseph and Andrew Bade.
10:25-10:50	***Break***
10:50-11:05	**Energy content of major prey species of Atlantic Salmon (*Salmo salar*) in the Northwest Atlantic as determined by proximate composition analysis.** Hobbs, Ethan, Ken Oliveira, Mark Wuenschel, and Tim Sheehan.
11:05-11:20	**Characterizing outmigration patterns and downstream passage of landlocked Atlantic Salmon in the Winooski River,**

	Vermont. Heisey, Aaron, Theodore Castro-Santos, Jonah Withers, Kurt Heim, Laurie Earley, and William Ardren.
11:20-11:35	**Investigating the size and spawning history of river herring within the Connecticut River over the past decade.*** Stephens, Jacqueline, Allison Roy, Adrian Jordaan, Dave Perkins, and Kenneth Sprankle.
11:35-11:50	**Comparing juvenile river herring growth and density in freshwater lakes and associated estuaries.*** Burgoff, Julian, Allison Roy, and Adrian Jordaan.
11:50-12:05	**Is drought the new fad diet? Effect of entrapment on size, body condition, and growth rates of juvenile anadromous alewives.*** Burgess, Michael, Katherine King, Ryan Adams, Eric Schultz, and James Knighton.
12:05-13:35	***Lunch and Posters***
13:35-13:50	**Oyster health and restoration in Long Island Sound.** Mayo, Isaiah M., Mariah Kachmar, Genevieve Bernatchez, Mark Dixon, LTJG Tyler Houck, Meghana Parikh, and Katie McFarland.
13:50-14:05	**A numerical investigation of size selectivity in a modified scallop dredge.*** Cowles, Geoff and Sean Boisvert.
14:05-14:20	**Using the Automatic Identification System and machine learning to improve estimates of development exposure for the scallop fishery in Southern New England.*** Livermore, Julia.
14:20-14:35	**American Lobster and Jonah Crab populations inside and outside the Northeast Canyons and Seamounts Marine National Monument, USA.** Arnott, Stephen A., Michael P. Long, Aubrey Ellertson, and N. David Bethoney.
14:35-15:00	***Break***

15:00-15:15 **Investigating the utility of complementary fixed and random stratified sampling to track marine fish and invertebrate abundance trends .** McManus, M. Conor, Chris J. Parkins, and Scott D. Olszewski.

15:15-15:30 **Unwrapping the natal origins of coastal Striped Bass.** Gahagan, Ben, Nathalie LeBlanc, Scott Pavey, P. Adrian Jordaan, Eric Anderson, and Andrew Whiteley.

15:30-15:45 **Accounting for avoidance behavior in fishery catch rates of Atlantic Cod.*** Grezlik, Max and Steve Cadrin.

15:45-16:00 **Prototype management strategy evaluation for ecosystem-based fisheries management in New England.** Guyant, Madeline, Gavin Fay, Lisa Kerr, Emily Liljestrand, Jerelle Jesse, Andrew Applegate, John Pappalardo, and Samuel Truesdell.

16:30-18:00 ***Social at Graduate Hotel***

* Denotes student paper

Presenter name is underlined

Posters

P1 **Maternal mercury transfer from pregnant Spiny Dogfish (*Squalus acanthias*) to their pups through ovoviviparous reproduction.**** Ajemian, Maxwell R. and David Taylor.

P2 **Chemical analysis of plastics particles in an estuary (Thames River, CT) and the digestive system of seabirds (Tasmania, Australia).**** Beauchemin, Elise, Mikasa Lierman, Sadie Olson, Sarah Skurat, Cheyenne Waters, Dr. Karina Mrakovcich, and Dr. Deanna Bergondo.

P3 **Engaging the fishing community to understand disease and reproductive dynamics of the Atlantic Sea Scallop.** Brander, Douglas, N. David Bethony, Anna Mercer, and George Maynard.

P4 **Ontogenetic effects of harmful algal blooms and ocean acidification on the *Artemia* spp.**** Candia, Joseph, Christopher J.Gobler, and Konstantine J.Rountos.

P5 **Investigating the diet of endangered sturgeon in the Connecticut River using gastric lavage and eDNA metabarcoding techniques.**** Kraczkowski, Michelle, Loren Tardif, and Jacqueline Benway.

P6 **Using fine-scale fishery data to estimate economic impact of wind farms on the Summer Flounder fishery.** Marjadi, Meghna N., Anna J. Mercer, Andrew W. Jones, and Steven X. Cadrin.

P7 **Pilot hook and line survey for data continuity in wind energy areas.** Mercer, Anna, Dave McElroy, and Katie Viducic.

P8 **Kokanee in Connecticut; the past, present and future.** Ransom, Andrew and Brian Eltz.

P9 **Pilot observer program for Rhode Island state waters gillnet fishery.** Remick, Abrielle and Nicole Lengyel Costa.

P10 **Launching an expert elicitation exercise to develop a comparative framework of synergies and tradeoffs from a suite of decarbonization solutions on fishery ecosystems.**** Sedore, Vanessa and Sarah Schumann.

P11 **Population dynamics and competitive interactions of Channel Catfish in Connecticut lakes and ponds.** Shubat, Danielle and Ryan Adams.

P12 **Terrestrial predator visitation patterns at riverscape cold-water thermal refuges.**** Sullivan, Christopher J., Chadwick D. Rittenhouse, and Jason C. Vokoun.

P13 **How does adaptation to local conditions affect the ability of gene flow to help widespread species adapt to changing climates along a latitudinal gradient?** Wasserman, Ben A. and Mark C. Urban.

P14 **Overwintering growth and lipid accumulation in northern stock Black Sea Bass (*Centropristis striata*) juveniles.**** Zavell, Max D., Matthew E.P. Mouland, Eric Schultz, and Hannes Baumann.

P15 New SNEC Logo Ballot

**Denotes student poster

Presenter name is underlined

Abstracts of Oral Presentations

American Lobster and Jonah Crab populations inside and outside the Northeast Canyons and Seamounts Marine National Monument, USA. Arnott, Stephen A.[a], Michael P. Long[a], Aubrey Ellertson[b], and N. David Bethoney[a]. *[a]Commercial Fisheries Research Foundation, Saunderstown RI, [b]Cape Cod Commercial Fishermen Alliance, Chatham MA.*

There is international pressure to increase the global expanse of marine protected areas (MPAs). In this sense, long-term biological datasets collected prior to MPAs being created are extremely valuable because they provide reference points for evaluating future MPA performance. The goal of this study was to establish biological baselines for American lobster (*Homarus americanus*) and Jonah crab (*Cancer borealis*) populations prior to a fishing ban inside the Northeast Canyons and Seamounts Marine National Monument, which is a recently created MPA on the US northeastern continental shelf break. Sampling was performed by the Commercial Fisheries Research Foundation's American Lobster and Jonah Crab Research Fleet over an 8-year period prior to the fishing ban, which was imposed in September 2023. Sampling occurred inside the MPA, and in two control areas outside the MPA. American lobster sizes and sex ratios varied among the three areas. In addition, their sizes, sex ratios, and proportion of ovigerous females differed between submarine canyons within areas, and there were significant effects of season and/or depth. Jonah crab characteristics did not vary among areas, although sex ratio and proportion of ovigerous females varied with season and/or depth. Our results show that there were long-term preexisting differences between the MPA and surrounding (control) areas prior to the fishing ban. To evaluate future biological responses to the fishing ban, it will be necessary to continue collecting data using comparable methods, and to account for the preexisting sources of spatial and temporal variation that we identified.

