

'Eve' and descendants shape global sperm whale population structure

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Credit: Oregon State University

Although sperm whales have not been driven to the brink of extinction as have some other whales, a new study has found a remarkable lack of diversity in the maternally inherited mitochondrial DNA within the species.

In fact, the mitochondrial DNA from more than a thousand sperm whales examined during the past 15 years came from a single "Eve" sperm whale tens of thousands of years ago, the researchers say.

Results of the study are being published this week in the journal *Molecular Ecology*.

While the exact origins of this sperm whale "Eve" remain uncertain, the study shows the importance of her female descendants in shaping [global population](#) structure, according to Alana Alexander, a University of Kansas Biodiversity Institute researcher who conducted the study while a doctoral student at Oregon State University.

"Although the male sperm whale is more famous in literature and cinema through 'Moby Dick' and 'In the Heart of the Sea,' the patterns in mitochondrial DNA show that female sperm whales are shaping genetic differentiation by sticking close to home," Alexander said.

Working in the genetic lab of Scott Baker, associate director of Oregon State's Marine Mammal Institute, Alexander combined DNA information from 1,091 previously studied samples with 542 newly obtained DNA profiles from sperm whales. The new samples were part of a global sampling of sperm whale populations made possible by the Ocean Alliance's "Voyage of the Odyssey," a five-and-a-half year circumnavigation of the globe, including some of the most remote regions of the world.

The new sampling, including sperm whales from the previously unsampled Indian Ocean, revealed global patterns of genetic differentiation and diversity.

"Sperm whales have been in the fossil record for some 20 million years," said Baker, a co-author on the study, "so the obvious question is how one maternal lineage could be so successful that it sweeps through the global population and no other lineages survive? At this point, we can only speculate about the reasons for this success, but evolutionary advances in feeding preferences and social strategies are plausible explanations."

The researchers say female sperm whales demonstrate strong fidelity to local areas, and both feeding habits and social structure are important to determine to better manage the species. "There is a real risk of long-term declines in response to current anthropogenic threats, despite the sperm whale's large worldwide population," the authors wrote.

"One concern is that this very strong local fidelity may slow expansion of the species following whaling," said Baker, a professor of fisheries and wildlife who works at OSU's Hatfield Marine Science Center in Newport, Oregon. "The Sri Lanka sperm whales, for example, don't seem to mix with the Maldives whales, thus local anthropogenic threats could have a negative impact on local populations."

The researchers note that while males are important for describing patterns in the nuclear DNA of sperm whales, ultimately the females shape the patterns within the species' mitochondrial DNA.

"Although there is low mitochondrial DNA diversity there are strong patterns of differentiation, which implies that the global population structure in the [sperm whale](#) is shaped by females being 'home-bodies' - at the social group, regional and oceanic level," Alexander said.

More information: Alana Alexander et al, What influences the worldwide genetic structure of sperm whales (), *Molecular Ecology* (2016). [DOI: 10.1111/mec.13638](https://doi.org/10.1111/mec.13638)

Provided by Oregon State University

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