

PATTERNS OF FAUNAL TURNOVER AND DIVERSITY IN THE WYOMING-MONTANA PALEOGENE IN RELATION TO REGIONAL AND GLOBAL EVENTS

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The Bighorn Basin of Wyoming and its northerly extension, the Crazy Mountains Basin of Montana, contain a continuous record of the middle Paleocene through early Eocene mammalian biota. This interval, spanning some eight million years, is subdivided into 18 faunal zones. Durations of the zones, ranging from 0.3 to 0.75 million years, are extrapolated from intrabasinal depositional rates and correlated with the early Tertiary paleomagnetic reversal record. This stratigraphic resolution allows us to document in detail regional diversity and turnover.

In the Bighorn and Crazy Mountains basins, standing generic richness (estimated number of genera at the midpoint of an interval) decreased slightly between the Torrejonian and Tiffanian (middle and late Paleocene), increased from the latest Tiffanian and Clarkforkian (latest Paleocene) to the early Wasatchian (early Eocene), and declined during the later Wasatchian.

Changes in diversity reflect first and last appearances (including originations, extinctions, and dispersal). Because first and last appearance rates are in part dependent on diversity and the duration of each interval, we plot generic turnover as rate quotients, ratios of observed to expected first or last appearances. Expected turnover rates are calculated from multiple regression of turnover on duration and generic richness. Turnover rates are evaluated in relation to the quality of the fossil record for each interval. Rate quotients show that the slight decline in generic richness in the Bighorn and Crazy Mountains basins between the Torrejonian and Tiffanian resulted from a higher than expected disappearance rate at the end of the Torrejonian. Lower than expected disappearance rates and higher than expected appearance rates in the early Clarkforkian and, particularly, the earliest Wasatchian contributed to the increase in richness during this period. The middle through late Wasatchian decline in generic richness resulted from surprisingly low appearance and high disappearance rates.

There was little change in taxonomic composition of faunas between the middle and late Paleocene; faunas from this interval were dominated by archaic groups (e.g., "condylarths", multituberculates, plesiadapiforms). In contrast, faunal composition changed markedly during the latest Paleocene and the early Wasatchian, with the introduction of major modern groups (e.g., rodents, artiodactyls, perissodactyls, primates) and the decline in diversity of the archaic forms that dominated earlier Paleocene faunas. There is strong evidence that this faunal change was influenced by global climatic factors: climatic warming, beginning in the latest Paleocene, opened new routes for intercontinental dispersal, and had a major effect on worldwide patterns of faunal composition and diversity, including those of the Bighorn and Crazy Mountains basins.