Where did the Smallmouth Bass go? Bade, Andrew P.[a], Spencer M. Mallette[a], Christopher P. McDowell[b], and Lillian A. Glynos[b]. *[a]Connecticut Department of Energy and Environmental Protection, Fisheries Division, Harwinton CT, [b]Connecticut Department of Energy and Environmental Protection, Fisheries Division, Marlborough CT.*

Smallmouth Bass (*Micropterus dolomieu*) populations are in decline across much of the eastern United States. Electrofishing data and angler reports also suggest reductions in the range and abundance of lacustrine Smallmouth Bass in Connecticut, with seven populations becoming apparently extirpated and six experiencing significant declines since the Fisheries Division warmwater monitoring program began in 1980. The causes are likely multifaceted, with complex interactions among threats that range in scale from local (e.g., species introductions, habitat alterations, and disease outbreaks) to global (e.g., climate change). To better understand the causes of the decline, Fisheries Division electrofishing sampling in 2023 revisited extirpated and declining Smallmouth Bass fisheries to assess current population status and perform fish pathology testing. Additionally, sampling occurred on several historically strong Smallmouth Bass populations to identify potential source locations for transplanting. Angler surveys on two lakes where Smallmouth Bass have become extirpated (Wauregan

Reservoir and Wyassup Lake) were performed to further confirm the disappearance of Smallmouth Bass, assess angler interest in reintroductions, and to develop baseline data to assess what fishery impacts arise from the expected reintroductions of Smallmouth Bass in 2024. Lastly, habitat enhancements (e.g., nest boxes) are planned at these waters to encourage natural reproduction of transplanted Smallmouth Bass. While Largemouth Bass (*Micropterus salmoides*) generally benefit from increasingly warm and eutrophic waters, it has become clear that Connecticut can no longer take its Smallmouth Bass fisheries for granted. Preserving these fisheries for future anglers may require a paradigm shift from managing "black bass" to species-specific management approaches.

Is drought the new fad diet? Effect of entrapment on size, body condition, and growth rates of juvenile anadromous alewives. Burgess, Michael[a], Katherine King[b], Ryan Adamsa[c], Eric Schultz[a], and James Knighton[b]. [a]*Department of Ecology and Evolutionary Biology, University of Connecticut, Storrs CT,* [b]*Department of Natural Resources and the Environment, University of Connecticut, Storrs CT,* [c]*Connecticut Department of Energy and Environmental Protection, Inland Fisheries Division, Marlborough, CT.*

Many species of fish rely on nursery habitats in early portions of their life history; movement to and from nursery habitat is essential for population success. Alewives (*Alosa pseudoharengus*) are one such species, moving from the marine environment to spawn in freshwater habitats. Populations of alewives have declined significantly; loss of connectivity due to anthropogenic barriers, such as dams, has contributed substantially to declines in abundance. Previous research on fish passage has been focused on restoring passage for spawning adults migrating into freshwater habitat but has largely neglected the need for juveniles to out-migrate to the sea. Juvenile alewives are frequently prevented from out-migrating by entrapment during periods of drought. The effects of entrapment have not been closely examined but are suspected to adversely impact juvenile growth and survival. To test the effects of drought-induced entrapment, we compared juvenile alewives collected during an extensive period of drought to emigrants collected in another year when connectivity was uninterrupted. Drought juveniles were 13% smaller in terms of length, 76% smaller in mass, had significantly lower body conditions, and grew 19% less during entrapment. Juveniles may have had limited growth potential because of depleted food availability and increased intraspecific competition. Reduced growth for juveniles can result in reduced sizes later in the life cycle; reduced size at maturity would reduce survivorship and reproductive potential. The success of juveniles while in nursery habitats contributes directly to year class success and maintaining connectivity is essential for producing strong year classes and overall population success.

Comparing juvenile river herring growth and density in freshwater lakes and associated estuaries. Burgoff, Julian[a], Allison Roy[b], and Adrian Jordaan[c]. *[a]Massachusetts Cooperative Fish and Wildlife Research Unit, Department of Environmental Conservation, University of Massachusetts, Amherst MA, [b]U.S. Geological Survey, Massachusetts Cooperative Fish and Wildlife Research Unit, Department of Environmental Conservation, University of Massachusetts, Amherst MA, [c]Department of Environmental Conservation, University of Massachusetts, Amherst MA.*

Anadromous juvenile river herring hatched and reared in freshwater lakes and rivers during the first stage of their life emigrate into estuaries throughout the summer and fall of each year. Minimal information exists regarding the factors that are associated with enhanced growth and survival as they transition between freshwater and estuary habitats. We sampled juvenile river herring in paired headwater lakes and downstream estuaries monthly from June through August 2021 in three coastal Massachusetts watersheds using nighttime purse seines. We counted daily growth increments from sagittal otoliths to compare juvenile age and growth among watersheds and habitat types over time. Growth rates varied widely among watersheds and habitat types, with the highest growth rates observed in the lowest density watershed (Chebacco Lake: mean ($\bar{x}$)= 1.20 mm/d, standard deviation (SD) = 0.155 and Essex Bay estuary: $\bar{x}$ = 1.24 mm/d, SD = 0.122) and the lowest growth rates in the highest density watershed (Upper Mystic Lake: $\bar{x}$ = 0.804 mm/d, SD = 0.090 and Mystic River estuary: $\bar{x}$ = 0.813 mm/d, SD = 0.129). Mystic River watershed had both Alewife (*Alosa pseudoharengus*) and Blueback Herring (*A. aestivalis*), and Alewife, which hatch earlier in the season, grew significantly faster than Blueback Herring in estuary habitat . The greatest disparity in growth between lake and associated estuary habitat was observed in Whitmans Pond ($\bar{x}$ = 0.801, SD = 0.104) and the Weymouth Back River estuary ($\bar{x}$ = 0.935 mm/d, SD = 0.123), suggesting a limit to growth potential in freshwater habitat. The observed differences in growth among watersheds and habitat types helps to understand the factors driving juvenile river herring productivity in these watersheds and identify management strategies that maximize growth during early life stages.

CT-DEEP update on Candlewood Lake Grass Carp and vegetation management efforts. Cassone, Joseph[a] and Andrew Bade[b]. *[a]Connecticut Department of Energy and Environmental Protection, Fisheries Division, Old Lyme CT, [b]Connecticut Department of Energy and Environmental Protection, Fisheries Division, Harwinton CT.*

Triploid Grass (TGC) were stocked in Candlewood Lake in 2015 and 2017 to control the invasive aquatic plant Eurasian Watermilfoil (EWM). In the six years following the initial stocking, the TGC had the desired effect of reducing the amount of EWM without eliminating vegetation. However, in 2022 there was a drastic decline in all varieties of aquatic vegetation to the point that it was virtually absent from the lake. The lack of vegetation was concerning since Candlewood Lake supports a high quality fishery and aquatic vegetation is an important habitat for multiple species. The potential causes of the 2022 decline were evaluated, including the likelihood of over grazing by TGC. The TGC population, biomass, and feeding rates were estimated and compared to estimates of vegetation biomass; this comparison indicated that annual grass carp grazing pressure exceeded the estimated standing stock biomass of

vegetation in the years preceding 2022. A reduction in the TGC population was deemed necessary to support the restoration of aquatic vegetation to desirable levels within a timeframe that minimizes impacts to fisheries resources. From May- September 2023, a total of 219 TGC were collected during 7 removal events. TGC were concentrated and captured in coves using a combination of large mesh gill nets and boat electrofishing. Additionally, removals of grass carp by recreational anglers were authorized using a scientific collectors permit and an innovative online reporting system. Future efforts will focus on vegetation monitoring, active restoration of vegetation, and additional TGC removals.

