Baseline Highlights From the Southern California Bight Regional Monitoring Program

Assessing Water Quality in South Coast Marine Protected Areas

Guest Snapshot Report

About This Snapshot Report

This report highlights results from the most recent cycle of the Southern California Bight Regional Monitoring Program (Bight '13). The South Coast water-quality management community conducts this collaborative monitoring initiative every five years.

Strategic Partnership Provides Water-Quality Data for South Coast MPAs

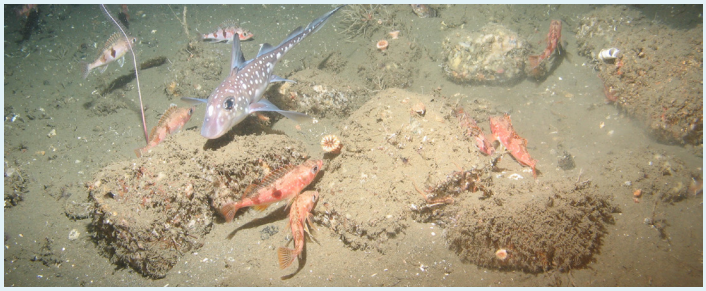
For more than two decades, Southern California's environmental management community has run a regional monitoring collaboration focused on assessing water quality across the Southern California Bight. During the Bight program's most recent five-year cycle—known as Bight '13—California's MPA monitoring program partnered with the Bight program to establish a water-quality monitoring baseline for South Coast MPAs.

The water-quality data serve as an additional line of evidence for illuminating the ecological condition of South Coast MPAs now and into the future. Furthermore, because the Bight program's water-quality data were collected within months of the implementation of South Coast MPAs, these data sets serve as the definitive region-wide monitoring baseline for water quality. The Bight data show which South Coast areas appear susceptible to impacts from water-quality impairments, which areas don't appear to be susceptible, and which areas appear inconclusive. These findings can enhance coordination among coastal managers and help guide follow-up studies to address water-quality issues that potentially affect all MPAs.

A Bight '13 field crew collects and processes seafloor sediment samples in San Diego Bay. Photo: Amec Foster Wheeler.

What is the Southern California Bight?

The Southern California Bight is a concave bend in the coastline that stretches from Point Conception in Santa Barbara County to Punta Colonet in Mexico. Here, subtropical waters flow north close to the shore, while subarctic waters flow south offshore. This mixing of currents, combined with varied habitat types, paves the way for rich ecosystem diversity, including more than 500 species of fish and thousands of invertebrate species.



The Southern California Bight Regional Monitoring Progam focuses on evaluating water quality in the South Coast region in five-year cycles. Photo: iFAME/MARE.

The Southern California Bight extends about 400 miles along the coast, from Santa Barbara County to Punta Colonet in Mexico. Source: SCCWRP.

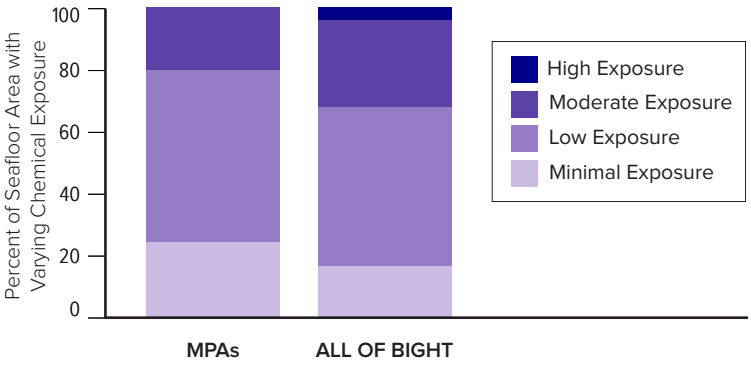
Trawl Surveys

Soft-Bottom Communities are Similar Inside and Outside of MPAs

Bight '13 examined the biological integrity of bottom-dwelling fishes and invertebrate communities in soft-bottom habitats, finding that community composition and the abundance of pollution tolerant/intolerant species inside MPAs were not significantly different from outside MPAs. These data sets can now serve as the baseline against which to evaluate the future success of MPAs in improving the integrity of soft bottom-dwelling marine communities.

