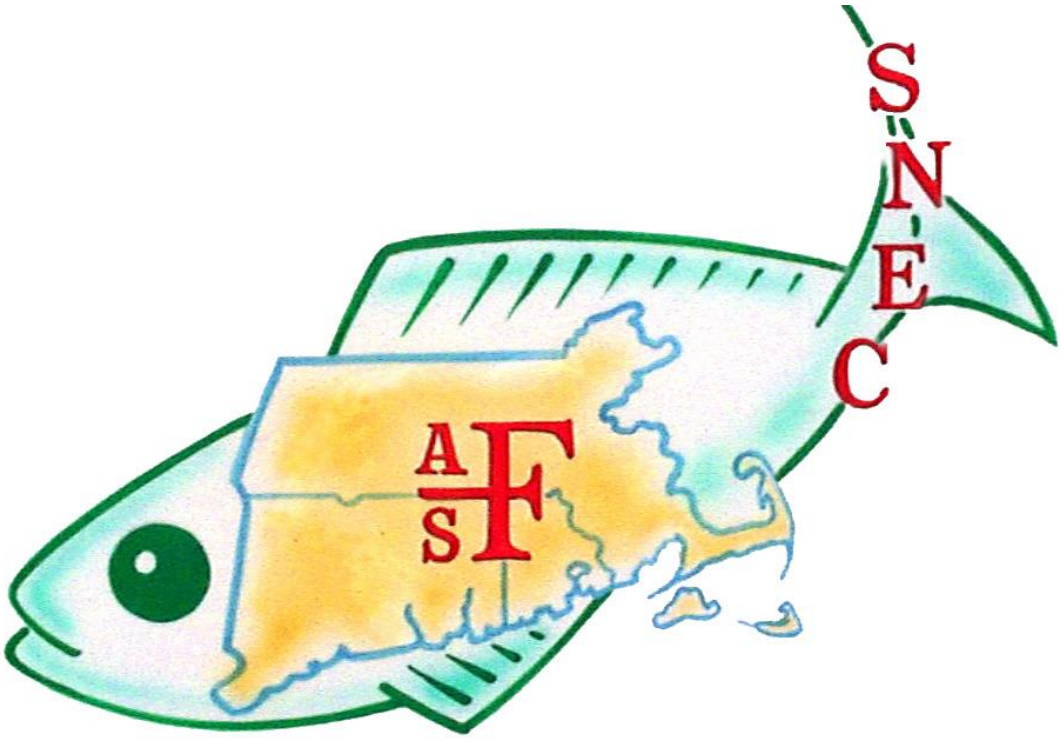
2019 Winter Science Meeting



Southern New England Chapter

American Fisheries Society

January 16, 2019

University of Connecticut
Storrs, CT

SCHEDULE

8:30 – 9:00	***Registration and Coffee***
9:00 – 9:10	**Opening Comments.** Owen Nichols, President
9:10 – 9:30	**Modifying age-based selectivity to rebuild overfished stocks and increase resilience.*** Kasper, Jacob, Jeffrey Brust, Amanda Caskenette, Jason McNamee, Jason Vokoun, Eric T. Schultz
9:30 – 9:50	**Identifying best catch-and-release practices to reduce discard mortality in northeast U.S. recreational fisheries.*** Capizzano, Connor, John Mandelman, Emily Jones, Douglas Zemeckis, Micah Dean, William Hoffman
9:50 – 10:10	**Utilizing fishermen-collected data to explore the Black Sea Bass (*Centropristis striata*) population and construct gear-specific discard characterizations.** Malek Mercer, Anna, Thomas Heimann, Jason McNamee
10:10 – 10:30	**Fishery characteristics, population trends, and environmental linkages of American lobster (*Homarus americanus*) as revealed from an industry-based sampling program.** Ellertson, Aubrey, Anna Malek Mercer, David Spencer, Robert Glenn
10:30 – 10:50	***Break***
10:50 – 11:10	**Bioaccumulation of mercury and methylmercury in northern quahogs (*Mercenaria mercenaria*) from Connecticut coastline embayments.*** Hansen, Gunnar, Zofia Baumann, Robert Mason
11:10 – 11:30	**Research and development of aquaculture techniques for the Royal Gramma (*Gramma loreto*).** Vacco, Vince, Eric Litvinoff, Catherine Guinovart, Paul Anderson
11:30 – 11:50	**The Massachusetts Aquaculture Permitting Plan.** Ford, Kathryn, Christopher Schillaci, Sean McNally, Michael Tlusty

11:50 – 13:10 ***Awards, Business, Lunch***

13:10 – 13:30 **Fluctuating pCO2 and dissolved oxygen conditions provide physiological refuge to a coastal forage fish, *Menidia menidia*.** Cross, Emma, Christopher Murray, Hannes Baumann

