Researchers develop stress test to predict how diatoms will react to ocean acidification

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Researchers at the Institute for Systems Biology (ISB) have shown that diatoms can withstand population collapse in an acidified environment by conserving valuable energy normally used for carbon dioxide consumption.

Diatoms are microscopic phytoplankton that are the foundation for many aquatic food webs, and are responsible for 40 percent of the total carbon sequestered in our oceans and release about 20 percent of the world's breathable oxygen. The impacts of ocean acidification on diatoms have not been completely understood, but a study titled " Ocean Acidification Conditions Increase Resilience of Marine Diatoms," published today in the journal *Nature Communications*, provides context.

"To date, the effects of ocean acidification on diatoms have been mixed, mainly because of the complex interactions between the biology and physical chemistry. We decided to take a new and different approach to this biological question by exposing the diatom to a stress test," said Dr. Jacob Valenzuela, a postdoctoral fellow in ISB's Baliga Lab and lead author on the study. "By using a systems biology approach in conjunction with a stress test, we were able to demonstrate diatom resilience increases under ocean acidification conditions," Valenzuela said.

In the study, researchers observed that diatoms at a lower pH were consistently more capable of adopting the appropriate cellular function in relation to their environment—a phenomenon that staves off

population collapse.

Climate change-induced ocean acidification may make diatoms more resilient, but it could also have adverse effects on other phytoplankton populations, potentially shifting them from stable to sensitive, Valenzuela said. The impacts of such a foundational shift may ripple throughout the marine ecosystems. The experimental framework developed in this study may be extended to evaluate the effects of many potential climate change-related threats on the microbial diversity of our most sensitive environmental habitats.

If diatoms were to shrink or explode in population abundance, there would be significant implications for marine food webs and beyond. For instance, coral reefs and fisheries rely on stable phytoplankton communities to feed higher organisms along the food chain like krill, fish and whales. Understanding how diatoms will respond to the impacts of climate change, and in particular ocean acidification, will be critical in predicting future outcomes that guide proactive conservation efforts.

More information: Jacob J. Valenzuela et al, Ocean acidification conditions increase resilience of marine diatoms, *Nature Communications* (2018). DOI: 10.1038/s41467-018-04742-3

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