The rising red tide with climate change

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Ashley Cryan worked on co-op at the Woods Hole Oceanographic Institution researching the toxic algae Alexandrium fundyense. Credit: Ashley Cryan

The tattoos on Ashley Cryan's ankles depict a chicken and a pig. Since the days of Captain Cook, sailors have donned the animals' likenesses to help them walk on water and guard against drowning. According to folklore, the animals—which survived shipwrecks more often than humans—had a special power that protected them from succumbing to the sea.

Cryan, whose grandfather taught her to sail when she was 11, got her tattoos after surviving a shipwreck. She said they symbolize strength and survival, two qualities that the recent environmental studies graduate is also interested in from a research perspective.

Cryan won the 2013 Research, Innovation, and Scholarship Expo's award in physical and life sciences for her work examining the impact of climate change on the incidence and severity of a toxic species of algae called Alexandrium fundyense. According to Cryan, the red tides—as the blooms are commonly known—have been a growing concern since the 1970s when a massive bloom shut down shellfisheries along the Gulf of Maine's coastline for more than a month during the peak of harvesting season.

Alexandrium naturally produces one of the most potent neurotoxins on the planet: saxitoxin. As this compound accumulates in the bodies of shellfish that consume the algae, the concentration of the toxin renders them unsafe for human consumption. There is no cure for paralytic shellfish poisoning—the life-threatening syndrome caused by ingestion of these contaminated shellfish—and so shellfish beds must be closed for the duration of the bloom. This puts an enormous financial burden on fishers whose livelihoods depend on oysters, clams, and mussels. If a contaminated shellfish makes it to a human's dinner plate, Cryan said, Alexandrium becomes a major public health concern.

Cryan first learned of Alexandrium on co-op at Woods Hole Oceanographic Institution in Massachusetts. "My supervisor was working on developing a way to suppress blooms by burying the cyst form of the organism in the sediment so it wouldn't germinate," she said.

On the WHOI annual cruise, Cryan measured cyst quantity in the Gulf of Maine's sediment bed. Changes in ocean temperature, average pH level, and carbon content and speciation, she explained, indicate that

Alexandrium's growth and survival may also be changing.

For her RISE research, Cryan examined the entire body of literature on the topic, looking for examples of how these kinds of changes affect the organism. "The focus of many recent studies of the dynamics of the Alexandrium population is on finding ways to prevent, control, or mitigate blooms," said Cryan. "We need to look at applying this knowledge to blooms in the context of climate change in the future."

Cryan plans on spending the summer researching toxic algae with WHOI and then setting sail for California, where she hopes to continue her research on the impact of climate change on marine ecosystems.

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