

When Earth went dark after Chicxulub, tiny ocean dwellers held the secret to survival

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Credit: Pixabay/CC0 Public Domain

When a 10-kilometer asteroid struck Earth 66 million years ago, the planet was plunged into darkness—and about 75% of species vanished, including marine life. Now, a new study reveals that the planetary effects from the impact and the simple fact of body size decided who lived or died in the sea.

After the [Chicxulub impact](#), dust and soot blocked sunlight from reaching the planet. Global temperatures fell drastically, and ocean photosynthesis was paralyzed. In the aftermath, most large marine animals vanished. But researchers noted a puzzle: some microscopic plankton clung on while their bigger cousins disappeared.

A sudden ocean blackout

The effects of this post-collision "winter" scenario in the oceans remained elusive to science for some time. One hypothesis suggested that total darkness would simply cause the extinction of primary producers in the seas. The sedimentary evidence showed, however, that photosynthesis dropped by only a little.

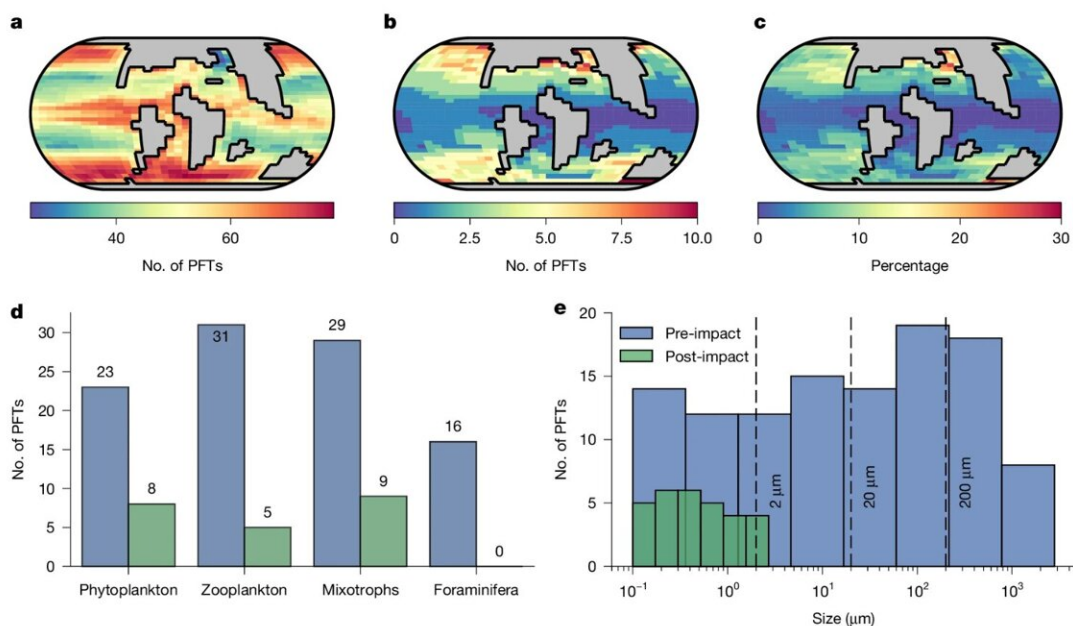
Furthermore, [fossil records](#) indicate that the plankton species in the colder higher latitudes—dinoflagellates, diatoms and other small plankton—that survived the collision were mostly small and fast-growing, whereas most of the larger, calcifying species became extinct. Why did size make such a huge difference?

Size and survival: The energy race

Body size is a master trait in biology, especially in crises. Big organisms simply need far more energy to survive—they eat more, reproduce more

slowly, and have lower metabolic rates, making them vulnerable when resources crash.

In the darkened oceans after Chicxulub, large plankton would have starved first. By contrast, the tiniest phytoplankton could get by on scant light and could eat other microbes (a strategy called mixotrophy). This gave small organisms an edge. In fact, the only plankton appearing above the K–Pg boundary in the fossil record are the small, opportunistic kinds that could survive on any scrap of energy.



