Fish Habitat Funded Research Projects (DRAFT)

2025

The Economic Impacts of Oyster Restoration and Seagrass Habitats of the Middle Peninsula, Virginia

Oyster and Eelgrass populations in the Chesapeake Bay are below historical levels, but Oyster restoration efforts have enhanced existing reefs. These habitats support commercially important species, implying economic impacts on the fishing industry from habitat changes. Ecosystem models and interviews with commercial fishers were used to estimate economic impacts of habitat changes. Increases in Oyster and Eelgrass are predicted to enhance fisheries and regional economies, while declines have negative effects. Combined restoration is predicted to maximize economic benefits, with significant gains from Eelgrass restoration alone.

Striped bass and summer flounder abundance trends and influencing factors in the Chesapeake Bay: an ecosystem-based evaluation

This study indicates that environmental factors, particularly increasing sea surface temperatures (SST), have impacted the abundance of key species like striped bass and summer flounder. Striped bass abundance has positively correlated with rising SST, while summer flounder abundance has declined with increasing SST. The fish community structure shifted notably after 2011, influenced by environmental perturbations such as hurricanes, with changes in species like striped bass, Bay anchovy, and summer flounder contributing to this shift. The research identified relationships between top predators and their prey, though no significant correlations were found between functional groups and environmental factors. Long-term monitoring and further research are recommended to better understand and manage the Chesapeake Bay community.

Valuation of ecological and social benefits provided by natural and restored nearshore habitat for communities and fisheries

This study found that recreational fishing, a key ecosystem service, benefits significantly from coastal marshes and living shorelines in the Middle Peninsula region of Virginia. Data from around 1500 licensed saltwater anglers indicated these habitats are preferred due to frequent use, low visitation costs, and high willingness-to-pay. The estimated annual economic benefit of recreational fishing in these habitats is approximately $6.42 million, which is more than three times higher than that of hardened shorelines. These ecosystem service values can help improve habitat restoration and shoreline management decisions and enhance the accounting of coastal natural capital assets.

2024

Spatiotemporal Variation in Habitat Suitability Within a Major Producing Area for Age-0 Atlantic Striped Bass, Morone saxatilis

The main findings of this research show that estuarine environments are critical nursery habitats for striped bass, which support recreational and commercial fisheries along the U.S. Atlantic coast. Using data from fishery-independent surveys and numerical models, researchers quantified the extent of summer habitats for age-0 striped bass in Chesapeake Bay from 1996–2017. They found that habitat suitability varied annually due to changes in water quality and habitat use, with shallow, nearshore areas consistently supporting suitable conditions. Despite a decline in the extent of suitable habitat Bay-wide since 1996, fish production was not limited. The research observed an increasing relative abundance of age-0 striped bass with greater habitat extent, suggesting the importance of suitable habitats in supporting the species' production. 2023-present

Estimating Fish Density and Production Enhancement Derived from Restored Salt Marsh Edge Habitats in the Chesapeake Bay

This Virginia Institute of Marine Science project will include comparative nekton sampling of shoreline habitats at five locations in the Middle Peninsula Habitat Focus Area. Also at these locations, researchers will count vegetation in the low marsh areas to determine vegetation density. They will place sensors along shorelines to record inundation duration, depth, and water temperature. Work will also include identifying certain species by natural or restored salt marsh edge habitat, statistical examination of data, integrating new data into productivity tools for salt marsh habitats and living shorelines, and developing science translation products for use in restoration decisions.

Migration Ecology of River Herring

Researchers from the Smithsonian Environmental Research Center will partner with the Rappahannock Tribe and George Mason University to track 50 targeted fish during their annual migrations using acoustic telemetry technology. The project will include deployment of 24 acoustic receivers at key sites on the Patapsco, Potomac, and Rappahannock rivers. They will also collect otoliths and scales from about 100 fish annually to assess population structures of river herring in the three rivers. They will then analyze the telemetry and biochemical data to assess differences in the migrating fish.

Striped Bass Recruitment in the Choptank and Patuxent Rivers

Researchers at the University of Maryland Center for Environmental Science will sample, quantify, and analyze zooplankton abundance and striped bass egg and larvae in the Choptank and Patuxent rivers, and will develop a spawning habitat model for striped

bass as it relates to zooplankton distribution using existing historical and hydrographic data.

2022

Spatial differences in estuarine utilization by seasonally resident species in Mid-Atlantic Bight, USA

This research found that climate-driven distributional shifts have affected fish species in the Chesapeake Bay, the largest estuary in the continental U.S., with a notable decline in finfish abundance while coastwide stock status remains unchanged. Seasonal residents may shift between coastal waters and northern estuaries in response to warming. Data from 2008 to 2019 showed that habitat utilization in Chesapeake Bay declined for most species, while it remained stable or increased in Delaware Bay. The study identified the North Atlantic Oscillation (NAO) as a key driver for Chesapeake Bay exchanges and average coastal ocean bottom temperature in April/May as significant for Delaware Bay. Overall, climate drivers have varying impacts on estuarine habitat use and species distribution within the Mid-Atlantic region.

Characterization of Nursery Habitats Used by Black Seabass and Summer Flounder in Chesapeake Bay and Coastal Lagoons

This study explored how different habitats support juvenile summer flounder and black sea bass. Scientists examined if the nursery habitat available in the Chesapeake Bay and oceanside lagoons on Virginia's Eastern Shore influenced juvenile fish populations in the Chesapeake Bay. Research was conducted in Virginia's Piankatank River and South Bay lagoon, with data collected from various habitats like seagrass areas, oyster reefs, intertidal marshes, and soft bottom areas.

Key findings:

- South Bay had more structured habitats (especially seagrass), saltier water, and more fish, including about 10 times more juvenile black sea bass than the Piankatank River.
- Marsh areas in both locations had more juvenile fish, emphasizing the importance of marsh habitats for fish nurseries.
- The Chesapeake Bay region has lost significant marsh area due to sea level rise, raising concerns about habitat quality in newly formed marshes.
- Temperatures above 78.6°F hinder juvenile summer flounder growth. The area with suitable temperatures has declined by 50% since 1996, leading to earlier departure of summer flounder from the Bay and declining catches in fall.

Overall, the study highlights the critical role of habitat quality and environmental factors in supporting juvenile fish populations.

2021

[The Extent of Seasonally Suitable Habitats May Limit Forage Fish Production in a Temperate Estuary]

This research found that the production of forage species in the Chesapeake Bay is critical for ecosystem-based management, yet factors affecting their local abundances and habitat conditions are not well understood. By analyzing data from 2000 to 2016, researchers quantified suitable habitats for four key forage fishes: juvenile spotted hake, juvenile spot, juvenile weakfish, and bay anchovy. They found that suitable habitat conditions varied among species and were influenced by water quality and geophysical properties. Seasonal variations in habitat suitability were more pronounced than annual variations, with specific areas near shorelines and tributaries serving as important habitats at different times. The study highlighted the importance of protecting and restoring areas that consistently provide suitable conditions for forage species to promote sufficient production for predators and suggested developing quantitative habitat targets for better management.