

How well do fossil assemblages of the Ediacara Biota tell time?

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Gehling and Droser's (2013) conclusion that Ediacaran fossils are not useful for biostratigraphy is an artifact of their lumping of all frond fossils into one indeterminate category, because there are potential biostratigraphic zones based on successive appearance of fronds of *Trepassia*, *Charnia*, *Avalofractus*, *Pambikalbae*, *Rangaea*, and *Swartpuntia* (Narbonne et al., 1997, 2009; Jenkins and Nedin, 2007; Vickers-Rich et al., 2013).

Also unfortunate is Gehling and Droser's failure to cite Jenkins and Nedin (2007), who outline a terminology for different South Australian paleovalleys (successive Chace Quartzite, Breakfast Time Creek, Winnowie, and Ediacara Members of the Rawnsley Quartzite), and describe a new South Australian frond fossil (*Pambikalbae hasenohrae*). Comparable South Australian paleochannels and fossils are claimed as new discoveries by Gehling and Droser. Furthermore, Jenkins and Nedin (2007) record "old elephant skin," discoid fossils and *Arumberia* from the Bonney Sandstone, Chace Quartzite, and upper Rawnsley Quartzite, stated to be unfossiliferous by Gehling and Droser.

The late Ediacaran stratigraphic range of *Pambikalbae* is not significantly changed by redeposition in paleochannels, unlike many Ediacaran fossils in growth position (Gehling, 2000; Retallack, 2007). Uprooting and transport is also plausible for effaced Ediacaran fossils in gray shales discussed by Gehling and Droser, such as *Eoandromeda* from China (Zhu et al., 2008) and *Pteridinium* from North Carolina (Gibson et al., 1984). Redeposited *Pambikalbae* and other paleochannel fossils of Gehling and Droser have no ferruginization or pyrite, so their high relief cannot be due to diagenetic mineralization, as proposed by Gehling (1999). Presumably they had a tough biopolymer like other Ediacaran fossils (Retallack, 1994, 2007).

Finally, observed paleoecological control of Ediacaran fossils undermines the fully marine paleoenvironmental model of Gehling and Droser. Paleoecological variation is expected in a linear clastic shoreline with coastal streams, floodplains, lagoons, and intertidal flats, which is the traditional reconstruction of the Ediacara Member in South Australia (Mawson and Segnit, 1949; Goldring and Curnow, 1967; Jenkins et al., 1983), and is supported by discovery of coastal paleosols (Retallack, 2012a, 2012b, 2013). In contrast, Gehling (as a contributor to Fedonkin et al., 2007) illustrates a submarine canyon depositional model for the Ediacara Member, with canyon heads incised into the continental shelf (>100 m depth) near Nilpena and Ediacara Hills, and extending out to the continental slope and rise (~1000 m depth) near Brachina Gorge. This model differs from the shallow-marine paleoenvironment of Gehling (2000) and Gehling and Droser (2012), who included supratidal facies missing from the modified reconstruction of Gehling and Droser (2013). Supratidal facies is the same in concept, if not in name, to my sequence of Inga pedotype, gypsiferous paleosols (Retallack, 2012a, 2012b, 2013). Because Ediacaran fossils have been assumed fully marine, like articulate brachiopods and crinoids, any rock with Ediacaran fossils has been interpreted as marine regardless of its appearance, but this is circular reasoning (Kolesnikov et al., 2012; Retallack, 2013). Pronounced local paleoecological control of Ediacaran fossil assemblages as documented by Gehling and Droser (2013) is com-

patible with varied coastal, rather than open marine habitats, and does not negate biostratigraphic uses of these fossils.

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