A numerical investigation of size selectivity in a modified scallop dredge. Cowles, Geoff and Sean Boisvert. *School for Marine Science and Technology, University of Massachusetts Dartmouth, New Bedford MA.*

The US Atlantic sea scallop fishery, valued at $670M in 2021, faces challenges due to unintentional capture of non-target species, particularly undersized scallops with high discard mortality rates. Improving size selectivity is crucial for economic gain and healthier populations. Recently, a modified dredge was developed by Atlantic Capes Fisheries, LLC to improve size selectivity. The geometry is derived from the standard New Bedford dredge but features a novel cutting bar, capable of rotating along the transverse axis and can be set to angles of 45 or 60o relative to the sea bed. This study complements concluded field research and delves into the detailed flowfield in the wake of the modified dredge in the context of size selectivity. NASA FUN3D's computational fluid dynamics solver models the unsteady viscous flowfield using an unstructured body-fitted mesh, resolving the boundary layer on the dredge frame. The resulting time-dependent velocity field drives scallop trajectory simulations in MATLAB, employing a Runge-Kutta integration scheme. These simulations account for scallop particles' drag and negative buoyancy forces, offering realistic insights into their responses to the flow field. The study examines scallop trajectories across a range of sizes (50-150mm shell height), revealing size-dependent effects on particle behavior. Preliminary results suggest that particle trajectories are strongly dependent on scallop size and the initial release location. Future work will focus on experiments specifically aimed at evaluating size selectivity as a function of cutting bar angle, further enhancing our understanding of this critical aspect of scallop fishing.

Unwrapping the natal origins of coastal Striped Bass. Gahagan, Ben[a], Nathalie LeBlanc[b], Scott Pavey[b], P. Adrian Jordaan[c], Eric Anderson[d], and Andrew Whiteley[e]. *[a]Massachusetts Division of Marine Fisheries, Gloucester MA, [b]University of New Brunswick - St. John, St. John New Brunswick, [c]University of Massachusetts Amherst, Amherst Massachusetts, [d]NOAA Fisheries, Southwest Fisheries Science Center, Santa Cruz CA, [e]University of Montana, Missoula MT.*

Striped Bass, an iconic species in the northwest Atlantic, have been a focus of fisheries management for decades. Long considered one of the bright spots for fisheries managers following population recovery from near collapse in the 1980s, this species is once again a focus for managers due to consistently poor recruitment and high amounts of fishing effort. A long-standing problem in striped bass management has been the inability to estimate the natal origins of fish caught or harvested in coastal areas outside their natal estuaries. Here, we

describe a 231 SNP GT-Seq panel for reliably assigning individuals of unknown origin to reporting groups (i.e., combinations of spawning populations) and generating estimates of reporting group origin. The GT-Seq panel produced calls that were highly concordant with the ddRAD panel it was derived from and showed no signs of performance bias due to subsampling to identify informative SNPs. Simulations across mixing proportions revealed composition estimates with high degrees of precision and accuracy. This novel panel was then used to explore a data set of 4,914 striped bass from Massachusetts during 2015 – 2019 and Connecticut in 2021. Differences in natal composition were found across treatments including collection area, size, and year collected.

Accounting for avoidance behavior in fishery catch rates of Atlantic Cod. Grezlik, Max and Steve Cadrin. *School for Marine Science and Technology, University of Massachusetts Dartmouth, New Bedford MA.*

New England fisheries for Atlantic cod (*Gadus morhua*) are managed as part of the Northeast U.S. multispecies groundfish fishery. Although multispecies and ecosystem-based fishery management are of interest to managers and stakeholders in the region, single species stock assessment and management remains the standard for New England groundfish. Almost all abundance indices for species within the complex are from the fishery-independent surveys, but standardized fishery-dependent indices are being considered to supplement survey indices. Inclusion of fishery-dependent indices of abundance can increase the spatiotemporal coverage and density of information in the assessment and further involves the industry in the management process, creating a greater since of ownership over the resource. Within the Complex, cod acts as a 'choke-stock', or a stock with such low quota that it constrains fishing on more abundant species. As a result, the fleet commonly fishes in a way that avoids capturing cod. This avoidance behavior introduces an added challenge in standardizing an index of abundance from fishery-dependent data. Here we explore one method to account for avoidance behavior in fishery catch rates of Atlantic cod. This research demonstrates how multispecies considerations can inform single species management until more holistic multispecies or ecosystem-based management methods are developed.

Prototype management strategy evaluation for ecosystem-based fisheries management in New England. Guyant, Madeline[a], Gavin Fay[a], Lisa Kerr[b], Emily Liljestrand[a], Jerelle Jesse[c], Andrew Applegate[d], John Pappalardo[e], and Samuel Truesdell[f]. *[a]University of Massachusetts Dartmouth, New Bedford MA, [b]University of Maine, [c]Gulf of Maine Research Institute, [d]New England Fishery Management Council, [e]Cape Cod Commercial Fishermen's Alliance, [f]Massachusetts Division of Marine Fisheries.*

The New England Fishery Management Council has embarked on a multiyear initiative to explore implementation of Ecosystem-Based Fisheries Management (EBFM). These efforts included developing an example fishery ecosystem plan (eFEP) for Georges Bank, though testing the likely performance of eFEP options through a public Management Strategy Evaluation (MSE) process has been slowed by limited familiarity of the Council and its regional participants with both EBFM and MSE. To address this, the Council conducted a prototype

EBFM MSE in 2022 and 2023. A workshop sequence mirroring key MSE elements was conducted with a core group of participants drawn from Council Committees and Advisory Panels. Simultaneously, an analytical team collaborated with technical advisors to develop a simulation modeling framework that used a multispecies population dynamics operating model to compare status quo and eFEP management alternatives. The illustrative prototype MSE results allowed participants to view a range of performance metrics showing how stock complex-based catch advice options could satisfy objectives with little increase in risk at the single stock level and identify aspects of the engagement process and modeling frameworks that would be necessary to address broader issues in a larger, more public facing MSE. Here we discuss lessons learned from the prototype MSE and provide an overview of the analytical results. The prototype was successful in facilitating dialogue and co-learning about EBFM and MSE. Written and interactive communication products from the prototype will be used during public workshops in 2024, enabling further exploration and discussions.

