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Crushed shells shield juvenile Pacific littleneck clams from ocean acidification impacts, study finds

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By Responsible Seafood Advocate

Study finds crushed shells in sediment reduce local acidity, improve clam shell growth and limit genetic responses to ocean acidification

New research finds that adding crushed shells to coastal sediments can reduce local acidity and help young clams grow larger shells, potentially protecting them from the effects of ocean acidification.

The study, conducted by researchers at the University of California (UC), Davis and published in ***Biogeosciences (https://bg.copernicus.org/articles/23/7627/2026/)***, examined how mixing crushed shells, known as shell hash, into sand affects water chemistry and the growth of juvenile Pacific littleneck clams.

During a 90-day experiment at the UC Davis Bodega Marine Laboratory, researchers raised clams in four conditions: regular seawater with sediment, acidified seawater with sediment, regular seawater with sediment and shell hash, and acidified seawater with sediment and shell hash.



UC Davis researchers added crushed shells to sand to better understand how the practice can protect shell-making animals from the negative effects of ocean acidification. Photo credit: Hannah Kempf/UC Davis.

They monitored acidity, salinity, temperature and dissolved oxygen three times a week, tracked clam growth and collected mantle tissue samples for gene sequencing at the end of the experiment.

Clams raised in sediments containing shell hash developed larger shells on average than those raised without it. Researchers also found that gene expression patterns in clams exposed to acidified seawater with shell hash were largely indistinguishable from those raised in non-acidified conditions.

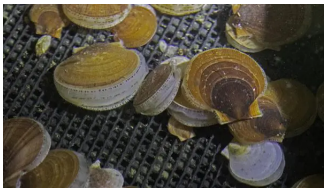


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“We found that, on average, clams grew larger shells when shell hash was present in their treatment,” said Hannah Kempf, the study’s first author and an environmental scientist at the California State Water Board. “Interestingly, we also found that, on a genetic level, the ‘acidification’ signal was dramatically

minimized when shell hash was present.”

Study: Ocean acidification and ocean warming hinder juvenile Atlantic sea scallop growth



Researchers find that ocean acidification conditions projected between now and 2100 would hinder the growth of juvenile Atlantic sea scallops.

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Ocean acidification occurs as seawater absorbs excess atmospheric carbon dioxide, changing water chemistry and making it more difficult for shell-forming organisms to build and maintain their shells. Young clams and other juvenile shellfish are considered particularly vulnerable to these conditions.

“Adding crushed shells removed the negative genetic changes that occur when young clams are raised in acidified water,” said David Gold, an associate professor of earth and planetary sciences at UC Davis and the study’s corresponding author.

The findings suggest that shell hash can reduce the effects of ocean acidification at a localized scale, potentially supporting shellfish growth in affected coastal habitats. The experiment was conducted at a marine laboratory rather than in natural clam beds.

The research also examined a practice with a long history among Indigenous communities, which have used crushed shells in coastal sediments to help maintain healthy coastal ecosystems.

Tsim Schneider, a study co-author and associate professor of anthropology at the University of California, Santa Cruz, said traditional ecological knowledge provides evidence of the benefits of shell hash and could inform future research and coastal management.

“For me, one of the interesting aspects of this research is the potential to engage more fully with tribes on designing projects that promote their long-standing expertise and Indigenous science,” Schneider said. “If there’s a history of adding shell hash to clam beds in California, for example, western science might be able to better support communities interested in reawakening dormant cultural knowledge and coastal stewardship practices.”

Read the full study here (https://bg.copernicus.org/articles/23/7627/2026/).

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