

# EXTINCTION AT THE FIFTH AND SIXTH MASS EXTINCTION – A FRESHWATER PERSPECTIVE

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Earth's biodiversity faces a massive decline today. Because of the magnitude of the already observed and future predicted change, many scientists consider the current biodiversity crisis an incipient "sixth mass extinction". The current crisis resembles the previous, fifth mass extinction event at the Cretaceous–Paleogene (K–Pg) boundary 66 million years ago in terms of the rapidity of the change – an asteroid impact paired with extreme weather conditions in the successive months/years vs. anthropogenic impact and climate change. The fifth mass extinction is well understood for terrestrial and marine biota, but little data are available on freshwater biota. Freshwater vertebrate faunas seem to experience a much lesser decline of 10–22% (compared to the global average of 76%). However, vertebrates make up only a minor proportion of freshwater biota, and no comprehensive data are available for invertebrates. We estimated speciation and extinction rates for a large dataset spanning the fossil record of freshwater gastropods of Europe, with 3,122 species from 24,759 fossil occurrences from Jurassic to Pleistocene deposits. To compare the impact of the sixth versus the fifth mass extinction, we predicted future extinction rates and species loss based on conservation statuses of the extant European freshwater gastropod fauna. The results were alarming. While our reconstructions show that already the fifth mass extinction has been dramatically underestimated – 92.5% of the gastropod species go extinct and the extinction rate is an order of magnitude higher than the background rate – the predictions for the future are much worse. Our estimates suggest that a third of the modern European gastropod fauna may be lost within 100 years. The estimated extinction rate is approximately a thousand times higher than for the fifth mass extinction event. Our results once more highlight the devastating prospects for Earth's biota and the need for immediate action.