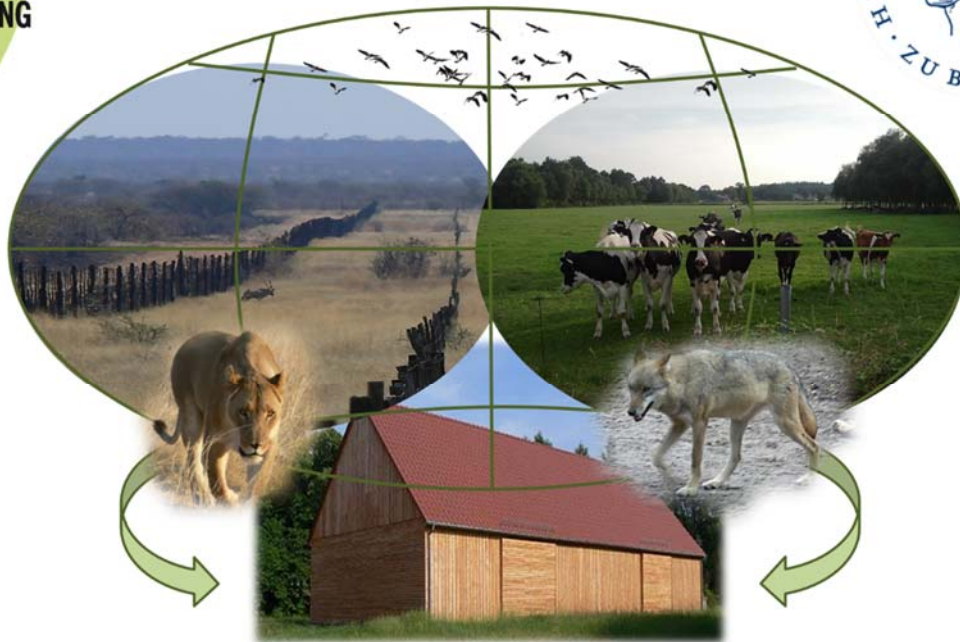


Workshop

“Connecting biodiversity and improving human livelihood beyond boundaries - a global perspective”

within the project

*“Land use conflicts and edge effects
– a comparative approach”*



11th - 14th September 2017

Linde (Germany)



*Connecting biodiversity and improving human livelihood beyond boundaries – a global perspective
Linde, 11th-14th September 2017*

Workshop
**“Connecting biodiversity and improving human livelihood beyond
boundaries - a global perspective”**

Linde, 11th -14th September 2017

Organization:

Systematic Zoology Division
Albrecht Daniel Thaer-Institute of
Agricultural and Horticultural Sciences
Faculty of Life Sciences
Humboldt-Universität zu Berlin
Unter den Linden 6, 10099 Berlin

Zwillingberg-Tietz Stiftung
Forschungsstation Linde
Brunnenweg 2
14715 Märkisch Luch /OT Linde

Links:

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Preface

The worldwide impact of land use practices and climatic change on biodiversity and ecosystem stability requires holistic approaches on a global scale. Our workshop forms part of a series of annual workshops and summer schools under the umbrella of „Biodiversity and Land use – a Comparative Approach“. The proclamation and development of Transboundary Protected Areas (TBPA) is based on a fundamental re-thinking and marks an important milestone in nature conservation, poverty reduction and the security of peace. During our workshop, we'd like to emphasize the global importance of TBPA including examples and case studies from Europe, Africa, Asia, and North- and South America. Different forms of boundaries (e.g. national, geographical, and cultural) are considered.

Our workshop is designed to comparatively examine the history, underlying concepts and global distribution of TBPA. We envisage contributions from a broad community of participants representing TBPA on five continents. The workshop includes speakers from Brazil, Germany, Mozambique, Namibia, Poland, Russia, South Africa, UK, and the USA.

The aim is to address the spatiotemporal dynamics between land use and biodiversity on the basis of comparative investigations, including case scenarios under different ecological conditions. This comparative reflection on case studies on a global scale allows differentiating between case-specificity and common applicability of underlying ecological and social processes and resulting management strategies.

The comparative framework addresses practical implications arising from the currently debated trade-off between biodiversity conservation and the provision of ecosystem services, by using the example of protected areas and the mitigation of edge effects, land use contrasts, and human wildlife conflicts in a transnational context. The goal is to develop innovative strategies for the protection and sustainable utilization of biodiversity and natural resources.

