



Evolutionary history of the holoplanktonic gastropods

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The Heteropoda (sea elephants) and Pteropoda (sea butterflies) are two groups of holoplanktonic gastropods that are an important component of the modern, open ocean, plankton. The geological record of the pteropods (Thecosomata) and heteropods (Pterotracheoidea) probably begins in the earliest Eocene (55 million years ago), although there are records – in the earliest Jurassic and mid-Cretaceous – of taxa that may be planktonic gastropods. In the early Paleogene there was the transition from a calcitic ocean to an aragonitic ocean (Stanley, 2006) and it seems logical that these aragonitic gastropods either appeared at that time or certainly began their diversification. While known diversity or species richness are subject to taxonomic ‘distortion’, especially when comparing biological data with palaeobiological data, the heteropods appear to have been the product of our modern, thermohaline-driven ocean. The pteropods, with a potentially longer record, appeared during the hyperthermal events of the early to mid-Eocene and also survived the transition to the modern, thermohaline-driven ocean and the onset of the present ‘icehouse world’.

The fossil record of the planktonic gastropods can be used in biostratigraphy but, as their thin, fragile shells are composed of aragonite, their geological history is certainly incomplete. In some places they are preserved as phosphate, pyrite or limonite moulds, though such preservation often fails to retain some of their diagnostic characters, making species identification difficult. Using the extensive literature available, including the recently published reviews of Corse et al. (2013), BurrIDGE et al. (2017) and Janssen & Peijenburg (2017), we can make a reasonable approximation of their diversity through time and their variations in response to changing palaeoceanography. The sudden increase in number of species in the Pleistocene and, especially, the Holocene probably reflects the increased interest in the groups shown by marine biologists and the increasing use of genetic data in species recognition.

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