Size not important for fish in the largest mass extinction of all time

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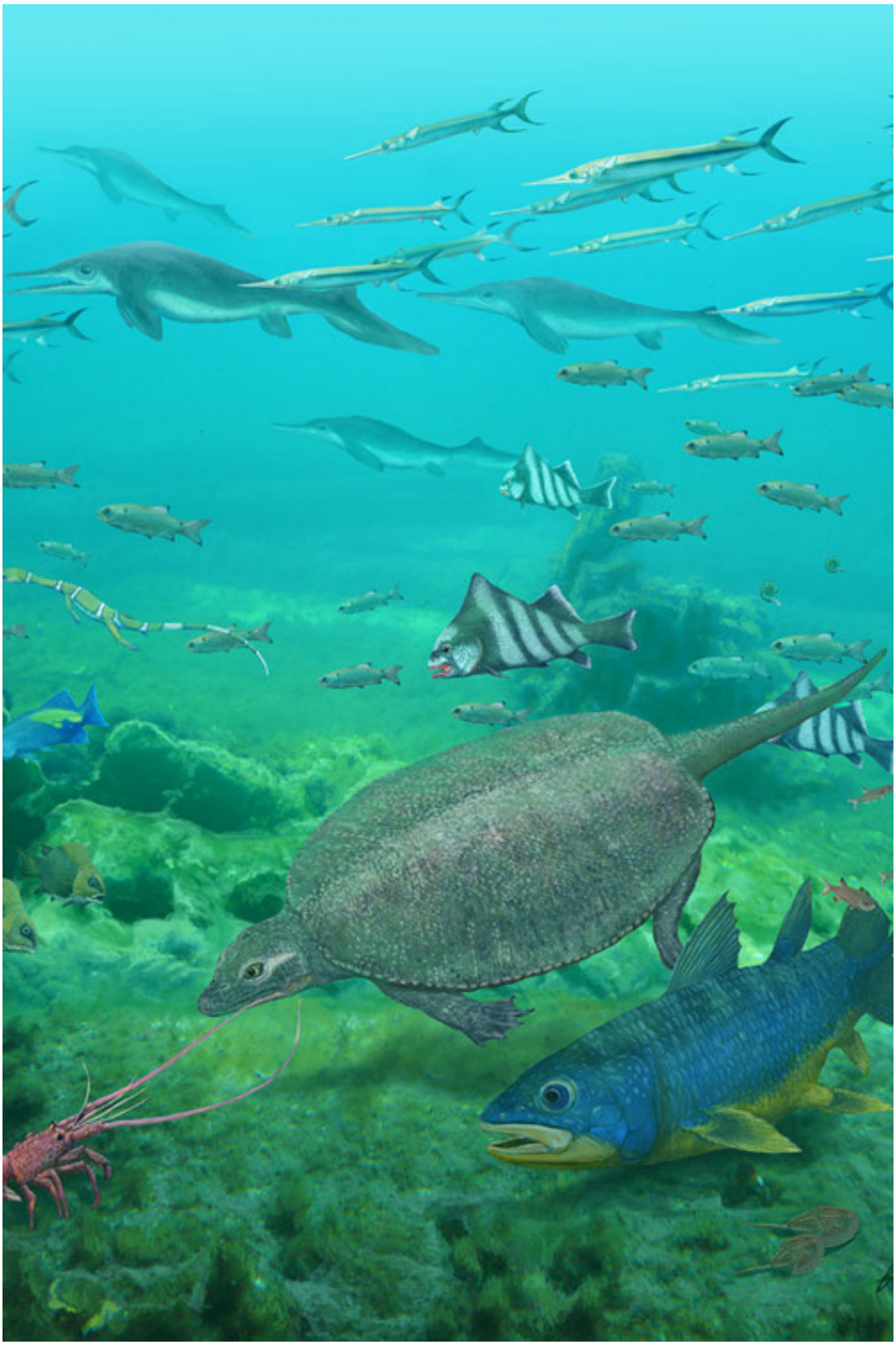

Fishes in Triassic seas of China 8 million years after the extinction crisis. Painting 'Lobster lunch of Luoping'. Credit: Brian Choo

Understanding modern biodiversity and extinction threats is important. It is commonly assumed that being large contributes to vulnerability during extinction crises.

However, researchers from the University of Bristol and the Chengdu Center of the China Geological Survey, have found that size played no role in the extinction of fish during the largest mass extinction of all time.

The study focused on the evolution of bony fishes during the Permian-Triassic mass extinction 252 million years ago. During this crisis, as many as 90 percent of all species on Earth were killed by massive climate change triggered by huge volcanic eruptions in Russia.

The erupted gases led to worldwide acid rain and atmospheric warming of as much as 20 degrees centigrade. This killed plants, and soil was stripped by rainfall and washed into the sea. Oceans were also heated and life fled from the tropics.

It was expected that a key feature in extinction would have been body size: the large animals would suffer heat and starvation stress first. However, in the new paper, published today in *Palaeontology*, it is shown that larger fish were no more likely to go extinct than small fish.

The study used a detailed summary of all information on fossil fish through a span of over 100 million years, from well before to well after the disaster. Body size information was identified for over 750 of these fishes, and multiple calculations were carried out to allow for variations in the shape of the evolutionary tree and the exact dating of all the species. The result was clear – body size did not provide any advantages or disadvantages to fish during the crisis.

Lead researcher Dr Mark Puttick from the Natural History Museum and University of Bristol's School of Earth Sciences, explained: "These results continue the trend of recent studies that suggest body size played no role in determining which species survive or go extinct. This is the opposite result we would expect, but provides increasing support for previous studies that show body size plays no role in extinction selectivity."

The team explored the largest dataset used in an analysis of this type and applied a range of computational evolutionary models to understand these patterns in deep time. The models take account of uncertainties in the quality of the fossil data and the reconstructed evolutionary tree, and the result was clear.

Professor Michael Benton, also from the University of Bristol, added: "These are exciting results. What is important also is that we were able to deploy new methods in the study that take greater account of uncertainties.

"The methods are based around a detailed evolutionary tree so, unlike most previous work in the field, we paid attention to the relationships of all the species under consideration."

Professor Shixue Hu, leader of the China Geological Survey: "It's great to see this new analytical work. We were able to include many new fossils from our exceptional biotas in China, and we can see the full impact of the extinction and the subsequent recovery of life during the Triassic."

More information: Mark N. Puttick et al. Body length of bony fishes was not a selective factor during the biggest mass extinction of all time, *Palaeontology* (2017). DOI: 10.1111/pala.12309

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