FISHERMEN STRENGTHEN SCIENCE

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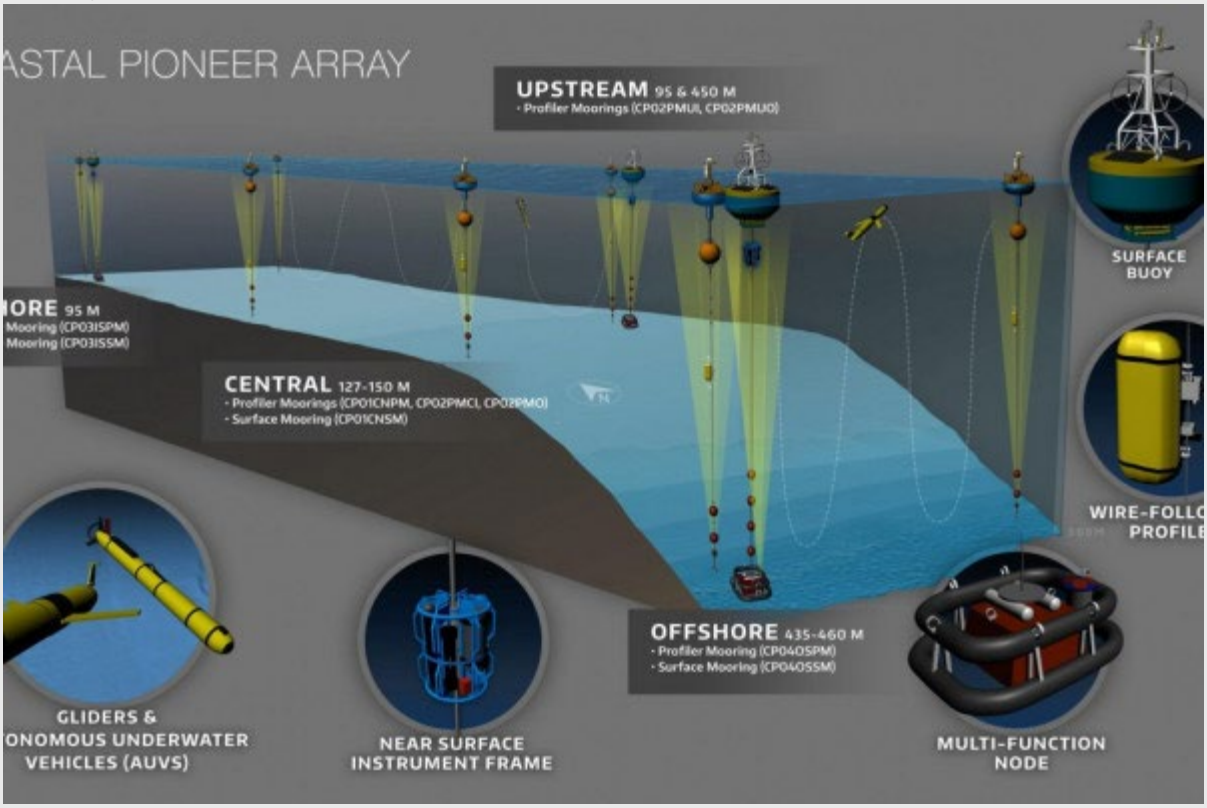

Ocean Observations Initiative graphic of the Pioneer Array off Martha's Vineyard

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When codfishing took a big hit in the Gulf of Maine close to a decade ago, longliner Eric Hesse went looking for something else to do in winter and found himself helping scientists test underwater research vehicles and gliders.

That introduction led to work on a project that may help explain cod's decline and other changes to the New England fishery.

Captain Hesse fishes full-time, but has degrees in physics and engineering, and an interest in physical oceanography.

“I wouldn’t call it a hobby. It is intellectually interesting,” he said, more so because even small changes in the ocean can mean big differences for his business.

When scientists with Woods Hole Oceanographic Research Institution reached out a few years ago about helping with the Ocean Observations Initiative Pioneer Array, he was in. The array, about 75 miles south of Martha’s Vineyard, is made up of seven moorings along and across the Continental shelf. Supplemented by gliders and an underwater vehicle, the array is situated at the edge of the shelf where water masses meet in “fronts,” and nutrients and other properties are exchanged between the continental shelf and deep ocean.