13:30 – 13:50 **High sensitivity of the Northern Sand Lance (*Ammodytes dubius*) to ocean acidification and warming.*** Murray, Christopher, David Wiley, Hannes Baumann

13:50 – 14:10 **Atlantic Cod in southern New England: are they climate deniers?*** Langan, Joseph A., M. Conor McManus, Douglas R. Zemeckis, Jeremy S. Collie

14:10 – 14:40 ***Break***

14:40 – 15:00 **Modeling the impact of climate change on American lobster larval connectivity in southern New England.** Casey, Flynn, James Churchill, Geoffrey Cowles, Kevin Stokesbury, Tracy Pugh, Richard Wahle, Robert Glenn, Burton Shank

15:00 – 15:20 **Telemetry of upstream migrant American Shad and river herring in the lower Pawcatuck River mainstem: preliminary results.** Haro, Alex, Seaver Anderson, Annie Ragan, Brett Still, Theodore Castro-Santos

15:20 – 15:40 **Preparing for offshore wind: results of the 2018 Southern New England Cooperative Ventless Trap Survey.** Collie, Jeremy, Anna Malek Mercer, Michael Long, Joseph Langan

15:40 – 17:00 **Poster and SciComm Social**

* Denotes student paper

Posters

P1 **Landscape scale adoption of barrier removal and floodplain restoration to help people and fish adapt to climate change.** Bowden, Alison, Galen Laurence

P2 **Preferences for alternative management - A Long Island Sound Tautog survey.**** Chen, Zhenshan, Jacob Kasper, Eric Schultz, Stephen Swallow, Pengfei Liu

P3 **Effects of the synthetic corticosteroid prednisolone on growth and osmoregulatory physiology of Atlantic salmon (*Salmo salar*) parr.**** Kalinowski, Matt C., Stephen D. McCormick, John T. Kelly

P4 **Quantifying quahogs (*Mercenaria mercenaria*) in Narragansett Bay: insights from a collaborative sampling program.** Malek Mercer, Anna, Thomas Heimann, Dale Leavitt, Conor McManus

P5 **Morphological re-descriptions of the larval stage of three *Urophycis* species (family: Phycidae) from the Northeast United States Continental Shelf.** Marancik, Katrin, David Richardson, Malgorzata Konieczna

P6 **Targeting bycatch: Predicting fish species overlap in the North West Atlantic Ocean.** Nye, Janet, Carolina Chong-Montenegro, Lesley Thorne, Julia Stepanuk

**Denotes student poster

Abstracts of Oral Presentations

Modifying age-based selectivity to rebuild overfished stocks and increase resilience. Kasper, Jacob[1], Jeffrey Brust[2], Amanda Caskenette[3], Jason McNamee[4], Jason Vokoun[1], Eric T. Schultz[1], *[1]University of Connecticut, Storrs, CT 06269, [2]New Jersey Department of Environmental Protection, Port Republic, NJ 08241, [3]Great Lakes Laboratory for Fisheries and Aquatic Sciences, Fisheries and Oceans Canada, Burlington Ontario, Canada, [4]Rhode Island Department of Environmental Management*

Rebuilding truncated age structures is an important goal in fisheries management as the reproductive contributions of older fish are predicted to reduce fluctuations in recruitment and increase stock resilience. Harvesting of older fish can be reduced by modifying fishery selectivity curves from asymptotic to dome-shaped. We model harvest slot limits (HSLs) for Tautog (*Tautoga onitis*) in Long Island Sound, a stock which is overfished and experiencing overfishing. Traditionally, the fishery was managed by temporal closures, bag limits, and minimum legal size (40 cm). Tautog are a candidate species for HSLs because they are a long-lived, slow-growing species with low release mortality (2.5%). Because angler behavioral response to regulatory changes is unknown, two responses were evaluated: full compliance and 50% noncompliance. We evaluated changes in population demographics relative to status quo (SQ), for three candidate HSLs: 38-44, 41-51 and 43-55 cm. Using a long-term projection model, stock recovery and equilibrium periods were analyzed. The population crashed with the 38-44 cm HSL noncompliant scenario. But with the other two HSLs, the abundance of older fish rapidly increased to 8-30 times SQ levels within the first 10 years and SSB was restored regardless of angler behavior. After stocks reached equilibrium, HSLs maintained two to three-fold more older fish than SQ management. Thus, the age-structure can be rebuilt while maintaining harvest levels. These results indicate that dome-shaped selectivity curves are likely to rebuild truncated age structures in other long-lived. slow growing species and should be considered in management approaches.

