Section 22 Delaware Estuary Sturgeon and Oyster Study (DE SOS)

Project Partners:

South Jersey Port Corporation
Seaboard Fisheries Institute
Rutgers University Haskin Shellfish Research Laboratory
Rutgers University Institute of Marine and Coastal Sciences
Environmental Research and Consulting, Inc.
Academy of Natural Science
U.S. Army Corps of Engineers, Philadelphia District

Project Status:

This fall investigators of the Delaware Estuary science community initiated a study to examine the effects of flow dynamics, salinity, and water quality on the eastern oyster, the Atlantic sturgeon, and the shortnose sturgeon in the Delaware Estuary. The study will focus on the oligohaline zone, the area where fresh and salt water interface. The oligohaline zone supports essential habitats for juvenile anadromous fish and provides critical disease refuge for oysters. The project study area will flank this critical zone with assessments occurring from the Marcus Hook area south to the Maurice River, including sites in New Jersey, Delaware and Pennsylvania.

Though very different in their functional significance to the estuary, oysters and sturgeon both represent important ecological indicators of the health of the estuary. Additionally both groups of animals are particularly vulnerable to anthropogenic and climatic changes effecting estuarine flow dynamics. The Haskin Shellfish Research Laboratory is presently involved in a multi-institutional National Science Foundation funded study focusing on understanding how oyster host genetics, population dynamics, and environment interact with disease organisms to structure host populations. The NSF study will examine how climate change may interact with these inter-related processes. As part of this effort a circulation-biogeochemical model (ROM v.3) has

The eastern oyster is one of, if not the most important, species of the Delaware Estuary. Foremost, the oyster is a keystone organism in the bay, providing several vital ecological services. The oyster has also served as a principal Delaware Bay fishery, holding particular economic, social and cultural-historical significance to communities along the Delaware Bay shore. There has also long been a considerable brain trust of oyster researchers in the region, generating a wealth of data and knowledge on oyster biology, ecology and population models. Such models have been critical to the management and sustainability of the Delaware Bay oyster resource. Additionally, there has been a highly successful oyster restoration program in recent years, which promises to preserve this critical resource for generations to come if the effort can be sustained.

been developed to identify dominant circulation phenomena in Delaware Bay and on the adjacent continental shelf that affect general changes in oyster parasite and larval transport. The model output also provides temperature, salinity, and flow velocities, which are not only essential to modeling oyster population dynamics, but are also valuable in modeling and examining other biological and environmental interactions occurring in the Estuary.

Of particular interest are the biological and environmental interactions taking place in the oligohaline zone at the fresh-salt water interface. The DE SOS research effort will utilize the ROM v.3 model to investigate interactions of flow dynamics, salinity, and water quality on the eastern oyster (*Crassostrea virginica*), the Atlantic sturgeon (*Acipenser oxyrinchus*), and the shortnose sturgeon (*Acipenser brevirostrum*) in the Delaware Estuary.

Study approach:

1) Gather information on spatial and temporal variability in water quality and food supply parameters to better ground truth and enhance the utility of the ROM v.3 model for modeling hydrodynamic influences, specifically freshwater inflow, on oyster population dynamics.

(2) Track juvenile sturgeon using acoustic telemetry to examine seasonal distribution and movements in relation to water quality and hydrodynamic factors.

(3) Apply the ROM v.3 model as a tool for examining the relationship of juvenile sturgeon distribution and environmental parameters with a view toward identifying essential habitats and examining the sensitivity of essential habitats to past, present, and future anthropogenic and natural alterations in flow and water quality.

Benefits:
This work will augment efforts to restore and protect oyster and sturgeon habitats in the Delaware Bay. Refinement of the ROM v.3 model will enhance its utility for examining a wide variety of questions relating to the effects of climatic shifts and flow alterations on the biological resources of the Estuary.

The Atlantic and shortnose sturgeon belong to a prehistoric group of fish that have existed for more than 70 million years. Being anadromous, they migrate between fresh and marine environments returning to their natal estuaries to spawn. Atlantic sturgeon supported a principal fishery in the Delaware Estuary in the late 1800s and early1900s; their roe being heavily sought for the international caviar trade. Populations of Atlantic and shortnose sturgeons are at historically low levels along the Atlantic coast of North America. The shortnose sturgeon is presently listed as endangered and the Atlantic sturgeon is currently a candidate for listing as a threatened or endangered species. Considerable research on the biology of sturgeon in the Delaware River and Bay has been performed. However, little is known regarding the occurrence, distribution, and movements of juveniles. Knowledge of the seasonal utilization of different parts of the estuary by, and habitat requirements of juvenile sturgeon is critical to the species' protection, management, and recovery. The lack of informed knowledge of their essential habitats precludes the implementation of appropriate protection and enhancement management strategies.