36th Annual Meeting
of the
American Fisheries Society

Tidewater Chapter

March 23-25, 2023
Solomons, MD
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American Fisheries Society

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# Meeting Schedule

## Thursday - March 23, 2023

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<tr>
<th>Time</th>
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<tr>
<td>3:30 pm – 6:00 pm</td>
<td>Registration/Poster Set-up/Presentation Loading</td>
<td>Chesapeake Biological Lab</td>
</tr>
<tr>
<td>4:00 pm – 6:00 pm</td>
<td>EXCOM Meeting</td>
<td>2nd floor Truitt Building</td>
</tr>
<tr>
<td>6:00 pm – 9:00 pm</td>
<td>Poster Social</td>
<td>Chesapeake Biological Lab</td>
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<tr>
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<tr>
<td>8:20</td>
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<tr>
<td>9:15 am – 12:00 pm</td>
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<tr>
<td>4:20 pm – 5:20 pm</td>
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<tr>
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<td>Chesapeake Ranch Estates</td>
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<tr>
<td>8:00 am – 12:00 pm</td>
<td>Oral Presentations</td>
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<td>Artificial illumination of trawl gear components to reduce Pacific halibut (<em>Hippoglossus stenolepis</em>) bycatch in U.S. West Coast bottom trawl fishery</td>
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<td>E2</td>
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<td>MarineGEO Upper Chesapeake Bay</td>
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<td>E3</td>
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<td>E4</td>
<td>*Shoup, W.</td>
<td>Accessibility and Compatibility of Fisheries-Independent Data in Offshore Wind Areas</td>
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<tr>
<td>E5</td>
<td>*McMains, A.</td>
<td>Investigating the Impacts of Dredging on Coastal Inlet Habitat Function Using Acoustic Imaging</td>
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<tr>
<td>E6</td>
<td>*Jainarine, N.</td>
<td>Investigating Summer Dredging Impacts on the Zooplankton Assemblage at Beaufort Inlet, NC</td>
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<td>E7</td>
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<tr>
<td>E8</td>
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<td>E9</td>
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<td>Eating for two (or 60)? Evidence of environmentally derived fecundity and growth differences between populations of <em>Neomysis americana</em></td>
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<td>E10</td>
<td>*Drzewicki, M.</td>
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<td>*Gabriel, C.</td>
<td>Prevalence and transmission of Black Gill Disease in penaeid shrimp within the Albemarle-Pamlico Sound</td>
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<td>E13</td>
<td>*Chelala, M.G.</td>
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<td>E19</td>
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<td>E21</td>
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<td>E22</td>
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Determining Relatedness of Juvenile Atlantic Striped Bass (*Morone Saxatilis*) in Chesapeake Bay Using Microsatellite Markers

**Oakley, J.**
Change of summer flounder abundance in the Chesapeake Bay, an ecosystem-based evaluation

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## Oral Presentation Schedule

**Friday - March 24, 2023**

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<tr>
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<td>*Mroch, R.</td>
<td>Evaluating and improving the forecast of annual Gulf menhaden reduction landings</td>
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<td>*Wade, K.</td>
<td>Environmental factors influence distributions of Jonah crabs (<em>Cancer borealis</em>) and Atlantic rock crabs (<em>Cancer irroratus</em>) regionally along the Atlantic coast</td>
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<td>*Tharp, R.M.</td>
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<td>1115</td>
<td>*Arai, K.</td>
<td>To stay or go: Partial migration in Hudson River striped bass</td>
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<td>1130</td>
<td>*Johnson, M.</td>
<td>Hatch dates and habitat use of juvenile sheephead <em>Archosargus probatocephalus</em> in North Carolina estuaries</td>
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<tr>
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<td>*Smith, S.</td>
<td>Habitat quality in two seascapes: as seen by juvenile summer flounder</td>
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<td>Lunch</td>
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<tr>
<td>Time</td>
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<tr>
<td>1320</td>
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<td>Can a native mud crab exploit low salinity refugia to escape an invasive body snatching parasite?</td>
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<td>Asch, R.G.</td>
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<td>Ontogenetic habitat constraints of marine fishes in temperate environments</td>
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<td>1520</td>
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<td>O’Brien, M.H.P.</td>
<td>Interactive cruise planning with Quarto</td>
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<td>1830</td>
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*Denotes Student Presenter
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<td>810</td>
<td>Schlenker, L.S.</td>
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<td>Nelson, T.R.</td>
<td>Shifts in the community structure of tidal freshwater fishes associated with alternate stable states</td>
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<td>850</td>
<td>Schlick, C.J.</td>
<td>How many is too many: Age structure sampling strategies of stock assessments for two important North Carolina fisheries</td>
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<tr>
<td>910</td>
<td>Aguilar, R.</td>
<td>Diet and movement of young Striped Bass (<em>Morone saxatilis</em>) within and among shallow tributary habitats of Chesapeake Bay</td>
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<tr>
<td>930</td>
<td>Kahn, D.M.</td>
<td>Striped Bass predation May Drive the Population Dynamics of Blueback Herring and American Shad in the Connecticut and Delaware Rivers</td>
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<tr>
<td>1000</td>
<td>Jay Fleming</td>
<td>Photographing the Chesapeake and Beyond</td>
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<td>1030</td>
<td>Uphoff, J.</td>
<td>Temperature and flow conditions associated with recent declining recruitment in Maryland’s Striped Bass spawning areas</td>
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<td>1050</td>
<td>Collins, L.D.</td>
<td>Effects of fish predation on a nearshore mysid community during August–October in the Patuxent River, Maryland</td>
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<td>1110</td>
<td>Kazyak, D.C.</td>
<td>Leveraging genetics to advance the conservation of Atlantic Sturgeon</td>
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<tr>
<td>1130</td>
<td>Sanderson-Kilchenstein, D.</td>
<td>American and Hickory Shad Population Trends from the Susquehanna River below Conowingo Dam 1986–2022</td>
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**Adjourn Meeting**
E1. **Authors:** *Jackson, D.*  
**Presenter Affiliation:** Virginia Institute of Marine Science

**ARTIFICIAL ILLUMINATION OF TRAWL GEAR COMPONENTS TO REDUCE PACIFIC HALIBUT (HIPPOGLOSSUS STENOLEPIS) BYCATCH IN U.S. WEST COAST BOTTOM TRAWL FISHERY**

Pacific halibut (*Hippoglossus stenolepis*) are a prohibited species for the U.S. west coast bottom trawl fishery and in the last decade there has been a concentrated interest in the use of artificial light serving as a potential bycatch reduction device for the commonly used low-rise, cutback trawls. However, recent regulation changes now permit high-rise trawls, a gear configuration that fishes a very different volume of water than the previously permissible configuration, in areas they were once prohibited. This study conducted length-dependent catch comparison and catch ratio analyses to determine if catches of Pacific halibut and three target groundfish species differ between illuminated and non-illuminated high-rise bottom trawls. While illuminated trawls caught fewer individuals than the non-illuminated trawls for all species in this study, the difference in catch was not statistically significant. Our findings are contrary to prior evidence and could have potential implications for the industry.

E2. **Authors:** Anderson, E.R. and M.B. Ogburn  
**Presenter Affiliation:** Smithsonian Environmental Research Center

**MARINEGEO UPPER CHESAPEAKE BAY**

Climate change and biodiversity loss pose existential challenges to the health of marine ecosystems and the people who depend on them. Yet our scattered knowledge of marine life hampers our ability to effectively address them. The Marine Global Earth Observatory (MarineGEO) is a unique network of partners around the world dedicated to tracking the vital signs of coastal marine life, diagnosing the causes of change, and informing science-based solutions to build coastal resilience using standardized, coordinated methods. MarineGEO research addresses how and why biodiversity is changing, how that influences ecosystem processes important to people, and how to use this knowledge to better inform management for resilient marine ecosystems. The Upper Chesapeake Bay MarineGEO site is based in Edgewater, Maryland at the Smithsonian Environmental Research Center (SERC). MarineGEO research at SERC is underpinned by over four decades of research on estuaries and adjoining watersheds, including time-series of benthic and mobile fish and invertebrate communities. Our research focuses on salt marsh, oyster reef, soft sediment bottom, submerged aquatic vegetation, course woody debris, and human-built (docks) habitats. Fieldwork is accomplished in collaboration with many of SERC’s research labs and builds upon our strong foundation of long-term studies and experiments. Here we present preliminary data from our monitoring programs including predation rates across habitats, oyster density, and beach seine fish abundance.

**Presenter Affiliation:** Smithsonian Environmental Research Center

**COMBINED METHODS FOR MONITORING AND EVALUATING SUBTIDAL OYSTER REEF RESTORATION**
Over the past century and a half, a once thriving oyster population in the Chesapeake Bay has declined by over 99% from overexploitation, habitat loss, disease, and declining water quality. The value of oysters as both an ecosystem service provider and an economic resource have brought restoration to the forefront of oyster management in recent years. The Smithsonian Environmental Research Center is using a combination of underwater video, high-resolution imaging sonar, and traditional diver surveys to evaluate existing subtidal oyster reef restoration projects and new large-scale restoration experiments. In Harris Creek, Maryland, underwater video and sonar revealed differences in habitat characteristics and fish communities among harvest, spat-on-shell restoration, and stone restoration reefs. In the South River, Maryland underwater video and diver surveys were used to assess harvest, restoration, and control sites prior to restoration that is anticipated to occur in 2023. Combining monitoring methods provides highly valuable datasets for evaluating and understanding outcomes of subtidal oyster reef restoration.

E4. Authors: *Shoup, W. and M. Pol

Presenter Affiliation: Virginia Institute of Marine Science

ACCESSIBILITY AND COMPATIBILITY OF FISHERIES-INDEPENDENT DATA IN OFFSHORE WIND AREAS

The Responsible Offshore Science Alliance (ROSA) works to advance regional fisheries research and monitoring to assess impacts on fisheries from offshore wind development. Two aspects of that advancement are broadening accessibility of fisheries-independent data collected and improving mutual compatibility of data. Existing fisheries-independent surveys completed by state and federal agencies and academic institutions may be impacted by, and in some cases suspended, due to offshore wind development. Subsets of fishery-independent data were requested from existing trawl fishery-independent bottom trawl surveys in the Northeastern United States to compare data fields and determine if de facto data standards had emerged independently of a guiding document. Major differences in the formatting of data fields such as date, geographical position, species code, and length were evident in all requested datasets. No existing set of data standards were found to be widely used. Upon evaluation of the requested materials, there was a lack of consistency in data collection, organization, and formatting. The absence of an existing set of data standards combined with the general incompatibility of existing datasets presents logistical challenges for the offshore wind community as projects continue to develop along the East Coast of the United States. Moving forward, ROSA will continue to seek solutions with stakeholders through a number of collaborative initiatives.