Characterizing outmigration patterns and downstream passage of landlocked Atlantic Salmon in the Winooski River, Vermont. Heisey, Aaron[a], Theodore Castro-Santos[a], Jonah Withers[b], Kurt Heim[b], Laurie Earley[b], and William Ardren[c]. [a]*United States Geological Survey, Silvio O. Conte Anadromous Fish Research Center, Eastern Ecological Science Center, Turners Falls MA,* [b]*United States Fish and Wildlife Service, Lake Champlain Fish & Wildlife Conservation Office, Essex Junction VT,* [c]*United States Fish and Wildlife Service, Northeastern Regional Office, Hadley MA.*
Habitat connectivity is a critical component of migratory species conservation as a means to preserve the full suite of life history strategies. Landlocked Atlantic Salmon (*Salmo salar*), are iteroparous, engaging in directed upstream movements to access spawning habitats followed by an outmigration post-spawning, potentially surviving to spawn in the subsequent season. Hydroelectric dams fragment the existing habitat and impose migratory delays in the upstream migratory phase of this species, however the characteristics of outmigratory behavior in relation dams is highly variable among river systems and populations. In the Winooski River, a major tributary of Lake Champlain with two mainstem dams, Landlocked Atlantic Salmon are undergoing a restoration effort with the object of achieving a self-sustaining population with natural recruitment. Between the years 2019 – 2021, 139 adult Landlocked Atlantic Salmon were trapped at the downstream most dam (Winooski One), implanted with radio-transmitters, and released 36 river kilometers upstream, above a second dam, near an observed spawning site. In total, 14 fixed receivers and weekly active tracking monitored movements across study years until the spring of 2022. Overall, outmigration rates, calculated by the number of fish detected after navigating both dams, varied from 10%, in 2020 to 19% and 25% respectively in 2019 and 2021. Further analysis is ongoing to model covariates that determine outmigration timing, dam-specific passage rates, and river reaches where downstream delays are incurred.

Energy content of major prey species of Atlantic Salmon (*Salmo salar*) in the Northwest Atlantic as determined by proximate composition analysis. Hobbs, Ethan[a], Ken Oliveira[a], Mark Wuenschel[b], and Tim Sheehan[b]. [a]*University of Massachusetts Dartmouth, New Bedford MA,* [b]*NOAA Fisheries, Northeast Fisheries Science Center, Woods Hole MA.*
Atlantic salmon (*Salmo salar*) are a commercially and recreationally important species that are also an important indicator species for the North Atlantic pelagic ecosystem's overall health. Atlantic salmon populations from North America have exhibited significant declines since the late-1980's, and it is hypothesized that a decrease in prey quality, occurring around their summer feeding habitat off the coast of West Greenland, may be one contributing factor. The energy density of three major prey species of Atlantic salmon off the coast of Greenland, *M. villosus, G. fabricii, and Themisto sp.* collected from (2016-2018), was determined using proximate composition analysis (PCA). The effect of location, season, year, and length on energy density values for each species was compared. The three species displayed a strong correlation between energy density and percent dry weight, meaning percent dry weight is a strong predictor of energy density. Our results suggest that Atlantic salmon can maximize energy gain inside fjords for *M. villosus* and *G. fabricii* and shift to *Themisto sp.* when outside of fjords, given the resulting energy density dynamics. Additionally, Atlantic salmon may gain more energy by concentrating feeding efforts on *G. fabricii* during the spring and shifting to targeting *M. villosus* in the fall. Combining current prey energy density data with diet composition data is necessary to evaluate changes in Atlantic salmon prey quality, either via variability within species or switching to alternate prey.

Using the Automatic Identification System and machine learning to improve estimates of development exposure for the scallop fishery in Southern New England. Livermore, Julia. *Rhode Island Department of Environmental Management Division of Marine Fisheries, Jamestown, RI & Department of Marine Affairs, University of Rhode Island, Kingston RI.*
As offshore development expands on the US East Coast the need for accurate estimates of fishing landings coming from harvest in areas slated for development, or fisheries exposure, increases. A variety of fisheries-dependent datasets exist to address this need, but all current corresponding data products present limitations (e.g., inadequate spatiotemporal resolution, low coverage rates). This intent of this work is to generate improved maps of fishing effort and landings values at sea, focused on Southern New England, as well as an enhanced methodology that can be applied more broadly. The project forms a baseline that can be used to limit conflicts between wind development and commercial fishing and to assess changes in fishing practices after wind farm development. To achieve the project goals, we have merged data from the AIS (Automatic Identification System), VMS (Vessel Monitoring System), VTRs (Vessel Trip Reports), dealer reports, United States Coast Guard registry records, and the NOAA Observer Program to produce a more comprehensive fisheries exposure estimate. We employ a novel approach of using fishing industry input for expert labelling of the AIS data and develop a machine learning approach to modeling the probability of fishing based on vessel activity at the Fishery Management Plan (FMP) level. Model results enable creation of fishing activity maps by extrapolating to the full unlabeled data set. Finally, we measure differences of our landings estimates relative to existing approaches.

Oyster health and restoration in Long Island Sound. Mayo, Isaiah M.[a], Mariah Kachmar[b], Genevieve Bernatchez[a], Mark Dixon[a], LTJG Tyler Houck[c], Meghana Parikh[a], and Katie McFarland[a]. *[a]NOAA Fisheries, Northeast Fisheries Science Center, Milford CT, [b]A.I.S. Inc., Northeast Fisheries Science Center, Milford CT, [c]NOAA Corps, Northeast Fisheries Science Center, Milford CT.*

Oysters in Long Island Sound (LIS) provide major economic and ecosystem services to the region's waters and coastal communities in the forms of harvested seafood and job creation, as well as denitrification, coastal protection, and habitat provisioning benefits. To more-fully realize these potential contributions, increasing shellfish production from aquaculture, recreation, and restoration has been identified as an ecosystem target by the LIS Study, a national estuary program dedicated to restoring and protecting the Sound's waters and watershed. This presentation will provide an overview of a newly established oyster health monitoring program funded by the LIS Study, that monitors the population health of four natural and restored oyster beds in the region. The primary objectives of this program are to 1) ascertain a quantitative understanding of the seasonal dynamics of disease and reproductive success in unmanaged oyster populations; 2) identify the key water quality and physical oyster bed characteristics that best relate to the population burden of disease; and 3) establish a standard methodology for incorporating disease burden in oyster population health assessments for future evaluation of restoration projects. Using this comprehensive approach, which considers disease progression in the context of the environment and overall population health, the aim is to fill critical information gaps needed to guide restoration planning in a way that promotes the success of natural, restored, and cultivated oysters and in turns supports healthy, resilient ecosystems and coastal communities.

Investigating the utility of complementary fixed and random stratified sampling to track marine fish and invertebrate abundance trends . McManus, M. Conor, Chris J. Parkins, and Scott D. Olszewski. *Rhode Island Department of Environmental Management, Division of Marine Fisheries, Jamestown RI.*

Fisheries independent surveys are employed to monitor long-term relative abundance trends of marine species, serving as proxies for understanding changes in overall population sizes. Stratified random sampling survey designs are often preferred over fixed station surveys to minimize biases in estimated abundance means and variances. However, in some instances, fixed station survey designs are required or preferred based on sampling limitations or the research questions posed, respectively. In 1979, the Rhode Island Division of Marine Fisheries began spring and fall stratified random bottom trawl surveys to assess relative abundance of fish and invertebrates in Rhode Island state waters. Concerns regarding fish migration phenology changes possibly biasing relative abundance trends led the program to initiate a complementary fixed station bottom trawl survey in 1990, using the same gear and within the spatial footprint of the seasonal stratified random sampling trawl survey. With over thirty years of concurrent data collected from the two surveys, we look to understand the utility of each survey in understanding marine species inhabiting Narragansett Bay (RI). Relative abundance (e.g., mean, variance, trend, rate of change) for the programs' two trawl surveys were compared for the top 20 species encountered in the survey over the past 30+ years. Here, we

highlight the advantages and disadvantages of fixed and random stratified sampling designs using the Rhode Island Division of Marine Fisheries trawl surveys as an example, and what reliance on fixed station survey designs in areas of increase development and use may mean for tracking marine fish population changes.

