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“Old genes are found in many young species”

Genes of the diverse Lake Victoria cichlid fish radiation in Africa are much older than the species themselves and the lake in which they live

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The adaptive radiation of cichlid fishes of Lake Victoria in Africa is one of the most famous and diverse groups of species. Known as the Lake Victoria superflock of cichlid fishes, more than 500 hundred of extremely closely related species are thought to have originated in less than 100 000 years. No other group of species originated this fast. This species flock contains a huge range of species that vary in colours and body shapes. Some of this variation is caused by evolution to different ecological niches. Especially in the hunt for particular types of diets bizarre adaptations such as algae scraping, snail crushing or paedophagy (eating of the young of other cichlids out of the mouths of their mothers) evolved. Other variation between species, such as colour, is probably due to sexual selection on males' colouration. Knowledge of the ecology and genetics helps to understand the processes of speciation and is fundamental to understanding how biodiversity evolves.



Biologists and geologists have long debated the mechanisms of speciation and the evolutionary history of the cichlid fishes in Lake Victoria. The lake basin is about half a million years old. Geological and palaeoclimatological data suggest that Lake Victoria, the second largest lake of the world, equal in surface area to the size of Ireland, and the surrounding region completely dried out during a period of profound climate change. It that was caused by several centuries of warming and drying in the late Pleistocene 18,000 – 15,000 years ago. However, if that were so, then the 500 species of cichlids that only live in Lake Victoria must have evolved since the lake refilled with water only about 15,000 years ago, implying an even faster rate of speciation than was previously thought.

A team of biologists from the University of Konstanz (Germany) and the Royal Belgian Institute of Natural Sciences (Belgium), used cutting-edge genetic analyses to study the age of the superflock. They found that the adaptive radiation is in fact much older than the current Lake Victoria itself in which they live now. Therefore the fishes and most of the gene variants they carry today must have survived the Pleistocene drying-up of the previous Lake Victoria in a different habitat near Lake Victoria. By tracing the migration of the superflock, the biologists identified that neighbouring and much deeper Lake Kivu is where the superflock originated. Further, they identified in the fishes' population genetics that a dramatic decrease in population size of the superflock occurred 18,000 to 15,000 years ago, coinciding with late Pleistocene drastic climate change. "Our study shows that most species died during that Pleistocene drying up of Lake Victoria, but some ancestors and many of their older genes did survive this period of severe climate change".

Their results are published "early online" in the week of July 27 issue of the Proceedings of the National Academy of Sciences USA.

Picture credits: "Haplochromis sp." Endemic cichlid fish to Lake Victoria by Erwin Schraml

More information:

Journal webpage: Proceedings of the National Academy of Sciences USA
<http://www.pnas.org/>

Local lab webpage:

www.naturalsciences.be/institute/structure/molelabo/vertebrates

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