Identifying best catch-and-release practices to reduce discard mortality in northeast U.S. recreational fisheries. Capizzano, Connor[1,2], John Mandelman[1], Emily Jones[1], Douglas Zemeckis[3], Micah Dean[4], William Hoffman[4], *[1]Anderson Cabot Center for Ocean Life, New England Aquarium, Boston, MA 02110 ,[2]University of Massachusetts Boston, Boston, MA 02125, [3]Rutgers, The State University of New Jersey, Toms River, NJ 08755, [4]Massachusetts Division of Marine Fisheries, Gloucester, MA 01930*

Recreational fishing removals can represent a significant proportion of total fishery removals for some stocks and can often include high discard rates, whether due to regulations, non-desirability, and/or heightened conservation ethics. This is the case for multiple stocks in the northeast United States, such as Atlantic Cod, Haddock, Cusk, and Black Sea Bass, where there has been a paucity of discard mortality research. Our team conducted several field-based tagging studies to address discard mortality data gaps in these recreational fisheries to inform stock assessments and fishery management plans. The efficacy of recommended best catch-and-release practices for reducing discard mortality were also evaluated against standard industry practices. For instance, by comparing how various terminal tackle configurations impact discard mortality rates in cod and Haddock, we identified the most advisable tackle and handling recommendations for use by stakeholders to reduce bycatch impacts. Among species such as Cusk and Black Sea Bass where barotrauma significantly influences discard mortality, we investigated mitigation techniques such as descending devices and swim bladder venting for their ability to reduce decompression and thus mortality. Results from these case studies can inform stock assessments and future management decisions, provide insights into solutions for reducing bycatch impacts, open opportunities for angler education, and promote the long-term sustainability of these recreational fisheries.

Modeling the impact of climate change on American lobster larval connectivity in southern New England. Casey, Flynn[1], James Churchill[2], Geoffrey Cowles[1], Kevin Stokesbury[1], Tracy Pugh[3], Richard Wahle[4], Robert Glenn[3], Burton Shank[5], *[1]School for Marine Science and Technology, University of Massachusetts Dartmouth, New Bedford, MA 02744, [2]Woods Hole Oceanographic Institution, Woods Hole, MA 02543, [3]Massachusetts Division of Marine Fisheries, New Bedford, MA 02744, [4]School of Marine Sciences, University of Maine, Walpole, ME 04573, [5]NOAA Northeast Fisheries Science Center, Woods Hole, MA 02540*

During the 1990s, Buzzards Bay supported a commercially viable American lobster fishery within Lobster Management Area-2 (LMA-2). Lobster landings and employment of commercial lobstermen in LMA-2 have since decreased substantially, concurrent with declines in abundance and inshore postlarval settlement. These changes occurred during a period of significant warming in southern New England, with coastal waters progressively characterized by thermal ranges affecting the physiology of all life stages. Impacts to recruitment are complex and multi-causal, as rising ocean temperatures can affect the development and survival of pelagic larvae and newly-settled juveniles, and can redistribute adults towards cooler offshore waters during the critical time of egg-release. We examine the impact of the observed offshore shift in the distribution of egg-bearing females on delivery to Buzzards Bay by simulating larval transport with a coupled biophysical individual-based model (IBM) driven by ocean hindcasts. Numerical trajectories are used to assess the connectivity between observed and potential larval release sites within LMA-2 and nursery habitat in Buzzards Bay. Preliminary results suggest that, in 2017, the average transport success with which larvae released from local eggers settled within Buzzards Bay was nearly half that of 1991. Additionally, simulations demonstrate a shift in high-settlement locations towards the upper bay, where post-settlement survival may be threatened by poor thermal suitability. These investigations advance our understanding of how a warming climate may impact lobster population dynamics and allow for more informed management decisions regarding the LMA-2 lobster population and those populations that may be exposed to similar warming regimes.

Preparing for offshore wind: results of the 2018 Southern New England Cooperative Ventless Trap Survey. Collie, Jeremy[1], Anna Malek Mercer[2], Michael Long[2], Joseph Langan[1], *[1]University of Rhode Island Graduate School of Oceanography, Narragansett, RI 02882, [2]Commercial Fisheries Research Foundation, Kingston, RI 02881*

Over 650 square miles of ocean have been leased for offshore wind energy development in the northeastern United States, but there is uncertainty surrounding how fisheries resources will be impacted by the installation, operation, and decommissioning of offshore wind turbines and power cables. The University of Rhode Island and Commercial Fisheries Research Foundation, in partnership with commercial lobstermen, are conducting the Southern New England Cooperative Ventless Trap Survey (SNECVTS) to address these uncertainties. This baseline survey aims to assess the seasonal distribution, movement, and habitat use of American lobster and Jonah crab in the Rhode Island/Massachusetts Wind Energy Area (RI/MA WEA), which is centered on Cox Ledge. Twenty-four lease blocks in the RI/MA WEA were selected for the study, based on their proximity to shore and planned development of offshore wind energy. The SNECVTS project comprises at-sea biological sampling, mark-recapture tagging, acoustic telemetry, and habitat characterization, and has provided a multi-year record of pre-construction conditions at one of the first federal offshore wind energy sites in the Northeast United States. Further, the survey was designed to be replicable during all phases of wind energy development including construction, operation, and decommissioning, which will enable assessment and mitigation of the impacts of offshore wind energy development.