Ontogeny of schooling in larval Atlantic Silversides reared under ocean acidification conditions. Mouland, Matthew E.P.[a], Max D. Zavell[a], Jacqueline F. Webb[b], and Hannes Baumann[a]. *[a]Department of Marine Sciences, University of Connecticut, Groton CT, [b]Department of Biological Sciences, University of Rhode Island, Kingston RI.*
Schooling is an important behavior that can increase foraging success and decrease mortality rates in fishes. Previous studies have examined the effects of ocean acidification (OA) on other larval fish behaviors, but none have directly examined its effects on schooling behavior. We developed a cost-effective and simple method to quantify schooling behavior in larval fishes using our automatic larval fish rearing system (AlFiRiS). Larval *Menidia menidia* were reared (under 12:12 light/dark cycle) in groups of 50 individuals in "schooling containers" under two pH conditions ('control pH' = 8.15 and 'low pH' = 7.2). Schooling behavior was quantified from 2 to 25 days post hatch (dph) by recording with a high-definition GoPro digital video camera fitted with a custom harness. Images were captured every two seconds for one minute (one hour after lights on), for a total of 30 replicate images each day. Images were analyzed by identifying the head of each fish to calculate nearest neighbor distance (NND) in order to quantify spatial trends in schooling behavior through the larval period. This provided an accurate and reproducible method that confirmed data from previous studies on the ontogeny of schooling behavior in larval *M. menidia* under natural conditions. Preliminary analysis of video data revealed a difference in the onset of schooling behavior and NND in fish reared in the two pH treatments.

Investigating the size and spawning history of river herring within the Connecticut River over the past decade. Stephens, Jacquelinea[c], Allison Roy[b], Adrian Jordaan[a], Dave Perkins[c], and Kenneth Sprankle[d]. *[a]University of Massachusetts, Amherst MA, [b]U.S. Geological Survey, Massachusetts Cooperative Fish and Wildlife Research Unit, University of Massachusetts, Amherst MA, [c]U.S. Fish and Wildlife Service, Richard Cronin Aquatic Resource Center, Sunderland MA, [d]U.S. Fish and Wildlife Service, Connecticut River Fish and Wildlife Conservation Office, Sunderland MA.*
River herring (Blueback Herring *Alosa aestivalis* and Alewife *A. pseudoharengus*) in many Southern New England populations have experienced low abundances and potential shifts in phenology in recent decades. Suspected decreases in fish lengths and changes in age structure through time raise additional concerns for these species, and further population-specific data is needed to understand population trends. This project assessed changes in the spawning composition (e.g., proportion virgin vs repeat spawners) and size of Blueback Herring by age and sex within the Connecticut River watershed, 2013-2022. There was no substantial trend in proportions of spawners (virgin vs repeat) of 3 and 4 years old fish over the ten years; however, there was a slight increase in the proportion of older fish (5 and above) returning for

the first time as virgins in more recent years. While older fish may have higher annual production, returning for the first time at a later age is concerning because delayed returners miss years of reproduction and have higher risks of ocean mortality. Length at age varied interannually; however, females were consistently larger than males at all ages. For older males (ages 5–8), we observed trends of increasing fish length over the last 10 years, further supporting the idea that river herring are investing more into growth than reproduction in recent years. Long term datasets are helpful to explore potential causes of declines and may help inform management considerations for species conservation.

Diet and maternal investment affect larval rockfish condition and survival. Walsh, Kamran A.[a], Andrew R. Thompson[b], Garfield Kwan[c], Brice X. Semmens[d], H. Will. Fennie[e], and Rasmus Swalethorp[d]. *[a]School for Marine Science and Technology, University of Massachusetts Dartmouth, New Bedford MA, [b]NOAA Fisheries Southwest Fisheries Science Center, La Jolla, CA, [c]University of California Davis, Davis CA, [d]Scripps Institution of Oceanography, University of California San Diego, San Diego CA, [e]NOAA Fisheries Alaska Fisheries Science Center, Seattle WA.*
Survival through the larval phase greatly affects the population dynamics of most fishes, and both diet and maternal investment have long been hypothesized as important contributors to interannual recruitment variability. This study examines the feeding ecology of larval Sebastes spp. rockfishes with respect to ontogeny, prey selectivity, and the respective influences of diet and maternal investment on size and growth. Prey selection and carbon biomass of consumed prey were calculated from larval gut contents, maternal investment was estimated using otolith core radii, which is an index of larval size at extrusion, and recent growth was derived from outer otolith increment widths. Bayesian multilevel models were used to describe independent and age-dependent effects of diet and core on length and growth. Larval rockfishes were observed to primarily feed on and select for copepod nauplii and Calanoid copepodites, modulating feeding with ontogeny and in response to prey availability in the environment. Based on carbon weight, the relative contribution of Calanoid copepodites to the diet was strongly and positively correlated with length and growth, while nauplii had a weaker correlation. Both older and younger larvae experienced different growth rates in association with consumption of these prey types. Positive relationships between core radius and fitness parameters suggest that maternal provisioning increases initial larval size and thus the likelihood of larval survival. These findings provide evidence of selective feeding throughout larval rockfish development, and support the notion that both maternal investment and ingestion of preferred prey support larval growth and survival.

Variation in fecundity of Winter Flounder, *Pseudopleuronectes americanus*, and Yellowtail Flounder, *Limanda ferruginea*: patterns across stocks over ten years. Wuenschel, Mark J.[a], Emilee Tholke[b], Yvonna Press[b], W. David McElroy[a], and Richard S. McBride[a]. *[a]NOAA Fisheries, Northeast Fisheries Science Center, Woods Hole MA, [b]IBSS Corp.*
Annual fecundity estimates in marine fishes have been limited for most species due in part to the challenges of traditional methods, however recent advances in image analysis have

facilitated fecundity estimation. Ongoing monitoring of potential annual fecundity (PAF) in winter and yellowtail flounder across multiple stocks (Gulf of Maine, Georges Bank, and Southern New England/Mid-Atlantic) provides a rich dataset to explore scaling in the fecundity-size relationship in addition to spatial and temporal variation in annual fecundity. Both species exhibited significant hyperallometric scaling of fecundity vs. weight; larger females produce disproportionally more eggs than smaller females. We modeled annual fecundity as a function of fish size, liver size, relative condition (Kn), and the mean oocyte diameter for these two species with different reproductive strategies (total vs. batch spawning) using generalized additive models (GAMs). Spatial and temporal effects were assessed as factors- across three stock areas over a ten-year period (2010-2019). As expected, fish size, condition metrics (Kn and liver size) and mean oocyte diameter (which served as a proxy for time before spawning) explained significant portions of variation in potential annual fecundity. For both species, GAMs also indicated significant spatial and temporal effects, as well as the interactions between them suggesting regional level forcing that has varied through time. Observed variation in reproductive output across stocks, species, and years provides empirical data to propose and test hypotheses related to 'upstream' regulation of fecundity (via environmental drivers and productivity) and 'downstream' effects on population replenishment and recruitment.

