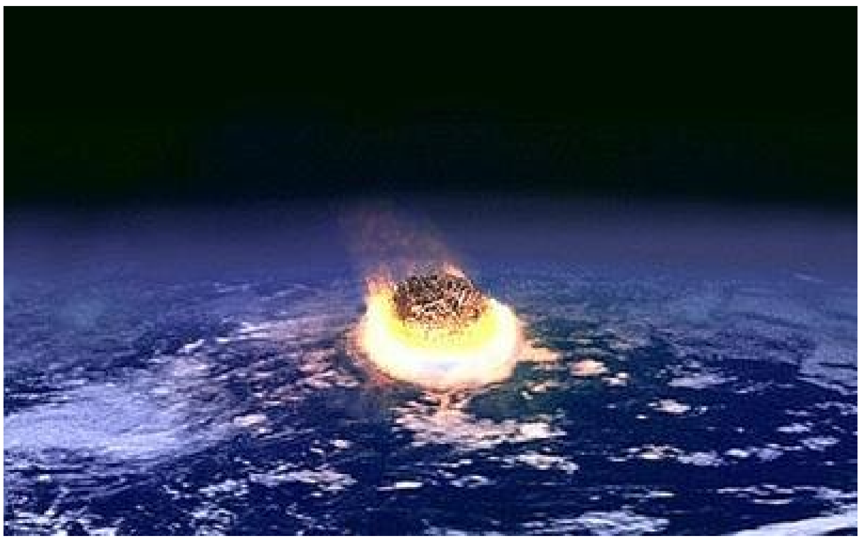
Tiny plankton slow to recover after dinosaur-killing asteroid collision

September 30 2019



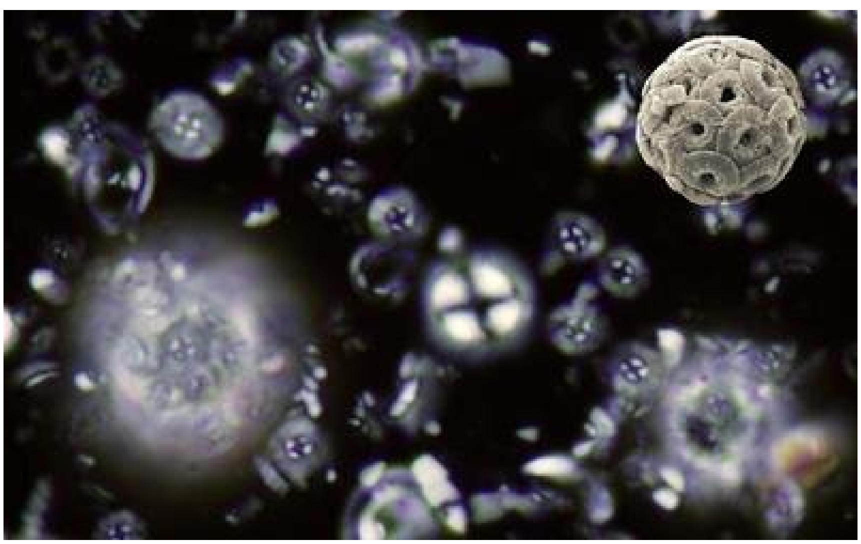
Artist's impression of impact event. Credit: NASA

A team of scientists have revealed that after the devastation caused by a mass extinction event on Earth 66 million years ago, the plankton at the base of the ocean ecosystem were disrupted for nearly two million years. It then took a further eight million years for global species numbers to fully recover.

The team, from the University of Southampton and the universities of Bristol, UCL, Frankfurt and California, found that while the plankton in the oceans showed the first signs of ecological recovery almost immediately, these early communities of microscopic organisms were highly unstable and cell sizes unusually small.

The Cretaceous/Paleogene mass extinction occurred when an asteroid impact caused global environmental devastation. It is well known for killing off the dinosaurs, but also laid waste to much smaller creatures, such as ocean plankton—removing crucial food sources from the base of the marine ecosystem which were critical for the recovery of large species.

In a study published in the journal *Nature*, the team shows major instability persisted for two million years following the extinction event, but after this, the gradual appearance of new species and larger cells helped re-establish an ecosystem which was resilient to the sudden change in climate. Also, the delivery of carbon to the sea floor returned to pre-extinction levels, restoring a critical ocean function that controls atmospheric carbon dioxide levels.



Microscopic nanoplankton fossils. Credit: Samantha Gibbs/Paul Bown

By conducting this research, the scientists have charted the aftermath of near annihilation through the creation of a 13-million-year record of fossil plankton dynamics and in-turn provided a remarkable glimpse into how the marine ecosystem "reboots."

Lead author Sarah Alvarez (University of Bristol, UCL and now Gibraltar) explains: "We looked at the best fossil record of ocean plankton we could find—calcareous nanofossils (they are still around today) and collected 13 million years of information from a sample every 13 thousand years. We measured abundance, diversity and cell size from over 700,000 fossils, probably the largest fossil dataset ever produced from one site."

As much today as in the past, the marine ecosystem is dependent on plankton at its base and this study highlights the risks posed by diversity loss which may result in highly unstable communities, loss of important ecosystem functions and the long timescales of recovery.

Palaeobiologist and co-lead author, Dr. Samantha Gibbs of the University of Southampton comments: "Losing species today runs the risk of eliminating key creatures in ecosystems. What we've demonstrated from this fossil record is that function is achieved if you have the right players fulfilling key roles.

"Today, by reducing biodiversity, we are running the risk of losing our critical ecosystem players, many of whose importance we don't yet fully appreciate."

More information: Sarah A. Alvarez et al. Diversity decoupled from ecosystem function and resilience during mass extinction recovery, *Nature* (2019). DOI: 10.1038/s41586-019-1590-8

Provided by University of Southampton