Fossil-calibrated molecular phylogeny of atlantid heteropods (Gastropoda, Pterotracheoidea)

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Abstract

The aragonite shelled, planktonic gastropod family Atlantidae (shelled heteropods) is likely to be one of the first groups to be impacted by imminent ocean changes, including ocean warming and ocean acidification. With a fossil record spanning at least 100 Million years (Ma), atlantids have experienced and survived global-scale ocean changes and extinction events in the past. However, the diversification patterns and tempo of evolution in this family are largely unknown. Based on a concatenated maximum likelihood phylogeny of three genes (cytochrome c oxidase subunit 1 mitochondrial DNA, 28S and 18S ribosomal rRNA) we show that the three extant genera of the family Atlantidae, Atlanta, Protatlanta and Oxygyrus, form monophyletic clades. The genus Atlanta is split into two groups, one exhibiting smaller, well ornamented shells, and the other having larger, less ornamented shells. The fossil record, in combination with a fossil-calibrated phylogeny suggest that large scale atlantid extinction was accompanied by considerable and rapid diversification over the last 25 Ma, potentially driven by vicariance events. Now confronted with a rapidly changing modern ocean, the ability of atlantids to survive past global change crises gives some optimism that they may be able to persist through the Anthropocene.

Full-text

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