E5. Authors: *McMains, A., C. Taylor, and J. Morley

Presenter Affiliation: East Carolina University

INVESTIGATING THE IMPACTS OF DREDGING ON COASTAL INLET HABITAT FUNCTION USING ACOUSTIC IMAGING

Despite the accepted importance of coastal inlets as foraging habitat, as well as critical movement corridors between estuaries and the littoral ocean, these areas remain understudied. Along with their ecological role, inlets play an important role in coastal economies. Deep draft shipping channels must be maintained through inlets to allow the passage of commercial shipping vessels, requiring consistent dredging. Historically, inlet dredging has been restricted to winter months to mitigate the impacts on larvae and nekton. While it would be desirable to allow the dredging of port serving inlets year-round, the ecological tradeoffs of that strategy are unknown. We utilized a Before, After, Control, Impact experimental design to investigate the impacts of inlet dredging on fish abundance and habitat utilization in Beaufort Inlet, NC in the summer and fall of 2022. Random stratified sampling was conducted using an acoustic imaging sonar to determine the relative abundances and trophic guilds of fish in the inlet area. Overall, we saw low fish densities in the inlet and large temporal variations in abundances; peak
abundances in Beaufort Inlet occurred in late August. Our data will provide important information to managers regarding the impacts of dredging on inlet use by fish as well as the duration of the disturbance. Additionally, this work will provide a baseline understanding of the seasonal trends in inlet utilization and will support future work identifying the drivers of large-scale inlet ingress and egress events.

**E6. Authors:** *Jainarine, N.* and R. Asch

**Presenter Affiliation:** East Carolina University

**INVESTIGATING SUMMER DREDGING IMPACTS ON THE ZOOPLANKTON ASSEMBLAGE AT BEAUFORT INLET, NC**

Dredging is necessary to maintain economically valuable shipping channels along the US Coast. In North Carolina, typically this process occurs during a winter period, known as the “environmental window”, to minimize potential impacts on the ecosystem. However, in 2020 subcontractors of the US Army Corps of Engineers were approved to temporarily dredge during the summer to promote safer and easier working conditions. To understand effects of summer dredging on marine fauna, zooplankton samples were collected at sites with differing proximities to dredging and at the site of the long-term Beaufort Inlet Ichthyoplankton Sampling Program (BIISP) via a Before-After Control-Impact (BACI) study. A recent analysis on larval fish density at the BIISP site showed a significant decrease in species richness and larval fish density for many species after dredging. These preliminary findings are part of a larger environmental assessment on summer dredging impacts. To help understand mechanisms behind these ichthyoplankton shifts, this preliminary investigation will look at zooplankton dynamics in a BACI study at the BIISP site from samples concurrently collected with ichthyoplankton samples. Given that zooplankton are the main prey items for first feeding larvae, it is important to understand if the zooplankton assemblage is changing. In previous work, we measured the volume displacement of zooplankton at dredging sites. The results suggest there may be a slight decrease in zooplankton volume after dredging. To analyze the samples at the BIISP site, we will be using Zooscan technology to obtain more informative results on taxonomic diversity, size spectra, and abundance.

**E7. Authors:** *Loonam, G.*, A. Wolf, A. Blakeslee, A. Fowler, and C. Keogh

**Presenter Affiliation:** East Carolina University

**NON-DESTRUCTIVE INDICATORS OF TREMATODE INFECTION IN LITTORINIDAE HOSTS**

Biological invasions are often investigated shortly after introduction, but the ecological legacy of older invasions is also significant, particularly for parasites. Non-destructive ways to determine infection status are useful for parasite experiments. This study compared two non-destructive methods: cercarial shedding and foot color assessment. Non-native *Littorina littorea* (LL) snails were collected alongside native *L. saxatilis* (LS) and *L. obtusata* (LO) in 2021 from Appledore Island, Maine. Their foot colors were assigned values using a color-gradient chart ranging from white (0) to dark orange (5) for LL, and 0-2 for LS and LO. After inducing cercarial shedding, snails were checked every two hours for cercariae, and if detected, cercariae were identified to trematode species and counted. All snails were dissected at experiment end. From dissection data, 36% LL (n=136), 13% LS (n=256), and 27% LO (n=124) were infected. Of these, 92% of infected LL released cercariae compared to 50% LS and 67% LO. Additionally, 88% of infected LL with foot colors 4-5 were infected, compared to 28% LS and 69% LO with foot color 2. These findings justify using non-destructive indicators of infection in littorinidae snails, which can further parasite work on these hosts in native and non-native populations globally.

Presenter Affiliation: University of North Carolina Wilmington

**OCCURRENCE AND MIGRATION OF ADULT ATLANTIC STURGEON IN THE CAPE FEAR RIVER**

The anadromous Atlantic sturgeon, *Acipenser oxyrinchus oxyrinchus*, is endangered throughout much of its geographic range due to historic overfishing and habitat loss. The Cape Fear River, North Carolina once supported a commercial fishery for sturgeon; however, the current existence of a spawning population in the river is uncertain and migratory dynamics are unknown. Beginning in February 2021, we used targeted sampling in hypothesized spawning areas to capture and acoustically tag adult (> 1300 mm FL) Atlantic sturgeon. The timing of riverine entrance/exit, residence duration in spawning areas, and migratory pathways were informed through a network of fixed acoustic receivers placed throughout the study system. Sampling was concentrated downriver of the first migration barrier, a lock and dam structure located approximately 100 km from the river mouth. Five adults (1620 – 1820 mm FL; all males) were captured and tagged in spring 2021 and nine adults (1480 – 1940 mm FL; 6 males, 2 unconfirmed, 1 female) were captured and tagged in spring 2022. All confirmed males were actively releasing milt and the single female contained ripe eggs. Only a single adult sturgeon (a 1435 mm FL male) during fall sampling over two years. During both years, tagged sturgeon were detected continuously within 3-4 km of the tagging location throughout most of April before beginning directed movements downstream in late April/early May and then emigrating to the ocean. Three of the five adult males tagged in 2021 were detected in the same area during spring 2022 (two were physically recaptured and released). Lower river detections of these fish indicated entrance into the river in Feb/Mar and directed upriver movements toward the lock and dam structure throughout March. When combined with the occurrence of river-resident juveniles (< 500 mm FL; ages 0-2), the occurrence and observed movements of adults provides strong evidence of a spring spawning population of Atlantic sturgeon in the Cape Fear River. Future work will include extensive egg mat sampling and identification of habitat use patterns to inform recovery and conservation decisions.

E9. Authors: Woodland, R.J., L. Plough, J. Molina, T.E. Murphy, and G. Winkler

Presenter Affiliation: East Carolina University

**EATING FOR TWO (OR 60)? EVIDENCE OF ENVIRONMENTALLY DERIVED FECUNDITY AND GROWTH DIFFERENCES BETWEEN POPULATIONS OF NEOMYSIS AMERICANA**

Mysids are small, cryptic crustaceans and important components of estuarine food webs. Given their unique ecology as omnivorous, diel-migrating zooplankters, mysids serve as a trophic link between benthic and pelagic food webs and a significant food source for many valuable fisheries species. In the present study, we analyzed spatial and temporal fecundity and growth rates of a dominant mysid species in the Chesapeake Bay (CB), *Neomysis americana*. In two estuaries of the CB, the Patuxent and Choptank rivers, individuals were sampled over the spring (May/June) and summer (July/August) of 2018/2019. The tributaries offer similar environments (e.g., salinity, temperature, biodiversity) but have different basin characteristics and water qualities. Tests for length-specific fecundity differences between tributaries indicated the number of eggs per female was higher in the Choptank (ANCOVA, \( p = 0.002 \)) and spring female fecundity was higher than fall fecundity (ANCOVA, \( p = 0.02 \)) with no difference in growth rates. Embryo length consistently increased through growth stages in both rivers but embryos were consistently larger (ANOVA, \( p < 0.0001 \)) among Choptank females than Patuxent females after accounting for size and total fecundity. With supplemental evidence of these populations being well mixed genetically, environmental factors likely play the largest role in the fecundity differences between the tributaries. Future research into the drivers of spatial fecundity differences will help inform development of mysid population models, contribute to our understanding of estuarine food web controls, and build our capacity to better integrate forage into ecosystem-based fisheries management.
**E10. Authors:** *Drzewicki, M.* and M. Wilberg

**Presenter Affiliation:** University of Maryland Center for Environmental Science, Chesapeake Biological Lab

**SPATIAL AND TEMPORAL PATTERNS OF SPOT (LEIOSTOMUS XANTHURUS) RECREATIONAL CATCH**

Spot (*Leiostomus xanthurus*) are a forage fish that support important commercial and recreational fisheries along the U.S. Atlantic coast. Approaches to estimate abundance of spot have previously not passed peer review. Our overarching goal is to develop a spatial model to estimate spot abundance in the Chesapeake Bay and the Atlantic coast. The objective of this study is to describe spatial and temporal patterns of spot catch during 1982-2021 using recreational data from the Marine Recreational Information Program (MRIP). Estimated recreational catch, which includes harvest, dead discards, and fish released alive, has declined over the time series. Recreational anglers mostly target spot in the late summer and early fall to coincide with their seasonal migration patterns. The majority of spot were caught by shore anglers and private or rental boats in the southern Atlantic states, most notably in the Carolinas and Virginia. Spot are encountered inside and outside of the Chesapeake Bay in Virginia, but only inside the Bay in Maryland. Spot are rarely encountered in the northern extent of their range, north of New Jersey. This preliminary spatiotemporal analysis will inform larger efforts to build a spatial population model for spot.

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**E11. Authors:** *Stancil, C.*, C. Manning-Moore, C. Moore, R. Gittman, and A. Blakeslee

**Presenter Affiliation:** East Carolina University

**DEMOGRAPHICS AND PARASITE DIVERSITY OF THE INVASIVE GREEN PORCELAIN CRAB IN ITS NEWLY EXPANDED RANGE**

Abundant green porcelain crabs, *Petrolisthes armatus*, have been observed for the first time in the temperate waters of mid-coast North Carolina (USA), likely due to rising temperatures. This project represents the first effort to determine the crab’s demographics, distribution, establishment success, and its interactions with natives in the region. Our work accounts for species, sex, and size of crabs, along with co-occurring densities of native crabs, collected at 50 sites in the study region between 2018-2022. Additionally, we seek to identify the crab’s parasitic relationships to better understand potential community impacts. During range expansions, organisms may encounter novel parasite infections, co-introduce parasites, or escape parasites from source ranges. By dissecting and performing microscopy on collected crabs, we show that common parasites infecting native panopeid crabs are not presently found in *P. armatus*. We also demonstrate that a parasite known to infect *P. armatus* in its native range is found in its expanded range. The implications of the range expansion of *P. armatus* are not yet fully known, but our research provides a solid foundation to examine possible community level effects at the leading edge of *P. armatus*’ range expansion.

