Press release

Wanted dead and alive – New concept for a better understanding of biodiversity in time and space

Frankfurt/Main. By now, biodiversity is a well known term even in the broader public, as it is used in many media reports about species extinction, natural resources or climate change. Yet research in this field is still lacking an integrative approach. Paleontologists and biologists, for example, still cut their own path, their studies in species diversity and species extinction are rarely combined. Scientists of the Biodiversity and Climate Research Centre (BiK-F) have now responded to calls for integration, and provide a concept for linking data of both research fields. They present their framework in the scientific journal *Trends in Ecology & Evolution*.

Up to now, biologists and paleontologists have been working in different worlds, focusing either on living or on extinct species. This division has limited an understanding of relationships in space and time. Prof. Dr. Katrin Böhning-Gaese, director of the BiK-F and member of the board of directors of the Senckenberg Gesellschaft für Naturforschung, stresses the importance of the conceptual framework for completely new scientific possibilities: „Thanks to covering both paleontological and biological expertise here at Senckenberg und BiK-F, we can put this interdisciplinary approach directly into practice."

Dead and alive: A concept for integrated framework to which paleontologists and biologists contribute

„If we combine our knowledge about extinct species with data about existing organisms, we can get a much deeper insight into the evolution and the extinction of species", says Dr. Susanne Fritz, BiK-F, leading author of the article. „We might understand why about 800 species of carnivorous mammalians became extinct during the last 15 million years in North America and in Eurasia, and why today only 280 species are left. Combining this with data about historical climate change will improve our estimates for the future number of species, especially when keeping the ongoing climate change in mind."

The hyena, a European citizen?

Biodiversity can also be explored by investigating how species' traits evolve in close interaction with the environment, for example by analyzing ecological

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Photos:

Inclusion of paleontological data into the modeling of ecological niches of living species might show that many of them could live under very different conditions than today, that their ecological niche is much bigger as assumed. One example is the spotted hyena, which is living in Africa today, but which appeared also in Europe during the glacial period.
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niches. These niches describe the environmental needs of a species and allow conclusions about how the species adapted to its environment. Biologists assume, for example, that the spotted hyena is now found in savannas and arid regions of Africa and the Middle East because it is perfectly adapted to their specific conditions, such as high temperatures and aridity. Paleontologists, however, have known for years that hyenas also lived in Europe even during the last glacial period. „If we take the paleontological data into account, ecological niches may be much broader than assumed so far“, says Fritz. In the case of the hyena, this means that the species doesn't exclusively need high temperatures. It also means that a new definition of the hyena's ecological niche is required – and that the question of where hyenas can or will live in the future under different climatic conditions remains unresolved.

A comprehensive understanding of complex processes

The present study will serve as a guideline for the integration of the different approaches used in both disciplines, and demonstrates the resulting additional benefit. The team around Susanne Fritz hopes to gain a new comprehensive understanding of how the interactions of the numerous processes shape temporal and spatial dynamics of life. Examples for those key processes are the relationships between species and their environment as well as interactions between different species, the evolution of species' traits, and the processes of speciation, dispersal and extinction of species. The new approach allows the integration of all these factors in comprehensive models.

Scientists of both disciplines are strongly interested in this concept: „The statistical models that describe the evolution of species can now be extended with paleontological data“, comments Böhning-Gaese. „Our work represents a solid theoretical foundation for future modeling approaches“.

The new concept will allow better projections of which species might go extinct due to environmental changes – and on the impact this will have on the whole ecosystem. Considering the effects of global warming, the increased knowledge generated by the new method is even more valuable.

The combination of data on extinct and still existing species will contribute to better understand how organism groups evolve and disappear. The horse family is a good example: All present species belong to the genus *Equus*, but during the Miocene, in Northern America alone more than 15 genera have been documented.
Photos:
Above: Extinct *Mesohippus*, 30-40 million years ago, © H. Zell
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Below: Recent member of the horse family (*Equus ferus caballus*)
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Photos: www.bik-f.de/root/index.php?page_id=32&ID=677&year=0

LOEWE Biodiversität und Klima Forschungszentrum, Frankfurt am Main

With the objective of analysis the complex interactions between biodiversity and climate through a wide range of methods, the **Bi**odiversität und **K**lima **F**orschungszentrum [Biodiversity and Climate Research Centre] (BiK-F) has been funded since 2008 within the context of the **L**andes-**O**ffensive zur **E**ntwicklung **W**issenschaftlich-ökonomischer **E**xzellenz (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