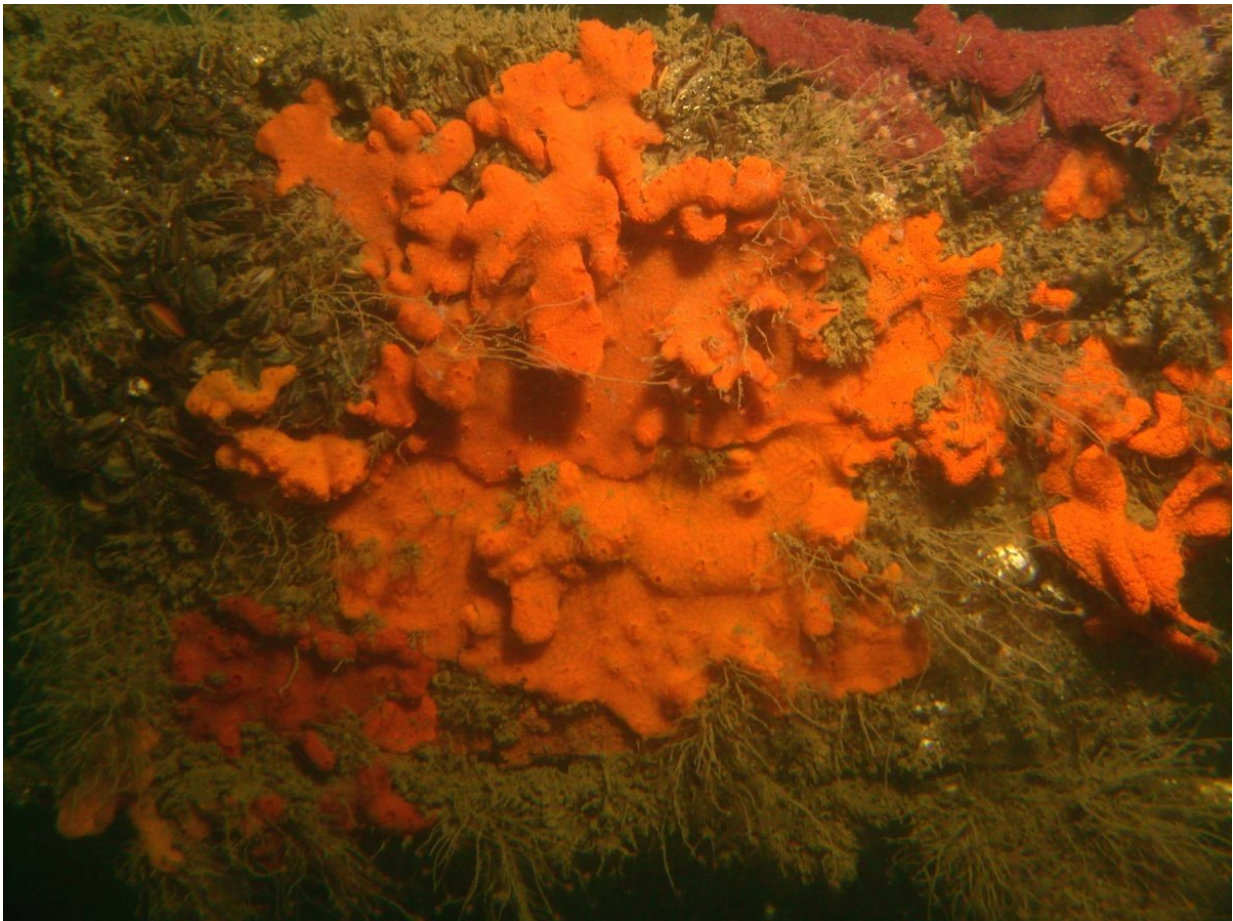


Researchers find warmer oceans could increase invasive 'sea squirts'

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The invasive tunicate *Botrylloides violaceus* has made its home in the Gulf of Maine. Credit: Jennifer Dijkstra/UNH

