How Drones Are Helping Scientists Figure Out Whales' Weight

By Brigit Katz October 3, 2019

Because it is so difficult to weigh the huge marine mammals, whale body mass is often not included in studies

Southern right whales.
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Weighing a wild baleen whale is no easy feat. For one, hulking marine mammals represent the largest animals on the planet, and their aquatic lifestyle makes it difficult for researchers to accurately measure their heft. So while body mass is considered fundamental to the understanding of animal physiology, studies of baleen whales often do not include their weight.

Fortunately, as Jennifer Leman reports for *Popular Mechanics*, a group of researchers has come up with a way to accurately and non-invasively estimate the weight of wild whales, using aerial images taken by drones. The team's study, published recently in *Methods in Ecology and Evolution*, focused on southern right whales—a baleen whale species, frolicking off the coast of Península Valdés, Argentina. But the researchers say their method has far-reaching implications. "Our approach can be directly applied to other marine mammals," the study authors write.

Historically, data on whale body mass has been derived from dead specimens resulting from whaling operations, bycatch or strandings. But trying to determine the weight of a living whale based on a carcass is difficult. Bloating or deflation of the body can distort measurements, and working with a single dead sample does not allow scientists to track an individual whale's weight over time. What's more, lethal sampling—or killing a whale for the purposes of scientific study—is widely considered to be unethical.

This has left researchers with few options when it comes to figuring out just how chunky wild whales are. But knowing the animals' weight is vital to gauging their overall health. As study co-author Michael J. Moore, a biologist and director of the Marine Mammal Center at the Woods Hole Oceanographic Institution, tells Jessica Leigh Hester of *Atlas Obscura*, body mass "tells you

about the health of the animal, and in the context of its environment, it gives you a sense of how it's doing nutritionally."

"If the weight is insufficient," Moore adds, "then the animal's not going to get pregnant. It's a critical number in terms of population."

Hoping to find a better way to determine whale body mass, Moore and his colleagues used drones to take aerial photos of 86 southern right whales—48 calves, seven juveniles and 31 lactating females—in the clear, still waters off Península Valdés, where the species congregates during its breeding season. The researchers then calculated the animals' approximate length, width and height, and estimated body shape and volume with the help of computer modelling. Finally, "to obtain a volume-to-mass conversion factor," the model was used to estimate the body volume of eight North Pacific right whales, which had been lethally captured in whaling operations and whose body masses were known.

"This conversion factor was consequently used to predict the body mass of the free-living whales," the study authors explain.

The team's predictions were in close range to existing body mass data for right whales, though the researchers concede that their method is not perfect. "We had to assume a constant body density of the whales, which is not realistic as the proportion of different body tissues (fat, muscle etc.) changes seasonally as the whales deposit or lose body condition," explains Fredrik Christiansen, lead author of the new report and ecophysiologist with the Aarhus Institute of Advanced Studies in Denmark.

Jarrod Hodgson, an ecologist at the University of Adelaide who was not involved in the study, tells Hester that with the help of the new technique, scientists will be able to monitor the growth of individual whales, their daily energy requirements, how much prey they need to consume—factors that were difficult to assess without knowing the animals' body mass.

"It will allow researchers to investigate questions that were previously off-limits or would have required techniques that negatively impacted sampled animals," says Hodgson.

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