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**E12. Authors:** *Gabriel, C.*

**Presenter Affiliation:** East Carolina University

**PREVALENCE AND TRANSMISSION OF BLACK GILL DISEASE IN PENAEID SHRIMP WITHIN THE ALBEMARLE-PAMLICO SOUND**

Warming coastal temperatures have altered disease dynamics in many ecologically and commercially valuable species. In the southeastern USA, this is exemplified by Black Gill Disease (BGD), a host pathogenic response to the presence of a parasitic ciliate *Hyalophysa lynni* (HL). BGD is reported in multiple crustacean species but is best known for its severe impacts on penaeid shrimp, which support a ~$22 million fishery in North Carolina. HL is native to the Gulf of Mexico, but a warming climate has allowed
it to expand its range northwards along the Atlantic coast, prompting the need for research into its impacts on local ecosystems. Visual observations by NCDMF suggest ~19% infection prevalence, but preliminary visual data estimates higher prevalence with peak values of ~26% when examining specimens under a microscope. However, visual-based assessments underestimate true prevalence by missing early stage and asymptomatic infections. Thus, we are using PCR-based methodologies to detect HL presence across symptomatic and asymptomatic individuals of penaeid shrimp and possible reservoir species (grass shrimp). Our work will improve the efficacy of ongoing monitoring of BGD and will have important implications for commercial shrimp fisheries in the southeast. We hope to enhance knowledge of climate change impacts on host-parasite ecology in estuaries. We ultimately aim to use our genetic, ecological, and environmental data to build a disease transmission model for BGD in the southeast.

E13. Authors: *Chelala, M.G.*, J.A. Mathews, and F.S. Scharf

**Presenter Affiliation:** University of North Carolina Wilmington

**AGE AND GROWTH CHARACTERIZATION OF ATLANTIC STURGEON IN THE CAPE FEAR RIVER, NC USING SECONDARY FIN RAY SECTIONS**

Non-lethal methods for estimating age and growth are critical for evaluating the population dynamics of threatened and endangered species. The Atlantic sturgeon *Acipenser oxyrinchus oxyrinchus* is distributed along the east coast of North America and is listed as endangered throughout much of its range. Longevity and maximum body size demonstrate a latitudinal gradient creating the need for age and growth data specific to each riverine population. Information on demography is particularly lacking for the coastal river systems in North Carolina. Here, we report on the use of the secondary pectoral fin ray to estimate age and inform growth models for Atlantic sturgeon in the Cape Fear River estuary. Samples were obtained through large-mesh gill net sampling during 2021 and 2022. Nearly 400 individuals were captured ranging between 308 – 1940 mm FL. A small (~1 cm) section of the secondary pectoral fin ray was removed from each fish and stored dry. Fin ray sections were cleaned, embedded in epoxy, sectioned (~0.4 mm thickness), and mounted on glass microscope slides for aging. Sections were read blind twice each by two different readers to estimate annuli counts (whole age). Estimated ages ranged from 0 – 15 years. Fish aged 0 and 1 were < 550 mm FL (river-resident juveniles), while fish aged between 2 and 6 were between 550 and 1000 mm FL (late-stage juveniles and sub-adults), and adults (> 1300mm FL) comprised the oldest individuals (10-15 years) encountered. The secondary pectoral fin ray has only recently started to be used for aging Atlantic sturgeon and its performance as a reliable aging structure remains uncertain. However, the non-invasive method of removal is believed to be less injurious for the species, and our initial preparations suggest that annuli clarity can be good. Future work will evaluate both within- and between-reader precision and comparison of growth parameter estimates to nearby populations. Our findings related to the challenges of reading secondary pectoral fin rays should inform a broader coastwide effort to standardize aging methods that provide key information to support conservation of Atlantic sturgeon.


**Presenter Affiliation:** University of Maryland Center for Environmental Science, Chesapeake Biological Lab

**ASSESSING THE PREVALENCE AND ECOLOGICAL CONSEQUENCES OF HABITAT CONNECTIVITY BETWEEN MARYLAND’S COASTAL LAGOONS AND COASTAL OCEAN FOR JUVENILE FISH**

Coastal lagoons and adjacent shallow coastal ocean areas provide nursery habitats for many species of fish. Understanding how juveniles use these habitats is important given ongoing changes in hydrodynamics, habitat availability, and environmental conditions in shallow coastal areas due to human development, dredging, and climate change. The goal of this study is to evaluate the strength of ecological connectivity between the Maryland Coastal Bays (MCBs [lagoons]) and the coastal ocean (CO), with a focus on juveniles of three species: bay anchovy (*Anchoa mitchilli*), weakfish (*Cynoscion regalis*), and silver perch (*Bairdiella*...
Fishes and epibenthic invertebrates were trawled in the summer and fall of 2009 in both habitats (<20m). All fish were identified, measured, and counted. Juveniles were collected for stomach contents, condition measures, and stable isotope (SI) analyses. Using random forest classification of the SI values, individuals were classified as recent migrants or residents of each habitat, and the proportion of residents to migrants was used as a metric of connectivity. Our results suggest strong bidirectional connectivity of MCB and CO habitats for bay anchovy and weakfish during summer months, and weak, unidirectional connectivity associated with seasonal migration for silver perch out of the MCBs. Stomach contents and SI values from the focal species were analyzed to compare how these species might be differentially utilizing these habitats. Given the ongoing development of coastal areas and limited funds to protect and enhance habitats, understanding spatial use and connectivity of nursery areas for fish communities provides valuable information for natural resource managers.

**E15. Authors:** Hoyt, E., M.S. Woodstock, and T.F. Ihde

**Presenter Affiliation:** Morgan State University

**AN EXPLORATION OF AGE AND GROWTH ESTIMATES FOR FISHES IN THE CHESAPEAKE BAY**

Estimates of natural mortality and maximum achievable age are necessary to understand the population dynamics of exploited populations and assist in stock assessment analyses. The Chesapeake Bay system includes multiple commercially-important fished species. Many of these species have subpopulations that occur over a broad range of habitats and physical conditions, but these subpopulations may mix in the system’s mainstem. Consequently, region-specific natural mortality rates have the potential to influence the entire stock. We compared two types of commonly-applied fishery methods to better understand how the choice of method used to estimate critical population parameters could bias such estimates. First, two methods used to estimate natural mortality were compared: one derived from von Bertalanffy growth parameters, and another from maximum age (tmax). In a second comparison, tmax estimates based on von Bertalanffy growth parameters are compared to literature-derived tmax values to examine the efficacy of using growth parameters to estimate tmax. Species-specific natural mortality differences were not explained by habitat, trophic guild, or taxonomic family. Growth-based estimates resulted in lower natural mortality rates than tmax-based estimates. However, there was a poor relationship between the tmax derived from growth parameters and estimates available in published literature. Assuming published literature is more representative of a population, the poor relationship between tmax estimates from the two sources could suggest caution is warranted when using tmax estimates based on growth studies. Regional differences in natural mortality and tmax exist for some species, indicating tributary-specific natural mortality estimates should be considered when such information is available.

**E16. Authors:** Baker, M.S., and S. Mirabilio

**Presenter Affiliation:** North Carolina Sea Grant

**TOP 10 REASONS YOU SHOULD WRITE ABOUT YOUR RESEARCH FOR SEA GRANT’S SALTWATER ANGLING BLOG**

Hook, Line and Science (www.hooklinescience.com) is a weekly blog geared towards catching the attention of North Carolina saltwater anglers in particular – and coastal stakeholders in general. Each week we summarize recent marine fisheries research or data in a format that is easy for the public to read and digest. Since we started the site in December 2018, we’ve had 192 posts, with 84 of those posts written by guest authors or students. Increasingly, popular blog posts get repurposed for Sea Grant’s Coastwatch magazine, reprinted with permission by other news outlets, or even become the subject for short science videos. We seek out blog posts that cover a variety of topics, always leading the reader with a question to be answered. We welcome guest posts from fisheries professionals and students featuring completed studies or works-in-progress. Stop by the poster to read the top 10
reasons why you – both fisheries professionals and students - should write about your research for Sea Grant’s saltwater angling blog.

E17. Authors: *Valenza, A.N.*, and F.S. Scharf

Presenter Affiliation: University of North Carolina Wilmington

REFORMING THE NC FISHERIES REFORM ACT: BUILDING A FRAMEWORK TO EXAMINE HISTORICAL CHANGES IN STOCK STATUS AND EFFECTIVE REGULATORY STRATEGIES FOR FISHERY RESOURCES

The North Carolina Fisheries Reform Act of 1997 (FRA) was enacted to “protect, enhance, and better manage coastal fisheries in North Carolina” at a time when the state recognized the need to conserve coastal fishery resources and achieve balance between the commercial and recreational sectors. The FRA mandated the creation of fishery management plans for state-managed species, with annual updates on the status of managed stocks, as well as re-assessment of the management plans every 5 years. The FRA also restructured the commercial fishing license, reduced the size of the Marine Fisheries Commission from 17 to 9 members, and led to the development of a coastwide habitat protection plan for wetlands, spawning areas, and nursery habitats. It has been 25 years since the adoption of the FRA, and the NC General Assembly tasked the North Carolina Collaboratory to “study the overall status of the coastal and marine fisheries regulated by the State, including an analysis of trends through time spanning the last few decades or longer to assess and develop policy recommendations to better manage the overall health and viability of the State’s fisheries and habitats.”

To meet this objective, we are developing a framework to assess the type and amount of information that is essential/available for 13 state-managed species (12 of these have established NC fishery management plans). The framework will be used to evaluate key changes in stock status and identify causal factors, regulatory responses, and outcomes of those responses. To provide appropriate context for the NC fishery management process, the framework will be applied to a subset of the managed species that are also managed by other states in the southern US (South Carolina, Florida, Louisiana, and Texas). Temporal patterns of stock status will be compared across management jurisdictions and best practices identified. Here, we outline an early draft of the framework and its application to the management history of Blue Crab, *Callinectes sapidus* in North Carolina.


Presenter Affiliation: Virginia Institute of Marine Science

MORPHOLOGICAL AND GENETIC ANALYSIS OF *ROSTRORAJA* IN THE GULF OF MEXICO: ARE OCELLATE SKATES (*ROSTRORAJA ACKLEYI*) BEING MISIDENTIFIED AS ROUNDEL SKATES (*ROSTRORAJA TEXANA*)?

