



PLANNING FOR A

Changing Ocean

Monitoring Acidification in the Mid-Atlantic

The chemistry of the oceans is changing. Carbon dioxide (CO₂) emissions from tailpipes, smokestacks and other human sources don't simply linger in the atmosphere – they are absorbed and dissolved into the oceans.

Once in the ocean, CO₂ combines with water to form a weak acid and lower pH levels in a process called ocean acidification, which can be harmful to marine life and ecosystems. The Mid-Atlantic's many estuaries and bays are also susceptible to coastal acidification due to their naturally acidic fresher waters.

Around the world, this acidification trend has proven problematic for organisms (e.g., mollusks) that rely on calcium carbonate to build the hard exterior shells that protect them. This is why ocean acidification has been referred to as osteoporosis of the sea. Acidification can also impact organism metabolism, behavior, and reproductive success. Spikes in acidification have led to localized collapses of fisheries in the Pacific Northwest, where government agencies are now devoting more legislative attention and research efforts to the issue.

In the Mid-Atlantic, efforts to understand the impacts of acidification are still in their infancy. However, scientists do believe that certain conditions make the region's ecosystems and economy particularly vulnerable.

About the Project

Planning for a Changing Ocean aimed to understand how a changing climate impacts our ocean and the Mid-Atlantic's diverse marine ecosystems, coastal communities and economies. The project examined the implications for resilience of current trends, including increased acidification of coastal and ocean waters, the availability of offshore sand resources and shifting marine life habitats. The project was a collaboration of the **Mid-Atlantic Regional Council on the Ocean (MARCO)**, the **Mid-Atlantic Regional Association Coastal Ocean Observing System (MARACOOS)** and the **Monmouth University Urban Coast Institute (UCI)**, made possible by a grant from the **National Oceanic and Atmospheric Administration (NOAA)**.



For more information, view the Mid-Atlantic Coastal Acidification Network website at MidACAN.org.



State of the Science

The Mid-Atlantic Bight – an area ranging from Cape Cod, Massachusetts, to Cape Hatteras, North Carolina – is home to a unique “cold pool” along the continental shelf in waters deeper than roughly 50 feet. Temperatures in the cold pool remain low all year round – conditions that species such as scallops, clams, and many finfish thrive in. Yet research has shown that colder, deeper waters are more susceptible to acidification.

To date, no major impacts have been observed to fisheries in the Mid-Atlantic. Nevertheless, water sampling in estuaries and offshore areas has turned up periodic results that are troubling to scientists. Many researchers are now attempting to answer questions such as how prominent acidification is in the region today, how fast conditions are changing, and if marine life can adapt. Others are exploring the viability of measures that have been shown to improve resilience in other places, like planting seagrasses that consume CO₂ in tidal bays and estuaries.

Monitoring Acidification

A consortium of government agencies, NGOs, academic institutions and fishing industry representatives came together in 2016 to enhance understanding of acidification in the five-state region spanning from New York through Virginia. The Mid-Atlantic Coastal Acidification Network (MACAN) has been compiling all of the existing research relevant to this unique region on its website, MidACAN.org, where it can serve as a resource for all who are interested in the subject. MACAN facilitates information exchange, including public webinars, where experts from around the region share their knowledge on the latest science.

MACAN recently developed seven interactive maps for the Mid-Atlantic Ocean Data Portal (portal.midatlanticocean.org) showing sites where waters are or have been monitored for signs of increased acidification. The maps will serve as a valuable tool as MACAN develops a robust network that monitors for changes to the region's water chemistry. If you know of research related to acidification in the Mid-Atlantic or would like to get involved with MACAN's work, email info@MidACAN.org. MACAN also helps to implement the [Mid-Atlantic Regional Ocean Action Plan's](#) Healthy Ocean Ecosystem action 3 on ocean acidification.

Examples of Acidification Vulnerabilities



MOLLUSKS

Shells of mollusks are made of carbonate, a material that can be vulnerable to low pH or acidified conditions. The larval stages of bivalves are especially sensitive to changes in pH and alkalinity, because their shells are thin, newly developing and made of an easily dissolved, highly soluble form of calcium carbonate called aragonite.



FINFISH

To date, only a half-dozen or so fish species of the Mid-Atlantic have been studied for their response and sensitivity to acidification. Among them were summer flounder (fluke), which showed lower egg fertilization rates and, among those that were successfully fertilized, a low rate of survival to hatching.



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