Triassic revolution: Animals grew back faster and smarter after mass extinction

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Michael Benton of the University of Bristol School of Earth Sciences, the lead author of the new study.

"Today, there is a huge difference between birds and mammals on the one hand, and reptiles on the other. Reptiles are cold-blooded, meaning they do not generate much body heat themselves and, although they can nip about quite quickly, they have no stamina, and they cannot live in the cold," said Prof Benton.

"It's the same in the oceans," said Dr. Feixiang Wu of the Institute for Vertebrate Paleontology in Beijing. "After the end-Permian mass extinction, the fishes, lobsters, gastropods, and starfishes show nasty new hunting styles. They were faster, snappier, and stronger than their ancestors."

Dr. Wu has studied amazing new assemblages of fossil fishes from the Triassic of China, and these include many kinds of predators that show how new hunting modes appeared earlier than had been thought. He has found modern-style sharks, and the long fish Saurichthys, which was very common worldwide and was an ambush hunter. This meter-long fish lurked in murky shallow seas and shot forward to snatch all kinds of prey in its toothy jaws.

On land too there were revolutionary changes. The latest Permian reptiles were generally slow-moving and used a kind of sprawling posture, like modern lizards, where the limbs stuck out at the side. When they walked, they probably generally moved slowly, and at speed, they could either run or breathe, but not both at the same time. This limited their stamina.
"Biologists have debated the origins of endothermy, or warm-bloodedness, in birds and mammals for a long time," said Prof Benton. "We can track their ancestry back to the Carboniferous, over 300 million years ago, and some researchers have suggested recently that they were already endothermic back then. Others say they became endothermic only in the Jurassic, say 170 million years ago. But all kinds of evidence from study of the cells in their bones, and even the chemistry of their bones, suggests that both groups became warm-blooded in the aftermath of the great end-Permian mass extinction, early in the Triassic."

The origins of endothermy in birds and mammals in the Early to Middle Triassic is suggested by two other changes: their ancestors mainly became upright in posture at this time. By standing high on their limbs like modern dogs, horses and birds, they could make longer strides. This probably goes hand-in-hand with some level of endothermy to enable them to move fast and for longer periods.

Second, it now seems that the Early and Middle Triassic bird and mammal ancestors had some form of insulation, hairs in the mammal line, feathers in the bird line. If this is true, and new fossil discoveries appear to confirm it, all the evidence is pointing to major changes in these reptiles as the world rebuilt itself after the end-Permian mass extinction.

"Altogether, animals on land and in the oceans were speeding up, using more energy, and moving faster," said Prof Benton. "Biologists call these kinds of processes 'arms races,' referring to the Cold War. As one side speeds up and becomes more warm-blooded, the other side has to as well. This affects competition between plant-eaters or competition between predators. It also refers to predator-prey relationships—if the predator gets faster, the prey does too in order to escape."

"It was the same underwater as well," said Dr. Wu. "As the predators became faster, snappier, and smarter in attacking their prey, these animals had to develop defenses. Some got thicker shells, or developed spines, or themselves became faster in order to help them escape."

"These are not new ideas," says Benton. "What is new is that we are now finding that they were all apparently happening about the same time, through the Triassic. This emphasizes a kind of positive aspect of mass extinctions. Mass extinctions of course were terrible news for all the victims. But the mass clear-out of ecosystems in this case gave huge numbers of opportunities for the biosphere to rebuild itself, and it did so at higher octane than before the crisis."


Provided by University of Bristol