Genetic study shows explosion of diversity in fish after end-Cretaceous mass extinction

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A team of researchers from several institutions across the U.S. has found evidence suggesting that there was an explosion of diversity in fish after the end-Cretaceous mass extinction. In their paper published in the journal *Nature Ecology and Evolution*, the team describes their genetic study involving more than 1800 species of fish and what they found.

After the end-Cretaceous mass extinction—the one that killed off the dinosaurs—mammals became much more diverse and dominant. Without the dinosaurs to feast on them, they were free to prosper. Much less is known about what went on in the oceans. In this new effort, the researchers have added some new pieces to that puzzle.

Prior research has suggested that the asteroid or comet that smashed into the Earth approximately 65 million years ago killed off more than the dinosaurs—approximately 50 percent of all species worldwide disappeared. These include many sharks and other reptiles, leaving a void of sorts in the world's oceans that allowed fish to flourish. And flourish they did, according to the researchers with this new effort.

To learn more about what happened with sea creatures after the end-Cretaceous mass extinction, the researchers collected tissue samples from 118 acanthomorph species, looking specifically at 1,000 DNA sequences that were similar across the genomes of their samples—as part of that effort, they searched for variations in genetic sequences that offered clues regarding how closely related the fish were to one another.

The researchers found that six large groups of fish originated over the course of 10 million years after the mass extinction. Of those groups, five were acanthomorphs (spiny-rayed fish). Today, there are approximately 18,000 members of the acanthomorphs species and they represent approximately one in three vertebrate species alive today. That so many of them originated in the time after the dinosaurs disappeared shows that they, like mammals, found the world a much friendlier place—one where they were allowed to prosper. Such an explosion suggests that sharks and other reptile populations and their diversity must have plunged, leaving a vast void for the acanthomorphs to fill. Still unclear is why acanthomorphs, rather than other fish species, became so dominant.

More information: Michael E. Alfaro et al. Explosive diversification of marine fishes at the Cretaceous–Palaeogene boundary, *Nature Ecology & Evolution* (2018). DOI: 10.1038/s41559-018-0494-6

Abstract
The Cretaceous–Palaeogene (K–Pg) mass extinction is linked to the rapid emergence of ecologically divergent higher taxa (for example, families and orders) across terrestrial vertebrates, but its impact on the diversification of marine vertebrates is less clear. Spiny-rayed fishes (Acanthomorpha) provide an ideal system for exploring the effects of the K–Pg on fish diversification, yet despite decades of morphological and molecular phylogenetic efforts, resolution of both early diverging lineages and enormously diverse subclades remains problematic. Recent multilocus studies have provided the first resolved phylogenetic backbone for acanthomorphs and suggested novel relationships among major lineages. However, these new relationships and associated timescales have not been interrogated using phylogenomic approaches. Here, we use targeted enrichment of >1,000 ultraconserved elements in conjunction with a divergence time analysis to resolve relationships among 120 major acanthomorph lineages and provide a new timescale for acanthomorph radiation. Our results include a well-supported topology that strongly resolves relationships along the acanthomorph backbone and the recovery of several new relationships within six major percomorph subclades. Divergence time analyses also reveal that crown ages for five of these subclades, and for the bulk of the species diversity in the sixth, coincide with the K–Pg boundary, with divergences between anatomically and ecologically distinctive suprafamilial clades concentrated in the first 10 million years of the Cenozoic.

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