This model reveals how a century of darkness acted as a biological filter, systematically erasing larger, energy-hungry plankton (red and orange) while allowing only the tiniest, most flexible survivors (blue) to inherit the post-impact ocean. Credit: *Nature* (2026). DOI: 10.1038/s41586-026-10541-4

Replaying extinction in a model

To examine this phenomenon, Rui Ying and his colleagues ran a global ocean ecosystem model called EcoGENIE, simulating the first 100 years after the impact.

The model included dozens of plankton "functional types" spanning sizes from a few micrometers up to millimeters. Critically, it implemented a size-dependent extinction rule: each plankton type went extinct if its biomass fell below the mass of a single individual of that size. In other words, larger plankton had a much higher threshold for survival.

The simulation also imposed K–Pg forcings: a 700 ppm CO₂ spike and, most importantly, a dramatic decrease in sunlight from dust and soot.

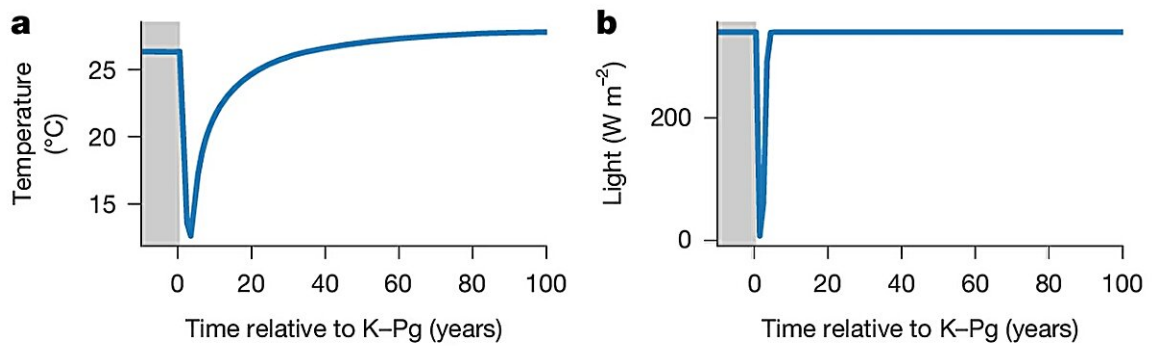
The results were striking. The computer model naturally produced the same selective culling seen in the fossil record. Virtually all large plankton types—especially big foraminifera and other zooplankton—died out, while nearly all the small phytoplankton and mixotrophs survived. In high-latitude waters, the losses were milder, just as paleontologists suspected.

As the team reports, "Impact-driven darkness and body-size-dependent extinction thresholds drove most of the observed extinction patterns." That simple coupling of ocean blackness with size explained the core mystery.

The study, [published](#) in *Nature*, goes further to tie the biology into survival.

The authors note that differences in how plankton eat and expend energy were crucial. In their words, "Plankton ecologies enhance survival through differences in energy demand and acquisition." In plain terms, the tiny plankton had low metabolic needs or could switch to eating other microbes, enabling them to ride out the darkness. Big plankton, by

contrast, collapsed without enough photosynthetic food.



Ocean environmental and plankton community responses to abrupt K–Pg climate change within a century (100 years) of the Chicxulub impact. a, Global mean surface ocean temperature. b, Global mean insolation. Credit: *Nature* (2026).

DOI: 10.1038/s41586-026-10541-4

Lessons for today's oceans

This research builds a bridge from rocks to living cells. By linking the conditions after the asteroid strike (dust, darkness, brief cooling) to a global model of plankton ecology, the researchers explain why some lineages vanished and others persisted. It also highlights a broader point: When environments suddenly change, size and energy strategy are king.

That insight is relevant now as modern oceans warm and acidify; it can help us predict which species might face similar collapses. In a warming, changing sea, tiny, flexible plankton may again fare better, while larger, energy-hungry species could be at greater risk.

As the researchers conclude, [trait-based models](#) like this one can illuminate both ancient extinctions and future biodiversity crises.

More information: Rui Ying et al, Darkness and body size shaped end-Cretaceous marine extinction patterns, *Nature* (2026). [DOI: 10.1038/s41586-026-10541-4](#)

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