Monitoring the effects of anthropogenic environmental change on the parasite diversity of small mammal species with emphasis on the disease risk to humans and domestic stock in southern Africa

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Increasing desertification processes through expanding land use have had severe degradation effects on southern Africa’s environments. The transformation of natural areas by agricultural practices, in addition, to climate change negatively influences community structure, population ecology and genetic variability of many taxa currently occupying the region. Small mammals play an important role in ecosystems and in some instances are particularly vulnerable due to their restricted dispersal capabilities. There is increasing evidence that show the importance of parasites in regulating the natural population fluctuations of small mammal species. However, very little is known regarding the influence of climate and habitat changes on the natural parasite communities in and on small mammals. Recent studies have indicated that the natural host diversity of small mammals is closely linked to the potential threat that pathogenic parasite species might pose to humans, domestic stock and wildlife (i.e. high host species richness acts as a dilution effect for pathogenic parasite species). A previous study (funded by BIOTA southern Africa) that focussed on the parasite diversity of small mammals in the Western Cape Province have indicated that regionally widespread and locally abundant species, such as the stripe mouse *Rhabdomys pumilio*, are parasitized by a large number of species (30 epifaunistic arthropod species and more than 5 helminth species). These include several flea, mite and tick species that can act as vectors for fatal and potentially fatal diseases such as bubonic plague, canine biliary fever, human tick-bite fever, equine babesiosis and sweating sickness in cattle.

The proposed study will be a continuation of the Western Cape study. Live trapping of small mammals will be conducted on several selected BIOTA biodiversity-observatories along the precipitation gradient from the Cape region (data already collected and analysed for Riverlands and Elandsberg) to northern Namibia (Remhoogte/Leliefontain, Fish River Canyon, Gellap Ost/Nabaos, Narais/Duruchaus, Otjiamongombe, Mile 46/Mutompo). By selecting localities along a latitudinal rainfall gradient we aim to determine the effect of natural climate variation on the parasite species richness, distribution and abundance on the selected host species. The striped mouse will again be the focus species but additional species will also be considered. Blood and organ samples will be collected from the host species for screening for the presence of blood protozoa and viruses. The parasitological study forms part of a large-scale collaboration between the groups of Prof. Simone Sommer (University of Hamburg) and Prof. Conrad Matthee (University of Stellenbosch). Our identification and documentation of the ecto- and endoparasite biodiversity across a landscape forms an integral part necessary to interpret the MHC variability and immune competence (Sommer) of the host population and it is also likely that differences in parasite community structure can be used as supportive evidence explaining spatial genetic structure obtained for natural host populations (Matthee).

Aims:
- Compare the parasite diversity and community structure of small mammals between natural and anthropogenic areas along a latitudinal gradient
- To record the small mammal diversity at the various localities and to determine the relationship between habitat type (natural and disturbed), host diversity, parasite diversity and disease risk
- Determine the prevalence of blood protozoan and virus species in *R. pumilio* and other small mammal species
- Evaluate selected ectoparasite species for the presence of virus species
- Expand the current ecto- and endoparasite species list for *R. pumilio* in southern Africa
- Establish a microparasite species list (e.g. protozoa and viruses) for *R. pumilio* in southern Africa.