

Acidification of coastal waters

As atmospheric concentrations of carbon dioxide increase, so do levels in the ocean, part of a process known as “ocean acidification”.



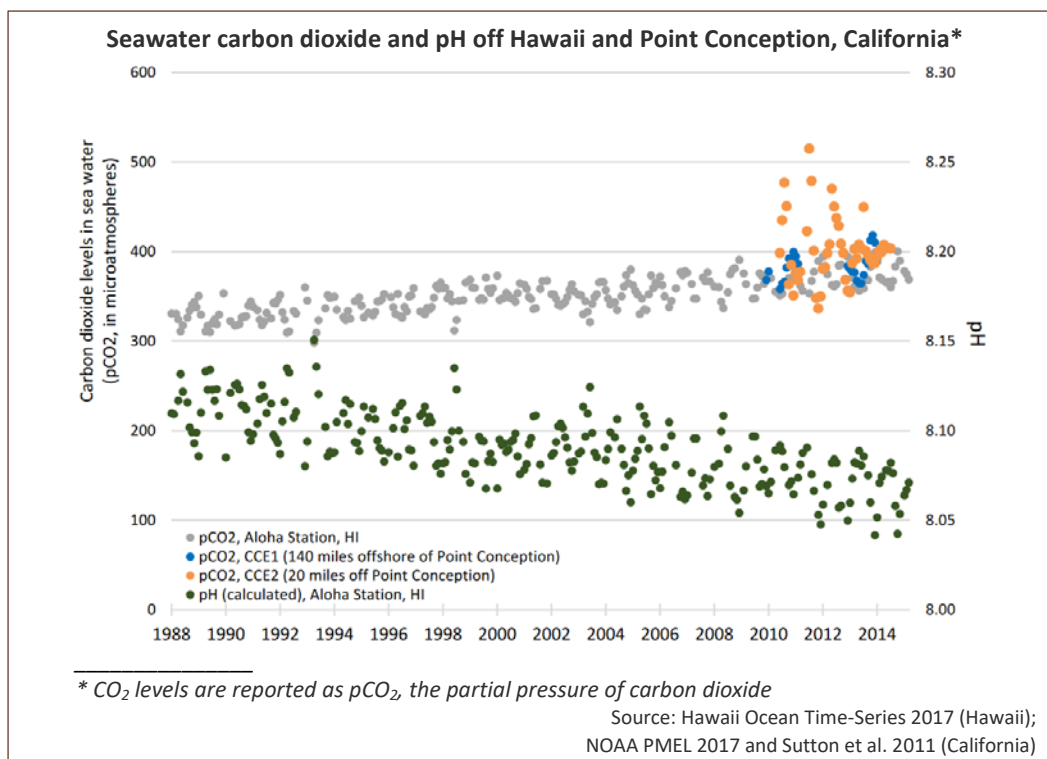
Levels of carbon dioxide (CO_2) in sea water are increasing worldwide, including at measuring stations off California and Hawaii. This is causing changes in the chemistry of the Earth's oceans. Oceans absorb about one third of CO_2 emitted by human activities. This absorption has reduced levels of the gas in the atmosphere and slowed the rate of global warming. However, because CO_2 forms a weak acid in water, the large amounts absorbed by the oceans are acidifying seawater. This process, called “ocean acidification,” can have major effects on marine life.

At seven long-term monitoring sites around the world, CO_2 levels in ocean waters have increased over the past three decades at about the same rate as levels in the atmosphere. Scientists are concerned that the capacity of oceans to absorb more CO_2 could diminish as more of the gas is released into the atmosphere.

What does the indicator show?

The graph below shows levels of CO_2 and levels of pH, a measure of acidity, in the Pacific Ocean. (A pH of 7 is considered neutral, while a pH of less than 7 is acidic. Ocean waters are currently mildly basic, ranging between 7.8 and 8.4.)

In ocean waters near Hawaii, CO_2 levels (grey dots) have increased, while pH levels (green dots) have decreased from 1988 to 2015, indicating that the waters are becoming acidic. Similar CO_2 levels have been measured at a monitoring station about 140 miles offshore of Point Conception (near Santa Barbara) in Southern California (blue dots). Levels closer to shore fluctuate more (orange dots). CO_2 measurements from this location began in 2010 and are the longest continuous publicly available data for the state.





Why is this indicator important?

Ocean acidification adds to the already naturally high levels of CO₂ in the waters off California. Here, a wind-driven process called “upwelling” brings deeper, CO₂-rich waters to the surface. As a result, California’s coastal waters may reach acidic conditions before other areas of the world, allowing for the early examination of the impacts of ocean acidification. These impacts include:

- *Shell dissolution and inhibited shell or skeletal formation.* Shellfish and other marine organisms that build skeletons or other structures – including oysters, mussels, coral, and plankton – are especially vulnerable to the effects of ocean acidification. Shells could dissolve under more acidic conditions. Ocean acidification also reduces the amount of carbonate ions available as building blocks for shells, skeletons and other structures of marine species.
- *Impaired physiology and behavior.* Fish are sensitive to even small changes in water chemistry. These changes could alter the pH of fish blood and impair hearing or the ability of fish to navigate effectively.
- *Disrupted marine ecology.* By harming key species in ocean ecosystems, ocean acidification can have wide-ranging effects. Shellfish are filter feeders that help to keep the water clean. Mussels create physical habitats for algae and other species. Krill and other plankton serve as prey to a wide variety of marine life and are thus a critical part of the food chain.
- *Increased impacts of other stressors on coastal ecosystems.* Ocean acidification adds to a list of stressors that are impacting the coasts. These include overfishing, pollution, invasive species, temperature change, and low levels of dissolved oxygen.
- *Potential losses to the seafood industry.* Ocean acidification could impact many economically important species. California’s commercial and recreational seafood industries are critical to its coastal economies.



Ocean acidification lowers the amount of carbonate available to build shells.



Ocean acidification poses a threat to the commercial fishing industry. Photo: NOAA Fisheries

For more information about this and other climate change indicators, visit:
<https://oehha.ca.gov/climate-change/report/2018-report-indicators-climate-change-california>

