Five things we know about ocean acidification and hypoxia in Oregon

- ✓ Ocean water is rapidly becoming more acidic.
- ✓ Coastal Oregon and the West Coast are particularly vulnerable to OA and Hypoxic Zones.
- ✓ Organisms that use carbonate in their shells are showing negative impacts from OA – today.
- ✓ Different species react differently to changing seawater chemistry.
- ✓ Oregon's economy is already being negatively impacted by OA.

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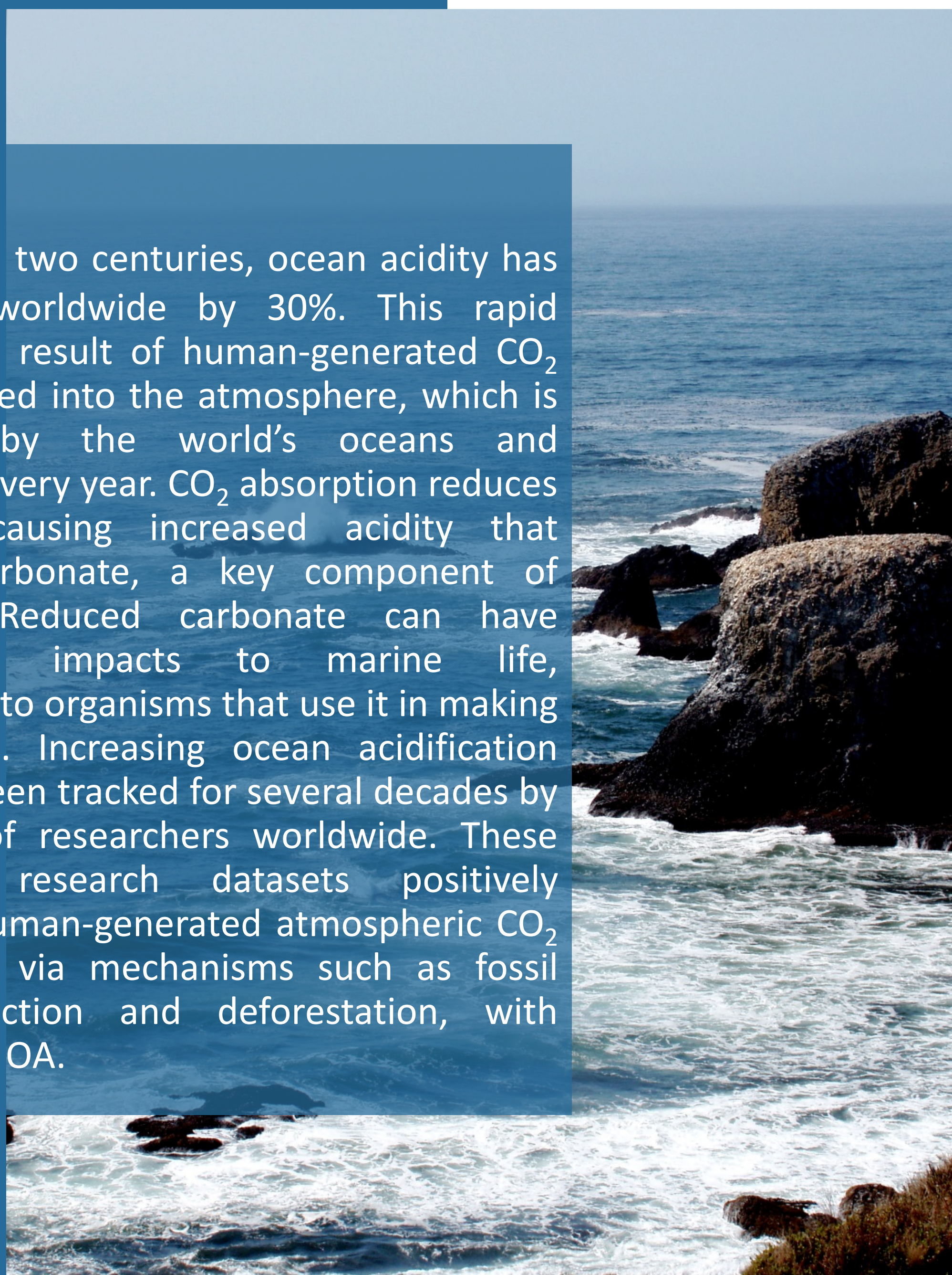
Ocean water is rapidly becoming more acidic.