Fluctuating pCO2 and dissolved oxygen conditions provide physiological refuge to a coastal forage fish, *Menidia menidia*. Cross, Emma, Christopher Murray, Hannes Baumann, *University of Connecticut-Avery Point, Groton, CT 06340*

Rising carbon dioxide concentrations, recently exceeding 400 µatm, are rapidly acidifying and depleting oxygen in our oceans. Current understanding of organism responses to this environmental phenomenon are based mainly on static conditions despite community metabolism in coastal systems causing fluctuating pCO2 and dissolved oxygen (DO) conditions on diel and tidal timescales. Long-term monitoring of our sampling site in Mumford Cove, CT, revealed pH and dissolved oxygen fluctuate on tidal and diel rhythms which reach extremes of 6.9-7.9 pH and 1-8 mg L-1 of dissolved oxygen concentrations in Late Summer. Two experiments were conducted in summer 2017 assessing the impact of fluctuating pCO2 x DO conditions on the early life stages of the Atlantic Silverside, *Menidia menidia*, to increase the environmentally realistic nature to multistressor experiments. We found an increase in the survival of embryos and larvae to 10 days post hatch and also in larval growth under fluctuating conditions compared to static conditions. This indicates that fluctuations may benefit coastal organisms by providing periodic physiological refuge from stressful conditions, which could promote species adaptability to climate change.

Fishery characteristics, population trends, and environmental linkages of American lobster (*Homarus americanus*) as revealed from an industry-based sampling program. Ellertson, Aubrey[1], Anna Malek Mercer[1], David Spencer[2], Robert Glenn[3], *[1]Commercial Fisheries Research Foundation, Kingston, RI 02881, [2]Owner of F/V Nathaniel Lee and Newport Lobster Shack, Newport, RI 02840, [3]Massachusetts Division of Marine Fisheries, New Bedford, MA 02744*

The American lobster, *Homarus americanus*, is one of the most economically and culturally important species in the United States, with landings valued at over $669 million in 2016. Scientists, managers, and fishermen, however, agree that the data being used to assess this species lack sufficient spatial and temporal coverage, particularly in Southern New England. In 2013, the Commercial Fisheries Research Foundation developed an industry-based data collection program to address these data gaps, increase transparency of the assessment process, and promote industry members' belief in the validity of the data sources used. Fishermen use a specialized tablet app, digital calipers, and wireless water temperature sensors to record information about their lobster and Jonah crab catch and the environment as part of their routine fishing practices. Since its inception the Lobster and Jonah Crab Research Fleet has collected biological data from over 120,000 lobsters as well as coupled bottom water temperatures from the Gulf of Maine to the Mid-Atlantic. The data collected by the Research Fleet suggest that there are distinct differences in the lobster fishery (CPUE, discard dynamics) and catch characteristics (size spectra, sex ratio, reproductive cycles, molting patterns, disease dynamics) between inshore and offshore waters and between seasons. This presentation will explore these findings and discuss the implications for the assessment and management of this valuable species.

The Massachusetts Aquaculture Permitting Plan. Ford, Kathryn[1], Christopher Schillaci[1], Sean McNally[2], Michael Tlusty[2], *[1]Massachusetts Division of Marine Fisheries, New Bedford, MA 02744, [2]University of Massachusetts Boston, Boston, MA 02125*

The shellfish aquaculture industry in Massachusetts has experienced tremendous growth over a period of 10 years. Between 2006 and 2016, statewide shellfish aquaculture landings grew from $6.2 million to $25 million. The industry contributes an estimated 900 jobs on Cape Cod alone. State law gives municipalities jurisdiction over the licensing (or granting) of space to run an aquaculture facility. The state must approve the municipal action and issue permits related to operating an aquaculture facility and projects that trigger certain impact thresholds are required to file under the Massachusetts Environmental Policy Act (MEPA). In addition, the Army Corps of Engineers has jurisdiction over aquaculture activities since they are located in navigable waters of the U.S. As the industry has grown, concerns regarding cumulative impact, impact calculations, gear types, and the complicated permitting pathways have grown. This talk will describe progress made in addressing these concerns through the development of the Massachusetts Aquaculture Permitting Plan (MAPP). The MAPP will map out all of the aquaculture facilities in Massachusetts, clearly define the permitting pathway and thresholds, and develop a cumulative impact assessment that is reviewable under MEPA. This project is guided by a citizen's advisory committee and an interagency task force and is integrated with the Massachusetts Shellfish Initiative. This work is being funded by ASMFC.

