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Device may help forecast outbreaks of red tide

By Lindsey Hoshaw | GLOBE CORRESPONDENT MAY 07, 2012

TOM KLEINDINST/WOODS HOLE OCEANOGRAPHIC INSTITUTION

Researcher Bruce Keafer, shown adjusting the environmental sample processor, says the device "will help shellfish managers because they can't see what's happening off the coast."

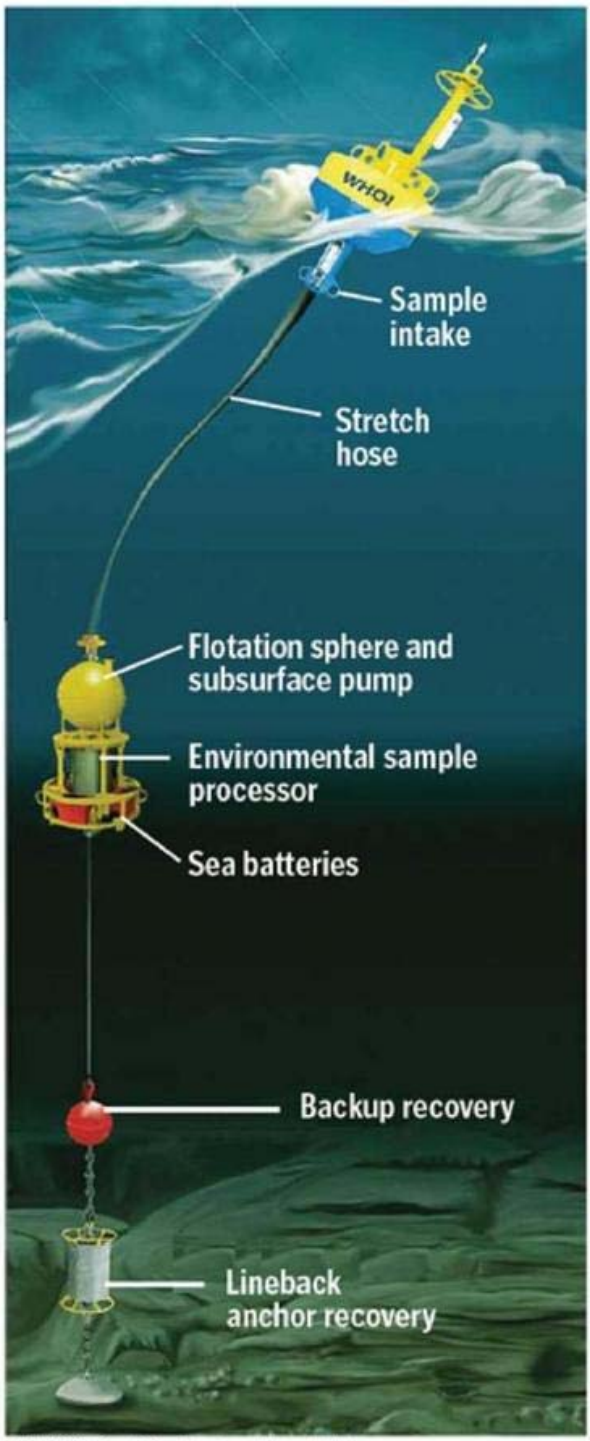
WOODS HOLE - Bruce Keafer calls it a robot in a box. Roughly the size of a kitchen sink, it was lowered into the waters off Portsmouth, N.H., last week, where it will sample marine organisms to measure toxic red tide cells over the next 45 days.

The device, he hopes, will be a tool for forecasting outbreaks of red tide.

Initial results have detected red tide cells off Portsmouth in areas where shellfish had not tested positive for toxins.

"This will help shellfish managers because they can't see what's happening off the coast," said Keafer, a research associate at Woods Hole Oceanographic Institution.

The brainchild of Chris Scholin, a former Woods Hole Oceanographic Institution doctoral student, the sensor transmits information in real time to researchers about the genetic makeup of organisms in the water so they can detect red tide.



SOURCE: Paul Oberlander, Woods Hole Oceanographic Institution

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Scientists are specifically looking for Alexandrium fundyense, an alga growing off the coast of Maine that releases natural toxins when it blooms in the spring and is the only species responsible for paralytic shellfish poisoning in humans, which can occur after ingesting fish or shellfish exposed to it.

Those toxins spread down to coastal New Hampshire and Massachusetts, making Alexandrium the largest contributor to red tide in New England.

Because states close shellfish beds before toxin concentrations reach levels that can cause illness, poisoning reports are rare. The Centers for Disease Control and Prevention receive about 30 reports of poisoning by marine toxins annually in the United States.

Keafer and his team at Woods Hole hope to make that number even smaller.

Their sensor, placed about 65 feet below the surface, is attached to a long flexible hose

that connects to a large floating buoy. The sensor is held steady by a cable that connects to an anchor at the bottom of the ocean, 6 miles offshore.

During scheduled sampling times, water enters two rectangular openings in the buoy and is pumped down a hose that connects to a flotation sphere above the sensor. The water exits the hose near a small tube on the sensor that draws in water for analysis.

The sensor filters cells from the water to remove their DNA. Once the DNA is analyzed, the sensor can identify organisms and transmit that information in real time to scientists at Woods Hole.

The new robotic sensor is intended to improve red tide forecasting. Current toxin-testing techniques involve collecting shellfish, grinding up their meat, and dissolving it in a mild acid solution to see if toxins are present and, if so, in what concentration.

With the new device, scientists and shellfish managers will be able to predict, with greater accuracy, where and when red tide will appear.

“Your daily weather forecasts are really accurate because [meteorologists] have to predict how the air will move, and similarly we have to predict how the water moves,” said Don Anderson, a senior scientist at Woods Hole. “What they have that we don’t are meteorological devices [constantly] feeding in information so they keep updating the models.”

Anderson said current red-tide forecasting models are created weeks or months before the algae bloom and scientists have no reliable way to obtain real-time information. He and Scholin, his former doctoral student, realized how slow the sampling process was when they measured algae off the coast of Massachusetts in the 1980s.

“It would almost take days or weeks to see if the organism [that creates red tide] was present,” said Scholin, who is president and chief executive of the Monterey Bay Aquarium Research Institute. “There was a time lag, and it seemed like there had to be a better way.”

After Scholin took the position at Monterey Bay in 1992, he started prototyping an early version of the red tide sensing robot, which was first tested in 2001.

Now, more than a decade later, Scholin will find out if his red tide sensing robot,

affectionately called Chris, can stand up to the elements on the East Coast.

But for all the device's benefits, some shellfish managers say it is no panacea.

"It's helpful, but not critical, since [shore] closures are based on the toxicity we measure in shellfish meat," said Chris Nash, shellfish program manager for the New Hampshire Department of Environmental Services.

Jeff Kennedy, an aquatic biologist with the Massachusetts Department of Fish and Game, had similar caveats.

"Unfortunately it will never replace toxicity tests because those are mandated by federal guidelines," Kennedy said. "But it will allow us to stay ahead of the bloom."

The sensor at Woods Hole was manufactured locally by Falmouth-based McLane Research Laboratories Inc. and is the first commercially available environmental sample processor, which is on loan from the Environmental Protection Agency.

The National Oceanic and Atmospheric Administration provided more than $1 million in funding for sensor testing and a $2 million grant from the National Science Foundation will allow Anderson's group to purchase five sensors, which he hopes to deploy over the next several years.

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