Abstracts of Posters

Maternal mercury transfer from pregnant Spiny Dogfish (*Squalus acanthias*) to their pups through ovoviviparous reproduction. Ajemian, Maxwell R. and David Taylor. *Department of Marine Biology, Roger Williams University, Bristol RI.*

Mercury (Hg) is a bioaccumulative contaminant that can be transferred from pregnant females to developing embryos (i.e., intrauterine maternal Hg transfer); thus, leading to health deficits in offspring. This study examined Hg transfer in the ovoviviparous spiny dogfish (*Squalus acanthias*). Female dogfish (74 – 98 cm total length, TL; n = 73) were collected from Narragansett Bay and Rhode Island Sound via rod & reel and trawling. In the laboratory, ovarian eggs and intrauterine pups (with attached yolk sacs) were extracted from pregnant dogfish, after which samples of mother/pup muscle tissue and ovarian/uterine yolk were analyzed for total Hg concentrations ([Hg] in ppm dry weight) using automated atomic-absorption spectroscopy. Maternal muscle [Hg] were positively related to TL, indicating bioaccumulation of the contaminant. In contrast, pups demonstrated an inverse Hg-TL relationship. No relationships were observed between maternal and pup muscle [Hg] or ovarian and uterine yolk [Hg]. Uterine yolk [Hg] were positively related to maternal muscle [Hg], however, and pup muscle [Hg] were directly correlated with uterine yolk [Hg]. These results suggest that maternal Hg transfer occurs in spiny dogfish through ovoviviparity.

Chemical analysis of plastics particles in an estuary (Thames River, CT) and the digestive system of seabirds (Tasmania, Australia). Beauchemin, Elise, Mikasa Lierman, Sadie Olson, Sarah Skurat, Cheyenne Waters, Dr. Karina Mrakovcich, and Dr. Deanna Bergondo. *United States Coast Guard Academy.*

Since the first reports of ocean plastic in the 1970s, much research has been conducted to monitor it (Andrady 2011; Kühn et al. 2020; Teboul et al. 2021; Keys et al. 2022). Our goals are to analyze plastic from the Thames River and the digestive systems of short-tailed shearwaters (*Ardenna tenuirostris*). Over three years, eight surface trawls on the Thames have been conducted with an average of 0.069 particle/m^2 in 2022. From 1970 to present, research has shown an increase in the number of short-tailed shearwaters containing plastic (Waters et al. 2022). The samples were collected from five 25-30 minute manta trawls on the Thames and the digestive tract contents of 109 poached short-tailed shearwaters obtained by the Tasmania government (Cousin et al. 2015). The items collected in the trawls and the seabirds were analyzed for possible plastics using visual identification and a dissecting microscope. The mass, length, width, and depth of each suspected microplastic was measured, then the particles were run through the Spectral Analysis Themo iS10 (FTIR) and compared to a database of sample spectra. We identified 16 plastic particles from 109 seabird samples with 18.9% of all samples containing a 70% match for plastic. In the five surface trawls we found 27 particles that were a 70% plastic match, a density of 0.0060 particle/m^2 of water. This study shows the most common plastic type in both seabirds and trawls was polyethylene, and there were lower plastic amounts in both data compared to previous studies.

Engaging the fishing community to understand disease and reproductive dynamics of the Atlantic Sea Scallop. Brander, Douglas, N.[a], David Bethony[a], Anna Mercer[b], and George Maynard[c]. [a]*Commercial Fisheries Research Foundation,* [b]*NOAA Fisheries, Cooperative Research Branch,* [c]*NOAA Fisheries, Marine Resource Management Specialist.*
A changing climate has begun to impact the biology of the Atlantic sea scallop (*Placopecten magellanicus*) through the emergence of diseases and changes in reproductive dynamics. In this project, an approach to collect data that tracks these conditions through space and time was piloted. A fishery dependent data collection tool was developed, in the form of an app that can be downloaded and operated by members of the scallop fishing community. The app, ScallApp, was designed as a self-instructed, quick to use tool by which scallopers have been able to collect timestamped and geolocated disease and gonad stage data along with images of individual scallops. In order to manage the images and sampling session data collected at sea, a database was constructed, which allowed the researchers to process the images and assign a 'verified' status to app users that submitted correctly identified biological parameters in sequential sampling sessions. These verified data submissions were then fed to an app that creates interactive distribution maps for use by the broader fishing industry, as well as fisheries scientists, managers, and educators. The components of this project provide a comprehensive infrastructure that can be utilized by a broader fleet of participating fishermen to collect images throughout the year, across the range of the resource, and contribute to a near real-time understanding of environmental impacts to sea scallop biology.

Ontogenetic effects of harmful algal blooms and ocean acidification on the *Artemia spp*. Candia, Joseph[a], Christopher J. Gobler[b], and Konstantine J. Rountos[a]. [a]*Department of Biology, St. Joseph's University, Patchogue NY,* [b]*School of Marine and Atmospheric Sciences, Stony Brook NY.*
Estuaries experience a variety of stressors often linked to eutrophication. In many regions, harmful algal blooms (HABs) and ocean acidification (OA) present significant challenges to estuarine resources and fisheries. While the impacts of HABs and OA have been investigated separately, their co-effects have remained underexplored. This research focused on examining the effects of HABs and OA on the commonly used zooplankton model organism, brine shrimp (*Artemia spp.*). Previous research has examined the effects of HABs and OA on the mortality of *Artemia spp.* separately, but not when the two conditions are combined. This study explored the effects of two cosmopolitan toxin-producing HAB species, *Margalefidinium polykrikoides* and *Alexandrium catenella*, on the mortality, immobilization, and hatching rates of *Artemia spp*. To achieve a more holistic understanding, experiments assessed the potential impacts on multiple life stages (i.e. cyst hatching rate, and survival for newly hatched nauplii, one-week post-hatch, and two-week post-hatch individuals). Overall, there were no clear indications of synergistic toxic effects of HABs at bloom concentrations (i.e. ~2500 cells ml-1) when paired with acidified conditions (i.e. 7.0-7.4 pH). The results demonstrate that *Artemia spp.* are largely resilient to these HABs and OA conditions. Ongoing work will examine the magnitude in which HAB cells were consumed in the respective algal treatments from these experiments.

Investigating the diet of endangered sturgeon in the Connecticut River using gastric lavage and eDNA metabarcoding techniques. Kraczkowski, Michelle[a], Loren Tardif[a], and Jacqueline Benway[b]. [a]*Biology Department, Central Connecticut State University, New Britain CT,* [b]*Connecticut Department of Energy and Environmental Protection, Fisheries Division, Old Lyme CT.*
The Connecticut River is home to two Sturgeon species: the Shortnose Sturgeon (*Acipenser brevirostrum*) and the Atlantic Sturgeon (*Acipenser oxyrinchus*). The Shortnose Sturgeon, endangered since 1967 due to overfishing and industrial use of rivers, has been monitored by CTDEEP since 1988. However, populations remain low due to life history traits and habitat changes. The Atlantic Sturgeon, federally listed as endangered in 2012, has five distinct population segments (DPSs). Connecticut's seasonal population of Atlantic Sturgeon is primarily comprised of the New York Bight DPS. For both species, there is minimal knowledge of their feeding habits and preferred diet. Our goal is to determine the current Sturgeon diet, and thus determine which prey items are important for them in the lower Connecticut River. We propose a study to collect and lavage approximately 40 Sturgeon, using gastric lavage as a safe technique to determine the diet of Sturgeon. CT DEEP will conduct Sturgeon collections through Federally permitted research activities. Genetic testing will be utilized to aid in determination of identification of prey consumed. So far, we have sampled and identified the stomach contents of 10 sturgeon (5 of each species), and we have found that both the quantity and volume of prey is low. Identified prey items include aquatic insect parts, amphipods, and more. We plan to continue our efforts to collect and lavage sturgeon into next year. This will be coupled with eDNA metabarcoding techniques to provide a more comprehensive and confident identification of prey.