Bioaccumulation of mercury and methylmercury in northern quahogs (*Mercenaria mercenaria*) from Connecticut coastline embayments. Hansen, Gunnar, Zofia Baumann, Robert Mason, *University of Connecticut-Avery Point, Groton, CT 06340*

The global pollutant mercury (Hg), and its neurotoxic form, methylmercury (MeHg) are detrimental to human and wildlife health. Consumers in marine ecosystems, including humans, are exposed to MeHg from their diet. Most bivalves have lower MeHg concentrations compared to pelagic fish due to their occupying lower trophic levels. Bivalves are important components of many coastal food webs, and thus an important link in the trophic transfer of contaminants, yet their bioaccumulation of MeHg is rarely studied. Therefore, we evaluated the patterns of total Hg (THg) and MeHg in soft tissues of northern quahogs (*Mercenaria mercenaria*). Samples were collected from the mouth of the Norwalk River and Mumford Cove. The soft tissue THg and MeHg concentrations were compared to shell height and age, which was determined by observing growth patterns in the shell. A subset of clams were dissected to enable inter-organ THg and MeHg comparisons. Organs of interest are the adductor muscles, foot, mantle, and viscera. We have found differences in THg and MeHg accumulation patterns between organs. Counter to our hypothesis, THg and MeHg did not increase with age and size, as observed in pelagic vertebrates. I will discuss the significant relationships of THg with age ($p=0.026$) and size ($p<0.001$) for quahogs from Norwalk and the unexpected negative relationship between MeHg with age and size for quahogs from Norwalk and Mumford cove ($p<0.005$). I will also report the distributions of MeHg and THg between the organs of interest.

Telemetry of upstream migrant American Shad and river herring in the lower Pawcatuck River mainstem: preliminary results. Haro, Alex[1], Seaver Anderson[2], Annie Ragan[2], Brett Still[2], Theodore Castro-Santos[1], *[1]Leetown Science Center, S.O. Conte Anadromous Fish Research Center, U.S. Geological Survey, Turners Falls, MA 01376, [2]Department of Natural Resources Science, University of Rhode Island, Kingston, RI 02892*

Restoration of American Shad (*Alosa sapidissima*) and Alewife (*A. pseudoharengus*) within the Pawcatuck River watershed, Rhode Island, has been ongoing for over 30 years. Recent removals of dams and/or construction of nature-like fishways at previous dam sites, as well as provision of upstream passage (breached dams, nature-like fishways) on remaining dams has created access to extensive potential spawning and rearing habitat for both these species. Using radio and PIT telemetry, we evaluated upstream passage of shad and Alewife through the lower Pawcatuck mainstem and past seven existing or remediated barriers. Some alewife ascended throughout the entire monitored reach, past all seven barriers, but the majority only passed one or two remediated barriers. Most shad ascended to the first barrier (Bradford Dam) but only one fish passed the new rock arch fishway there and did not ascend past more than two remediated barriers. Passage efficiencies through each of the breached dams, nature-like fishways, and the stream gauging weir are still to be determined; none appear to be complete barriers. Technical fishways on remaining dams had modest to high internal passage efficiency. 2018 data will be further analyzed to evaluate passage efficiency and rates of movement within and between sites and assess the effects of river flow on passability. Studies planned for 2019 will repeat the 2018 study and expand the number of monitoring sites to include some tributaries, and more intensively monitor mainstem sites that may serve as spawning areas for shad.

Atlantic Cod in southern New England: are they climate deniers? Langan, Joseph A.[1], Conor M. McManus[2], Douglas R. Zemeckis[3], Jeremy S. Collie[1], *[1]University of Rhode Island Graduate School of Oceanography, Narragansett, RI 02882, [2]Division of Marine Fisheries, Rhode Island Department of Environmental Management, Jamestown, RI 02892, [3]Rutgers, The State University of New Jersey, Toms River, NJ 08755*

Atlantic Cod (*Gadus morhua*) in southern New England have been referred to as the world's southernmost indigenous group of cod. Currently managed as a part of the depleted Georges Bank stock unit, the status of cod in southern New England is less well known than other regions because they are not well sampled by federal trawl surveys. The productivity of this subpopulation has been expected to decline due to anticipated adverse climate change impacts on their life history. However, anecdotal reports from Rhode Island fishermen suggest that cod abundance has increased during the past decade. Using several fisheries-independent surveys and fisheries-dependent data sources capturing multiple life stages of cod, the objectives of this work were to: 1) characterize contemporary distribution and habitat use of cod in Rhode Island waters, 2) evaluate population trends in the area, and 3) identify environmental factors that influence cod abundance and/or variability. Results indicate that cod likely complete their life cycle in southern New England waters, where they have increased in abundance since the early 2000s. Yet, it appears that the productivity of and habitat available to this subpopulation are being influenced by climate change as previously hypothesized.

