DIVERSIFICATION AND PARACLADE SURVIVORSHIP IN MORPHOSPACE

WAGNER, Peter J. Department of Paleobiology, MRC-121, Smithsonian Institution, Washington, D.C., 20560, U.S.A.

Many macroevolutionary scenarios focus on correlations between diversity patterns and morphology, especially when morphologies are associated with basic trophic strategies. These scenarios often predict that clades in diversification patterns should differ in different regions of morphospace. This is explored here using data from Paleozoic (Ordovician - Devonian) gastropods. Gastropods with nearly planispiral and/or open-coiled shells and radial apertures are thought to have been sessile suspension feeders whereas species with moderate-to-high spires typically occupy mobile strategies among extant taxa. It often has been suggested that sessile suspension feeders display different diversity dynamics than do taxa occupying mobile habits. If the morphologic generalizations outlined above are typically true and if differences exist in the respective diversity dynamics of sessile and mobile taxa (as often suggested), then diversity dynamics should differ in across the morphospace.

To separate the correlations of clade membership from those of basic morphology, testing the basic ideas outlined above often requires a phylogenetic context as well as a morphospace. This is especially true if there is a strong association between clade membership and general morphology and/or trophic strategy. Such is the case with Paleozoic gastropods, as nearly-planispiral forms associated with sessile habits typify one major clade (the Euomphalina) whereas spired forms associated with mobile habits typify the other major clade (the Murchisoniina). However, sufficient numbers of convergent taxa in both clades permit adequate contrasts of grade and clade.

Euomphalinaes and murchisoniinaes display very different logistic diversifications, with the latter showing much higher peak diversity. The difference is even greater when contrasting diversity within "euomphalinae" morphospace with that within "murchisoniinae" morphospace, hinting that morphologic grade rather than clade membership is responsible. Survivorship is evaluated here based on the durations of paraclades within various arbitrarily defined regions of morphospace using different phylogenetic estimates. A paraclade's demise therefore coincides with the extinction of the last species within a certain morphologic range; daughter taxa outside that range are placed in new paraclades. The use of frequently paraphyletic taxa is appropriate here, as the hypotheses being tested concern the durations of different morphologies and whether certain regions of morphospace are less "stable" (i.e., more prone either to extinction or morphologic change) than others. Notably, survivorship is not significantly lower within the "euomphalinae" region of morphospace than in the "murchisoniinae" region. However, it appears lower in intermediate morphospace regions, suggesting the low-spired species tended to become nearly-planispiral or moderate-to-high spired forms. Differences in peak diversities apparently are not associated with differences in extinction intensities for morphotypes but instead likely are due to low origination intensities at relatively low levels of diversity.