TESTING FAUNAL ORIGINATION AND STABILITY IN THE HAMILTON GROUP USING PHYLOGENETIC ANALYSIS

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Recently it has been argued that faunal stability is a fundamental feature of the fossil record, with the long term stability of species and communities pervasive. It has been suggested that faunas in the fossil record show the following characteristic pattern: i) the appearance of large numbers of species (comprising the members of the fauna) relatively suddenly, ii) the persistence of this fauna and the communities it is made up of for a long period of time, iii) the sudden extinction of the fauna, and finally iv) the appearance of a new fauna. To determine whether or not this pattern truly is pervasive, the Middle Devonian Hamilton Group fauna of Eastern North America (ENA) was used as a case study. Phylogenetic analyses were conducted on a series of trilobite taxa in the Hamilton Group to determine if the appearance of these taxa in that fauna represents a single invasive event from one biogeographic region. Diversification within faunal boundaries was also studied to determine to what extent faunas and the communities they contain truly are stable.

Phylogenetic analyses indicated that the Hamilton Group fauna arrived in ENA from different biogeographic regions in several waves which could not be traced to a single tectonic event. This implies that faunas may originate piecemeal, with different taxa arriving from different regions at different times. In addition, differentiation occurred within faunal boundaries during the Middle Devonian. Thus, communities were probably changing throughout the persistence of the fauna. Within faunal boundaries, in some cases speciation fit a vicariant pattern, but there were also several episodes of intra-basinal dispersal reflecting responses to relative sea-level change. The chief aspects of the faunal stability model replicated in the Hamilton Group fauna were the long term morphological stability of species within the fauna, and the relative rapidity with which the fauna disappeared.