Endangered Whales Get a High-Tech Checkup

DRONES GIVE RESEARCHERS AN UNPARALLELED VIEW OF MARINE MAMMAL HEALTH

by Véronique LaCapra

Scientists at Woods Hole Oceanographic Institution and the National Oceanic and Atmospheric Administration are studying the health of critically endangered whales—using drones. In spring 2016, a research team led by WHOI biologist Michael Moore, NOAA researcher John Durban, and Holly Fearnbach of SeaLife Response, Rehabilitation and Research (SR3) sailed out into Cape Cod Bay in search of North Atlantic right whales feeding just off the coast. They used a remotely controlled, six-rotor hexacopter to take detailed aerial photographs of the whales and to collect samples of their "blow"—the moist breath that a whale sprays out of its blowhole when it exhales. Over the course of three weeks, the researchers completed 67 drone flights, photographing about 35 different whales and gathering 16 blow samples.

Here you see the research team in action—and the amazing images the drone took of these rare whales, some of which are almost as long as the 55-foot sailboat used for the project.

The next step for the researchers will be to analyze the data they collected. Using the photos, Durban and Fearnbach will work with NOAA colleagues to assess each whale's size and body condition and to look for any injuries or scars. At WHOI, Carolyn Miller and Amy Apprill will sequence genetic material they find in the blow samples to determine what kinds of bacteria, viruses, and fungi make up the blow "microbiome." By comparing blow samples from different whales—and different whale species—the researchers hope to figure out what the microorganisms in a whale's respiratory tract can tell us about an individual's overall health.

Understanding the health of North Atlantic right whales may prove critical to their survival. There are fewer than 500 of these animals left. They spend most of their lives within 50 miles of the East Coast of North America, making them vulnerable to human activities. Based on available data, more than half of all right whale deaths are the result of collisions with ships or entanglement in fishing gear. In addition, climate change and a warming ocean may be reducing their main source of food—tiny crustaceans called copepods—leaving some right whales undernourished and less able to reproduce. ▲

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Drones are providing a powerful new tool for whale research and conservation. NOAA's John Durban (center rear) uses a remote control to guide a hexacopter into the outstretched hands of SR3's Holly Fearnbach, as WHOI microbiologist Amy Apprill (seated) and New England Aquarium whale specialist Marilyn Marx look on. Durban makes it look easy, but maneuvering a drone from a rocking sailboat is anything but.

In the past, getting aerial photographs of whales meant taking them from a plane or helicopter. A small drone equipped with a specialized camera can get close to a whale without disturbing it, resulting in images of unprecedented quality and detail. In a process known as photogrammetry, a team led by NOAA's John Durban will use the images to estimate the size of the whales, assess their body condition, and draw conclusions about their overall health.

Photo by John Durban (NOAA), Holly Fearnbach (SR3), and Michael Moore (WHOI)

To get a sample of a whale's blow, the researchers attach a sterilized petri dish to the top of the hexacopter. After a successful flight, they transfer the collected liquid to a small plastic vial and freeze it. Back at WHOI, Amy Apprill and her colleague Carolyn Miller will use a technique known as metagenomics to analyze genetic material and identify microbes in the blow.

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WHOI biologist Michael Moore collects a sample of seawater. Amy Apprill and Carolyn Miller will compare microbial communities in seawater and in blow samples to distinguish microorganisms that live in the water from those specific to a whale's respiratory tract. Respiratory system microbes are the most common source of disease in whales.

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The drone hovers in the whale's blow to collect a sample. The V-shaped spray pattern is characteristic of baleen whales such as North Atlantic right whales, which have two blowholes through which they breathe. Whales with teeth—such as sperm whales—have only one blowhole.