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Estimation of past extinction rates to predict future diversity loss

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In recent years, we have been witnessing well-recorded, dramatic declines in population sizes of numerous species and several instances of extinction, which can be attributed to a large extent to the impact of our own species. These negative trends raise concerns about the future of biodiversity. However, in order to properly assess the magnitude and severity of the current rate of species loss, we need to understand, how many extinctions we would expect under natural conditions, including fluctuations in climate. Here we use recent mammal extinctions to infer diversity loss during the past 130,000 years (130 ka), a time period with significant fluctuations in world climate. Using Bayesian analysis we estimate that the extinction rates have increased 1000-fold within this time frame. The rapid increase in extinction rates does not follow climatic variations but rather coincides with the accelerated population growth and expansion of Homo sapiens. We contrast fossil-based extinction rates with species-specific extinction risk assessments provided by the IUCN (International Union for Conservation of Nature). We develop a simulation framework to use IUCN assessments as well as past extinction rates to model future extinctions. The results show that we are entering an unprecedented extinction of mammal species, which may lead to a loss of hundreds of mammalian species by the year 2100. This would equate to a further increase of extinction rates by orders of magnitude in comparison to the extinction rates estimated for the recent past. Our simulations show, however, that efficient conservation management has the potential to decrease future species losses significantly.