Two of the eight species in the genus *Rostroraja* are known to occur within the Gulf of Mexico: Clearnose Skate, *Rostroraja eglantaria* (Bosc 1800) and Roundel Skate, *R. texana* (Chandler 1921). Samples of *R. texana* were collected in 2019 from NOAA bottom longline vessels within the eastern and western boundaries of the Gulf of Mexico, separated by the Mississippi River freshwater plume. Preliminary assessment of these specimens suggests that another species of *Rostroraja* is also being caught in the Gulf of Mexico and is tentatively identified as the Ocellate Skate, *R. ackleyi* (Garman 1881). The currently accepted geographic range for the *R. ackleyi* has been described from Southern Florida to Cuba, and southern boundaries of the Gulf of Mexico in the Western Atlantic, and not overlapping with that of *R. texana*. Since *R. ackleyi* and *R. texana* share many morphological characteristics, including similar body form and pectoral ocelli, it is possible that if *R. ackleyi* is present in the Gulf of Mexico, it is being mistaken as *R. texana* by recreational and commercial anglers. The purpose of this project is to use morphological and genetic data to determine if *R. ackleyi* is present in the Gulf of Mexico. Misidentification of species can have serious implications on the exploitation status of both species. It is therefore important to determine if *R. ackleyi* is found in this region to better inform the management practices of *Rostroraja* spp.
E19. **Authors:** *Wright, A.M.*, R. Asch, N. Jainarine, and C. Chan

**Presenter Affiliation:** East Carolina University

**EFFECT OF SUMMER DREDGING ON ZOOPLANKTON DENSITY NEAR THE CAPE FEAR RIVER INLET**

This study examines the impact of summer dredging on the zooplankton community near the mouth of the Cape Fear River. Zooplankton are important biological indicators because their short life cycles can be sensitive to environmental disturbances. The Cape Fear River is the location of the port of Wilmington, a significant port for East Coast industries, which contributes $12.9 billion annually to North Carolina’s economy. Based on mid-water sampling with a bongo net, zooplankton density was calculated before, during and after dredging at multiple sites. Sample sites were categorized by hydrodynamic factors and dredging intensity based on their distance to the path of dredging. Sites were classified as: near dredging, away from dredging and river plume. Plume sites can be characterized as sites with potential sediment entrainment from nearby river dynamics or dredging activity. The samples taken from each site were analyzed using a Zooscan instrument for image processing and pattern recognition and Ecotaxa, which uses machine learning to classify the images by taxa. Assessing if there was damage to the ecosystem from dredging is necessary to fully assess the costs and benefits of dredging. These results will be used to inform a larger assessment of the impact of ship-channel dredging during the summer months. Initial results indicate that summer dredging could be impacting the density of zooplankton at the sites closest to where dredging occurred, but zooplankton communities were able to recover in the following month.

E20. **Authors:** *Bevans, A.T.*, M. Sulyman, M.S. Woodstock, S. Knoche, and T.F. Ihde

**Presenter Affiliation:** Morgan State University

**IMPROVING OUR UNDERSTANDING OF HABITAT CHANGES IN THE CHESAPEAKE BAY WITH A YORK RIVER ECOSYSTEM MODEL**

Eastern Oyster (*Crassostrea virginica*) and Eelgrass (*Zostera marina*) serve as important living habitats for species in the Chesapeake Bay. A 200-acre oyster restoration effort is nearing completion in the York River, the 5th largest tributary of the Chesapeake system; concurrently, the eelgrass population continues to decline due to increasing water temperatures. Population biomasses of commercially, recreationally, and ecologically important species associated with these habitats are also expected to change. An ecosystem model can improve our understanding of the synergistic effects of simultaneous habitat changes by simulating varying degrees of oyster and seagrass restoration separately and in combination overtime. The Ecopath software was used to develop an ecosystem model of the York River, which integrates food web and fisheries interactions. Preliminary model results show secondary consumers (e.g., Atlantic Croaker, *Micropogonias undulatus*) and apex predators (e.g., Striped Bass, *Morone saxatilis*) exert the largest proportion of predation mortality on fished species. The top two fisheries (87% of total landed biomass) are Eastern Oyster and Blue Crab (*Callinectes sapidus*). Blue Crab and Atlantic Croaker experience the most pressure from fishing by individual gears; the pot fishery is responsible for nearly all Blue Crab fishing mortality, while the seine fishery is the primary source of Atlantic Croaker fishing mortality. Additional work is currently underway to predict the effects of oyster restoration and continued Eelgrass change on fished populations in the ecosystem overtime.

E21. **Authors:** *Duba, S.* and D. Collar

**Presenter Affiliation:** Christopher Newport University

**THE ANATOMICAL BASIS OF BODY SHAPE DIVERSITY IN FISHES OF THE SUBORDER ZOARCOIDEI**
Shifts towards elongate forms have occurred repeatedly across fishes, and reconstructions of the underlying anatomical changes allow us to infer selective demands that have caused them. Body elongation arises in different ways, such as increases in the number and size of vertebrae, which may confer increases in flexibility and swimming efficiency, or changes in head length and shape, which may be associated with shifts in feeding habits. We investigated the anatomical basis for body elongation in the suborder Zoarcoidei, which includes an assortment of elongate forms that live in a diverse range of benthic environments, from soft deep-water substrates to rocky coastlines. To conduct this work, we analyzed 195 specimen radiographs, representing 69 species from 9 zoarcoid families. Results indicate that eelpouts (family Zoarcidae) tend to have greater numbers of caudal vertebrae but similar Elongation Ratios (the body’s length relative to its depth) to other zoarcoid fishes. As some eelpouts have the deepest habitat ranges of the suborder, this pattern may indicate a need for greater flexibility and swimming efficiency against the high pressures and cold temperatures they experience. There is also a trend of positive correlation between Elongation Ratio and vertebral aspect ratio (the centrum’s length relative to its height) among all families studied, indicating the presence of a developmental constraint on vertebral shape. These patterns suggest that a variety of anatomical modifications drive body elongation, which may be related to the diversity of zoarcoid habitats and their distinct selective pressures.

E22. Authors: *Davis, J.*, C. McGarigal, and R. Asch

Presenter Affiliation: East Carolina University

ESTIMATING SPAWNING TIMES OF NORTH CAROLINA PARALICHTHYS LETHOSTIGMA BASED ON DAILY OTOLITH GROWTH RINGS

Southern flounder (*Paralichthys lethostigma*) range across the Atlantic coastline from Florida to North Carolina and are an important ecological and economical member of this coastal system. Southern flounder are among some of the most valuable North Carolina finfishes, both commercially and recreationally. The population of southern flounder has been decreasing since the 1970’s and protection measures, such as harvest quotas and size limits, have not helped the population substantially recover. This project evaluates the abundance, size, and age of larval flounders obtained through the Beaufort Inlet Ichthyoplankton Sampling Program (BIISP) in Beaufort, North Carolina to estimate the time that these flounder spawn. Flounder larvae were sorted from weekly collected samples, identified using morphological characteristics, and measured for total length (mm). Samples from the 2019-2022 spawning seasons ranging from December to April indicate that southern flounder spawn in frequent and regular intervals based on larval otolith daily-growth rings and the size of larvae, as well as abundance data gathered through the multiple spawning seasons. Age and size of southern flounder larvae did not generally increase through the season but tended to decrease and increase following a biweekly pattern, while abundance of larvae is highest in the early winter months of January and February. Understanding southern flounder life history could aid fisheries managers by improving stock assessments and protective measures, contributing to recovery efforts.

E23. Authors: Salmoiraghi, A.C., E. Biesack, and J. McDowell

Presenter Affiliation: Virginia Institute of Marine Science

DETERMINING RELATEDNESS OF JUVENILE ATLANTIC STRIPED BASS (*MORONE SAXATILIS*) IN CHESAPEAKE BAY USING MICROSATELLITE MARKERS

This study used genotyping of 16 microsatellite loci to investigate relatedness among 362 young-of-year (Y0Y) striped bass sampled over a range of roughly 50-miles in the Rappahannock River, VA in 2016. Ranges of expected relatedness values for full-sibling, half-sibling and unrelated pairs were generated based on simulations using allele frequencies estimated from adult samples. Due to the limited number of loci used, strict boundaries between half-siblings and unrelated pairs could not be determined. In total, 5 full-sibling pairs were identified with high-confidence, and 562 putative half-
sibling pairs were identified but with lower confidence. To further investigate relatedness patterns, estimates of average pairwise relatedness values were calculated and compared by partitioning YOY samples using three criteria: sampling month, fork length (FL), and capture location. For sampling month, there were significantly higher levels of average relatedness among June samples than among August samples. For FL comparisons, larger FL (55mm-70mm) samples were significantly more related than smaller FL (20mm-35mm) samples. Finally, comparison of samples based on capture location found significantly higher average relatedness in pairs caught within the lower (<45 river miles from the mouth) river than within the upper river (>45 river miles from the mouth). Decreasing levels of average relatedness among YOY samples as the spawning season continued may be attributed to more spawners entering the river over time. Increasing the number of genetic markers and sampling other sub-estuaries could be used to better understand connectivity among sub-estuaries of Chesapeake Bay, enabling better management.