Utilizing fishermen-collected data to explore the Black Sea Bass (*Centropristis striata*) population and construct gear-specific discard characterizations. Malek Mercer, Anna[1], Thomas Heimann[1], Jason McNamee[2], *[1]Commercial Fisheries Research Foundation, Kingston, RI 02881, [2]Marine Resource Management, Rhode Island Department of Environmental Management, Jamestown, RI 02892*

Black Sea Bass is an ecologically and economically important species, but assessment and management efforts have not been reflective of the shifting distribution and growing abundance of this species, in part due to a dearth of data throughout the species range. As a result, thousands of pounds of Black Sea Bass are discarded and economic opportunities are lost. To address this issue, a Black Sea Bass Research Fleet was constructed to engage fishermen from a multitude of gear types to collect critically needed biological Black Sea Bass data from areas and times of year not covered by existing surveys. Research Fleet participants use a specialized app to collect data about fishing effort, catch, and bycatch, including the length/sex of individual Black Sea Bass. Black Sea Bass are also retained for analysis of sexual maturity, diet, and age. To date, the Research Fleet has sampled over 11,000 Black Sea Bass at sea and collected over 1300 Black Sea Bass for laboratory analysis. By virtue of the Research Fleets' wide variety of gear types, vessel sizes, and two consecutive years of sampling, the data are seasonally and spatially comprehensive, providing a unique perspective into the fishery and population. This presentation will explore the collected by the Black Sea Bass Research Fleet, including gear selectivities, catch characterizations, and diet compositions which allow for analysis of each gear types discard characterization. Ultimately, the data from the Research Fleet will be used to reduce uncertainties in the stock assessment, inform management, and expand fishery opportunities.

High sensitivity of the Northern Sand Lance (*Ammodytes dubius*) to ocean acidification and warming. Murray, Christopher[1], David Wiley[2], Hannes Baumann[1], *[1]University of Connecticut-Avery Point, Groton, CT 06340, [2]NOAA Stellwagen Bank National Marine Sanctuary, Scituate, MA 02066*

Fish early life stages are potentially vulnerable to the combined effects of ocean acidification (OA) and warming, yet divergent responses are well documented across similar species and populations. This plasticity may reflect local adaptation to varying degrees of existing pCO_2 fluctuations that characterize marine environments. Spatially varying tolerances that reflect local pCO2 conditions have been documented in marine invertebrates, but evidence for fish is still lacking. To explore this relationship, we conducted factorial pCO_2— temperature exposure experiments on offspring of northern sand lance *Ammodytes dubius*, an ecologically important forage fish that spawns on the northwest Atlantic shelf in early winter under relatively stable pCO_2 conditions. Spawning-ripe adults were collected from Stellwagen Bank National Marine Sanctuary, and fertilized embryos were reared at three pCO_2 conditions (400, 1,000, and 2,100 µatm) crossed with three temperatures (5°, 7°, and 10°C). Across trials, exposure to future pCO_2 conditions consistently resulted in severe reductions in embryo survival. Sensitivity to elevated pCO_2 was highest at 10°C, resulting in up to 16-fold differences in embryo survival between control and predicted end-of-century pCO_2 conditions. Moreover, elevated pCO_2 conditions delayed hatching, reduced remaining endogenous energy reserves at hatch, and in combination with higher temperatures reduced embryonic growth. The severity of the response likely place *A. dubius* among the most CO2-sensitive fish species tested to date. Furthermore, the contrasting CO2-sensitivity of *A. dubius* and another well-studied temperate forage fish (Atlantic silverside, *Menidia menidia*) suggests that life history, spawning habitat, phenology, and developmental rates mediate early life CO_2 tolerance.

Research and development of aquaculture techniques for the Royal Gramma (*Gramma loreto*). Vacco, Vince[1], Eric Litvinoff[2], Catherine Guinovart[1,3], Paul Anderson[1,3], *[1]Mystic Aquarium, Mystic, CT 06355, [2]Marine Science Magnet High School of Southeastern Connecticut, Groton, CT 06340, [3]Marine Sciences Department, University of Connecticut-Avery Point, Groton, CT 06340*

The Joint Aquaculture Research Laboratory conducts research to develop industry-adoptable aquaculture techniques to provide a sustainable alternative source of livestock for the marine aquarium trade. The goal of the current study was to develop an efficient and cost-effective protocol for the haremic coral reef fish, the royal gramma (Gramma loreto), among the top 1% of U.S. marine aquarium imports. The objective was to establish optimal sex ratios of broodstock groups while balancing territorial aggression. Three two-month trials were carried out; each in six 19 L aquaria stocked with one male and one, two, or three females. During the trials, each aquaria was filmed for one hour at first light weekly to record courtship, nest use, and aversive behaviors. Behaviors were quantified with JWatcher software and analyzed in a repeated measures ANOVA. Results suggest that in small aquaria, a sex ratio of one male to two females may be optimal for spawning because courtship and nest use behaviors are optimized while aversive behaviors are moderated. Past efforts to aquaculture the species have been conducted with one to one broodstock sex ratios. These results offer the potential to increase productivity of commercial aquaculture of the species.

