

TAPHONOMY OF PALEOGENE AND NEOGENE VERTEBRATE ASSEMBLAGES

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The Paleogene of Wyoming and Montana and the Neogene Siwaliks of Pakistan contain deposits representing a wide variety of terrestrial environments. Although fossils are preserved in all of these environments, fossil vertebrates are abundant in only certain facies. These principal preservational environments vary within and, particularly, between formations in each region.

The Bighorn and Crazy Mountain basins of Wyoming and Montana contain abundant remains of Paleocene and Eocene vertebrates. Over 1800 localities in this region have been established in the Paleocene Fort Union and Paleocene to Eocene Willwood formations. The distribution of vertebrate remains changes dramatically upsection in this sequence. The Fort Union consists of thick fluvial sandstones and minor swampy floodplain mudstones in the lower part, and more widely separated channel sandstones interbedded with better drained floodplain deposits that include paleosol horizons in the upper part. These changes reflect a local increase in aggradation rate. Vertebrates are preserved almost exclusively in channel mud-clast conglomerates in the lower part of the formation, but appear in a wider variety of environments (channels, splays, swamps, and paleosols) in the upper part. The Willwood Formation continues the changes evident in the upper Fort Union. With increased aggradation rates, floodplain deposits became thicker and more well drained. Except for rare occurrences in other environments (channels, a variety of calcareous environments, and oxbows), fossils are recovered primarily from paleosol horizons developed in fine grained floodplain deposits.

The Fort Union channel deposits contain assemblages that are often highly biased samples of faunal composition with large aquatic taxa well represented and small terrestrial forms unevenly represented. The upper Fort Union and Willwood floodplain paleosols contain more homogeneous (and therefore comparable) assemblages. These paleosols differ systematically, however, in terms of soil maturity and vertebrate composition, and they are commonly biased against large or aquatic taxa.

The distribution of Siwalik vertebrate localities among sedimentary environments is known for four formations spanning early middle to late Miocene: Kamlial, Chinji, Nagri, and Dhok Pathan. The principal deposits in which fossils occur are: major stream channel complexes, secondary (floodplain) channels, crevasse splays, and floodplains. The Kamlial and Nagri formations, dominated by coarse lithologies (>50% sandstone), are notably less productive of fossil localities than the Chinji and Dhok Pathan formations, dominated by fine grained lithologies (>50% mudstone). In the Kamlial and Nagri formations, major channel complexes form the most prevalent environment, and more localities are associated with these channels than with any other environment. In the Chinji and Dhok Pathan formations, the most prevalent environment is floodplain, but more localities are associated with the secondary channels on these floodplains than with any other environment. In the Chinji Formation, most localities developed in secondary channels occur in fining-upward fill sequences, whereas in the Dhok Pathan Formation, most sites in these channels occur in their lag deposits. In these more productive formations, the abundance of certain mammalian taxa is correlated with specific depositional environments. Change upsection in the abundance of these taxa could result largely from change in facies productivity.

The taphonomy of the two areas is similar in that channel lag deposits are an important source of fossil vertebrates. The major difference is that the Rocky Mountain Paleogene contains fewer, but highly productive, environments that changed significantly through time, including the Eocene emergence of floodplain paleosols as the primary environment of vertebrate preservation.