Using fine-scale fishery data to estimate economic impact of wind farms on the Summer Flounder fishery. Marjadi, Meghna N.[a,b], Anna J. Mercer[a], Andrew W. Jones[a], and Steven X. Cadrin[b]. [a]*NOAA Fisheries, Northeast Fisheries Science Center, Narragansett RI,* [b]*School for Marine Science and Technology, University of Massachusetts Dartmouth, New Bedford MA.*
Offshore wind projects are being developed across the Northeast continental shelf as an approach to mitigate the effects of climate change; however, these projects will overlap with historical fishing grounds and displace fishing. Accurate spatial data to represent fishing activity is required to inform decisions about wind farm locations and estimate economic exposure. In the northeast, the National Oceanic and Atmospheric Administration uses logbooks to estimate fishing locations for active vessels. Logbook 'footprints' use one central location for each trip to produce coarse estimates of fishing areas and uncertain estimates of exposed revenue. At-sea observer data is used to expand logbook positions to broader 'footprints'. Fine-scale data, available from Northeast Fisheries Science Center Study Fleet vessels, provide more precise estimates of active-fishing footprints and can be used to estimate exposure and determine biases of logbook footprints. Previous comparisons of logbook and active-fishing footprints for longfin squid (*Doryteuthis pealeii*) suggested that restricting the assumed spread of logbook locations could reduce biases. Application of these methods for other fisheries will facilitate understanding of how coarse logbook data can be used to accurately estimate economic exposure across fishing gears and types when fine-scale data are unavailable. We used Study Fleet data from the summer flounder fishery (*Paralichthys dentatus*; 2014-2022), to compare

coarse logbook footprints and fine-scale active-fishing footprints. Preliminary results suggest that spreading coarse logbook footprints to the 90th percentile of observer distributions underestimates economic exposure, while restricting logbook footprints to the 25th and 50th percentiles yields more accurate estimates of economic exposure.

Kokanee in Connecticut; the past, present and future. Ransom, Andrew and Brian Eltz. *Connecticut Department of Energy and Environmental Protection, Fisheries Division, Harwinton CT.*
Kokanee salmon (*Oncorhynchus nerka*) are a popular sportfish native to the western United States that have been introduced to waterbodies across the country by many state agencies, including Connecticut. These introductions typically occur in oligotrophic lakes that support cold water and high oxygen content throughout the year. Kokanee have a unique ability to provide both a direct recreational fishery and act as an abundant food source for other gamefish. The Connecticut Inland Fisheries Division has maintained a kokanee program since 1959, and is now one of only two states east of the Mississippi River with an active management plan. A total of 18 lakes have historically been targeted for stocking kokanee, however, West Hill Pond and East Twin Lake are the remaining two waterbodies that support a fishery. Competition with non-native landlocked alewives (*Alosa pseudoharengus*) results in significantly reduced survival of stocked kokanee fry, and has hindered the expansion of the program to other lakes within the state. However, the population within West Hill Pond continues to be successful, receiving an estimated 20,000 angler hours per year and provides the Burlington Fish Hatchery with the broodstock needed to continue the program. Opportunities to expand the program may be possible in the future, however in-depth habitat and zooplankton assessments will be necessary to identify candidate lakes.

Pilot observer program for Rhode Island state waters gillnet fishery. Remick, Abrielle and Nicole Lengyel Costa. *Atlantic States Marine Fisheries Commission, Rhode Island Gillnet State Waters Fleet, Rhode Island Department of Environmental Management, Division of Marine Fisheries, Atlantic Coastal Cooperative Statistics Program.*
There have been increasing requests for regulatory changes from the Rhode Island state waters gillnet fleet in recent years. RIDMF has not been able to support these concerns due to a lack of data specifically regarding the striped bass prohibition and the weekly aggregate limits for pulse fisheries, such as bluefish. To address such concerns, RIDMF implemented a pilot observer program in June 2023 to collect necessary data to understand these concerns and better regulate the RI gillnet state waters fleet. At-sea sampling occurred from July-late October. Analysis is currently underway to determine if there is probable cause to adjust current regulations, conduct modeling on trends to characterize pulses within the bluefish fishery, and determine the feasibility of this pilot observer program for future years and data needs.

Launching an expert elicitation exercise to develop a comparative framework of synergies and tradeoffs from a suite of decarbonization solutions on fishery ecosystems. Sedore, Vanessa[a] and Sarah Schumann[b]. [a]Brown University, Providence RI, [b]Fishery Friendly Climate Action, Warren RI.
As many U.S. states pursue ambitious decarbonization goals and follow the UN Paris Agreement's "net zero by 2050" goal, it is necessary to understand how green energy and other decarbonization solutions can have a variety of impacts, both positive and negative, on

environmental processes and ecosystems. Our SNEC presentation represents the kickoff of a pilot project that seeks to use expert elicitation to identify and compare tradeoffs and co-benefits from different decarbonization pathways on marine and aquatic ecosystems. During our presentation, we will recruit experts to participate in an individual survey and a subsequent workshop (in late January 2024) that will yield a comprehensive comparison across a range of decarbonization pathways in terms of their impacts (positive and negative) on fishery ecosystems. We pursue an expert elicitation method because there is no readily available comprehensive comparative data set on these impacts, and there are a large number of decarbonization solutions like offshore wind, marine carbon dioxide removal, nuclear, biofuels, geothermal, and solar energy of interest with potential tradeoffs and synergies for marine ecosystems. Expert elicitation has been used in several reference studies and accounts for uncertainties. Experts are asked to make informed judgments on the intensity and likelihood of impacts for each driver-receptor interaction. The goal of this project is to supply a framework that stakeholders and decision-makers can consult to pursue well-informed public processes that achieve decarbonization goals with minimal disruption and maximum co-benefits for fishery ecosystems.

Population dynamics and competitive interactions of Channel Catfish in Connecticut lakes and ponds. Shubat, Danielle and Ryan Adams. *Connecticut Department of Energy and Environmental Protection, Fisheries Division, Marlborough CT.*
Channel Catfish can provide quality fishing in warm, eutrophic, and urbanized waterbodies where the establishment of other sport fish can be difficult. Recognizing the popularity of naturalized Channel Catfish populations in the Connecticut, Thames, and Housatonic Rivers, the Connecticut Fisheries Division began stocking Channel Catfish into 11 waterbodies in 2007. Following early success, the program expanded to 24 lakes and ponds. These waterbodies were stocked using two different strategies. The first was stocking adults (14-18 inch) to provide immediate fishing opportunities. The second was stocking smaller (9-11 inch) yearlings that were expected to survive and grow to catchable size within 1-2 years. However, the stocking of yearling catfish was paused in 2019 when early assessments indicated that the number and size of Channel Catfish in these “put-and-grow” waterbodies had more than doubled. To better understand Channel Catfish abundance and size structure, population estimates were conducted from 2019 to 2023 using baited tandem hoop nets at the yearling-stocked lakes. The results indicate that abundant fishable populations were created that are apparently underutilized by anglers and may be negatively impacting other resident fish species. Increasing angler awareness of the Channel Catfish program, and a fuller understanding of the competitive interactions between Channel Catfish and pre-existing fish communities will be essential to the continued success of the Channel Catfish management program.