The methodology that is used to assess biological integrity for Bight '13 monitoring has been refined and expanded over the past 20 years; nearly 800 standardized small otter trawls have been collected by the Bight program since 1994. Each organism collected via trawl is identified, measured, weighed, and then returned to the ocean.

For the Bight '13 MPA baseline monitoring effort, researchers developed a sampling design that optimizes the number of samples that will be needed in the future to detect changes in bottom-dweller biological integrity. This design will improve the efficiency of trawl-based monitoring going forward. Learn more at **oceanspaces.org/sc-vrg-trawl-report**.

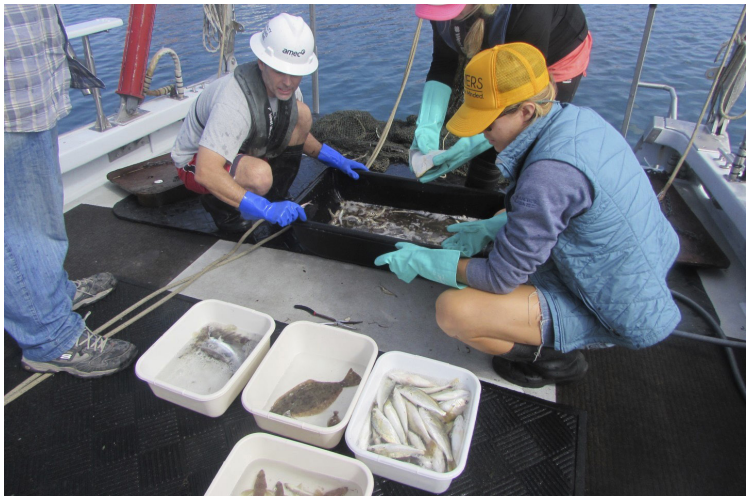


Areal extent of sediments in MPAs in varying categories of exposure to contamination. Source: SCCWRP.

Why track water quality in South Coast MPAs?

Although water quality is a consideration for all MPAs, South Coast MPAs are especially susceptible to the impacts of water-quality impairments because of intense urbanization across the region:

- More than 27 million people live within an hour's drive of South Coast beaches.
- More than 1.5 billion gallons of treated wastewater effluent are discharged each day in the South Coast region.
- More than 1,500 miles of streams drain into the Southern California Bight; most of this runoff is not treated prior to discharge.
- The South Coast region is home to the largest commercial and naval ports in the nation, as well as more than 30,000 boat slips and moorings.



Bottom-dwelling fish and other invertebrates caught via trawl nets are sorted by field crews. Photo: Amec Foster Wheeler.

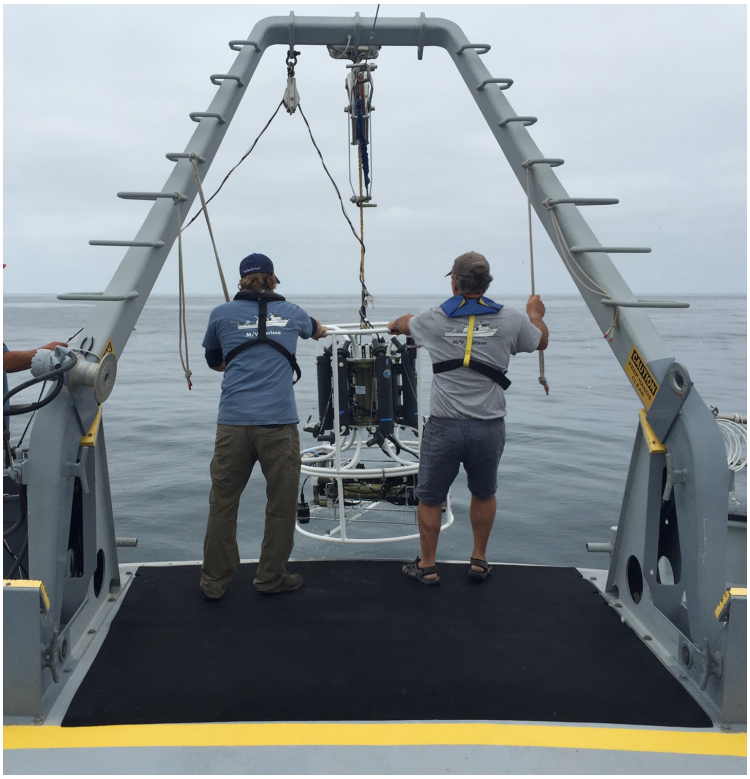
Sediment Quality

Minimal to Low Levels of Exposure in Most MPAs

For Bight '13, researchers looked for the presence of nearly 200 individual chemicals in sediment samples collected from nearly 400 South Coast sampling sites; 30 of the sites were inside MPAs. Learn more at **goo.gl/S6KjPS** and **goo.gl/VASA6Z**.