We would like to express our thanks to all participants for their contributions. In particular, we wish to thank Humboldt-Universität zu Berlin and Zwillingberg-Tietz Stiftung.

Berlin, September 2017

Prof. Dr. Ulrich Zeller, Dr. Thomas Göttert & Dr. Nicole Starik



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Programme



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Monday, 11th of September

Arrival

17.00h *Musical introduction, Humboldt-Quartett (violin: Ansgard Benecke & Miriam Götze; viola: Matthias Zollitsch; violoncello: Katja Kerstiens)*

U. Zeller (Germany, HU): Welcoming notes and introduction to the research station Linde

Come together and refreshments

18:30h *Dinner*

Tuesday, 12th of September

09.00h **U. Zeller (Germany, HU):** Transboundary protected areas: potential, limitations and approaches for future development

09.45h **J. McCallum (United Kingdom, IUCN):** Transboundary conservation - in theory and in practice

10.30h *Coffee and Tea*

11.00h **T. Göttert (Germany, HU):** Physical and immaterial dimensions of the avifauna -implications for transboundary nature conservation

11.45h **N. Starik (Germany, HU):** Linking biodiversity beyond borders - bats in an urban-rural context

12.30h *Lunch break*



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- 14.00h **P. Taylor (South Africa, University of Venda):** Valuation of biological control in commercial macadamia orchards in a tropical landscape
- 14.45h **T. Rottstock (Germany, HU):** Comparative studies on cattle grazing systems, associated agrobiodiversity and human-wildlife conflicts in central Europe and Sub-Saharan Africa
- 15.30h *Coffee and Tea*
- 16.00h **V. Macandza (Mozambique, UEM):** Biodiversity status and human being across a gradient of conservation measures in the Maputo Special Reserve, Lubombo Transfrontier Conservation Area in Mozambique
- 16.45h **N. Odendaal (Namibia, NamibRand Nature Reserve):** The Greater Sossusvlei-Namib Landscape Association and the NamibRand Nature Reserve - an example for connecting biodiversity and improving human livelihood beyond boundaries
- 18:30h *Dinner*

Wednesday, 13th of September

- 9.00h **N. Selva (Poland, Polish Academy of Sciences):** Bears without borders: managing transboundary populations of large carnivores
- 9.45h **M.L. Frey (Germany, Welterbe Grube Messel):** Global Geoparks Network: Exchange and collaboration “on eye-level” for a sustainable development
- 10.30h *Coffee and Tea*



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- 11.00h **C.C. Chester (United States, Yellowstone to Yukon Conservation Initiative):**
Yellowstone to Yukon: twenty-five years of large-landscape transboundary conservation
- 11.45h **C. Fiderer (Germany, HU):** Spatial behavior and feeding ecology of mammalian predators in the Special Protection Area “Mittlere Havelniederung” with special focus on ground breeding bird communities
- 12.30h *Lunch break*
- 14.00h **N. Fernandez (Germany, iDiv):** Rewilding: opportunities for boosting large-scale biodiversity restoration
- 14.45h **B. Coutinho (Brazil, CI):** Landscape corridors: no borders for protected areas?
- 15.30h *Coffee and Tea*
- 16.00h **P. Leitner & C. Miguel (Mozambique, Limpopo National Park):** Parque Nacional do Limpopo: An introduction to the vision and critical programs driving the development of a trans-frontier park
- 16.45h **A. Frank (Germany, Universität zu Köln):** Improving livelihoods in the face of global change – insights from South Africa’s Limpopo Province and beyond
- 17.30h **O. A. Goroshko (Russia, Daursky State Nature Biosphere Reserve):**
International cooperation of the Dauria International Protected Area, conservation of biodiversity, climate change and land use
- 18.30h *Barbeque*



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Thursday, 14th of September

9.00h Excursion to Westhavelland Nature Park & State Bird Observatory & Field Centre Buckow

12.30h *Lunch*

From 13.30h *Departure*





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Abstracts of presentations



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Transboundary protected areas: potential, limitations and approaches for future development