Presenter Affiliation: Virginia Tech

CHANGE OF SUMMER FLOUNDER ABUNDANCE IN THE CHESAPEAKE BAY, AN ECOSYSTEM-BASED EVALUATION

Summer flounder (*Paralichthys dentatus*) are an important species in the Chesapeake Bay, both economically and ecologically. Summer flounder population has declined drastically in recent years along the Atlantic Coast and in the Chesapeake Bay. It is important to assess which conditions are contributing to the population decline and if other fish species within the community are exhibiting similar trends. To improve our understanding of summer flounder abundance, we examined the population trends, local water temperature, life history traits of the fish community in the Chesapeake Bay, and large-scale climate ocean oscillations to determine if population trends are related to these factors. Based on fishery-independent trawl survey data in the Chesapeake Bay from 2002-2018, a correlation analysis was done to identify species with similar or contrary trends in interannual abundance to summer flounder. We found that the Atlantic croaker, windowpane, clearnose skate, smooth dogfish, smooth butterfly ray, Bay anchovy, weakfish, and spot have similar trends with summer flounder in the Bay. Among the factors examined, water temperature in the Bay has increased since 2005 while the mean bay temperature range and gradient have both decreased after 2005 based on change point analyses. Summer flounder and correlated species have declined in abundance since 2005, which demonstrates significant correlations between bay water temperature range and gradient, and species abundance. Future studies on the life history traits and their influence on species abundance in the bay under local environmental changes are needed to better understand the responses of the summer flounder population in the Bay.
FREE-LIVING AND PARASITIC COMMUNITY DIVERSITY ASSOCIATED WITH AN INTRODUCED ALGA

Non-native foundational species can alter invaded habitats in a number of ways. The red seaweed *Gracilaria vermiculophylla* (henceforth *Gracilaria*), native to northwestern Pacific, has invaded much of the coastal habitats throughout the Northern Hemisphere, including the eastern U.S. *Gracilaria* has physically transformed soft-sediment habitats by increasing structural complexity; its branching morphology provides interstitial space for macroinvertebrates, many of which are important prey for commercially important fisheries. We surveyed *n*=17 sites from South Carolina to New Hampshire where *Gracilaria* is found, spanning three biogeographic provinces. At each site, we sampled the assemblages of free-living (FL) and parasitic invertebrates associated with *Gracilaria* by collecting five replicates of alga, and preserving all macroinvertebrates associated with them. We sampled parasites by collecting eastern mudsnail *Ilyanassa obsoleta* from all five replicates of Gracilaria and randomly selecting *n*=100 to be dissected for parasite identification. We used Generalized Linear Mixed Models and AICc to determine which predictors best explained the abundance (or prevalence for parasites), richness, and diversity of FL and parasites associated with *Gracilaria*. For FL & parasite abundance (or prevalence for parasites) and richness, we found that *Gracilaria* biomass was an important predictor. We found that site and biogeographic regions were the sole important predictors for FL & parasitic diversity, respectively. A comprehensive understanding of macroinvertebrate & parasitic communities associated with *Gracilaria* on a biogeographic scale is critical for monitoring how invertebrates and food web dynamics are responding as this invasive seaweed physically transforms estuarine habitats along the U.S. East Coast.

LOW SALINITY TRANSCRIPTOMIC PROFILE OF THE HARD CLAM (*MERCENARIA MERCENARIA*)

The hard clam is an important ecological and economic resource along the U.S. Eastern Seaboard. In Virginia, farm gate sales were estimated at $57.8 million in 2021, making Virginia the largest hard clam producer in the U.S. Although hard clams can be found in lower salinity habitats, they do not grow or survive at rates that are practical for productive aquaculture in these areas. Even in areas of higher salinity, hard clams are vulnerable to extreme precipitation events, which can lead to hyposaline stress and threaten natural and aquacultured populations. Transcriptomic analysis is a powerful tool for exploring the altered gene expression that occurs under osmotic stress. In the spring of 2019 and 2021, clam lines were created at the VIMS Eastern Shore Laboratory. Salinity exposures were conducted in the summer of 2021 and included replicates for two different salinities (35 and 15 ppt) and eight clam lines. RNASeq data from either the gill (2019) or pooled whole bodies (2021) of exposed clams were used to assess the transcriptomic response to salinity stress. Using DESeq2, 545 genes in gills of adult hard clams and 465 genes in whole bodies of juvenile were significantly differentially expressed between 15 and 35 ppt. Some of these genes belonged to important families like heat shock proteins, inhibitors of
apoptosis, and solute carrier transporters. Results from this study allow for a better understanding of how hard clams respond to low salinity stress and identified keys genes that could be the focus of future studies.

**Time- 945**
**Authors:** *Clark, K.R.*, S. Roman, R. Mann, and D.B. Rudders
**Presenter Affiliation:** Virginia Institute of Marine Science

**THE EFFECT OF POPULATION DENSITY ON OOCYTE DEVELOPMENT IN ATLANTIC SEA SCALLOPS (PLACOPECTEN MAGELLANICUS)**

The Atlantic sea scallop fishery employs a rotational closed area strategy designed to increase yield-per-recruit and allow sea scallops to spawn multiple times before they are susceptible to the fishery. Though generally successful, this strategy was challenged by two high-density recruitment events that occurred in the Nantucket Lightship Closed Area in 2012 and the Elephant Trunk Flex Area in 2013. The sea scallops at these sites persisted at high densities and initially exhibited varying degrees of impacted performance. The effect of sea scallop population density on growth, yield, and reproduction was investigated through quarterly sampling trips from 2018–2020 with sampling at 21 random stations divided among high, medium, and low-density sea scallop beds. In previous work on this objective, sea scallop density was identified as an important factor in predicting reproductive effort, with sea scallops at the extreme densities observed in the Nantucket Lightship allocating less energy to gamete production than sea scallops at more typical population densities. Sea scallops in the high-density beds of Nantucket Lightship also exhibited reduced reproductive activity, with fewer sea scallops staged as mature or spawning. A subset of female sea scallop gonads retained during at-sea sampling are being examined using histological methods to directly investigate the effects of density on oocyte development, particularly the volume fraction of developing, mature, and resorbing oocytes. A secondary goal is to assess the agreement between reproductive stages assigned through gross examination at sea with those assigned through histological examination to improve future sea scallop survey efforts.

**Time- 1000**
**Authors:** Damiano, M., *Wager, B.*, A. Rocco, K.W. Shertzer, G.D. Murray, and J. Cao
**Presenter Affiliation:** Center for Marine Sciences and Technology, North Carolina State University

**INTEGRATING INFORMATION FROM SEMI-STRUCTURED INTERVIEWS INTO MANAGEMENT STRATEGY EVALUATION: A CASE STUDY FOR SOUTHEAST UNITED STATES MARINE FISHERIES**

Management strategy evaluation (MSE) has become a more common tool for engaging stakeholders in fisheries management, and stakeholder participation in MSE is increasingly recognized as a vital component of the process. Stakeholders, specifically fishers, often possess intimate knowledge of the socio-ecological management system that MSE seeks to model. When the resources to conduct a “full” MSE with direct fisher involvement are unavailable, MSEs are sometimes conducted by desk-based analysts without fisher engagement. We propose an intermediate framework in which information from semi-structured interviews is used to inform “desk-based” MSE. We demonstrate that semi-structured interviews with commercial and recreational fishers can elicit some of the same kinds of information that fishers provide during direct participation in MSE. We conducted 30 semi-structured interviews with commercial and recreational fishers from the Southeast United States participating in either Atlantic cobia (Rachycentron canadum) or black sea bass (Centropristis striata) fisheries. We collected information about preferred conceptual objectives and management measures, and how their fishing behavior has changed in response to past management action. Commercial fishers generally preferred conceptual objectives and management measures that align with traditional MSY-based fisheries management, while
recreational fishers’ responses were substantially more heterogeneous. We synthesized this information to develop a suite of management procedures that employ a range of fishing mortality-based constant-catch harvest control rules and size-based management measures for simulation testing against preferred objectives by sector. We demonstrate that integrating information from semi-structured interviews with MSE in this way offers a cost-effective alternative intermediate approach to fisher participation in MSE.

Time- 1015
Authors: *Mroch R., and M. Wilberg
Presenter Affiliation: NOAA Fisheries Southeast Fisheries Science Center, Beaufort Laboratory

CHARACTERIZING ENVIRONMENTAL AND PHYSICOCHEMICAL CONDITIONS IN NURSERY AREAS OF RIVER HERRING IN CHOWAN RIVER, NC

NOAA Fisheries has published yearly forecasts of purse-seine reduction landings of Gulf menhaden (Brevoortia patronus) since 1973. The results of the forecast are used each year to inform fisheries managers, investors, and industry about the expectations for the upcoming fishing season. The data used in the forecast are the landings and effort reported from the Gulf menhaden reduction fishery since 1955. The model consists of a multiple linear regression using an estimate of the current year’s effort and the most recent year’s landings and effort as independent variables to forecast the landings for the next year. A desire for consistency in methods has meant that this approach has not been updated or evaluated for decades. Meanwhile, the fishery has undergone many changes from the number of participants and processors to changes in fishing techniques. These changes warrant revisiting the data and methods used to forecast landings. We tested the existing model in use by NOAA Fisheries against simpler models such as using the previous year’s landings and a moving three-year average as predictors by comparing root mean squared error of the forecasted landings. The three-year moving average approach had a lower root mean squared error (77.60) than the existing regression model (81.97). Future work will consider a wider range of statistical approaches and data inputs.

Time- 1030 ---------------------------------------------------BREAK--------------------------------------------------------------

Time- 1045
Authors: *Wade, K., M. Wilberg, and D. Cullen
Presenter Affiliation: University of Maryland Center for Environmental Science, Chesapeake Biological Lab

ENVIRONMENTAL FACTORS INFLUENCE DISTRIBUTIONS OF JONAH CRABS (CANCER BOREALIS) AND ATLANTIC ROCK CRABS (CANCER IRRORATUS) REGIONALLY ALONG THE ATLANTIC COAST

Traditionally considered as bycatch species in the American lobster fishery, the economic importance of Jonah crabs (Cancer borealis) and Atlantic rock crabs (Cancer irroratus) has increased greatly in the United States, since the 1980s. However, population assessments are not available to guide management of these species, including the influence of environmental factors on their distributions off the Atlantic coast. Our objective was to determine relationships between crab distributions and environmental variables using data obtained from offshore spring bottom trawl surveys conducted by the Northeastern Fisheries Science Center during 1968-2021. The presence and absence of Jonah and Atlantic rock crabs were mapped, and their species-habitat relationships were estimated and visualized using generalized additive models and cumulative distribution functions. The environmental variables
considered were temperature (°C), depth (m), salinity, rugosity, grainsize, and time of day. The environmental associations of Jonah and Atlantic rock crabs varied among Georges Bank, the northern Mid-Atlantic Bight, and the southern Mid-Atlantic Bight. These spatial differences did not appear to be solely caused by differences in environmental conditions in each region. Jonah and Atlantic rock crabs also displayed different habitat preferences with Jonah crabs preferring slightly warmer temperatures, higher salinity, deeper depths, and larger grainsizes compared to Atlantic rock crabs. This work will provide information about habitat preferences for both species, which could serve as a foundation to help elucidate how Jonah and Atlantic rock crabs may respond to environmental changes.