While chemical concentrations varied by location, the relative areal extent of sediment with minimal to low chemical exposure in MPAs was 80%, whereas the relative areal extent of sediment in this acceptable condition was 68% for the South Coast region as a whole. Also, MPA sediment was not as severely impacted by contamination as non-MPA sediment: Unlike non-MPA habitats, no sediment sampling site within an MPA was deemed to have high chemical exposure, which is the most severe contamination classification for sediment quality.

A Bight '13 field crew collects seafloor sediment using a grab sampler. Photo: SCCWRP.



A Bight '13 field crew lowers a CTD (conductivity, temperature, depth) rosette into the ocean to measure seawater pH and other parameters. Photo: SCCWRP.

Sediment contamination is a key indicator of water quality, as pollutants often stick to particles in the water column and eventually settle to the seafloor, where they can accumulate over decades. The Bight program has developed a robust methodology for measuring chemical contaminant concentrations in sediment, and then analyzing the data to determine whether organisms living in and on the sediment are being impacted by chemical exposure.

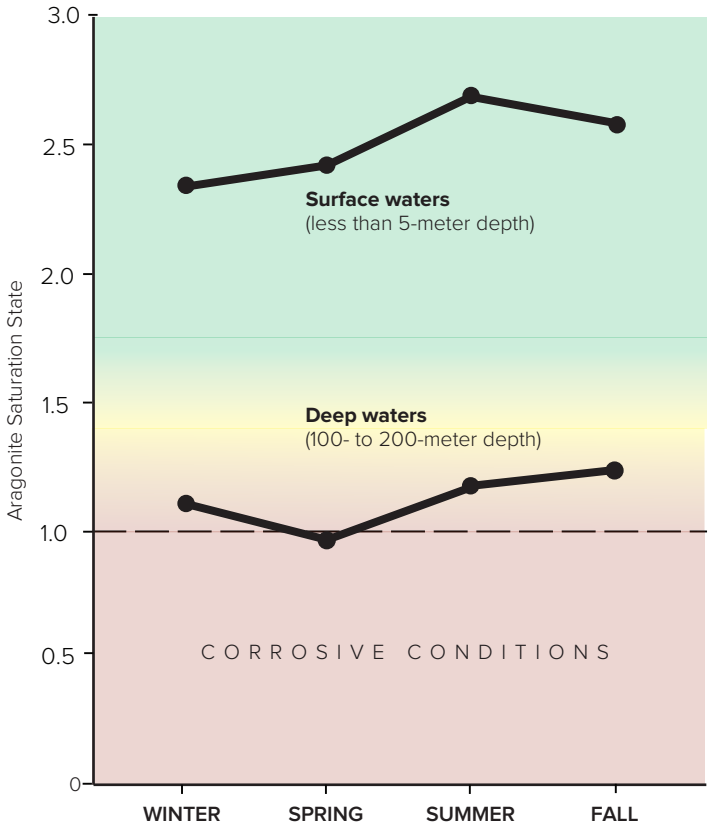
Other lines of evidence used by Bight '13 to assess sediment quality in MPAs–including biological community integrity, laboratory toxicity testing, and contaminant bioaccumulation testing—showed comparable conclusions as the chemistry data, or showed even less evidence of sediment-quality impacts.

The quality of seafloor sediment, filled with worms and other bottom-dwelling marine life, serves as a key indicator of water quality. Photos: SCCWRP.

Water Column Monitoring

Acidification Could Bring Corrosive Waters into MPAs

For Bight '13, researchers completed the first synoptic evaluation of ocean acidification (OA) conditions across the Southern California Bight continental shelf. Bight '13 found that corrosive waters can be found in the South Coast region, albeit mostly in deeper waters more than 300 feet. During spring upwelling events, however, when deep ocean water is pulled to the surface and toward the shore, relatively shallow MPAs can be exposed to corrosive conditions.



