How ocean acidification and warming could affect the culturing of pearls

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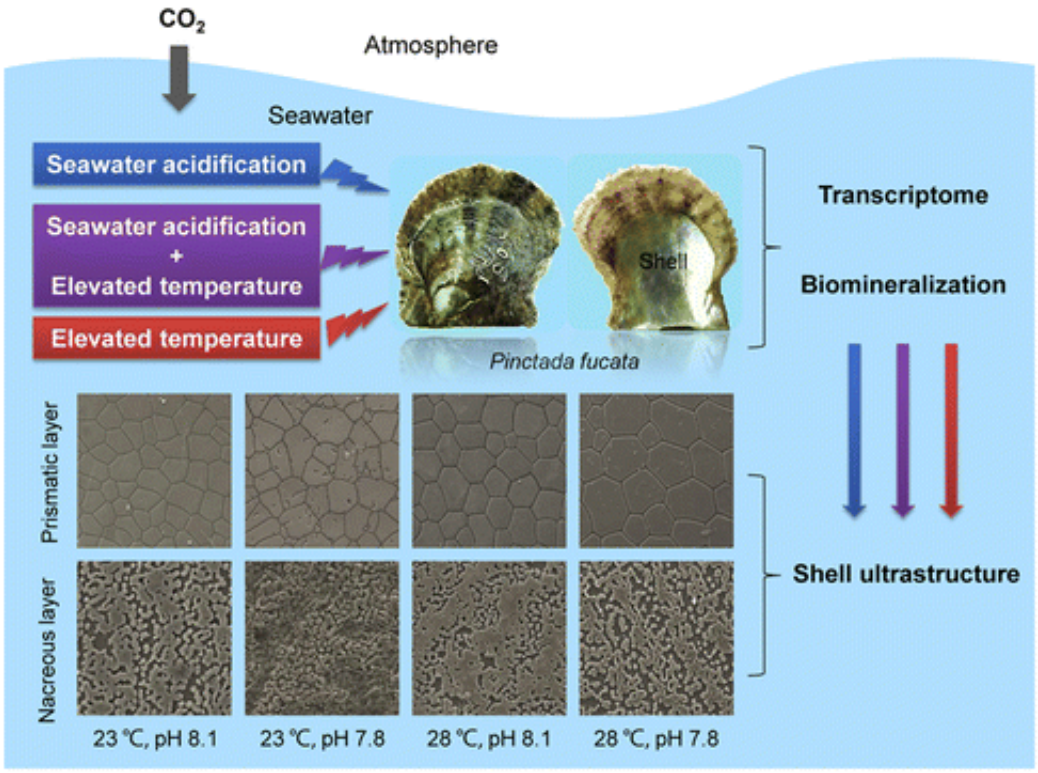

Pearls have adorned the necklines of women throughout history, but some evidence suggests that the gems' future could be uncertain. Increasingly acidic seawater causes oyster shells to weaken, which doesn't bode well for the pearls forming within. But, as scientists report in ACS' journal *Environmental Science & Technology*, the mollusks

might be more resilient to changing conditions than previously thought.

Pearl aquaculture is big business, particularly in Asia and Australia. But much of it takes place in oceans, which are susceptible to the increasing amounts of carbon dioxide human activity releases into the atmosphere. CO2 from the air gets absorbed by the oceans, which become more acidic as a result. Research has found that pearl oysters produce weaker shells under these conditions, and this could hurt their chances of survival. But in addition to acidity, rising water temperature could also play a role in oyster health. Rongqing Zhang, Liping Xie and colleagues wanted to see how combining acidity and water temperature would affect pearl oysters.

The researchers tested oysters for two months under varying water temperature and pH conditions, including those predicted for oceans in 2100. Their results confirmed previous work that had found boosting acidity led to weaker shells, but that effect didn't occur when the water temperature was also higher. The researchers concluded that warmer oceans could buffer these valuable marine animals from increasingly acidic seawater.

More information: Shiguo Li et al. Interactive Effects of Seawater Acidification and Elevated Temperature on the Transcriptome and Biomineralization in the Pearl Oyster , *Environmental Science & Technology* (2016). DOI: 10.1021/acs.est.5b05107

Abstract
Interactive effects of ocean acidification and ocean warming on marine calcifiers vary among species, but little is known about the underlying mechanisms. The present study investigated the combined effects of seawater acidification and elevated temperature (ambient condition: pH 8.1 × 23 °C, stress conditions: pH 7.8 × 23 °C, pH 8.1 × 28 °C, and pH 7.8 × 28 °C, exposure time: two months) on the transcriptome and

biomineralization of the pearl oyster Pinctada fucata, which is an important marine calcifier. Transcriptome analyses indicated that P. fucata implemented a compensatory acid–base mechanism, metabolic depression and positive physiological responses to mitigate the effects of seawater acidification alone. These responses were energy-expensive processes, leading to decreases in the net calcification rate, shell surface calcium and carbon content, and changes in the shell ultrastructure. Elevated temperature (28 °C) within the thermal window of P. fucata did not induce significant enrichment of the sequenced genes and conversely facilitated calcification, which was detected to alleviate the negative effects of seawater acidification on biomineralization and the shell ultrastructure. Overall, this study will help elucidate the mechanisms by which pearl oysters respond to changing seawater conditions and predict the effects of global climate change on pearl aquaculture.

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