

Gene analyses reveal that there are not one, but four giraffe species

Frankfurt, Germany, 08/09/2016. Scientists from the Senckenberg and the Giraffe Conservation Foundation have analysed the genetic relationships of all major populations of giraffe in the wild. The large study on the genetic makeup of giraffe, published today in "Current Biology", shows that there are four distinct giraffe species. Until now, only one giraffe species had been recognized. The unexpected results are based on analyses using several nuclear marker genes of more than 100 animals. The new insights are set to improve protection efforts of these endangered animals in Africa.

Despite their large size and iconic presence, giraffe have been incompletely explored until now, with many aspects of their biology poorly understood. Latest estimates have revealed that giraffe numbers have plummeted by >35% over the past 30 years down to approximately 100,000 individuals across their range in Africa. Traditionally giraffe are classified as one species with nine subspecies based on coat patterns, ossicone (horn) structure and geographical distribution – now, this view has to be thoroughly revised.

"We have studied the genetic relationships of all giraffe subspecies from across the continent. We found, that there are not only one, but at least four genetically highly distinct groups of giraffe, which apparently do not mate with each other in the wild. This we found looking at multiple nuclear genes considered to be representative of the entire genome" says Professor Axel Janke, researcher at the Senckenberg Biodiversity and Climate Research and Professor at the Goethe University in Frankfurt, Germany. "Consequently, giraffe should be recognized as four distinct species despite their similar appearance."

The four distinct giraffe species are (1) **southern giraffe** (*Giraffa giraffa*), comprising two distinct subspecies, Angolan (*G. g. angolensis*) and South African giraffe (*G. g. giraffa*), (2) **Masai giraffe** (*G. tippelskirchi*), (3) **reticulated giraffe** (*G. reticulata*), and

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Press Images



Angolan giraffes (*G. g. angolensis*), previously *G. c. angolensis* in Northwest Namibia
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These animals have been previously classified as Rothschild's giraffe (*G. c. rothschildi*) but are should be synonymised with Nubian giraffe (*G. c. camelopardalis*), as they are genetically identical
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(4) **northern giraffe** (*G. camelopardalis*), which includes Nubian giraffe (*G. c. camelopardalis*), West African giraffe (*G. c. peralta*) and Kordofan giraffe (*G. c. antiquorum*) as distinct subspecies.

The study and new classification is based on more than hundred skin biopsy samples from all previously recognized giraffe subspecies, which were collected by the Giraffe Conservation Foundation (GCF) and partners over the past decade including in remote areas and civil war zones. These giraffe DNA samples were then analyzed by Janke's research group at the Senckenberg Biodiversity and Climate Research Centre in cooperation with colleagues from the Senckenberg Natural History Collections of Dresden, Germany. The sample set included for the first time the elusive Nubian giraffe, the nominate subspecies (*G. c. camelopardalis*) – the “camel-leopard” – described by Linnaeus in 1758 on the basis of a 200-year-old record.

The large-scale analysis of giraffe DNA also yielded further surprising insights. The formerly recognized subspecies Rothschild's giraffe (*G. c. rothschildi*) turned out to be genetically identical with Nubian giraffe, and thus should be synonymized with this subspecies. Similarly, the genetic studies supported previous findings by the team that could not differentiate the formerly recognized subspecies Thornicroft's giraffe (*G. c. thornicrofti*) with Masai giraffe (*G. c. tippelskirchi*). Additionally, research into the history of the distinct species showed that their last common ancestor lived about 0.4-2.0 million years ago, which yields a rate of speciation that is typical for mammals.

“Species conservation is based on understanding the numbers, range and threats to the species. To date, the estimated total number of all giraffe has until now not been considered a particular threat for the species' survival. However, as we now recognize four distinct species as well as some genetically unique subspecies, some of their biodiversity is very much under threat,” explains Janke. “In particular, GCF estimates that there are maybe as few as 400 West African giraffe remaining in the wild and restricted to a small communal area in Niger. Although it is not a distinct species, this subspecies is genetically unique and requires increased special protection along with the other distinct species.”

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Dr. Julian Fennessy, first author of the study and Co-Director of GCF adds, "Now that we know that there are four giraffe species, it is even more important and urgent to support governments and other partners across Africa to protect giraffe. We rightly worry about the fate of the African elephant, with an estimated 450,000 in the wild. By contrast, the numbers of three of the four giraffe species are rapidly declining, and two numbering <10,000 individuals in total. I think we should start working together to secure the future of giraffe in Africa and take action before it is too late."

To study and understand nature with its limitless diversity of living creatures and to preserve and manage it in a sustainable fashion as the basis of life for future generations – this has been the goal of the Senckenberg Gesellschaft für Naturforschung (Senckenberg Nature Research Society) for almost 200 years. This integrative “geobiodiversity research” and the dissemination of research and science are among Senckenberg’s main tasks. Three nature museums in Frankfurt, Görlitz and Dresden display the diversity of life and the earth’s development over millions of years. The Senckenberg Nature Research Society is a member of the Leibniz Association. The Senckenberg Nature Museum in Frankfurt am Main is supported by the City of Frankfurt am Main as well as numerous other partners. Additional information can be found at www.senckenberg.de.

*2016 is the Leibniz year. On the occasion of the 370th birthday and the 300-year death anniversary of polymath Gottfried Wilhelm Leibniz (*7/1/1646 in Leipzig, † 11/14/1716 in Hanover), the Leibniz Association is organizing an extensive topical year. Under the title “The best of all possible worlds” – a Leibniz quote – it brings into focus the diversity and timeliness of the subject matter currently studied by the scientists at the 88 Leibniz institutions across the Federal Republic of Germany. www.bestewelten.de*