



An unexpected fossil lagerstätte under the Early Triassic hyperthermal event showing a modern-type marine ecosystem

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Following the most severe mass extinction event during the Phanerozoic, the Permian-Triassic mass extinction (PTME, ~251.9 Ma), Early Triassic marine fossil communities were thought to be depauperate, poorly diversified, and dominated by abundant and cosmopolitan disaster or opportunistic taxa. Full re-establishment of complex marine ecosystems was thought to have not occurred until, ~8 million years after the PTME, being represented by the Luoping Biota. The highly suppressed Early Triassic marine ecosystem has been thought to be a consequence of recurrent environmental stresses, including high sea surface temperature, episodes of oceanic acidification, and anoxic/euxinic events mainly occurring during the Permian-Triassic transition, the late Dienerian and late Smithian. Alternatively, it can also result from preservation and sampling biases, which are often neglected in many previous works. Here, we report an exceptionally preserved Early Triassic fossil assemblage, the Guiyang Biota, from the Daye Formation near Guiyang, South China. The Guiyang Biota comprises at least 12 classes and 19 orders, including diverse fish fauna and malacostracans, revealing a trophically-complex marine ecosystem. High-precision U-Pb dating shows that the age of the Guiyang Biota is 250.83 ± 0.07/-0.06 million years ago. This is only 1.08 ± 0.08 million years after the severe Permian-Triassic mass extinction, and this assemblage therefore represents the oldest known Mesozoic lagerstätte so far. The Guiyang Biota indicates the rapid rise of modern-type marine ecosystems after the Permian-Triassic mass extinction.

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