

NEOGENE SIWALIK MAMMALIAN LINEAGES: SPECIES LONGEVITIES, RATES OF CHANGE, AND MODES OF SPECIATION

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The Siwalik sequence, particularly the interval from 18 to 7 Ma, provides one of the few terrestrial data sets that allows direct measurement of temporal durations of mammalian species. Its data are drawn from a single biogeographic subprovince and superposed collections likely represent successive samples of single lineages. Observed temporal ranges underestimate total species longevity if (1) species existed in other biogeographic provinces before or after the temporal ranges recorded in the Siwaliks, or (2) the fossil record inadequately samples species durations in the Siwalik subprovince. Some data, notably from Afghanistan, China, and Thailand, bear on the first variable. The second can be controlled by considering data quality, in this case the temporal distribution of good data sets, to assess the scale of accuracy available for defining range endpoints. In general, range endpoints can be estimated to the nearest 0.1 million years.

The diverse Rodentia give a mean species longevity of 2.2 million years for the Miocene Siwaliks. This includes single records, but of course ignores unretrieved rare or short-lived taxa. The diverse Artiodactyla yield 3.1 million years. The difference may reflect greater body size and longer generation time; large Perissodactyla and Proboscidea have longer temporal ranges. Carnivorous mammals also show about 3 million year durations. Given these data, the average longevity for *Sivapithecus* species (1.6 million years) is modest. The deposits of the Clarks Fork Basin, Wyoming, offer a Paleogene data set comparable to that of the Neogene Siwaliks. Paleocene-Eocene mammals of North America yield shorter longevity (most less than one million years).

Extinction is the dominant mode of species termination for Siwalik mammals. Most taxa originated by immigration (as at about 13.5 Ma) or abrupt speciation. There are some cases for *in situ* transformation of lineages, for example in the genera *Punjabemys*, *Antemus*, *Percrocuta*, *Dorcatherium*, *Giraffokeryx*, and *Selenoportax*. The rodent *Kanisamys* shows a rate of increase in tooth size of 0.5 darwins. This overall rate is moderate by Paleogene standards, but includes an interval of more rapid change between 9.0 and 8.5 Ma.