



Press release

Evolution: Vangas beat Darwin's finches in diversity

Frankfurt am Main, Germany, April 19, 2012. The diversity of the Madagascan vangas is unique. The bird family only consists of 22 species, but these cover the whole range of body size of the passerines, the bird group vangas belong to (6,000 species). Whereas smaller species use their comparatively small bill to feed by picking up insects, the largest among the vanga species may even catch amphibians with its very large bill. Thus vangas are much more diverse than Darwin's finches, known to be a model for rapid evolution. As a study published now in "PNAS" shows, Vangidae are the only known birds which experienced two peaks of rapid diversification. For birds, only one such peak is common.

The 22 Madagascan vanga species differ considerably from one another. Each species looks different, has a different body size and a different kind of bill specially adapted to their diet. The Nuthatch Vanga (13 centimeters small) usually feed on insects which it picks up in bushes using its small bill. Sickle-billed Vangas (30 centimeters large) on the contrary have a large curved bill which allows the birds to scratch under tree bark in their search for edible insects. Last but not least, Helmet Vangas are equipped with a stunningly huge blue bill in which lizards, frogs or even geckos may end up. The song birds which are endemic to Madagascar are therefore even more diverse than the well-known Darwin's finches. Researchers from the German Biodiversity and Climate Research Center in Frankfurt, the Center for Macroecology, Evolution and Climate, University of Copenhagen, Denmark and other German, Swedish and French research institutes have now constructed a complete, dated species-level phylogeny to discover how this diversity came about.

At home on Madagascar

It is now 25 million years ago that an originally African ancestor of the Vangidae arrived on Madagascar. Many potential predators and competitors

For further information, please contact:

Dr. Susanne Fritz
LOEWE Biodiversity and Climate
Research Centre
Forschungszentrum (BiK-F)
phone +439 69 7542 1803
email:
susanne.fritz@senckenberg.de

oder

Sabine Wendler
LOEWE Biodiversity and Climate
Research Centre (BiK-F), Press
officer
phone +49 69 7542 1838
email:
sabine.wendler@senckenberg.de

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Press images:



<Helmet Vanga.jpg>
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Helmet vangas measure up to 30 centimeters. The bird has a huge blue bill which it uses to catch lizards, frogs and geckos.

had not reached the island at this time. This allowed the vangas to quickly occupy ecological niches, diversify and spread across the island. "This first bout of rapid diversification resulted in vanga species which differ considerably in terms of body size. These older species feed on insects which they catch in mid-air or in vegetation" says one of the authors of the study, Dr. Susanne Fritz, at the Biodiversity and Climate Research Centre (BiK-F). Once the ecological niche space was filled by the new species, the rate of diversification decreased significantly. Well-known examples of this evolutionary pattern on islands are the Darwin's finches found on the Galápagos islands. Until now, Madagascan vangas were also viewed to be a textbook example of this process.

New foraging strategy led to second peak of diversification

However, the new study shows that the first peak of diversification was followed by a second one around ten to five million years ago – something that is highly unusual for birds. "Our computer-based models indicate that this unexpected second peak of diversification was caused by an increase in available ecological niche space. One potential explanation might be that the birds simply spread into new areas. However, the vangas only occur on Madagascar. Instead, we show that this second peak of diversification most probably followed the morphological key innovation of a new shape of bill" explains Dr. Fritz. At that time, a group of vangas with very long, sometimes curved bills emerged, such as the Sickle-bill Vanga. These bills enabled the new species to retrieve insects hidden under the bark of trees, and so occupy a new dietary niche.

First evidence for old ideas

The fundamental study by the international team indicates for the first time that the amazing diversity of the vangas evolved in a two-step process. The study also illustrates how much of Madagascar and its unusual biodiversity is still not fully understood, and what exciting scientific discoveries may await there. Furthermore, the study shows that a morphological key innovation and related new foraging strategy may result in a burst of speciation, even after the group has already reached its ecological limit. Previously, researchers had



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The Madagascan vangas include 22 species which differ considerably in terms of morphology and resulting foraging habits.

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thought this to be possible, but it had never been demonstrated. However, the high specialization of the vangas might now be their doom: the habitat to which the birds have adapted over the past 25 million years is shrinking quickly as a consequence of land use and climate change.

LOEWE Biodiversity and Climate Research Centre, Frankfurt am Main

With the objective of analysis the complex interactions between biodiversity and climate through a wide range of methods, the **Biodiversität und Klima Forschungszentrum** [Biodiversity and Climate Research Centre] (BiK-F) has been funded since 2008 within the context of the **Landes-Offensive zur Entwicklung Wissenschaftlich ökonomischer Exzellenz (LOEWE)** of the Land of Hessen. The Senckenberg Gesellschaft für Naturforschung and Goethe University in Frankfurt as well as other, directly involved partners, co-operate closely with regional, national and international institutions in the fields of science, resource and environmental management, in order to develop projections for the future and scientific recommendations for sustainable action. For further details, please visit www.bik-f.de