

# New insights into the evolutionary history of bears

June 12 2014

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Amerikanischer Schwarzbär. Credit: Tobias Bidon

According to researchers of the LOEWE Biodiversity and Climate Research Centre (BiK-F), Goethe University Frankfurt and the U.S. Wildlife Service several bear species that today only occur in America or in Asia have hybridized in their evolutionary history. The Beringia land bridge, which in former times connected the habitats of these species, might have enabled their encounter. The large-scale study is based on the

comparison and analysis of genetic material of all bear species that still exist. The results have been published recently in the journal *Molecular Biology and Evolution*.

If in documentaries or in the zoo - everyone has seen and knows about [brown bears](#), [polar bears](#) and pandas. However, there are several other bear species in Asia and South America that are less well-known, such as the sloth bear, the Asiatic or the spectacled bear. There are eight bear species that still exist worldwide. Despite many years of research, the exact relationships between them remain unresolved.

## **Who with whom? Polar bear and brown have hybridized**

Previous analyses of [genetic material](#) of polar [bears](#) and brown bears have proven already that the two species have hybridized during their long evolutionary history. This behavior can still be observed today and the ongoing climate change drives the bear even closer. It is therefore likely that there have been similar exchanges of genetic material between other species of the bear family.

### **... as well as brown bears and black bears**

To shed light on this, a team of the German Biodiversity and Climate Research Centre (BiK-F) and the Goethe University Frankfurt in cooperation with colleagues from the US have now analyzed certain genome parts of all bear species alive today. "We were able to show that several bear species have hybridized during their evolutionary history. The exchange can still be traced in the genetic makeup of today's bears," says the lead author of the study, Verena Kutschera (BiK-F). This mix-up makes it difficult to classify some gene fragments as belonging to a particular species.

## **Beringia land bridge serving as an intercontinental meeting point**

Surprisingly, several bear species which nowadays live on different continents have also taken part in the mating and thus gene exchange. This may have been possible because the significantly lower sea level during past ice ages resulted in a land bridge between Asia and North America, the Beringia [land bridge](#). Thus the ancestors of today's bear species, e.g. of the Asiatic black bear and the American black bear, had the opportunity to meet and to mate.

## **Darwin's species tree is insufficient to map complicated relationships**

All eight bear species that occur today have well adapted to their present habitat and differ physically very much. A prime example for this is polar bears and [black bears](#). Nevertheless, the speciation of some individual genes has not finished yet which additionally complicates the research of the evolution of bears.

With new molecular methods more gene parts might be discovered in the genomes of mammal species that could originate from other species. Apparently separate genetic lineages turn out to have merged – sometimes repeatedly – during the evolutionary history and exchanged genetic material with each other. "The traditional pedigree already used by Darwin is not always suitable to map [evolutionary history](#) in full detail. So-called phylogenetic networks are more useful to depict the genetic mix-up that we have found", comments evolutionary biologist Prof. Dr. Axel Janke, BiK-F, leader of the research team. The study demonstrates that evolution often is not a linear process; thanks to modern molecular methods its complex processes are finally revealed.

**More information:** Kutschera, V. et al. "Bears in a forest of gene trees: Phylogenetic inference is complicated by incomplete lineage sorting and gene flow" – *Molecular Biology and Evolution*, [DOI: 10.1093/molbev/msu186](https://doi.org/10.1093/molbev/msu186)

Provided by Senckenberg Research Institute and Natural History Museum

Citation: New insights into the evolutionary history of bears (2014, June 12) retrieved 26 April 2024 from <https://phys.org/news/2014-06-insights-evolutionary-history.html>

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