U. Zeller, N. Starik, T. Göttert, Germany

Protected areas are increasingly integrated into larger conservation landscapes, including various forms and intensities of land use and nature conservation. However, different types of land use conflicts and edge effects can be observed, especially when sharp land use contrasts collide at the borders of protected areas. Various forms of boundaries (e.g. national, administrative, fences) act as artificial barriers, which can influence or even destroy naturally occurring ecological phenomena and processes (such as seasonal long-distance migratory behavior of wildlife). Transboundary protected areas (TBPA) are widely considered as an effective approach to protect biological and cultural diversity and to maintain the ecological integrity of a region beyond the level of national borders. The idea behind TBPA follows the Peace Parks concept and is based on a fundamental re-thinking. It marks an important milestone in nature conservation, poverty reduction and the security of peace. Originally initiated in North America (Waterton-Glacier International Peace Park between Canada and the USA) and Europe (Pieniny Mountains Nature Park between Poland and Slovakia) in the early 1930s, international Peace Parks obtained increasing importance on a global scale. In 2007, the IUCN listed a total of 227 TBPA worldwide.

Here, we examine the history, underlying concepts and ecological conditions of different TBPA. On the basis of case studies and own research findings concerning (transboundary) protected areas in Sub-Saharan Africa, we furthermore aim at illustrating the potential of transboundary nature conservation (e.g. restoration of natural processes, such as wildlife migration), but also major challenges associated with TBPA management (e.g. disease transmission between wild and domestic animals, poaching). Among others, particular focus is on the Etosha National Park (Namibia), the Kavango Zambezi Transfrontier Conservation Area (Angola, Botswana, Namibia, Zambia & Zimbabwe), and the Great Limpopo Transfrontierpark (Mozambique, South Africa & Zimbabwe). Data on the influences of land use systems on biodiversity, the spatial behavior and ecology of wildlife, the intensity of human-wildlife conflicts, as well as the socioecological conditions are urgently needed for a selective opening of boundaries (fences) at strategically sensible locations. Ecological interrelations and socioeconomic dynamics between protected areas and surrounding land play a crucial role for the establishment of sustainable TBPA management practices.

We highlight the importance of knowledge on natural phenomena (e.g. seasonal migratory behavior of large ungulates) for an effective maintenance of landscape connections through effective migration corridors and buffer zones. Increasing the connectivity between existing protected areas is a highly complex process and needs to be based on sound scientific knowledge. Only on this basis, the ecological and socioeconomic / sociopolitical potential of TBPA can be fully appreciated.



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Transboundary conservation – in theory and practice

J. McCallum, United Kingdom

As we become more aware of the interconnected nature of ecology, politics and socio-economics - transboundary conservation seems to provide a way that we can meaningfully combine them under a single banner, in which each theme can provide support and stimulation for the others. This is underpinned by the ecological understanding that "bigger is better" for most species most of the time. As a result, transboundary conservation initiatives have received increasing attention over the past 15 years. But in a world where fears of invasion (not just militarily speaking) are trumping fears of isolation, there is a countervailing argument which suggests that fences and barriers are the best way to preserve national sovereignty and ecological integrity. This forces us to look more closely at the realities of transboundary conservation on the ground. Does it really offer the value that it promises? We look at two case studies in Africa and North America and use supporting evidence from a protected area questionnaire conducted with IUCN to explore these questions in more detail and provide guidelines for future initiatives.



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Physical and immaterial dimensions of the avifauna – implications for transboundary nature conservation

T. Göttert, M. Robischon, U. Zeller, Germany

Birds fulfilled indicator functions all through human history. They have aided in land finding at sea and the discovery of watering holes in the deserts, or served as the proverbial 'canary in the coalmine'. Covering a broad range of ecological niches, being exposed to and responding to a wide range of environmental factors, birds are still in our times biological indicators of environmental quality. The encounter with birds as an experience of living nature further contributes to human wellbeing also at an emotional level. Appreciation of the immaterial dimensions, the avifauna has for humans, is however often at odds with the material exploitation of birds or destructive use of their habitats. Even in parts of the world, where the importance of conservation is recognized, efforts towards a sustainable energy supply (e. g. wind power) might cause conflicts and negatively impact biodiversity. To illustrate this dilemma, we present data on bird mortalities at wind turbines in the Havelland region in Brandenburg (Germany). A total of 130 wind turbines were included into the analysis and data were collected over a period of 10 years. A better understanding of the effects of wind energy use on bird communities contributes to a mitigation of such edge effects. Moreover, taking conservation decisions, it is necessary to weigh options and potential outcomes not only considering the effects on avifauna as a physical element of ecosystems, but also effects on those aspects that grow via perception and reflection from encounters with living nature.