Presenter Affiliation: Center for Marine Sciences and Technology, North Carolina State University

FINE-SCALE MOVEMENTS AND HABITAT USE OF RECREATIONALLY IMPORTANT REEF FISHES AT NORTH CAROLINA ARTIFICIAL REEFS

Artificial reefs can play an important role in marine fisheries management by supplementing or enhancing natural habitats. Despite their increased use in recent years, the choice of materials used at artificial reef sites remains largely haphazard due to the lack of information on their performance. There have been few studies that have examined the usage of different artificial reef materials at the individual fish level. From 2021-2022, we tagged 72 black sea bass (*Centropristis striata*), 34 gag (*Mycteroperca microlepis*), 27 greater amberjack (*Seriola dumerilii*), nine almaco jack (*S. rivoliana*), and eight red snapper (*Lutjanus campechanus*) on four artificial reef complexes near Cape Lookout, North Carolina. Available artificial reef materials consisted mostly of concrete pipe, manhole sections, reef balls, concrete H-units, and vessels. Tagged fish were tracked using a VEMCO Positioning System for ~100 days. Black sea bass had high site fidelity to the artificial material that they were captured from and rarely ventured away from the material. Gag and red snapper moved larger distances away from artificial materials and routinely moved between materials. The jacks moved the largest distances from the materials and were detected moving off site. Black sea bass, almaco jack, greater amberjack, and red snapper used all available material while gag used most available material, relative to their tagged reefs. Our results suggest that black sea bass are habitat generalists and display high site fidelity to their release material while gag, red snapper, almaco jack, and greater amberjack select for high relief material such as vessels.

Authors: *Arai, K.*, J.E. Best, C.A. Craig, and D.H. Secor
Presenter Affiliation: University of Maryland Center for Environmental Science, Chesapeake Biological Lab

TO STAY OR GO: PARTIAL MIGRATION IN HUDSON RIVER STRIPED BASS

Partial migration is a widespread phenomenon in fishes, whereby multiple groups follow different migration behaviors (i.e., contingents) within a single population. Striped bass exhibits partial migration early in life, although drivers that cause juveniles to adopt a specific migratory trajectory remain unclear. Here, we used otolith microchemistry to assess the influence of early life conditions and environmental drivers on the early dispersal behaviors of Hudson River (HR) striped bass in 2019 and 2020. We hypothesize that (i) juveniles will exhibit discrete early migration patterns, (ii) that early dispersal is a conditional response, triggered by slower growth and external forces, and (iii) that migrants will compensate for their slower growth by enhancing post-dispersal growth in productive brackish habitats. Time-series clustering analysis on otolith strontium and barium profiles revealed four dominant early migration contingents in both years: (i) freshwater residents, (ii) oligohaline migrants, (iii) small
mesohaline migrants, and (iv) large mesohaline migrants. Otolith microstructure and multinomial logistic regression indicated that in both years, oligohaline migrants arose from individuals with the slowest larval growth and later hatch dates associated with low flow and high temperature. In contrast, individuals that exhibited the highest larval growth and early hatch dates during a period of high flow and low temperature migrated to mesohaline habitats at a large size. Further, in both years, the slow-growing oligohaline migrants exhibited compensatory growth following dispersal into brackish environments. These results suggest that early migration modes of HR striped bass are controlled by the interaction between early growth and environmental drivers.

**Time- 1130**

**Authors:  *Johnson, M.*, A. McMains, and J. Morley**

**Presenter Affiliation:** East Carolina University

**HATCH DATES AND HABITAT USE OF JUVENILE SHEEPSHEAD ARCHOSARGUS PROBATOCEPHALUS IN NORTH CAROLINA ESTUARIES**

Important life history information for sheepshead (*Archosargus probatocephalus*) is missing for populations in North Carolina and the southeastern United States. Commercially and recreationally important, sheepshead currently lack a formal stock assessment or management plan in North Carolina. Recently, potential spawning aggregations of adult sheepshead have been identified in nearshore habitats, but there is little information regarding the spatial extent of juveniles recruiting to coastal North Carolina, or how spawning periods might differ across major estuarine systems. Sheepshead are thought to prefer structured areas including biogenic habitats such as oyster reefs and seagrass beds. We placed traps in biogenic and non-biogenic habitats within three locations in Pamlico Sound to determine distribution and fine-scale habitat preferences of juveniles. Daily increments of otoliths from fish collected across the State were examined to determine hatch dates of juvenile sheepshead. Marginal increment analysis found that hatch dates corresponded to a spring spawning season, which matches the timing of identified spawning aggregations. Our data will provide important information to fisheries managers, allowing for future efforts to protect spawning adults, examine stock structure, and to aid in understanding juvenile life history dynamics and annual abundance.

**Time- 1145**

**Authors:  *Smith, S.*, M. Fabrizio, T. Tuckey, P.G. Ross, and R. Snyder**

**Presenter Affiliation:** Virginia Institute of Marine Science

**HABITAT QUALITY IN TWO SEASCAPES: AS SEEN BY JUVENILE SUMMER FLOUNDER**

Juvenile fishes rely on resources in estuarine and coastal habitats to facilitate growth and survival, which can in turn influence recruitment and fisheries productivity. Identification of habitats critical to the growth and survival of juvenile fishes will support protection of these habitats as coastal regions experience sea-level rise, altered hydrological regimes, and temperature shifts due to climate change. To identify essential juvenile fish habitats, we analyzed relative abundance, body condition, and recent growth of juvenile summer flounder (*Paralichthys dentatus*) from a sub-estuary of Chesapeake Bay and a coastal lagoon on Virginia’s Eastern Shore. We examined differences in relative abundance, body condition, and recent growth between the sub-estuary and coastal lagoon and among habitat types common to this region (marsh, oyster, seagrass, unstructured soft-bottom) within each system. We used a seascape approach to describe habitat characteristics within these two systems; seascape metrics included habitat availability, complexity, and connectivity metrics, in addition to bathymetric and environmental conditions. Juvenile summer flounder were more abundant in the coastal lagoon compared with the sub-estuary and were more abundant in marsh habitats compared with other habitat types within each system. We did not
detect differences in body condition or recent growth among habitat types or between systems, which may indicate this species’ wide-ranging use of these seascapes.

Time- 1200 --------------------------------------------------------------LUNCH--------------------------------------------------------------

Time- 1320
Authors: *Hagemeier, H., C. Stancil, G. Strobel, C.K. Tepolt, A.E. Fowler, A.M.H. Blakeslee
Presenter Affiliation: East Carolina University

CAN A NATIVE MUD CRAB EXPLOIT LOW SALINITY REFUGIA TO ESCAPE AN INVASIVE BODY SNATCHING PARASITE?

Investigating organismal response to invasions is increasingly important given human-mediated global change. Estuarine organisms face numerous biotic and abiotic factors that influence their ability to respond to invaders like parasites. When confronted with parasitic invaders, hosts can either develop resistance or expand distributions beyond the limits of the invader’s tolerance. One such invader of US Atlantic estuaries is the Rhizocephalan *Loxothylacus panopaei*, which infects native panopeid crabs including *Eurypanopeus depressus* (*ED*). Given that successful development of *L. panopaei* larvae is dependent on salinities >10 PSU, *ED* may have a parasite refuge in lower salinity waters. Over a three-week exposure period, we tested low salinity tolerance in adult *ED* by examining mortality and righting response after exposure to treatments (n=7) from fresh to moderate salinities (0–10 PSU) in *ED* sourced from three sites in the US East Coast. We found higher mortality and slower righting response in the fresh/near-fresh salinities, but high survival in salinities between 3-10 PSU where field surveys do not detect the crab. Our study helps determine the low salinity tolerance range of *ED*, allowing us to resolve whether salinity is a key barrier to the species’ ability to exploit low salinity parasite refugia in Atlantic estuaries.

Time- 1325
Authors: *Munoz, A., J. McDowell, and D. Rudders
Presenter Affiliation: Virginia Institute of Marine Science

USING DNA METABARCODING TO UNDERSTAND THE FEEDING ECOLOGY OF THE SEA SCALLOP, *PLACOPECTEN MAGELLANICUS*

The composition of sea scallop (*Placopecten magellanicus*) diet and how diet relates to reproductive success is not well understood. Studies of other scallop species have correlated food availability during gonadal development to spatfall density, suggesting that this could be a predictor of subsequent recruitment and an important consideration for both spatial management of the resource and the development of a stock enhancement program. DNA metabarcoding involves simultaneously amplifying the same genetic locus from a multispecies sample, followed by high-throughput sequencing and comparison of recovered DNA sequences to reference sequences for taxonomic identification. This study aims to establish a DNA metabarcode sequencing approach to identify prey diversity in the digestive glands of sea scallops collected off the U.S. Atlantic coast. Sediment and water samples collected concurrently with scallop samples will also be sequenced to investigate potential food selectivity. This study will initially focus on identification of diatoms, an important component of scallop diet, but will also include identification of other prey. Diet composition will be compared across spatial and temporal gradients and correlated with size at age, density, gonadal somatic index, chlorophyll a concentrations and other environmental parameters. Benthic and pelagic diatoms will be partitioned, which may provide
insight into this aspect of the feeding ecology. Diet composition during gonadal development will be compared to subsequent estimates of recruitment to analyze which food items are predictive of sea scallop productivity, which can then inform and help predict future habitat suitability and recruitment.

Time- 1330
Authors: *Reyes Delgado, A.
Presenter Affiliation: University of Maryland Eastern Shore

DIET VARIATION AND TROPHIC IMPACT OF WEAKFISH (CYNOSCION REGALIS) WITHIN MULTIPLE MARINE HABITATS OF THE EASTERN U.S.

Weakfish (Cynoscion regalis) is a species that is not federally managed, but feed on species that are of federal and ecological interest. Our objectives were to examine the trophic ecology of weakfish in Chesapeake Bay, and the coastal and offshore waters of the Eastern United States. For these areas, we determined the most dominant prey of weakfish; identified how much diet variation was explained by the factors: area, size class, and year; and quantified how much prey biomass was removed by weakfish, 2007-2019. In general, diet composition was mostly dominated by Engraulidae, Mysidacea, Doryteuthis sp., Brevoortia tyrannus, and Teleostei (bony fishes) and significantly varied by area and size class. The total amount of variance explained by the three factors was 40% with year not being a significant factor in explaining weakfish diet variation. Weakfish prey biomass removal occurs primarily in coastal waters (annual mean: approximately 240,000 tonnes, max: approximately 690,000 tonnes). Highly opportunistic, weakfish cannibalism also plays an essential part of their diet. These results have implications for fisheries management of weakfish, the natural mortality of their prey, and competition with federally-managed fishes when considering ecological interactions in regulatory approaches.

