

PRESERVATIONAL, PALEOECOLOGICAL, AND EVOLUTIONARY PATTERNS IN THE WYOMING-MONTANA PALEOGENE AND SIWALIK NEOGENE RECORDS

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The Paleocene to early Eocene sequence of Wyoming-Montana and the Miocene to Pleistocene Siwalik record of Pakistan are exceptionally long, continental sequences, each containing a rich and well documented fossil record, especially of mammals. The two sequences are broadly similar in tectonic setting and sedimentary environment, in duration and facies changes, and in diversity of fossils. Each contains a paleoclimatic record in stable isotopes and, in the Paleogene, floras. Comparison of these two sequences has focused our attention on the interaction of tectonic, climatic, sedimentologic, and taphonomic factors that produce a particular fossil record and on the co-occurring ecological and evolutionary changes that result in a historical series of biotas, each the product of local and global events.

In the Paleogene record, the geographic scope of the record encompasses much of the floodbasin, and the spatial distribution of paleoenvironments formed fairly straightforward gradients from channel to distal floodplain. The Siwalik record has a smaller window onto a larger, heterogeneous fluvial system often with multiple, contemporaneous river systems that differ in magnitude. The spatial distribution of paleoenvironments was a mosaic without long proximal to distal gradients. In both records, major facies changes are correlated with striking changes in fossil productivity.

The overall pattern of fossil preservation by depositional environment differs substantially in the two areas. The Siwalik sequence has a greater variety of depositional environments that produce fossils throughout the section. The primary productive environment in the older part of the Paleocene record declined in productivity upsection, while a previously unproductive facies became the major source of fossils. Much of the record represents attritional accumulation in each area, but a significant portion is transported. The taphonomic processes that created fossil concentrations led to better taxonomic resolution for most Paleogene localities than in most Siwalik localities.

In each record, both aquatic and terrestrial components of the vertebrate faunas are correlated with facies. Since facies varied in productivity over time, some changes in faunal composition may have resulted from change in the prevalence or productivity of particular facies. At least one faunal turnover coincided with major facies changes in each sequence.

For mammals in each record, immigration rather than speciation in situ was the primary means of appearance of new species. Episodes of immigration were not closely followed by extinctions of resident species. Mean species longevity appears to have been more than twice as great in the Neogene than in the Paleogene record. Changes in faunal composition and species richness occurred during times of global climatic change; causal connections are still being explored. Changes in species richness did not track changes in relative abundance of taxa or changes in size within lineages or faunas. In terms of guild structure, the herbivore guild had high relative generic diversity through most of both sequences. The Paleogene record had a more even distribution of taxa in the five principal guilds, while the Siwalik record was heavily dominated by the herbivore guild. Size distributions differed substantially, reflecting the early and late windows into the mammalian radiation, rather than sampling bias.