Terrestrial predator visitation patterns at riverscape cold-water thermal refuges. Sullivan, Christopher J., Chadwick D. Rittenhouse, and Jason C. Vokoun. *Department of Natural Resources and the Environment, University of Connecticut, Storrs CT.*
Perceived predation risks by terrestrial predators are major ecological forces in aquatic systems, particularly for aggregating fish. Riverscape thermal refuges are discrete, localized cold-water patches where fish temporarily aggregate to buffer against heat events. Predation pressures by terrestrial predators at thermal refuges may decrease the thermoregulatory

benefits of refuge use, but quantifying such effects can be challenging and controversial when sampling can impose additional stress on fish. We monitored terrestrial predator visitation patterns and predation at four thermal refuges in the Housatonic River, Connecticut, between May 18th and September 29th, 2022, with camera traps. Specifically, we assessed diel visitation patterns by different categories of terrestrial predators at thermal refuges and determined if patterns varied among predator categories or with prevailing environmental conditions, and estimated the probability of predation by hour of the day combined across all predator categories, quantifying general predation pressures. We detected at least one terrestrial predator at a thermal refuge each day, and mean hourly visitation rates (count/h) were highly variable across predator categories and sampling dates. The most supported GAMM indicated that terrestrial predator visitation rates (count/h/day) varied with mean daily river discharge and water temperature differential, and relationships differed across categories of terrestrial predators. We observed 22 predation attempts on thermoregulating salmonids and predicted that the probability of predation by any predator increased from 0.002 to 0.017 throughout a 24 h day ($p = .004$). Camera traps provided novel evidence that terrestrial predators are pervasive at riverine thermal refuges, which is relevant for refuge conservation and management globally.

Pilot hook and line survey for data continuity in wind energy areas. Viducic, Katie[a], Dave McElroy[b], and Anna Mercer[a]. *[a]NOAA Fisheries, Northeast Fisheries Science Center, Narragansett RI, [b]NOAA Fisheries, Northeast Fisheries Science Center, Woods Hole MA.*
Offshore wind energy development is rapidly advancing in the Northeast USA, with over 22 million acres of ocean space planned, leased, or already built. Areas developed for offshore wind farms will be difficult or impossible to access using traditional mobile-gear surveys; thus, there is a critical need for alternative survey techniques that can provide data on the distribution, abundance, biomass, length composition, and biology for federally managed species and their habitats. Hook and line surveys conducted aboard recreational fishing vessels have been used successfully in other regions to inform stock assessments and assess impacts of ocean planning efforts. This presentation will detail the process of developing a new collaborative hook and line survey in the Northeast USA to fill data gaps created by preclusion of long-term mobile gear surveys from offshore wind energy areas. A key element of this hook and line survey is partnership with the fishing industry, from survey design and gear selection to survey operations and protocols. Inviting stakeholders to working sessions to refine survey methodologies and leveraging captain expertise to ensure feasibility of survey operations are some of the approaches that were used to engage constituents. The ultimate goal of this hook and line survey is to ensure continuity of monitoring fisheries resource populations and habitats in the Northeast USA as offshore wind energy development progresses. Data produced by this survey will be critical for assessing the cumulative impact of offshore wind energy development and the collaborative process for developing this survey can provide a model for other regions.

How does adaptation to local conditions affect the ability of gene flow to help widespread species adapt to changing climates along a latitudinal gradient?. Wasserman, Ben A. and Mark C. Urban. *Department of Ecology and Evolutionary Biology, University of Connecticut, Storrs CT, University of Connecticut, Storrs, CT.*
Climate change threatens many species and populations. We might expect that widespread

species will be less impacted, since they exist in a wide variety of climates along latitudinal or altitudinal gradients. Many species of freshwater fishes fit this description. If individuals can migrate freely, then gene flow should facilitate adaptation to the changing climate via poleward movement of alleles. But climate is not the only selective factor on the landscape. If other aspects of the environment (i.e. predator abundance) are also selective, then alleles for temperature tolerance may not be able to immigrate poleward if the next population is mismatched for predators. Using a mathematical model we explore how this mismatch limits the flow of adaptive alleles and population persistence. We next explore how assisted migration, the intentional introduction of individuals from one population with a certain historical climate to another site whose future climate it is projected to match, may ameliorate these effects. We also explore the effect of source population choice, whether based on geographical proximity, climactic proximity, or total environmental proximity (including climate and predator abundance), or a diverse set of source populations. Managing gene flow in this way may become an important tool for conservation of freshwater fish species facing environmental change on a fragmented landscape. Understanding the ways in which variation in selection across the landscape may limit gene flow's ability to facilitate evolutionary rescue, we will better be able to target this tool to cases where it will be most useful.

Overwintering growth and lipid accumulation in northern stock Black Sea Bass (*Centropristis striata*) juveniles. Zavell, Max D.[a], Matthew E.P. Mouland[a], Eric Schultz[b], and Hannes Baumann[a]. [a]*Department of Marine Sciences, University of Connecticut, Groton CT,* [b]*Ecology and Evolutionary Biology, University of Connecticut, Storrs CT.*
The northern stock of black sea bass (BSB) has spatially expanded over the past decade, potentially due to warming Northwest Atlantic shelf waters affecting overwintering. To gather empirical data on temperature-dependent energetics, we quantified winter growth and lipid accumulation in juveniles from Long Island Sound using three experiments to simulate two overwintering strategies: migrating offshore and staying inshore. Exp1 quantified mortality and individual length growth (GR), weight-specific growth (SGR), and lipid content under constant food levels and three static temperatures (6,12,19°C). GR(SGR) subsequently decreased with decreasing temperature; 0.24 mmd-1 (0.89% d-1) to 0.04 mm d-1 (0.17% d-1), while [lipid] was highest at 12°C which is nearest to what overwintering juveniles likely encounter offshore. Exp2 quantified the same metrics at an offshore thermal profile (20 → 13°C) with seasonally varying rations. Growth varied with diet ration, increasing under higher rations, while individuals fed a low ration fall diet exhibited compensatory growth in the winter once all rations were normalized (~4 & 1.4× faster GR & SGR in winter). Exp3 utilized an inshore thermal profile (17 → 5 → 12°C) to identify size-specific trends in winter mortality, growth, and lipid accumulation. Mortality was low (≤ 27%) and was not size-selective, even though larger individuals had higher lipid stores. Overall juveniles disproportionately accumulated lipid over lean mass, providing increased energy stores for overwintering. At present, juveniles may have a tolerance for lower temperatures than previously realized, potentially allowing them to overwinter inshore as winters become milder, shifting the energetic trade-offs of offshore migrations.

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