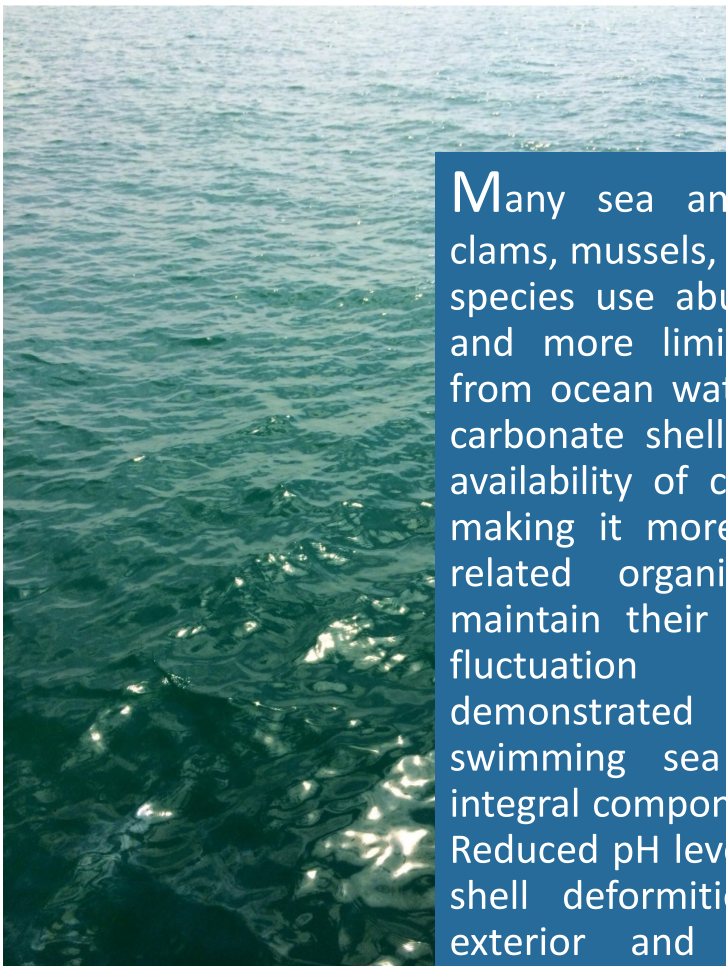


In less than two centuries, ocean acidity has increased worldwide by 30%. This rapid change is a result of human-generated CO_2 being emitted into the atmosphere, which is absorbed by the world's oceans and increasing every year. CO_2 absorption reduces the pH, causing increased acidity that reduces carbonate, a key component of seawater. Reduced carbonate can have detrimental impacts to marine life, particularly to organisms that use it in making their shells. Increasing ocean acidification (OA), has been tracked for several decades by hundreds of researchers worldwide. These long-term research datasets positively correlate human-generated atmospheric CO_2 production, via mechanisms such as fossil fuel production and deforestation, with increases in OA.

2 Coastal Oregon and the West Coast are particularly vulnerable to OA and Hypoxic Zones

The compounded effects of natural and human-generated factors increase the intensity of OA off Oregon, exacerbating the impacts from seasonal Hypoxic Zone formation. Naturally occurring seasonal upwelling of acidified deep ocean waters is a component of the Pacific Northwest's ocean carbon chemistry processes. This natural occurrence causes seawater to fluctuate acidity levels throughout the year. Concurrently, low oxygen hypoxic zones form in the nearshore. Hypoxic zones occur when oxygen becomes depleted from decomposition such that seawater can no longer support most aerobic marine life. Oregon's marine species are accustomed to seasonal encounters with both upwelling and hypoxic zones. However, human-released CO_2 (and related factors) is intensifying the natural fluctuations so that they are more extreme and more frequent, resulting in acidic conditions that are intolerable to some species. For some species, even small changes in ocean carbon chemistry can cause very significant problems.

3 Organisms that use carbonate in their shells are showing negative impacts from OA – today.



Many sea animals including oysters, clams, mussels, corals and some plankton species use abundant dissolved calcium and more limited dissolved carbonate from ocean water to form their calcium carbonate shells. As CO_2 has risen, the availability of carbonate has decreased, making it more difficult for these and related organisms to produce and maintain their shells. Sensitivity to pH fluctuation has already been demonstrated in pteropods, free swimming sea snails, which are an integral component in marine food webs. Reduced pH levels can result in pteropod shell deformities, dissolution of shell exterior and lower rates of shell development. The ripple effect that this will have on food webs is unknown.

4 Different species react differently to changing seawater chemistry.

OA will not kill all ocean life. However, many scientists agree that there will be changes in the number and abundance of marine species. With significant impacts already occurring to larval shellfish and plankton species, scientists are also concerned about amplified impacts to species higher in the food web that prey on these organisms. For example, threats to crab larvae may not only have implications for crab harvests, but could also affect survival rates of juvenile coho and chinook salmon that rely on the larvae as an important food source. As a response to changing ocean chemistry, we might expect that some marine ecosystems will be populated by different, and potentially fewer, species in the future.

5 Oregon’s economy is already being negatively impacted by OA.

The Whiskey Creek Shellfish Hatchery appealed to Oregon researchers to help them with failed production in their hatchery. The story of the discovery of the role of OA in this hatchery failure has become well-known in the Pacific Northwest and even world-wide. Seawater chemistry modulation of their mariculture tanks has made it possible for Whiskey Creek to continue its business but it is now more complex and expensive to maintain productivity at past levels. At least one other Pacific Northwest shellfish hatchery has given up and left the area due to challenges associated with maintaining production in the face of intensifying OA. Much less known but with greater potential impacts, are the effects of OA on wild populations in Oregon that are facing OA outside of controlled hatchery settings. Scientists and fishery managers are concerned that the fishing industry may also be vulnerable to OA. While wild fishery population impacts have not yet been linked to OA, as OA and hypoxic zones increase in frequency and intensity, these experts anticipate that linkages will emerge.