They're lovingly called 'sea squirts', but certain marine soft-bodied animals, or tunicates, could cause a giant-sized problem in cold water areas like the Gulf of Maine. New research from the University of New Hampshire shows that with a water temperature increase of just two degrees Celsius (or 3.6 degrees Fahrenheit) [predicted in the coming years](#), the invasive tunicate species *Botrylloides violaceus* will be able to double their reproduction because warmer water allows them a longer growing season. This seemingly modest temperature increase could cause the sea squirts to take up more space on natural and artificial places where organisms grow (like the ocean floor or fishing lines), therefore crowding out native species and potentially creating more problems for the aquaculture and fishing industries who work along the northern New England coast.

"In the past decade, we've seen their populations spread more northeastward to places like Eastport, Maine where there are now much larger colonies than before and these colonies have also spread to natural substrates, like rocks and seaweed," said Jennifer Dijkstra, a research assistant professor in the School of Marine Science and Ocean Engineering at UNH's Center for Coastal and Ocean Mapping and lead author on this research. "So our first question was, what changed during that time period to cause this [invasive species](#) to take hold and spread? We know from our research, and others, that seasonal water temperatures have increased during that time, so we started there. Then we wanted to see if that change might drive future spread of this specific tunicate species."

This first-of-its-kind research incorporates current and predicted maximum and seasonal water temperatures in the model to estimate future reproductive rates of *B. violaceus*. The model shows *B. violaceus* will be able to reproduce three times per year in Salem Harbor, Mass., twice a year in Portsmouth Harbor, N.H. and once per year in Eastport with just a small increase in maximum water [temperature](#). Although

temperature is the driving factor in *B. violaceus* reproductive rates, it isn't the only factor: salinity, food availability, predators and space also play a role in how common this species is in areas in the region.



An American lobster walks past invasive tunicates, or sea squirts, near the Isles of Shoals. Credit: Jennifer Dijkstra/UNH

Tunicates are marine invertebrate animals with sack-shaped bodies that live in underwater colonies by the hundreds. Originally from Asia, the *B. violaceus* species was first discovered in the Gulf of Maine in the early 1980s, but since then has infiltrated the rocky underwater landscape.

These yellow-orange blobs are now established in rocky areas with native plant species, and they use a glue-like substance to attach to just about any surface, including the ocean floor, piers, fishing gear, and other marine plants—even on invasive seaweeds that have made their home near the Isles of Shoals off the coast of New Hampshire. And like many invasive [species](#), once they've settled in an area, it's tough to get rid of them.

For those who make their living on the water, this may come as no surprise. Oyster farmers in the Great Bay sometimes have to use power sprayers to remove tunicates that grow on their oyster bags, costing additional time and added expense to the farming operation. This form of eradication can help to some extent on the local scale, but their regional population has been on the rise and researchers say this trend is likely to continue given the findings of this study.

"Even our neighbors to the north, where water temperatures were once too cold to promote tunicate population growth, have had and are continuing to have issues," said Dijkstra. "While the focus of this study was on the correlation between [water](#) temperature and reproduction rate, we do know that tunicates are becoming a bigger nuisance in northern areas like Prince Edward Island where mussel growers are spending a lot of money and time to keep the sea squirts off their lines so they don't compete with the mussels for food and space."



Jenn Dijkstra, UNH research assistant professor of biological sciences at the UNH Center for Coastal and Ocean Mapping, inspects an experimental panel for the invasive tunicate *Botrylloides violaceus* in Portsmouth Harbor, N.H. Credit: Becca Toppin/UNH

More information: Jennifer A. Dijkstra et al. Elevated seasonal temperatures eliminate thermal barriers of reproduction of a dominant invasive species: A community state change for northern communities?, *Diversity and Distributions* (2017). [DOI: 10.1111/ddi.12604](https://doi.org/10.1111/ddi.12604)

Provided by University of New Hampshire

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