

Press Release

## **Tropical carriers: Hornbills are long-distance seed-dispersal agents in South African forests**

**Frankfurt, February 8, 2011. Deep-rooted but also highly mobile: tropical tree species spread successfully in fragmented landscapes made up of forest and agricultural land with the help of hornbills. Although the distance from one forest patch to the next is larger than in an unfragmented landscape, the animal carriers of the plants seeds respond to this by also moving larger distances. These are the results of a study conducted by scientists of the German Biodiversity and Climate Research Centre in collaboration with the Max-Planck-Institute for Ornithology, which has been published a short time ago online in „Proceedings of the Royal Society B“. The two-step-study included feeding trials as well as tracking of bird movement patterns with a new, ultra-light GPS data logger.**

### **Plants “on the move”**

The tropical landscape is undergoing a process of fragmentation by humans. Parts of the forest have to give way to agricultural lands – what remains are isolated forest patches. A process that may also be observed in many other regions worldwide. In this manner plants face isolation from other individuals of the species. Thus the adaption to changing environmental conditions is under threat. The problem is further accelerated by global climate change, which forces plants to track changes in the geographical position of their preferred climatic niche. Fruit bearing trees cannot disperse by themselves and rely on carriers to exchange and transport seedlings and genes from one forest area to the other. Birds and other vertebrates are important to them, as up to 95 per cent of tropical tree species are dispersed by them. They are the focus of investigation when aiming to assess whether the plant diversity may be conserved in a fragmented landscape.

### **Trumpeter hornbills as the object of study**

A German research team led by Professor Dr. Katrin Böhning-Gaese, Biodiversity and Climate Research Centre (BiK-F), has investigated trumpeter hornbills in South Africa. She explains: „The trumpeter hornbill is the largest frugivorous bird in South Africa and the species is abundant on the east coast, which is why we chose it for the study.“ Related species of the singular trumpeter

hornbill with the eye-catching beak are to be found not only in Africa, but also in the Asian tropics. In the South American Neotropics toucans play a similar role in the ecosystem. To which extent do these animals have the capacity to carry seeds beyond the man-made agricultural landscapes into other forest patches?

### **South African forests were study site**

How far the seedling is dispersed by the bird carrier can be judged using two reference points: how long is the gut passage of the seedling and how far does the bird fly in this time? To find out more, feeding trials were conducted with trumpeter hornbills resident at the Max-Planck-Institute for Ornithology as a first step. The scientists fed them with different types of fruit of tropical trees and recorded the time needed until all the indigestible seeds of the fruits were excreted. A maximum period of 2.5h was thus detected. "This way we knew about the maximum transport time of plant seedlings and went on to track the distance the birds moved meanwhile when in the wild", Johanna Lenz, PhD student at BiK-F and one of the leading authors of the study says. The scientists tracked birds in a continuous forest in South Africa to see how far the birds would move within a space which offers a large variety of fruits. On the other hand, birds were tracked when they foraged in agricultural landscapes with forest patches where fewer fruits are on offer.

### **One of the first studies using GPS lightweights**

The birds were caught using canopy mist nets in flying routes to fruit-bearing trees and equipped with data loggers before being released into the wild. Data loggers then measured and saved the position and thus the movement of the bird with an accuracy of eight meters via GPS. The data logger attachment straps had predetermined breakage points allowing loggers to drop off eventually. The novel logger weighed only 27 grams which is lighter than conventional models. "We were able to use prototypes, which are low-weight. Previous loggers had been too heavy for relatively small birds such as trumpeter hornbills whose males weigh 750 grams on average." Professor Dr. Katrin Böhning-Gaese comments and goes on to say "Another exciting thing about these loggers is you don't have to catch the birds again. It is possible to download movement data stored on the logger by radio telemetry of up to 2 kilometers afar. With this one may track all movement patterns of birds at once even if they have distanced themselves from their point of entrapment by up to 40 kilometers in the meantime".

### **Potential seed-dispersal up to 14.5 kilometers**

The results show that trumpeter hornbills do cover long distances. The maximum distance that a bird flew during the 2.5 h gut passage of the indigestible seeds was up to 14.5 kilometers. The distances

differed considerably between the two different study areas. Long-distances were covered by birds moving in an agricultural landscape with few forest patches. In contrast, birds moving in a large, continuous forest flew shorter distances. "This shows that the landscape structure strongly influences the birds' behavior, and the ability of trumpeter hornbills to cover such large distances has been underestimated so far. We have proved that trumpeter hornbills have the potential to disperse seeds over large distances.", Professor Dr. Katrin Böhning-Gaese concludes. Seed transport by birds between habitat patches is therefore much more frequent than previously assumed. Plant seedlings thus get the chance to disperse into new territories allowing them to adapt to global climate change and the changing environment conditions.

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The Biodiversity and Climate Research Centre has been established in 2008 to carry out internationally outstanding research on the complex interactions of organismal biodiversity and climate using a broad spectrum of state-of-the-art methods. The centre is a joint venture of Senckenberg Gesellschaft für Naturforschung und Goethe Universität Frankfurt am Main, Germany. It is funded by the Hessian initiative for scientific and economic excellence (LOEWE) and works in tight collaboration with local, national and international institutions which are engaged in research in the field as well as sustainable management. The aim of the centre is to provide reliable predictions of future developments and develop management recommendations based on scientific findings.