

Research tracks whales by listening to sounds

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Researchers have developed a new tool to help them study endangered whales – autonomous hydrophones that can be deployed in the ocean to record the unique clicks, pulses and calls of different whale species. Those efforts are leading to some surprising findings, including the discovery by a team of researchers of rare right whales swimming in the Gulf of Alaska.

"There has been only one confirmed sighting of a right whale in the Gulf of Alaska since 1980, so discovering them is not only surprising, it is fairly significant," said David K. Mellinger, an assistant professor at Oregon State University's Hatfield Marine Science Center in Newport. "We picked up the sounds of one whale off Kodiak Island, and several others in deep water, which is also something of a surprise, since most right whale sightings have been near-shore."

Results of these and five years of studies have been published in the January 2006 issue of the journal *BioScience*. Mellinger said scientists have been able to use the hydrophones to distinguish sounds made by different whale species. And some species, he added, have different "dialects" depending on where they are from. Blue whales off the Pacific Northwest sound different than populations of blue whales that live in the western Pacific Ocean, and those sound different from populations of blue whales off Antarctica.

And they all sound different than the blue whales off Chile.

"The whales in the eastern Pacific have a very low-pitched pulsed sound, followed by a tone," Mellinger said. "Other populations use different combinations of pulses, tones and pitches. The difference is really striking, but we don't know if it is tied to genetics, or some other reason.

"There are also some hybrid sounds that are rare," he added. "We don't know if they are part of a common 'language' that different populations of whales use to communicate with each other, or if they come from a confused juvenile who hasn't completely learned the complexities of communicating."

Scientists began hearing whale sounds several years ago on a U.S. Navy hydrophone network. The hydrophone system – called the Sound Surveillance System, or SOSUS – was used by the Navy during the Cold War to monitor submarine activity in the northern Pacific Ocean. As the Cold War ebbed, these and other military assets were offered to civilian researchers performing environmental studies.

Another Oregon State researcher, Christopher Fox, first received permission from the Navy to use the hydrophones at his laboratory at OSU's Hatfield Marine Science Center to listen for undersea earthquakes – a program now directed by Robert Dziak.

While listening for earthquakes, the OSU researchers begin picking up sounds of ships, marine landslides – and whales. An engineer at the center, Haru Matsumoto, then developed an autonomous hydrophone that can be deployed independently and Mellinger's colleagues placed seven of these instruments in the Gulf of Alaska about five years ago. The hydrophones can pick up right whale sounds from about 40 kilometers away – and even farther, if the waters are shallow and the terrain even.

Using those hydrophones, Mellinger discovered a number of sperm whales living in the Gulf of Alaska in the winter. The hydrophones picked up almost half as many whale sounds as in the summer – indicating a surprisingly robust "off-season" population.

"There are a handful of records of people spotting sperm whales in the region – and they're all in the summer," Mellinger said. "Likewise, all of the historic whaling records are from the summer. The Gulf of Alaska is not a place you want to be in the winter. But apparently, sperm whales don't mind."

Other researchers participating in the study include Sue Moore, NOAA's Alaska Fisheries Center in Seattle; Kathleen M. Stafford, an OSU graduate now at the University of Washington; and John A. Hildebrand, Scripps Institution of Oceanography.

This spring, the researchers plan to deploy three more hydrophones in the Bering Sea next to a series of long-duration NOAA moorings. They will analyze possible connections between the appearance of the whales and ocean conditions. "We'll look at water temperature, salinity and even chlorophyll growth," Mellinger said. "Ultimately, what we hope is to be able to identify a certain water mass and know that it will lead to chlorophyll growth and an abundance of plankton, and that the whales will soon appear."

Source: Oregon State University

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