Major extinction events [edit]

In a landmark paper published in 1982, Jack Sepkoski and David M. Raup identified five mass extinctions. They were originally identified as outliers to a general trend of decreasing extinction rates during the Phanerozoic,[7] but as more stringent statistical tests have been applied to the accumulating data, the "Big Five" cannot be so clearly defined, but rather appear to represent the largest (or some of the largest) of a relatively smooth continuum of extinction events.[7]

1. **Cretaceous–Paleogene extinction event** (End Cretaceous, K-T extinction, or K-Pg extinction): 66 Ma at the Cretaceous(Maastrichtian)-Paleogene(Danian) transition interval.[8] The K–T event is now officially called the Cretaceous–Paleogene (or K–Pg) extinction event in place of Cretaceous-Tertiary. About 17% of all families, 50% of all genera[9] and 75% of all species became extinct.[10] In the seas it reduced the percentage of sessile animals to about 33%. All non-avian dinosaurs became extinct during that time.[11] The boundary event was severe with a significant amount of variability in the rate of extinction between and among different clades. Mammals and birds emerged as dominant land vertebrates in the age of new life.
2. **Triassic–Jurassic extinction event** (End Triassic): 200 Ma at the Triassic-Jurassic transition. About 23% of all families, 48% of all genera (20% of marine families and 55% of marine genera) and 70% to 75% of all species went extinct.[9] Most non-dinosaurian archosaurs, most therapsids, and most of the large amphibians were eliminated, leaving dinosaurs with little terrestrial competition. Non-dinosaurian archosaurs continued to dominate aquatic environments, while non-archosaurian diapsids continued to dominate marine environments. The Temnospondyl lineage of large amphibians also survived until the Cretaceous in Australia (e.g., *Koolasuchus*).
3. **Permian–Triassic extinction event** (End Permian): 251 Ma at the Permian-Triassic transition. Earth's largest extinction killed 57% of all families, 83% of all genera and 90% to 96% of all species[9] (53% of marine families, 84% of marine genera, about 96% of all marine species and an estimated 70% of land species, including insects).[12] The evidence of plants is less clear, but new taxa became dominant after the extinction.[13] The "Great Dying" had enormous evolutionary significance: on land, it ended the primacy of mammal-like reptiles. The recovery of vertebrates took 30 million years,[14] but the vacant niches created the opportunity for archosaurs to become ascendant. In the seas, the percentage of animals that were sessile dropped from 67% to 50%. The whole late Permian was a difficult time for at least marine life, even before the "Great Dying".
4. **Late Devonian extinction**: 375–360 Ma near the Devonian-Carboniferous transition. At the end of the Frasnian Age in the later part(s) of the Devonian Period, a prolonged series of extinctions eliminated about 19% of all families, 50% of all genera[9] and 70% of all species.[*citation needed*] This extinction event lasted perhaps as long as 20 Ma, and there is evidence for a series of extinction pulses within this period.
5. **Ordovician–Silurian extinction events** (End Ordovician or O-S): 450–440 Ma at the Ordovician-Silurian transition. Two events occurred that killed off 27% of all families, 57% of all genera and 60% to 70% of all species.[9] Together they are ranked by many scientists as the second largest of the five major extinctions in Earth's history in terms of percentage of genera that went extinct.

Despite the popularization of these five events, there is no fine line separating them from other extinction events; indeed, using different methods of calculating an extinction's impact can lead to other events featuring in the top five.[15]