Time- 1345
Authors: *Bartlett, B.S., R.G. Asch, and B. Erisman
Presenter Affiliation: East Carolina University

CURRENT MPAS CONSERVE FISH SPawning AGGREGATIONS UNDER CLIMATE CHANGE DUE TO HABITAT REFUGIA

Spawning aggregation forming tropical reef fish species, such as Nassau Grouper, are threatened due not only to overfishing, but climate change stressors, as well. While management strategies, such as marine protected areas (MPAs), seasonal sales bans and fishing closures, may be currently effective at reducing the impacts of fishing pressure, they may not remain effective in the future. By looking at oceanographic conditions at known Nassau Grouper spawning aggregations, along with earth system model output of future conditions under multiple climate change scenarios (RCPs 4.5 and 8.5), projections were made of suitable spawning habitat throughout Nassau Groupers range. Additionally, no-take MPAs and seasonal sales bans/fishing closures were considered for their success in protecting Nassau Grouper spawning currently and under future conditions. By the end of the century, declines in suitable spawning habitat were seen throughout the region under both climate scenarios. While seasonal fisheries management measures for most countries showed declines in protecting spawning habitat, many MPAs fared better than their surrounding areas. This work also demonstrates that by the end of the century, only modest improvements could be made to locating new protected areas. Utilizing adaptive management for temporal management strategies, such as changing the timing of seasonal fishing closures, would likely improve protection of Nassau Grouper spawning aggregations in the face of climate change, as would identifying climate refugia and utilizing networks of smaller MPAs.
CREATING A SPATIALLY-EXPLICIT OPERATING MODEL TO EVALUATE MANAGEMENT OPTIONS FOR EASTERN OYSTERS IN CHESAPEAKE BAY, MARYLAND

Management of oysters in Maryland occurs at a spatial scale smaller than the spatial scale of the current stock assessment; therefore, it is difficult to assess the consequences of management actions conducted at these smaller spatial scales. As part of a stakeholder-centered process conducted during 2019-2021, we developed a method for conditioning a down-scaled oyster stock assessment model to produce a spatially-explicit operating model on the scale of individual oyster bars for eastern oysters (Crassostrea virginica) in Chesapeake Bay, Maryland. We then used this operating model to project the dynamics of the oyster population and fishery forward in time for 25 years. To ensure that parameter values of the operating model were consistent with the harvest data, planting data, and the Maryland oyster stock assessment, we fitted the model to data on bar-specific harvest during 1999-2020 and regional abundance estimates during 1999-2020. We then considered different scenarios, such as planting hatchery-reared oysters, addition of substrate, or modifying fishing regulations, to examine the outcome of proposed management actions with respect to a set of metrics, including oyster abundance and fishery harvest, over the 25 year time period. Our method of downscaling a stock assessment could potentially be useful for other fisheries where regulations vary at a spatial scale smaller than that of the stock assessment.

SHIP-CHANNEL DREDGING IMPACTS ON THE LARVAL FISH COMMUNITY OF NORTH CAROLINA

Inlets connecting the Albemarle-Pamlico Estuarine System to the ocean are important since they serve as corridors for fish migration and maritime transport. Until recently, ship-channel dredging of inlets was restricted to winter to protect estuarine habitat. During 2020-2022, dredging was permitted in summer under the condition that ecological impacts be monitored. We conducted a before-after-control-impact study examining how dredging affected abundance, biodiversity, and community composition of larval fishes surrounding Beaufort Inlet, North Carolina. Larvae were collected at the site of a >35-yearlong monitoring program (Beaufort Inlet Ichthyoplankton Sampling Program [BIISP]) and inshore and offshore stations historically sampled by the South Atlantic Bight Recruitment Experiment (SABRE). Nearly 33,000 larvae from 68 taxa were collected in Summer 2020. Density of larvae was depressed at BIISP during dredging, with a recovery to prior levels following dredging cessation. Seven of the nine most abundant taxa at BIISP exhibited significant changes consistent with negative impacts of dredging. Species richness and Shannon-Wiener diversity declined at BIISP during dredging with little-to-no recovery afterwards. Despite high spatial variability, a significant interaction between SABRE location and time indicated that larval density and species richness were depressed close to intense dredging one month after dredging cessation. Since dredging impacts on water quality were short lived and localized, we hypothesize that changes among larval fishes may instead be due to shifts in larval origin if spawning fishes avoided dredged areas. In conclusion, summer dredging could have implications for the reproductive success of forage fishes and commercially important species.
ONTGENETIC HABITAT CONSTRAINTS OF MARINE FISHES IN TEMPERATE ENVIRONMENTS

Climate-driven range shifts are well documented in marine species, yet studies of distribution shifts rarely distinguish among life stages. Marine species often occupy distinct environments through ontogeny, reflecting the varying habitat needs ranging from spawning grounds to nurseries. Understanding life-stage specific habitat constraints will help identify bottlenecks that may prevent species from tracking suitable thermal habitat in response to warming ocean temperatures. We estimated ontogenetic spatial habitat constraint as a function of consistency of geographic occupancy through time and spatial extent of the core distribution, using a generalized additive model approach. This method was applied to over 40 marine fish species on the Northeastern U.S. Continental Shelf and California Current Ecosystems, including groundfish, flatfish, elasmobranchs, rockfish, and pelagic species. Species-specific variability was high, both in the overall degree of habitat constraint and the changes to geographic dependence with ontogeny. Early life history stages commonly displayed the highest geographic constraint within species, although this pattern was not universal among species or life history strategies. Strong seasonal differences in ontogenetic habitat constraint were detected among many species, particularly in the Northeast U.S. Insights into the individual species, seasons, and life stages that are most geographically anchored and thus vulnerable to climate change will help inform climate adaptive fisheries management as resources continue to shift across boundaries. Efforts to identify spatial constraint patterns relative to species traits suggest that complexity of reproductive strategy and early life history survival requirements may contribute to climate vulnerability during early ontogeny.

MICROPLASTICS IN FISH FROM THE ANACOSTIA AND POTOMAC RIVERS

Microplastic pollution in the aquatic environment has been a growing concern for the past two decades. Recent interest in the issue in the Chesapeake region spurred research into the regional scope of microplastic pollution and contamination in local waters. This project was designed to assess the current extent of microplastic contamination of various trophic levels of fish in the tidal waters of the Potomac and Anacostia rivers around Washington, DC. Microplastic fragments were found in all trophic levels examined in this study, demonstrating the ubiquity of particles in the aquatic environment, with particle type dominated by fibers. 23% of fish collected in the Washington, DC, region contained microplastics in their stomachs. More microplastics and higher frequency of occurrence of microplastics was found in higher trophic positions (planktivores lowest, invertivores most). Regional differences were only present in smallest, least mobile taxa (planktivores).
INTEGRATING MARK-RESIGHT AND COUNT DATA TO ESTIMATE EFFECTIVE SAMPLING AREA AND FISH DENSITY

Conservation and management of populations benefit from accurate estimates of abundance. N-Mixture models, commonly used to estimate abundance from count data, have the assumption of a closed population among visits and a known sampling area—which is often violate when working with mobile species—, leading to an unknown effective sampling area (ESA) and inability to estimate density. We describe an approach to estimate ESA and density from repeated counts of unmarked and previously marked individuals within a modified Marked-N-mixture framework, using data from a telemetry study of red snapper (*Lutjanus campechanus*) at a reef in the Atlantic Ocean off North Carolina, USA. We marked 16 fish with acoustic tags and deployed 31 baited cameras across the reef (1.6 km2). Cameras recorded observations of unmarked and marked individuals, while acoustic data indicated the number of tagged fish on the reef during that period. We developed a modified Marked-N-Mixture model to estimate abundance, ESA, detection probability, and covariate relationships, and evaluated model performance in a case study and using simulations under a range of scenarios of data quality and animal movement. The estimated density of red snapper was 102 (95% CI: 99-165) individuals/km2. Our model improved precision of parameter estimates relative to the standard N-Mixture model, even under scenarios of poor data, and provided unbiased estimates under multiple scenarios of animal movement. This approach demonstrates a flexible alternative to estimating density in geographically open populations, especially for species that are marked but unique identification is not possible during resighting efforts.

INTERACTIVE CRUISE PLANNING WITH QUARTO

Starting spring 2023, UMCES is embarking on a 7-year, multi-platform Before-After-Control-Impact monitoring program within the US Wind offshore wind development areas near Ocean City, MD (see [https://tailwinds.umces.edu](https://tailwinds.umces.edu) for project-specific information). In trials during the "shakedown" year of 2022, plans often needed to "change on the fly" to match project goals with the realities on the ground. We developed an iterative, interactive cruise planning process leveraging the Quarto scientific publishing system in response. Quarto allows intuitive access to JavaScript libraries and website production within R, the lingua franca of fisheries analysis. The use of one common language (R) lowered barriers to adoption of the framework by analysts, while the interactivity allowed by underlying JavaScript libraries provided a means for the multiple project PIs to interact with the data. Reports were readily converted to a website, allowing easy access and iterative participation with project funders and contracted fishers. Our workflow and lessons learned will be presented.
Saturday, March 24th

Time- 810
Authors: Schlenker, L.S., N. Hall, J. Nye, J. Fodrie, and J.W. Morley
Presenter Affiliation: Coastal Studies Institute, East Carolina University

EVALUATING LONG TERM SHIFTS IN ECOSYSTEM INDICATORS AND THE FISHERIES SEASCAPE OF NORTH CAROLINA

North Carolina is a unique ecoregion that is bisected by Cape Hatteras, one of the most significant climate and biogeographic breaks in the world, and the Pamlico-Albemarle Sound ecosystem, the largest lagoonal estuary in the United States and a critical nursery habitat for ecologically and commercially important species on the U.S. east coast. There is growing interest in the “status” of North Carolina’s coastal fisheries and ecosystems, but a comprehensive analysis of this broad and complex region is lacking. This study is examining how commercial and recreational fisheries landings and ecosystem parameters have shifted over the last several decades and evaluates likely drivers of ecosystem shifts. Using multivariate analyses, our results show that commercial fisheries landings have undergone largescale shifts over time, with very few species groups that were harvested heavily in the 1980s remaining a primary target in recent years. In contrast, analyses of recreational landings largely show much more similar patterns across species groups over the timeseries, with increases in catches across nearly all species groups. Together, the composition of recreational and commercial landings indicates shifts in the early 1990s and 2000s that may suggest ecosystem transitions. Assessment of ecosystem indicators will be conducted similarly to landings data to evaluate connections between ecosystem health, policy actions, and fisheries trends. These results will be assessed to evaluate potential drivers of ecosystem and fisheries transitions in North Carolina (e.g., large-scale climate patterns and management actions) that will aid fisheries managers in determining climate-adaptive management strategies.

