

Press release

Small forest with big impact: Fragmented rainforests maintain their ecological functionality

Frankfurt am Main / Germany, November 24, 2011. The value of a rainforest is not only measured by its biological diversity but also by its ecological functionality. Scientists have now presented the results of a comprehensive study in Kenya carried out over the course of nine years within the framework of the BIOTA East Africa project, which was supported by the German Federal Ministry of Education and Research. A team of authors lead by Dr. Matthias Schleuning (Biodiversity and Climate Research Centre, BiK-F) writes in the open-access journal “PLoS One” that rainforests that are subject to use by the human population and are divided into forest fragments can maintain their ecological functionality.

The results are surprising: "What we didn't expect was the fact that the intensity of ecosystem functions such as decomposition, pollination or seed dispersal remain stable or have in some cases even increased in fragmented forests, in which selective logging of trees occurs. This means that the overall functionality of these forests has been preserved, despite moderate human disturbance," says Dr. Matthias Schleuning (BiK-F), lead author of the study. The results might well stimulate a rethink in the area of tropical forest conservation. "The classical approach is to preserve large, intact forest areas, such as the Amazon or Congo basins. Our study shows that it can also make sense to protect the many isolated rainforests that have been influenced by humans." explains Schleuning. The location of the study was the Kakamega rainforest in Western Kenya. It contains a high biological diversity, including over 400 bird and more than 320 ant species. However, the forest is under threat, because its area has shrunk by more than half of its former size in the last century. The once enclosed forest area has now become a series of isolated forest fragments, surrounded by agricultural land on which primarily sugarcane and maize is grown. The remaining forest is nowadays still used by the human population and individual trees continue to be felled in spite of protective measures.

Is the Kenyan rainforest still able to function?

The consequences of these human interventions for the ecosystem functionality and biodiversity in the Kakamega rainforest was examined by Schleuning and his colleagues within the framework of the German-African research programme BIOTA. The scientists concentrated on six ecosystem functions.

The forest's ecological functionality can be measured according to criteria such as decomposition, predation of seeds, pollination, seed dispersal and insect predation by army-ants and ant birds. In contrast to previous studies, which analysed primarily biodiversity changes in rainforests, the current study observed biodiversity and ecosystem functions together, and for the first time a number of functions were examined simultaneously. At eleven sample sites, the scientists recorded the diversity of different groups of animals and studied their ecosystem functions in experiments. For example, leaf samples were laid out and measurements were taken as to how quickly the material degraded. In order to measure the intensity of the raids of the army-ants, hundreds of traps were buried in the ground and evaluated.

Fragmentation and selective logging have different effects

It was shown that ecosystem functions – though generally stable – are influenced to different degrees by forest fragmentation and the selective logging of individual trees. When large forest areas develop into isolated forest fragments, the effects on the ecosystem functions are especially noticeable in instances where the composition of the animal communities changes substantially. Selective logging impacts primarily on ecosystem functions in which mobile animal species play a role. The scientists thus noticed positive effects on pollination by insects, seed dispersal by birds and also on the raids of the army-ants – probably due to the altered movement patterns of these species. Schleuning says: “The mechanisms of the two types of human intervention are different. Fragmentation tends to have an indirect influence on ecosystem functions. The fragmentation of forests changes the biological diversity, which causes a threat to the preservation of their ecosystem functions. In contrast, selective logging impacts directly on ecosystem functions and has, at the moderate intensities in our study area, hardly any effect on the diversity of the animal species we examined. The next step would now involve projects that would examine the long-term functionality of the fragmented forests.”

Paper

Schleuning M., Farwig N., Peters MK. et al. (2011) Forest Fragmentation and Selective Logging Have Inconsistent Effects on Multiple Animal-Mediated Ecosystem Processes in a Tropical Forest. PLoS ONE 6 (11): e27785. doi:10.1371/journal.pone.0027785

Online available at

<http://www.plosone.org/article/info%3Adoi%2F10.1371%2Fjournal.pone.0027785>

Press images

<Kakamega forest fragment.jpg> Copyright: N. Farwig, BIOTA-E02

Kakamega rainforest in Kenya: The once comprehensive forest has been divided into isolated forest parts with agriculture in between, which are subject to human disturbance.

<BIOTA field work.jpg> Copyright: M.K. Peters

Field work in the rainforest: Scientists monitored the species richness of six animal taxa (e.g. antbirds) and studied their ecosystem functions.

<Army ants> Copyright: G. Fischer

One of the six ecosystem functions that were studied to determine the functionality of the fragmented rainforest were raids by army-ants.

Terms of use: Images may be used for editorial purposes only. Please state the copyright information as given in the image caption. Use of images for commercial purposes prohibited.

For further information please contact:

Dr. Matthias Schleuning
LOEWE Biodiversity and Climate Research Centre
Phone +49 69 7542 1892
email: matthias.schleuning@senckenberg.de

or

Sabine Wendler
LOEWE Biodiversity and Climate Research Centre, press officer
Phone +49 69 7542 1838
email: sabine.wendler@senckenberg.de

LOEWE Biodiversity and Climate Research Centre, Frankfurt am Main, Germany

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