Abstracts of Posters

Landscape scale adoption of barrier removal and floodplain restoration to help people and fish adapt to climate change. Bowden, Alison, Galen Laurence, *The Nature Conservancy-Massachusetts Chapter, Boston, MA 02111*
The Taunton River, a ~1300 km2 watershed in Massachusetts, hosts one of the largest river herring runs in New England and is federally designated Wild and Scenic. Since 2005 2 unmaintained dams in the watershed caused high profile emergencies. Concern for public safety catalyzed statewide policy changes to expedite restoration permitting and increased funding. Record floods in the watershed in 2010 again highlighted the need for communities to plan proactively to increase their resilience to extreme weather events.
TNC and US EPA New England Region founded the Resilient Taunton Watershed Network to advance consideration and use of nature based solutions to increase climate resilience, natural hazard mitigation, water quality and fish habitat goals. Healthy, intact natural systems provide multiple benefits to the challenges posed by climate change. Members of the network have mapped green infrastructure resources as climate assets, developed case studies, and created a training program. Integrated strategies may lower overall adaptation costs and provide multicriteria regional benefits.
In 2016, the statewide Municipal Vulnerability and Preparedness program launched, providing communities state funding to complete vulnerability assessments and develop action-oriented resiliency plans to identify existing and future vulnerabilities and strengths related to extreme weather and climate hazards, and identify actions to reduce risk and build resilience. Certified communities are eligible for follow-up grant funding and other opportunities. Addressing climate risks to people and nature in a holistic framework is creating new opportunities to protect and restore fish habitat at landscape scale.

Preferences for alternative management - A Long Island Sound Tautog survey. Chen, Zhenshan[1], Jacob Kasper[1], Eric Schultz[1], Stephen Swallow[1], Pengfei Liu[2], *[1]University of Connecticut, Storrs, CT 06269, [2]Department of Fisheries and Aquaculture, University of Arkansas, Fayetteville, AR 72701*
Fisheries managers have determined that the Long Island Sound Tautog stock is overfished. While there might be other causes for the decline, ASMFC is legally required to modify regulations in order to reduce the amount of fish being kept (harvested), consistent with rebuilding the population. Under a Sea Grant project, we are developing a discrete choice experiment (DCE) survey to evaluate anglers' preferences toward different alternative regulations. Also, we hope to elicit anglers' behavioral changes upon the implementation of alternative management strategies. Several rounds of focus groups have been finished, which generates many helpful comments on the recreational fishery, the Tautog regulations, and the survey design. While the design work of the survey is still ongoing, we are happy to share the current draft and get suggestions to improve the survey.

Effects of the synthetic corticosteroid prednisolone on growth and osmoregulatory physiology of Atlantic Salmon (*Salmo salar*) parr. Kalinowski, Matt C.[1], Stephen D. McCormick[2], John T. Kelly[1], *[1]Department of Biology & Environmental Science, University of New Haven, New Haven, CT 06516, [2]Leetown Science Center, S.O. Conte Anadromous Fish Research Center, U.S. Geological Survey, Turners Falls, MA 01376*
The smolting process that many anadromous salmonids undergo prior to migration is largely mediated by release of the corticosteroid cortisol which serves to alter osmoregulatory physiology and prepare the fish to move from freshwater into seawater. The synthetic corticosteroid prednisolone mimics the effects of cortisol and is widely used as a potent anti-inflammatory medication. It has been detected in measurable concentrations of some freshwater systems, and it is possible that environmental prednisolone may negatively impact salmonids by altering parr physiology or interfering with smoltification. Forty-Eight Atlantic Salmon parr of similar length (10.1 cm fork length, SD = 0.5) were split into four groups of 12 fish and individually PIT tagged. Treatments consisted of implantation of hormones dissolved in vegetable oil: a) 2.5 µg/g prednisolone, b) 25 µg/g prednisolone, or c) 25 µg/g cortisol, d) vegetable oil (control). Fish were held for 22 days in two mixed group holding tanks at ambient temperatures and natural day length and fed ad lib. Individuals were sacrificed, measured (length, weight), and plasma and gill filaments were collected. Growth rate, hematocrit, levels of plasma chloride, glucose and cortisol, and gill Na+/K+-ATPase (NKA) activity were determined. Suppression of growth was observed with 25 µg/g prednisolone and 25 µg/g cortisol. Plasma chloride was significantly lower in the 25 µg/g prednisolone group compared to controls. Our results indicate that exposure of Atlantic Salmon parr to prednisolone had a significant effect on growth and osmoregulation, suggesting this hormone may act as an endocrine disrupting chemical in the aquatic environment.

