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Foraminifera and the ecology of sea grass communities since the late Cretaceous

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Sea grasses are marine angiosperms (plants) that, in the late Cretaceous, migrated from the land into shallow-water marine environments. They represent a distinct, but fragile, marine habitat and sea grass meadows are often regarded as biodiversity hot-spots with a range of species (including fish, sea horses and cuttlefish) using them as nurseries for their young. Foraminifera are often found associated with sea grass meadows, with the associated taxa reflecting both the environment and palaeolatitude. In the tropics and sub-tropics, miliolid foraminifera dominate (e.g., Peneroplis spp.) as do large discoidal taxa such as Marginopora and Calcarina. In temperate to cool latitudes the assemblage changes to one dominated by smaller benthic taxa, including Elphidium spp. One taxon, Elphidium crispum, is geotropic and is often found – in the summer months – to crowd the fronds of the sea grass.

In the Gulpen and Maastricht formations of the Maastricht area (The Netherlands and Belgium) sea grass fossils (both fronds and rhizomes) have been recorded in association with assemblages of both larger and smaller benthic foraminifera (Hart et al., 2016). Some of the large discoidal forms (e.g., Omphalocyclus and Orbitoides/Lepidorbitoides) and the distinctive Siderolites are associated with these sea grass fossils and are suggestive of the modern sea grass communities of sub-tropical areas. While earlier records were of relatively isolated sea grasses, in September/October 2015 surfaces with abundant sea grasses were found that are suggestive of complete ‘meadows’. Preservation of some silicified rhizomes indicates that silicification must have been very rapid, before any degradation or compaction of the delicate tissues.

The presence of sea grass fossils and their associated benthic foraminifera is indicative of a clear, shallow-water seaway, with a maximum depth of 15–20 m. The reported variations in sea level during the latest Cretaceous cannot, therefore, have been very large as such a change in water depth would have been disastrous to such a fragile ecosystem. The fossil record of sea grasses in the Cenozoic is relatively limited, though there are some assemblages of benthic foraminifera that are suggestive of their presence, despite the lack of plant fossils.

Hart, M.B., FitzPatrick, M.E.J. & Smart, C.W. 2016. The Cretaceous/Paleogene boundary: Foraminifera, sea grasses, sea level change and sequence stratigraphy. Palaeogeography, Palaeoclimatology, Palaeoecology, 441, 420–429.