Paleobiogeography and completeness of the Early Eocene through Early Oligocene molluscan fossil record

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Incomplete and inconsistent data are among the most significant challenges for paleontologists undertaking the kinds of global analyses necessary for testing and developing concepts of paleobiogeography. Such analyses require adequate sampling of globally distributed fossil assemblages and an internally consistent and systematic source of data; the *Paleobiology Database* (www.paleodb.org) provides such a resource. The database presently comprises over 11,000 occurrences of Early Eocene-Early Oligocene molluscs, derived from nearly 3,000 faunal assemblages. While the database is now fairly comprehensive with regards to geographic coverage (so far as published data exists), significant effort has focused on the development of a sound taxonomic framework. This resource now permits adequate analyses of spatial relationships between faunal assemblages throughout the middle and late Paleogene.

This investigation demonstrates the utility of the database for analyzing patterns of distribution among marine invertebrate taxa. Specifically, these data are used to quantify changes in provincialism during the Eocene and Early Oligocene. Biogeographic units (realms and provinces), defined with both genus- and species-resolution data in the context of tectonic reconstructions, are shown for four geologic intervals across the Paleogene using consistent quantitative protocols. The faunal rosters of paleogeographic areas (5° paleolatitudinal and paleolongitudinal grid cells) are compared using standard biogeographic similarity measures and with endemism metrics for each time interval. A quantitative assessment is also made of the completeness of the reported molluscan fauna across the paleogeographic landscape in each geologic interval through analysis of sampled paleoenvironments and a comparison of body size distributions captured by the fossil record against modern baseline data.

The study succeeds in recognizing key features of previously published analyses of Cretaceous-Cenozic faunal provincialism, such as tethyan, neotropical, and southern hemisphere temperate realms. Biogeographic provinces (geographically and taxonomically distinct faunas) are also illustrated for each interval and indicate areas of high species-level endemism within each realm. Regions prone to active tectonics (resulting in accelerated burial and/or uplift and weathering) are susceptible to lithification and dissolution and often host a depauperate fossil record relative to areas along passive margins. However, active margins often preserve a broader range of paleoenvironments (shallow- and deep-water) than regions with passive tectonism. These data contribute to a greater understanding of the role that biogeographic gradients (beta diversity) play in varying biodiversity during the Paleogene, and provide insight into how geographically expressed preservational biases might be mitigated.