

A coherent and unifying framework to investigate biodiversity and prioritize conservation in a large and heterogeneous landscape

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Many components of global biodiversity, from alleles, genotypes, to consumer–resource interactions and ecosystems are endangered but resources to protect them are limited, making it necessary to prioritize areas and optimize conservation efforts. Here we focus on a poorly known wilderness of a heterogeneous forest-savanna ecotone in eastern Central African Republic. For this region a new comprehensive land use plan has to be evolved to allow sustainable development of local communities and international transhumant pastoralism and exact borders of existing and recently created protected areas need to be defined to guarantee long term preservation of biodiversity and ecosystem function and services. A case study was conducted in the recently created Chinko Nature Reserve (CNR) to illustrate a coherent and unifying framework to quantify biodiversity on different levels 1.) using species diversity of larger mammals and birds, 2.) considering endemism, 3.) evaluating for certain endangered keystone species like chimpanzees or apex predators spatial distribution and main threats, and 4.) taking into account evolutionary processes by quantifying standing phenotypic and genetic variation of *Glossina* biting flies. Standardised methods were used such as camera trap surveys, track counts, and landmark geometric morphometrics but also relatively new approaches like low depth whole genome high throughput sequencing to generate large data sets. New methods to analyse these large amounts of raw data were developed and we introduced a Bayesian method to directly quantify differences in noisy data sets consisting of findings based on different techniques. We found a surprisingly high mammalian and avian species richness within the heterogeneous forest-savanna ecotone of the CNR and could document that about 40 to 54 percent of it was not described in existing databases. Certain species of conservation interest like Eastern chimpanzees show unexpected and puzzling spatial distributions and need to be considered separately to inform and refine conservation efforts. In general, larger mammals with assumed disproportionally high relevance for the ecosystem, are highly threatened by poaching and retaliation killing, mainly assigned with transhumant pastoralism and the international ivory trade. First evaluations indicate that phenotypic variation is not only driven by small scale habitat but also by the large-scale gradients of the heterogeneous forest-savanna ecotone like climate and topography. Advances in methods to quantify genetic and phenotypic variation as well as species richness on a community level reliably and affordably, new modelling techniques and the availability of climate and remote sensing variables at high resolutions allow to integrate different levels of biodiversity, their main drivers and threats in order to map current and potential future biodiversity thanks to which conservation efforts can be prioritized and optimized even in large and difficult to access areas.

Jury:

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