Genetic survey of endangered Antarctic blue whales shows surprising diversity

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A new study, using samples collected during cruises coordinated by the International Whaling Commission, has found a surprisingly high level of genetic diversity among critically endangered Antarctic blue whales. Photo by Paul Ensor, with support from Canon New Zealand Community Sponsorship Programme

More than 99 percent of Antarctic blue whales were killed by commercial whalers during the 20th century, but the first circumpolar genetic study of these critically endangered whales has found a surprisingly high level of diversity among the surviving population of some 2,200 individuals.

That, says lead author Angela Sremba of Oregon State University, may bode well for their future recovery.

Results of the study have just been published in the open-access journal, PLoS ONE. As part of the study, the researchers examined 218 biopsy samples collected from living Antarctic blue whales throughout the Southern Ocean from 1990 to 2009, through a project coordinated by the International Whaling Commission.

The genetic survey revealed a "surprisingly high" level of diversity that may help the population slowly rebound from its catastrophic decimation by whalers.

"Fewer than 400 Antarctic blue whales were thought to have survived when this population was protected from commercial hunting in 1966," noted Sremba, who conducted the research as part of her master's degree with the Marine Mammal Institute at OSU's Hatfield Marine Science Center. "But the exploitation period, though intense, was brief in terms of years, so the whales' long lifespans and overlapping generations may have helped retain the diversity."

"In fact," she added, "some of the Antarctic blue whales that survived the genetic bottleneck may still be alive today."

Prior to whaling Antarctic blue whales were thought to number about 250,000 individuals – a total that dwindled to fewer than 400 animals by 1972 when the last blue whales were killed by illegal Soviet whaling. Blue whales are thought to be the largest animals ever to have lived on Earth, said OSU's Scott Baker, associate director of the Marine Mammal Institute and an author on the study – and the Antarctic blue whales were even larger than their cousins in other oceans.

"These animals are very long-lived – maybe 70 to 100 years – and they can grow to a length of more than 100 feet and weigh more than 330,000 pounds," he said. "There is a jawbone in a museum in South Africa that takes up most of the lobby. This is one reason they were so intensively

exploited; they were the most valuable whales to hunt."

Despite their history of exploitation, little is known about modern-day movements of Antarctic blue whales, which are considered a separate subspecies – differing in size and habitat use – from the smaller "pygmy" blue whales, which live in more temperate regions of the Southern Hemisphere.

Through "microsatellite genotyping," or DNA fingerprinting, the PLoS ONE study was able to track some of the movements of individual Antarctic blue whales.

"We documented one female that traveled from one side of Antarctica to the other – a minimum distance of more than 6,650 kilometers over a period of four years," said Sremba, who is now continuing her studies as a Ph.D. student in the Department of Fisheries and Wildlife at OSU. "It is the first documentation of individual movements by Antarctic blue whales since the end of the commercial whaling era."

Baker said the long distance movement of a few individuals was "somewhat surprising" in comparison to the evidence for genetic differences between areas of the Southern Ocean. On one hand, it is apparent that individual Antarctic blue whales are capable of traveling enormous distances in search of food.

"On the other hand," Baker said, "there seems to be some fidelity to the same feeding grounds as a result of a calf's early experience with its mother. This 'maternally directed' fidelity to migratory destinations seems to be widespread among great whales."

There is much, however, which scientists still don't know about Antarctic blue whales, Baker pointed out.

"This is a poorly understood species of whales, despite its history of exploitation," Baker said. "Only now are we developing the technology to study such a small number of whales spread across such a vast habitat."

The biopsy samples were collected during more than two decades of research cruises supervised by the International Whaling Commission, and with international scientists joining research vessels from the Japanese Ministry of Fisheries.

Now that their population is slowly recovering, future studies may focus on Antarctic blue whales' migration patterns, and the locations of their breeding and calving grounds.

Provided by Oregon State University