Average aragonite saturation state in deep waters hovers around 1.0, which is a biologically significant threshold at which water becomes corrosive to shell-forming organisms. As ocean acidification intensifies in the coming decades, surface waters also could be impacted by these lower aragonite saturation states. Source: SCCWRP.

The Bight '13 OA analysis involved collecting bottle samples at 72 locations across the Bight each quarter for two years. Measurements were taken that enabled researchers to calculate aragonite saturation state, a primary measure of a shell-forming organism's ability to sequester calcium carbonate into its shell. Shellfish hatcheries in the Pacific Northwest already have experienced the economic consequences of these corrosive conditions, which are the result of the global OA phenomenon. OA is a by-product of excess carbon dioxide emissions, in which atmospheric carbon dioxide dissolves into ocean water, lowering seawater pH and aragonite saturation state.

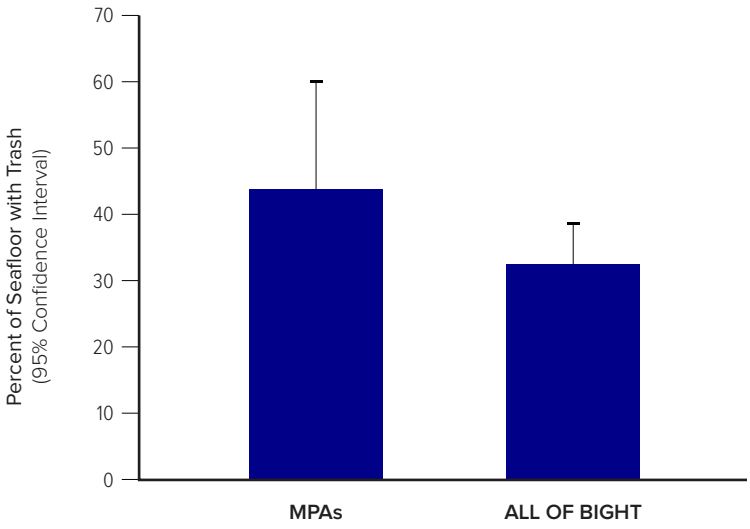
The Bight '13 OA analysis is an important first step toward better understanding this global water-quality issue and how South Coast habitats might be impacted. Researchers are continuing their work to understand how length, duration, and frequency of exposure affect biological responses, and how MPAs might serve as refugia from OA impacts.

Trash Monitoring

Storm drain systems that terminate at the coastal zone can transport litter from across hundreds of square miles. Photo: SCCWRP.

Debris is accumulating in MPAs

Bight '13 tracked the accumulation of litter across more than 120 sites, including 30 sites inside MPAs. The study found that the relative extent of trash and debris in MPAs was greater than in the rest of the South Coast region, and that the majority of this debris was plastic. Most marine debris originates on land and is whisked through storm drain infrastructure to the coastal zone.



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Because some plastics can last many hundreds of years, and plastic ingestion can be harmful to marine organisms, California water-quality managers in recent years have rolled out next-generation regulatory measures designed to more effectively curb the spread of trash in aquatic systems; these trash-reduction measures are in addition to legislative source-control measures such as the statewide ban on carry-out plastic bags.

Looking Ahead

Enhanced Integration and Coordination Between MPA and Bight programs

The MPA monitoring program's partnership with Bight '13 already has helped bridge the gap between water-quality issues and fishing issues—twin stressors that can work in tandem to define the condition of MPAs. Going forward, the MPA and Bight programs will look for additional opportunities to integrate and coordinate their monitoring activities. Especially as ocean conditions change in response to climate change, the Bight program's ongoing tracking of water quality in five-year cycles will provide a valuable, leveraged opportunity to drill down deeper into how water quality is affecting MPAs in the South Coast region.

The tern is among the seabirds that can be impacted by water-quality impairment. Photo: Andrew Yamagiwa.

Learn More

To find out more about the Bight '13 regional monitoring program, which is facilitated by the Southern California Coastal Water Research Project (SCCWRP), go to **www.sccwrp.org/documents** to view SCCWRP's 2016 Annual Report, which focuses on the value, findings and implications of Bight '13.

Southern California Bight 2013 Regional Monitoring Program

SCCWRP Established 1969

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