Tiny organisms yield big clues

Tatiana Rynearson, URI Graduate School of Oceanography
Associate professor, oceanography

To the non-scientist, the idea sounds farfetched — microscopic organisms drift freely in the currents and tides of the world’s oceans, generating half of the oxygen we breathe. These tiny, one-celled plants — phytoplankton — undergo photosynthesis in the sunlit waters of the ocean’s surface, drawing down enormous amounts of carbon dioxide and pumping oxygen into the atmosphere. Unseen by the naked eye, they also form the base of the marine food web, eaten by tiny floating animals, zooplankton, which in turn serve as a food source for the next level of predators. Consequently, climate change or not, these organisms hold considerable interest for scientists and are the subject of much study.

“We want to know what they do and how they work,” says Tatiana Rynearson, whose research focuses on plankton ecology and evolution. “Then, you add in climate change, and there is the concern of how they are going to respond. What drives their productivity, what regulates their success over time?”

Stepping back and contemplating the impact of her research, Rynearson says no single project or outcome is likely to change minds or spur leaders to act. However, she figures, her findings will add to a continually growing body of work and help fill in the unknowns. The information produced by the RI EPSCoR community as a whole can help leadership adapt policy to projected change; for example, less phytoplankton in Narragansett Bay could lead to less fish, which means adjusting to the new normal.

“Capstone conclusions are always supported by many, many research projects,” she explains. “One paper may not change the trajectory of policy, but if we have a list of 20 publications that all reach the same set of conclusions, then we can say, globally, here are the changes we expect.”

Rebecca Robinson, URI Graduate School of Oceanography
Associate professor, oceanography

The research work of the Rhode Island NSF EPSCoR community spans the depth and breadth of the Ocean State’s coastal and offshore waters, from surface to sediment, and all manner of life and movement found in between. Rebecca Robinson’s focus lies at the deepest point, in the particles that comprise the ocean floor. There, in the sediment, Robinson looks at diatoms, a single-celled organism distinctively known for its glass cell wall.

“In the last 50 years or so, the type of diatoms that were typically in Narragansett Bay are starting to decline,” Robinson says. “Some have surmised that this is in response to climate change. So, as the system warms up, it is possible the chemistry of the water is changing.”

In turn, that means change for the Bay’s marine life and ecosystem. Diatoms are phytoplankton, a plant or algae, and exist at the base of the food web, the initial source of energy on which the whole ecosystem depends. The status of these microscopic organisms provides important insight to the Bay’s health and yields clues — indicators of sea ice to salinity — about the environment.

Using equipment at the Marine Science Research Facility (MSRF), a RI EPSCoR facility at the URI Bay Campus, Robinson examines cores of Narragansett Bay sediment. She compares diatom communities in the sediment from the deep past (decades to centuries ago) to those from more modern to recent times, using phytoplankton surveys by URI Graduate School of Oceanography scientists.

“We want to understand how to use this environmental data,” Robinson says. “If the diatom community is changing and is really different than what Narragansett Bay has seen, if the organisms are being pushed outside of their normal limits, then maybe it’s an alarm bell. But, if they’re within the natural limits, we can consider that as plans are made to adjust our management of the ecosystem.”