Researchers shed new light on the genetic history of the European beaver

February 17 2014

An international team of scientists has used detailed analysis of ancient and modern DNA to show that the distribution and lack of genetic diversity among modern European beavers is due largely to human hunting.

The research, which was led by University of York researcher Professor Michi Hofreiter, provides important new insights into the genetic history of the Eurasian beaver *Castor fiber*. Crucially, it shows the European beaver has been strongly affected by expanding human populations for many thousands of years.

The researchers say that centuries of hunting, rather than changing climate conditions since the beginning of the Holocene (or recent) period, accounts for the lack of genetic diversity, as well as the geographic distribution of genetic diversity, seen in modern European beavers.

The research, which also involved researchers from Germany, USA, Norway, New Zealand, Russia, Poland, Sweden, Austria and the Netherlands, is reported in the journal *Molecular Ecology*.

Through DNA sequencing, the research team discovered that the Eurasian beaver can be divided into three distinct groups. The two main ones are in western and eastern Europe, with a now extinct, and previously unknown, third group in the Danube basin. This population existed at least 6,000 years ago but went extinct during the transition to

modern times.

Professor Hofreiter, from York's Department of Biology and the University of Potsdam's Faculty of Mathematics and Life Sciences, said: "While beaver populations have been growing rapidly since the late 19th century when conservation efforts began, genetic diversity within modern beaver populations remains considerably reduced to what was present prior to the period of human hunting and habitat reduction.

"In addition, the rapid loss of diversity prior to conservation efforts appears to have established a very strong pattern for the geographic distribution of genetic diversity among present-day beaver populations."

Beavers have long been an important resource for human populations across the northern continents. Their fur is of exceptional quality, and has been a highly traded commodity. Beavers have also been hunted for meat and for castoreum - an anal gland secretion often used in traditional medicine. Stone engravings at Lake Onega in northern Europe indicate that beavers played a role in ancient human societies from around 3,000-4,000 years ago.

After centuries of human hunting, the Eurasian beaver had disappeared from most of its original range by the end of the 19th century, with only an estimated 1,200 beavers remaining.

The research team set out to discover whether the lack of genetic diversity and strong phylogeography (geographic distribution of genetic diversity) seen today are the result of its near extinction, or already existed prior to the reduction in its range. To do this, they examined DNA from 48 ancient beaver samples, ranging in age from several hundred to around 11,000 years old, and 152 modern DNA sequences.

The experimental work was carried out in Leipzig, Germany.

Corresponding author Dr Susanne Horn, from the Max Planck Institute for Evolutionary Anthropology, Leipzig, said: "We found that overall there was more genetic diversity in the past. Apparently, already in ancient times an ancient contact zone existed between the eastern and western populations of beavers in the Oder River area. This is close to a present-day contact zone in Germany and Poland."

Professor Hofreiter added: "The present-day contact zone was assisted by conservation management and members of the eastern and western population groups meet there today as they did in the past. This suggests that conservation management may, in the long run, help to restore the pre-human impact population structure of threatened species."

More information: "Ancient mitochondrial DNA and the genetic history of Eurasian beaver (Castor fiber) in Europe." Susanne Horn et al. *Molecular Ecology* 2014. DOI: 10.1111/mec.12691

Provided by University of York