New technologies – and a dash of whale poop – help scientists monitor whale health

5 October 2016

Credit: Oregon State University

A lot of people think what Leigh Torres has done this summer and fall would qualify her for a spot on one of those "World's Worst Jobs" lists.

After all, the Oregon State University marine ecologist follows gray whales from a small inflatable boat in the rugged Pacific Ocean and waits for them to, well, poop. Then she and her colleagues have about 20-30 seconds to swoop in behind the animal with a fine mesh net and scoop up some of the prized material before it drifts to the ocean floor.

Mind you, gray whales can reach a length of more than 40 feet and weigh more than 30 tons, making the retrieval of their daily constitutional somewhat daunting. Yet Torres, a principal investigator in the university's Marine Mammal Institute, insists that it really isn't that bad.

"We're just looking for a few grams of material and to be honest, it doesn't even smell that bad," she said. "Now, collecting a DNA sample from a whale's blow-hole – that's a bad job. Their breath is horrendous."

Being a marine pooper-scooper isn't some strange fetish for the Oregon State research team. They are conducting a pilot project to determine how gray whales respond to ocean noise – both natural and human – and whether these noises cause physiological stress in the animals. Technology is changing the way the researchers are approaching their study.

"New advances in biotechnology allow us to use the fecal samples to look at a range of things that provide clues to the overall health and stress of the whales," Torres said. "We can look at their hormone levels and genetically identify individual whales, their sex and whether they are pregnant. And we can analyze their prey and document what they've been eating.

Aerial shot of a gray whale. Credit: Oregon State University

"Previously, we would have to do a biopsy to learn some of these things and though they can be done safely, you typically don't repeat the procedure often because it's invasive," she added. "Here, we can follow individual whales over a four-month feeding season and pick up multiple samples that can tell us changes in their health."

The study is a pilot project funded by the National Oceanic and Atmospheric Administration's Ocean

Acoustics Program to determine the impacts of noise on whale behavior and health. Torres, who works out of OSU's Hatfield Marine Science Center in Newport, Oregon, focuses on gray whales because they are plentiful and close to shore.

"Many marine mammals are guided by acoustics and use sound to locate food, to navigate, to communicate with one another and to find a mate," said Torres, a faculty member in OSU's Department of Fisheries and Wildlife and an ecologist with the Oregon Sea Grant program.

Ten years ago, such a study would not have been possible, Torres acknowledged. In addition to new advances in genetic and hormone analyses, the OSU team uses a drone to fly high above the whales. It not only detects when they defecate, it is giving them unprecedented views of whale behavior.

"We are seeing things through the drone cameras that we have never seen before," Torres said. "Because of the overhead views, we now know that whales are much more agile in their feeding. We call them 'bendy' whales because they make such quick, sharp turns when feeding. These movements just can't be seen from the deck of a ship."

The use of small, underwater Go-Pro cameras allows them to observe what the whales are feeding upon below. The researchers can identify zooplankton, benthic invertebrates, and fish in the water column near feeding whales, and estimate abundance – helping them understand what attracts the whales to certain habitats.

Researchers use a drone to monitor whale behavior. Credit: Oregon State University

Joe Haxel and Sharon Nieukirk are acoustic scientists affiliated with OSU's Cooperative Institute for Marine Resources Studies and the NOAA Pacific Marine Environmental Laboratory at the Hatfield center who are assisting with the project. They deploy drifting hydrophones near the whales to record natural and human sounds, help operate the overhead drone camera that monitors the whales' behavior, and also get in on the fecal analysis.

"Gray whales are exposed to a broad range of small- and medium-sized boat traffic that includes sport fishing and commercial fleets," Haxel said. "Since they are very much a coastal species, their exposure to anthropogenic noise is pretty high. That said, the nearshore environment is already very noisy with natural sounds including wind and

breaking surf, so we're trying to suss out some of the space and time patterns in noise levels in the range of habitats where the whales are found."

It will take years for the researchers to learn how ocean noise affects whale behavior and health, but as ocean noises continue increasing – through ship traffic, wave energy projects, sonar use, seismic surveys and storms – the knowledge they gain may be applicable to many whale species, Torres said.

And the key to this baseline study takes a skilled, professional pooper-scooper.

"When a whale defecates, it generates this reddish cloud and the person observing the whale usually screams "POOP!" and we spring into action," Torres said. "It's a moment of excitement, action - and also sheer joy. I know that sounds a little weird, but we have less than 30 seconds to get in there and scoop up some of that poop that may provide us with a biological gold mine of information that will help protect whales into the future.

"That's not such a bad job after all, is it?"

Provided by Oregon State University