What happens to carbon dioxide in the ocean? From Oceana

Pure water is neither acidic nor alkaline; it has a pH of 7.0. But because seawater contains many dissolved substances, it is actually slightly alkaline (basic), with a pH near 8.2.

The continuing buildup of carbon dioxide (CO_2) in the atmosphere means more CO_2 going into the oceans. Carbon dioxide dissolves in seawater to form carbonic acid (H_2CO_3). The latter rapidly breaks down into hydrogen ions (H^+) and bicarbonate ions (HCO_3^-), and the bicarbonate ions further break down into H^+ and CO_3^{-2} ions. More H^+ ions makes seawater more acidic, but scientists do not think the seas will become truly acidic (with a pH less than 7.0), but rather less alkaline.

Marine organisms need carbonate ions to build their shells, but even though the total amount of carbon in solution increases as more CO_2 dissolves in seawater, the concentration CO_3^{2-} ions actually decreases. This happens because more CO_2 means more hydrogen ions (H^+) in seawater. Those additional H^+ ions react with (consume) carbonate ions to form bicarbonate ions.

In tropical waters (with temperatures at or above 77°F, or 25°C), as the partial pressure of CO_2 (pCO_2) in seawater reaches roughly 1,800 parts per million (ppm), the decreasing supply of carbonate ions crosses a threshold, and aragonite—the form of calcium carbonate commonly used in shell—spontaneously dissolves. Aragonite is more soluble in colder waters, and cold water takes up more carbon dioxide from the atmosphere than does warm water. As a result, the threshold at which aragonite dissolves in cold waters will occur well before the pCO_2 in the oceans reaches 1,800 ppm. Scientists expect that the cold, fertile Southern Ocean and north Pacific Ocean will reach this threshold by—or before—2070.

"The balance is changing," said Justin Ries, a former postdoctoral scholar in the Ocean and Climate Change Institute at WHOI. "The change in pH is already occurring in surface waters, and it's hard to reverse." Because carbon stays in the oceans for a long time, to return CO_2 levels to those that existed before the Industrial Revolution, "we're going to have to reduce CO_2 emissions as soon as possible, and then wait a few hundred years for the oceans to adjust," Ries said. —*Kate Madin*