Quantifying quahogs (*Mercenaria mercenaria*) in Narragansett Bay: Insights from a collaborative sampling program. Malek Mercer, Anna[1], Thomas Heimann[1], Dale Leavitt[2], Conor McManus[3], *[1]Commercial Fisheries Research Foundation, Kingston, RI 02881, [2]Roger Williams University, Bristol, RI 02809, [2]Division of Marine Fisheries, Rhode Island Department of Environmental Management, Jamestown, RI 02892*
The quahog (*Mercenaria mercenaria*) fishery is the most valuable fishery in Narragansett Bay, with a dockside value over $5 million. The quahog's complex population and fishery dynamics in combination with aggregated distribution patterns make it difficult to accurately assess the population and thus, properly manage the resource. This work pilots a novel technique that involves commercial shellfishermen using a tablet app to collect quahog data via bullrake sampling year-round, focusing on regions of Narragansett Bay not assessed by the Rhode Island Department of Environmental Management (RI DEM) hydraulic dredge survey. The catch efficiency of the RI DEM hydraulic dredge survey and bullrake sampling were calibrated via in-situ SCUBA observations, enabling direct comparison of fishery dependent and fishery independent data. Preliminary results suggest that quahog density varies at a suite of spatial scales as a result of complex environmental conditions. Furthermore, bullrake sampling appears to document higher quahog densities than the hydraulic dredge survey by accessing different areas and habitats within Narragansett Bay. Specifically, this collaborative data collection program has allowed for the quantification of the quahog fishery and population outside of areas possible to sample with the hydraulic dredge. Further, this project provides an example of how engaging fishermen can benefit stock assessments through targeted at-sea fishery dependent data collection. Ultimately, this work fosters a transparent and accurate quahog management system by providing commercial shellfishermen an opportunity to actively participate in the scientific and management process.

Morphological re-descriptions of the larval stage of three *Urophycis* species (family: Phycidae) from the Northeast United States Continental Shelf. Marancik, Katrin[1], David Richardson[2], Konieczna, Malgorzata[3], [1] *Integrated Statistics, Woods Hole, MA 02543,* [2]*NOAA Northeast Fisheries Science Center, Narragansett, RI 02882,* [3]*Morski Instytut Rybacki: National Marine Fisheries Institute, 81-332 Gdynia, Poland*
Early life history data can improve our knowledge of stock structure and spawning habitat only if we can identify larvae to species. Three species of hakes from the genus *Urophycis* are common on the northeast United States Continental Shelf; at least two of which occur in ichthyoplankton samples collected during the Ecosystem Monitoring (ECOMON) cruises of the Northeast Fisheries Science Center. Unfortunately, identification of larval *Urophycis* was only possible to the genus level. A subset of ECOMON samples preserved in ethanol allowed us to use genetic identification techniques to examine morphological characteristics. 277 *Urophycis* larvae collected in this subset of samples were identified through barcoding of the cytochrome oxidase I gene and used to re-describe the larval stage of these three species. Using the genetic identification of these ethanol samples to describe traits for species-level morphological identification of the entire ECOMON dataset, we can greatly improve our understanding of the spatial and temporal distribution of abundance and spawning habitat for these and many other federally managed species.

Targeting bycatch: Predicting fish species overlap in the North West Atlantic Ocean. Nye, Janet[1], Carolina Chong-Montenegro[1], Lesley Thorne[1], Julia Stepanuk[2], [1]*School of Marine and Atmospheric Sciences, Stony Brook University, Stony Brook, NY 11794,* [2]*Department of Ecology and Evolution, Stony Brook University, Stony Brook, NY 11794*
Alewife and blueback herring are species of concern because of their low population sizes. Previous research has illustrated the potential to successfully reduce bycatch of these species in the Atlantic herring and Atlantic mackerel fisheries, but less research has focused on the predictability of bycatch in other fisheries and with lead times of days to weeks. Here we present a novel study that predicts future potential fish species overlap in the Northwest Atlantic Ocean. We used data collected by the NOAA Northeast Fisheries Science Center (NEFSC), to create models using 3 different approaches: 1) individual species models, 2) multiplicative individual models and, 3) species overlap models. After comparing models, the approach that best explained species overlap was used. Using short-term forecasts of sea surface temperature, depth, distance to bays, and solar azimuth and elevation, we predicted overlap of alewife and blueback herring with Atlantic herring, mackerel, red hake, and silver hake. Ultimately, this project's goal is to create a platform using these predictions to inform fisheries in real-time, and minimize bycatch.

Thanks to our sponsors!