Acidification, predators pose double threat to oysters

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Credit: NOAA

The once-booming, now struggling Olympia oyster native to the West Coast could face a double threat from ocean acidification and invasive predators, according to new research from the University of California, Davis' Bodega Marine Laboratory. The work is published Jan. 15 in the journal *Proceedings of the Royal Society B*.

Invasive snails ate 20 percent more juvenile oysters when both oysters and snails were raised under ocean conditions forecast for the end of this century, the researchers found. The results highlight the dangers of multiple stressors on ecosystems, said Eric Sanford, professor of

evolution and ecology at UC Davis and first author on the study.

"You might decide to go to work if you had a toothache. But what if you had a toothache, the flu, and a broken leg? At some point, multiple stressors will cause natural systems to break down," he said.

Native Olympia oysters were once so common in San Francisco Bay that they were a cheap food during the Gold Rush, commemorated in Hangtown Fry, an omelet of eggs, bacon and oysters. The population collapsed from overfishing in the late 1800s and has never recovered.

Atlantic oysters imported to the West Coast brought predatory snails such as the Atlantic oyster drill, which uses acid and a rasping tongue to drill holes in oyster shells.

Scientists have become increasingly concerned about the effects of climate change on ocean chemistry. As heat-trapping carbon dioxide builds up in the atmosphere, some of the gas dissolves in the oceans, causing a steady rise in the overall acidity of the oceans. An interdisciplinary team of researchers based at UC Davis' Bodega Marine Laboratory is looking into the oceans' future by raising animals in seawater with raised levels of dissolved carbon dioxide. In earlier work, they found that oysters raised under conditions predicted for the end of this century are smaller than present-day animals.

In Tomales Bay north of San Francisco, young snails emerge from egg capsules at about the same time of year that juvenile oysters settle from the plankton and grow into adults. Sanford and colleagues raised both oysters and snails in the lab to simulate this process under present-day conditions and with levels of carbon dioxide forecast for 2100.

They found that oysters raised under high carbon dioxide were smaller, but did not have thinner shells than oysters reared under present-day

conditions. The snails were not affected by high carbon dioxide, but ate 20 percent more oysters under these conditions.

"It's like if you go out for tacos," Sanford said. "If the tacos are smaller, you're going to eat more of them."

The experiment was based on the average acidity of the oceans. However, as the overall acidity of the ocean rises, short-term fluctuations mean that locations like Tomales Bay are already experiencing peaks of acidity similar to those used in the experiment.

Apart from their culinary delights, oysters perform important ecosystem services, for example filtering material out of the water, and there have been growing efforts to restore their populations along the West Coast, including in San Francisco Bay. But the new work shows that the combination of climate change and invasive predators may make restoration increasingly difficult.

More information: Ocean acidification increases the vulnerability of native oysters to predation, rspb.royalsocietypublishing.or … .1098/rspb.2013.2681

Provided by UC Davis

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