Hesse works with gliders from the Pioneer Array, which began providing data in 2014. Critical data for the region also comes from team of commercial fishermen called the Shelf Research Fleet, part of the Commercial Fisheries Research Foundation in Rhode Island.

“We discovered all these things happening on the New England Shelf that we didn’t anticipate,” said Al Plueddemann, a senior scientist in physical oceanography with Woods Hole Oceanographic.

An important change in recent years is an increase in the meandering or “wiggliness” of the Gulf Stream. In addition the Gulf Stream has been generating more “Warm Core Rings,” large clockwise eddies.

These warm, salty core rings can extend 60 nautical miles and can be 20 degrees warmer than the waters around them. They frequently drift near the edge of the continental shelf and may be associated with bottom intrusions on the shelf, small ecosystems that bring a Noah’s Ark of inhabitants with them. They can last several weeks.

“The Gulf Stream species are being caught in less than 50 fathoms of water,” said Plueddemann. “It’s crazy. It is unreasonable, but it’s happening.”

When fishermen began working with WHOI senior scientist Glen Gawarkiewicz, a colleague of Plueddemann, they became much more aware of the phenomenon and scientists were able to gather far more data. Aubrey Ellertson, at the Commercial Fisheries Research Foundation, said members of the shelf team take biweekly measurements of temperature and salinity at a variety of depths. After seven years there are 500 data points.

“There are long, warm, very salty masses on the bottom that can either shut off your catch or just bring new species,” said Ellertson. “They seem to be happening more frequently.”

Fishermen have found that lobsters prefer 55-to-65-degree temperatures; if the temperature suddenly goes to 67 the lobsters are gone. If the target is Jonah crabs, when it hits 58 fishermen pull their gear. Fishermen are used to changes in surface water, but the warm core rings can cause rapid 20-degree swings at lower levels.

The changes bring tropical species, such as triggerfish, onto the shelf. Fishermen are also seeing baby black sea bass in winter (previously unheard of) and more squid, which may be coming on eddies off the rings. A recent plethora of yellowfin tuna also may be related to the presence of the rings.

“They are just trying to connect the dots,” Ellertson said of fishermen’s efforts.

Hesse said he and others believe warming waters did affect cod spawning closer to the Cape. He said one marine heat wave or warm water core can permanently change habits.

Scientists have also suggested that the Gulf of Maine’s increasing surface temperature, coupled with the changing Gulf Stream, may have caused the collapse of the cod fishery in New England.

In the early days of the project, when Glen Gawarkiewicz had been doing work with the shelf team, he looked at data

from the Pioneer Array and saw a significant warm water intrusion. He left a message with Ellertson and asked that she call back.

She soon did. Fishermen had noticed right off there was a bottom intrusion. The rings can travel across the shelf, 20 to 60 feet thick along the bottom of the water column.

Fishermen, who get data in real time, have changed their business practices, including using the arrival of bottom intrusions to take time ashore to work on their boats.

Although Hesse is involved in a variety of research programs, he is not part of the Shelf Fleet. He works primarily with gliders.

As the calendar closed on 2021, he took four of six long yellow gliders out 100 miles to the array to launch into the sea. The battery-life on these submariners is usually about three months, but invariably something happens – a collision, too much algae builds up – so he'll often need to go back earlier and switch one out.

"Eric has been a great partner for OOI glider operations," Plueddemann said.

He explained that gliders fill in the spatial picture because unlike moorings they can "fly" between pre-defined way points as they go up and down in the water column. All the technology, and the fishermen's contributions, has shown a worrisome trend.

"In the past 20 years, the average number of rings per year has gone from 18 to 33," Gawarkiewicz said. "I think it's really important in these times, for the sustainability of the fishing industry and marine conservation issues, to understand how the ocean is changing.

"The changes are coming at a dizzying rate."

Array research here is scheduled to wrap up late this year in preparation for a move to the mid-Atlantic. The Pioneer Array is part of a larger project, run through the National Science Foundation, that has arrays across the globe.

Gawarkiewicz wants to keep the research going.

"We have to come up with a legacy system to conduct similar operations," he said.

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