

Previously unknown extinction of marine megafauna discovered

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Over two million years ago, a third of the largest marine animals like sharks, whales, sea birds and sea turtles disappeared. This previously unknown extinction event not only had a considerable impact on the

earth's historical biodiversity but also on the functioning of ecosystems. This has been demonstrated by researchers at the University of Zurich.

The disappearance of a large part of the terrestrial megafauna such as saber-toothed cat and the mammoth during the ice age is well known. Now, researchers at the University of Zurich and the Naturkunde Museum in Berlin have shown that a similar [extinction event](#) had taken place earlier, in the oceans.

New extinction event discovered

The international team investigated fossils of marine megafauna from the Pliocene and the Pleistocene epochs (5.3 million to around 9,700 years BC). "We were able to show that around a third of marine megafauna disappeared about three to two million years ago. Therefore, the marine mega-faunal communities that humans inherited were already altered and functioning at a diminished diversity", explains lead author Dr. Catalina Pimiento, who conducted the study at the Paleontological Institute and Museum of the University of Zurich.

Above all, the newly discovered [extinction](#) event affected marine mammals, which lost 55 per cent of their diversity. As many as 43 per cent of sea turtle species were lost, along with 35 per cent of [sea birds](#) and 9 per cent of sharks. On the other hand, the following new forms of life were to develop during the subsequent Pleistocene epoch: Around a quarter of animal species, including the polar bear *Ursus*, the storm petrel *Oceanodroma* or the penguin *Megadyptes*, had not existed during the Pliocene. Overall, however, earlier levels of diversity could not be reached again.

Effects on functional diversity

In order to determine the consequences of this extinction, the research team concentrated on shallow coastal shelf zones, investigating the effects that the loss of entire functional entities had on coastal ecosystems. Functional entities are groups of [animals](#) not necessarily related, but that share similar characteristics in terms of the function they play on ecosystems. The finding: Seven functional entities were lost in coastal waters during the Pliocene.

Even though the loss of seven functional entities, and one third of the species is relatively modest, this led to an important erosion of [functional diversity](#): 17 per cent of the total diversity of ecological functions in the ecosystem disappeared and 21 per cent changed. Previously common predators vanished, while new competitors emerged and [marine animals](#) were forced to adjust. In addition, the researchers found that at the time of the extinction, coastal habitats were significantly reduced due to violent sea levels fluctuations.

Large warm-blooded marine animals are more vulnerable to global environmental changes

The researchers propose that the sudden loss of the productive coastal habitats, together with oceanographic factors such as altered sea currents, greatly contributed to these extinctions. "Our models have demonstrated that warm-blooded animals in particular were more likely to become ex-tinct. For example, species of sea cows and baleen whales, as well as the giant shark *Carcharocles megalodon* disappeared", explains Dr. Pimiento. "This study shows that marine megafauna were far more vulnerable to global environmental changes in the recent geological past than had previously been assumed". The researcher also points to a present-day parallel: Nowadays, large marine species such as whales or seals are also highly vulnerable to human influences.

More information: Catalina Pimiento et al, The Pliocene marine megafauna extinction and its impact on functional diversity, *Nature Ecology & Evolution* (2017). [DOI: 10.1038/s41559-017-0223-6](https://doi.org/10.1038/s41559-017-0223-6)

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