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On the margins: exceptionally preserved small carbonaceous fossils (SCFs) from Silurian marginal marine strata of southern China

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Small carbonaceous fossils (SCFs) have recently emerged as a novel means to track the evolution of non-mineralized animals throughout the early Palaeozoic. Currently however, records are largely concentrated in Cambrian-age strata, and little is known of the post-Cambrian extent of this style of preservation. Here, a previously unknown variety of SCFs are reported from shallow marine sediments of the Silurian (Ludlow to Pridoli) age Xiaoxi Formation, revealing exceptionally preserved microscopic anatomical remains of animals in what is otherwise a relatively unfossiliferous package of clastic rocks. Recovered SCFs encompass cuticular structures derived from eurypterid arthropods, including exquisitely preserved respiratory organs (kiemenplatten and lamellate book gills), sensory setae, fragments from other euarthropods, jaws of eunicid polychaete annelids (scolecodonts), a range of ornamented cuticles and spines of unknown affinity, and delicate protistan remains assigned to the possible euglenid *Moyeria*. Discovery of a range of animal-derived SCFs in the Xiaoxi Formation demonstrates that this style of fossil extraction and processing might be successfully developed and expanded into comparable upper Palaeozoic strata and deposits where the biota is similarly otherwise known only via trace fossil evidence. A concerted effort to expand this record has the potential to enrich our knowledge of otherwise poorly documented non-mineralized fossil taxa in shallow marine settings throughout the Palaeozoic.

Key words: Arthropoda, Eurypterida, Euglenida, Moyeria, scolecodonts, taphonomy, exceptional preservation, small carbonaceous fossils, Silurian, China

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