The Pleistocene overkill

More than half of the planet's large mammal species have become extinct since the last Interglacial, which ended about 120,000 year ago. Whilst this has happened all over the world, the extent of these extinctions is not geographically uniform, with Europe, northern Asia, the Americas and Australia experiencing a far greater number and proportion of mega-fauna extinctions than Africa and southern Asia.

For over fifty years there has been a heated debate about what has caused these extinctions. In 1966 Paul S. Martin (1966) formulated the Pleistocene overkill hypothesis in the journal Nature. This hypothesis has been tested in many publications. Almost ten years ago researchers at the University of Aarhus published the results of their examination of the correlations between the number of extinct large mammals, human pressure and changes in temperature and precipitation (Sandom et al. 2014). This month an article was published in the journal Anthropocene, that, again, presents good evidence that hunting by man, rather than climate change, was the main cause of these extinctions (Lemoine et al. 2023).

Africa is the continent of the origins of modern man. From there they first occupied southern Asia and then expanded in other directions. Remmert (1982) has put forward evidence that the reason for the relative richness of the African mammal fauna is a very early co-evolution between evolving man and the mega-fauna of this continent. Continents without such an early co-evolution, like the Americas, suffered severe losses of their native mega-fauna when early hunters invaded them. Hortolà and Martínez-Navarro (2013) put forward another explanation. They argue that mega-fauna have only survived until recent times in areas where modern man has not been able to thrive: basically the African savannahs and rainforests and the Southern Asian rainforests. Tropical rainforests are not the best habitat for *Homo sapiens* and its predecessors, so until recently they have remained sparsely inhabited. The vast African savannahs are areas where human settlement has been historically limited due to the tsetse fly (*Glossina* spp.), which transmits the deadly sleeping sickness.

It has even been suggested that Neanderthal man and the closely related Denisova man were also victims of the invasion of modern man into Eurasia. Hortolà and Martínez-Navarro (2013) argue that those two extinct archaic *Homo* species should be considered to be part of the Pleistocene overkill. Except in its native continent of Africa, in the other continents *Homo sapiens* could be considered as an invasive species, and since the Industrial Revolution, following its exponential demographic increase, as a worldwide pest species. It seems that Palaeolithic man did not

exploit the mega-fauna in a sustainable way and depleted it, including some of history's most charismatic species. They were aggressive and skilful hunters, perhaps even eradicating archaic man.

Given the big impact of large-bodied animals on vegetation structure, plant dispersal, nutrient cycling and co-dependent biota, the simplification and downsizing of mammal faunas worldwide represents the first planetary-scale, human-driven transformation of the environment. It has been argued that the start of the Pleistocene overkill should be the beginning of the envisaged new geological epoch: the early Anthropocene (Malhi 2017). However this claim seems to be exaggerated, as it would mean that the Holocene should be ignored.

The Dutch atmospheric chemist and Nobel Prize laureate Paul J. Crutzen proposed taking the start of the Industrial Revolution in the 1780s as the starting point of the Anthropocene. He has widely popularised the term 'Anthropocene' and has argued that the influence of human behaviour on the Earth's atmosphere since the Industrial Revolution is so significant as to constitute a new geological epoch for its lithosphere (Crutzen 2002).

In 2009, the International Union of Geological Sciences (IUGS) created the Anthropocene Working Group. In May 2019 a large majority of this working group voted in favour of denoting the present geological time period as the Anthropocene, which started around the mid-twentieth century. This starting point is much later than the Industrial Revolution, as proposed by Paul Crutzen. The IUGS argued that the most notable changes in the lithosphere, such as the worldwide radioactive fallout from testing of hydrogen bombs, have happened from the 1950s, much later than the changes in the atmosphere. It is expected that the congress of the IUGS in 2024 will approve the recommendations of their Anthropocene Working Group. After the approval the Anthropocene will be official. This will be a 'late' Anthropocene.

On the subject of hunting large mammals, albeit marine mammals, this issue of Lutra contains an article by Koken et al. which presents a new reconstruction of a mass-stranding of long-finned pilot whales (*Globicephala melas*) in 1825 in the south-western Netherlands. After an extended study of sources, the authors conclude that at least some of the 38 stranded animals were victims of an opportunistic drive hunt.

There is more on sea mammals in this issue. For almost a hundred years the Netherlands has had a system for registering stranded cetaceans. However, until the 1970s the harbour porpoise (*Phocoena phocoena*) was not sufficiently registered, as their numbers were initially very high compared to the other cetaceans. Keijl and Niessen use the old notebooks of two birdwatchers to (partially) close the registration gap between 1931 and 1970.

The other two papers in this issue of Lutra highlight terrestrial mammals. Researchers from two Flemish institutes (the Research Institute for Nature and Forest and the Agency for Nature and Forests) present an account of attempts to control a population of the invasive Reeve's muntjac (*Muntiacus reevesi*) in a large park near the city of Antwerp (D'hondt et al). The authors also provide suggestions on how to improve control practices for this species.

In a final paper, van Manen describes the frequency pattern over time, and interactions of, scavengers, both mammalian and avian, visiting a carcass of a wild boar in a natural setting in a Polish forest. The scavengers were recorded by a camera trap continuously for two months, after which the carcass had disappeared.

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