Time- 830
Authors: Nelson, T.R., R. Kelmartin, K. de Mutsert, and R.C. Jones
Presenter Affiliation: Potomac Environmental Research and Education Center, George Mason University

SHIFTS IN THE COMMUNITY STRUCTURE OF TIDAL FRESHWATER FISHES ASSOCIATED WITH ALTERNATE STABLE STATES

Tidal freshwater ecosystems are the most landward reaches of estuaries, providing valuable habitat for fishes, while experiencing multiple environmental stressors, given their proximity to metropolitan areas. In this study, we assessed changes in the community structure of tidal freshwater fishes downstream of Washington DC throughout the last decade. Concurrent with a shift in primary producers from a state dominated by submerged aquatic vegetation (SAV, years 1 – 5) to a phytoplankton dominated state (years 6 – 10), we detected significant changes in the fish community between states. White Perch and Banded Killifish contributed most to community differences in seine sampling, followed by Alosa sp., and Gizzard Shad. Although White Perch was still a dominant member of the fish community sampled by trawling, Blue Catfish was the only species whose difference between states was a significant component of their contribution to community differences. These differences in community assemblage were driven by higher Banded Killifish abundance in the SAV-dominated state, and greater abundances of all other highlighted species in the phytoplankton-dominated state. Our results mirror the response seen in a similar embayment farther downstream, where decreased nutrient loads resulted in SAV establishment concurrent with increased Banded Killifish and decreased White Perch abundance. Our results further support alternate stable states in tidal freshwaters, a phytoplankton-dominated turbid water state,
HOW MANY IS TOO MANY: AGE STRUCTURE SAMPLING STRATEGIES OF STOCK ASSESSMENTS FOR TWO IMPORTANT NORTH CAROLINA FISHERIES

Sampling age structures is a crucial process for timely and cost-efficient data collection in fisheries management, but it can be difficult to determine sample size needs for stock assessments, particularly when multiple strata are concerned. Determining the number and proportions of samples needed from each fishery and survey can greatly impact the development of age-length keys and estimation of growth parameters. Recommendations from previous studies are variable, ranging from 75 to 1,000 age samples per year. Additionally, numerous studies have mentioned the importance of keeping the length distribution the same as the fishery or population, but the most common approach is to use fixed length bins. This study examined how sample size and sampling strategy (proportional versus fixed) impact the von Bertalanffy growth parameter estimates for two important fisheries in North Carolina, the Spotted Seatrout Cynoscion nebulosus (87% recreational) and Striped Mullet Mugil cephalus (95% commercial) fisheries. In this study, we also estimated the sample size for a juvenile survey used for estimating von Bertalanffy growth parameters. The results from this can help estimate age sampling efforts that will be used to inform future stock assessments.

DIET AND MOVEMENT OF YOUNG STRIPED BASS (MORONE SAXATILIS) WITHIN AND AMONG SHALLOW TRIBUTARY HABITATS OF CHESAPEAKE BAY

Striped Bass Morone saxatilis are large anadromous fish native to the eastern US/Canada that perform yearly migrations from offshore areas to freshwater spawning habitats and are dominant predators within these systems. Although both the diet and movement of adult Striped Bass have been studied extensively, their spatiotemporal patterns across ontogeny remain poorly understood, especially for young fish in shallow nursery habitats. In this study, we examined the diet of young-of-year and juvenile Striped Bass collected across nine Chesapeake Bay (MD & VA) tributaries during the summer and fall of 2018 using both morphological and metabarcoding methodologies. In combination, we identified numerous key prey taxa underrepresented in adult diets, including insects (primarily dipterans), grass shrimp (Palaemon spp.), killifish (Fundulus spp.), silversides (Menidia spp.), and small bivalves (e.g., Mya arenaria). Metabarcoding produced a large number of species level assignments for important prey taxa, including fish, polychaetes, crustaceans, and mollusks, far exceeding morphological examinations. Most strikingly were multiple sequences of the non-native amphipod Grandidierella japonica, the first report for Chesapeake Bay. Additionally, we tagged 40 young (269–575 mm TL; mean ±SE = 349 ±11 mm) Striped Bass with acoustic transmitters (Innovasea V9) in the Rhode River, Chesapeake Bay, MD during July–October 2020. Tagged fish displayed a high degree of residency in Chesapeake Bay (with substantial movement among tributaries), though roughly a third of fish made forays into Delaware Bay via the Chesapeake & Delaware Canal, and a small number were detected as far north as Cape Cod, MA.
STRIPED BASS PREDATION MAY DRIVE THE POPULATION DYNAMICS OF BLUEBACK HERRING AND AMERICAN SHAD IN THE CONNECTICUT AND DELAWARE RIVERS

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

TEMPERATURE AND FLOW CONDITIONS ASSOCIATED WITH RECENT DECLINING RECRUITMENT IN MARYLAND’S STRIPED BASS SPAWNING AREAS

Striped Bass year-class success in Maryland’s portion of Chesapeake Bay has recently been poor. Increasing spawning stock has occupied management’s attention even though temperature and river discharge during late winter–spring are major influences. We compiled spawning season temperature records from egg and larval surveys conducted in two eastern shore rivers during 1954-2021 to examine changes in patterns before and after 1999. Early temperature milestones (first egg collected and 12°C) exhibited little or no change on average and later milestones (16°C and 20°C) were progressively earlier. The temperature span when most eggs were collected (12°C to 16°C) has shortened and lethally high temperatures (indicated by days to 20°C) were reached 6-12 days earlier. We examined how often poor or strong year-classes (juvenile indices in bottom and top quartiles, respectively) occurred at above or below average flows for each of the four areas sampled for the juvenile index (JI). When all spawning
areas were combined during the most recent period with strong JIs, 1993-2020 (N = 112 area and year combinations), there were 4 strong year-classes when flows were below the 1957-2020 average, 24 strong year-classes when flow was above average, 17 poor year-classes when flow was below average, and 13 when it was at or above average. Frequency of below average flow conditions has increased since 1993-2006 in 3 of the 4 spawning areas, increasing odds that a lesser year-class will form.

Time- 1050
Authors: Collins, L.D., M.J. Wilberg, and R.J. Woodland
Presenter Affiliation: University of Maryland Center for Environmental Science, Chesapeake Biological Laboratory

EFFECTS OF FISH PREDATION ON A NEARSHORE MYSID COMMUNITY DURING AUGUST–OCTOBER IN THE PATUXENT RIVER, MARYLAND

Shallow near-shore habitats are important for various life stages of many species of fish that live in Chesapeake Bay. The silty flats surrounding the Chesapeake Biological Laboratory Research Pier at the mouth of Patuxent River are habitat for many fishes, as well as multiple species of mysids. *Americamysis* is a common genus in Chesapeake Bay and is often prey for juvenile and nearshore finfish species. However, predator-prey dynamics of fish and mysids in shallow waters of Chesapeake Bay remains poorly understood. The goal of this study is to estimate the consumption of mysids by fishes in this shallow near-shore habitat of Chesapeake Bay. Specifically, we are 1) estimating mysid density and abundance, 2) quantifying consumption of mysids using fish stomach contents analysis, and 3) estimating the effects of predation on the mixed-species mysid community near the mouth of the Patuxent River. Mysids were sampled and enumerated by species, and densities for each species were calculated over time. Per capita consumption of mysids was quantified by enumerating individual mysids found in the stomachs of each species of finfish. To estimate the predation on mysids, the per capita consumption was extrapolated using abundance estimates of each fish species. We found three species of mysids in our sampling area, *A. almyra*, *A. bahia*, *A. bigelowi*, and their densities fluctuated during August–October. Four species of fish had mysids in their stomachs: white perch (*Morone americana*), spot (*Leiostomus xanthurus*), needlefish (*Strongylura marina*), and spotted sea trout (*Cynoscion nebulosus*). Fish predation did not appear to be a substantial source of mortality for mysids in the lower Patuxent River within our study.

Time- 1110
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LEVERAGING GENETICS TO ADVANCE THE CONSERVATION OF ATLANTIC STURGEON

Atlantic sturgeon are large, long-lived, highly migratory fish that may be found across the Atlantic Coast of North America. Historic overharvest and habitat degradation resulted in significant declines to populations and, following decades of limited recovery, the species was listed under the U.S. Endangered Species Act in 2012. The Eastern Ecological Science Center is engaged in an array of research activities to support the conservation of Atlantic Sturgeon. We will provide an overview of recent endeavors, including the development of a population genetic baseline, assessments of stock mixing in coastal habitats, estimation of spawning population size, and characterization of migration patterns.
AMERICAN AND HICKORY SHAD POPULATION TRENDS FROM THE SUSQUEHANNA RIVER BELOW CONOWINGO DAM 1986–2022

The Maryland Department of Natural Resources conducts annual surveys targeting adult American shad and hickory shad in the Susquehanna River below Conowingo Dam. American shad are angled from the dam tailrace, measured, sexed, tagged and released. Indices of abundance are derived from these hook and line data and from combined fish lift data. Recreational creel, logbook and online surveys also provide information on American and hickory shad abundance. In 2022, 113 American shad were angled from the Susquehanna River below Conowingo Dam from 27 April through 24 May, and 111 were successfully scale-aged. Males were present in age groups three through six and females were present in age groups four through seven. The 2018 year-class (age four) was the most abundant for males and the 2017 year-class (age five) was most abundant for females. Estimates from the mark-recapture tagging study show the American shad population in the Conowingo Dam tailrace is stable and low, near the levels seen in the late 1980’s and well below peak levels seen around 2001. The trend in arcsine-transformed percentage of repeat spawning American shad continues to increase from historic lows in the 1980s. Recreational angler logbook surveys for American shad in the Susquehanna totaled 51 fishing trips and 161.5 hours with a CPUE of 0.34 fish/hour, the lowest since the time series began in 2001. Hickory shad logbooks for Maryland statewide totaled 60 fishing trips with 199 hours and a CPUE of 8.3 fish/hour, the highest in the time series.

----------------------------------------------------------------ADJOURN---------------------------------------------
List of Restaurants

**Sit-down**

Charles Street Brasserie ($$$)
120 Charles St, Solomons, MD 20688

La Vela Italian Restaurant ($$)
251 C St, Solomons, MD 20688

Ruddy Duck Brewery & Grill ($$)
13200 Dowell Rd, Dowell, MD 20629

The CD Cafe ($$)
14350 Solomons Island Rd S, Solomons, MD 20688

The Island Hideaway ($$)
14556 Solomons Island Rd S, Solomons, MD 20688

The Lighthouse Restaurant & Dockbar ($$)
14636 Solomons Island Rd S, Solomons, MD 20688

The Pier Restaurant ($$)
14575 Solomons Island Rd S, Solomons, MD 20688

**Quick bites**

Island Sushi & Grille ($$)
13880 H G Trueman Rd, Solomons, MD 20688

Jerry’s Subs and Pizza ($)
13962 Solomons Island Rd S, Solomons, MD 20688

Subway ($)
13330 H G Trueman Rd, Solomons, MD 20688

Dynasty Chinese Restaurant ($) 
13322 H G Trueman Rd, Solomons, MD 20688