Thyasirid bivalves from ancient cold seeps and their evolution

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A systematic study of thyasirid bivalves from Cretaceous to Oligocene (ca. 145–23 Myr old) seep carbonates worldwide enabled us to distinguish ten species belonging to three genera: six species belonging to Conchocele Gabb, 1866; two to Maorithyas Fleming, 1950 and two to Thyasira Lamarck, 1818. Our review of the first occurrences of these thyasirids suggests that they could have originated at seeps and later colonized also “normal” marine environments. This pattern is surprising and needs further collection efforts to exclude a potential bias from an incomplete fossil record. Thyasirids appear to be of deep-water origin and the group was not influenced by the Cretaceous and Paleogene Oceanic Anoxic Events, as seen in other seep-inhabiting groups as well. Compared to other chemosymbiotic bivalves, thyasirids prefer low sulfide-levels and we speculate that this habitat preference is a legacy of their origin and radiation during the Cretaceous time of low marine sulfate concentrations and hence low sulfide-availability at seeps. Lastly, the thyasirids maintained a low diversity at seeps at least since the Late Cretaceous and do not show a significant rise of diversity after the mid-Eocene (ca. 48 Myr ago) rise of sulfide levels at seeps.