

PATTERNS OF FAUNAL TURNOVER AND DIVERSITY IN THE SIWALIK NEOGENE RECORD IN RELATION TO REGIONAL AND GLOBAL EVENTS

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The fluvial Neogene Siwalik formations of northern Pakistan contain one of the longest and richest sequences of terrestrial vertebrate faunas known. The complete sequence extends from ca. 18 Ma to 1 Ma, with the interval between 18 and 7 Ma being best sampled. Throughout this best known interval vertebrate remains are frequently abundant in channel fills and less common in large channel sands, levees, and paleosols. Although the abundance and quality of fossil preservation varies, all stratigraphic levels have some fossils and the record of most subintervals is good to excellent. As a consequence the patterns of faunal turnover and changes in diversity can be documented and analyzed for 0.5 my long subintervals.

Thirteen orders of Siwalik mammals have been identified, with well sampled subintervals typically having 50 or more species. Despite the ordinal diversity, however, most Siwalik mammal species belong to just three orders: rodents, artiodactyls, and perissodactyls. Among the larger mammals, the bovids and equids are the most common and have the most species, while the murid and cricetid rodents dominate the small mammal assemblages. These Siwalik abundance and diversity patterns differ markedly from those of the Paleogene and are a result of Neogene radiations in these four families and extinction of Paleogene groups.

Between 18 and 7 Ma species diversity varies considerably. Among artiodactyls and rodents the number of species first increases between 15 and 13 Ma and then falls after 12 Ma. Significant changes in relative abundance are also known, including an increase in the abundance of bovids between 16.5 and 15 Ma and a very abrupt increase of murids at 12 Ma.

Data on stratigraphic ranges of rodents and artiodactyls show that faunal change in the Siwaliks was episodic, occurring as short intervals with high turnover, followed by longer periods with considerably less change. Maxima of first appearances occur at approximately 13.5 and 8.5 Ma, while maxima of last appearances come at 12.0, 9.5, and 8.0 Ma. It is thus apparent that in the Siwaliks increased extinction did not accompany or closely follow maxima of first appearances.

Correlations of these faunal events to global climatic trends are ambiguous. However, it is apparent that the middle Miocene diversification of Siwalik faunas occurred during a period of global cooling, while the late Miocene decline in diversity preceded a second episode of cooling and increasing aridity.