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Linking biodiversity beyond borders – bats in an urban-rural context

N. Starik, T. Göttert, U. Zeller, Germany

Bats can be regarded as most vulnerable to human land use. Especially bats of temperate zones are threatened by increasing agricultural intensification and land use change due to their complex life cycle including seasonal migration. Changes in land use may therefore influence the distribution of species on the local, landscape and even international scale. Thus, there is an urgent need for developing effective approaches and conservation strategies considering the entire life cycle of bats including the relevant habitats used by them regardless of (administrative) boundaries.

Since more than ten years, we conduct field studies on the influence of different forms of land use (e.g. wind turbines, agricultural and silvicultural practices) on bat communities in the Havelland region, which is situated in close vicinity to the city of Berlin. We detected and identified several ecological indicator species that turned out to be particularly sensitive to specific land use forms. At the same time, we identified important factors affecting bat communities and associated ecosystem services. Furthermore, we conducted pilot studies in the city of Berlin revealing the applicability of specific indicator species that also occur in an urban context.

On this basis, we provide future research directions to better understand, which factors are influencing the occurrence of different bat species in urban versus rural environments. The aim of our proposed research concept is to derive ecological knowledge on bat habitat use and habitat requirements in an urban-rural context and across different habitat types that otherwise always have been investigated separately. Thus, we aim at highlighting the importance of a multiscale and cross-habitat approach in bat conservation to link biodiversity beyond boundaries.



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Valuation of biological control in commercial macadamia orchards in a tropical landscape

P. Taylor, V. Linden, S. Weier, I. Grass, D. Alberts, T. Tsharntke, South Africa

We reviewed studies estimating the economic value of crop pest predation services of bats in different agroecosystems worldwide, and we provide new data for these services in subtropical macadamia orchards in South Africa. Approaches for estimating predation services in bats have involved either a bottom-up (modelling) or a top-down (exclusion) approach. Economic models are based on parameters such as bat consumption rates of pest insects and population size, crop yield and current prices, longevity and fecundity of insect pests, losses (injury coefficient) due to insect damage and the costs of chemical pest control. Such studies usually model a single bat species and a single pest insect species, usually the dominant pest in the system. The top-down approach involved exclusion of bats from experimental plots and comparison of pest insect numbers and crop damage and yield in experimental and control plots. Studies involving predator exclusion measure the net trophic effect of all predator and prey species. Estimated values for bat predation services in dollars per hectare varied by orders of magnitude (from zero ha⁻¹ pa to \$730 ha⁻¹ pa) depending on the method of estimation, the agricultural system studied and technological advances such as the use of pest-resistant transgenic strains. We aim to compare for the first time, independent top-down and bottom-up estimates in the same agro-ecosystem. Using a modelling approach, the avoided cost of bats in macadamia orchards in South Africa was conservatively estimated to be \$1.9 million (\pm \$1.3 million) per annum nationally, or \$102 (\pm \$66.8) per hectare per annum. Bat and bird exclusion trials in progress in macadamia orchards will provide an independent top-down estimate of the economic value of bats; initial analyses after the first year demonstrate that bats and birds (separately and combined) can suppress insect populations (8% decrease in nut quality when birds and bats are excluded), but that very high variability exists between replicate sites.



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Comparative studies on cattle grazing systems, associated agrobiodiversity and human-wildlife conflicts in central Europe and Sub-Sahara Africa

T. Rottstock, T. Götttert, U. Zeller, Germany

Despite pronounced differences between grassland ecosystems in Sub-Sahara Africa and temperate Europe, there are also strong natural connections and cultural parallels. Here, we present a comparative study on the impacts of different cattle grazing systems on associated agrobiodiversity and human-wildlife conflicts in these regions. Since European and African cattle breeds have a common origin and developed independently under different ecological conditions, cattle grazing systems appear to be a suitable theoretical framework for this comparative analysis.

This PhD study is based on the overall hypothesis that (relatively) natural savannah ecosystems and associated rangelands in Sub-Sahara Africa provide a valuable reference for the anthropogenic transformed agroecosystems in Europe, whereas elements of European grazing management seem to have the potential to support the mitigation of conflicts caused by overgrazing in Sub-Sahara Africa. The identification of region-specific aspects along with common patterns concerning cattle grazing systems in temperate Europe and Sub-Sahara Africa is supposed to achieve a better understanding of the interrelations between livestock, wildlife and humans. This info is needed for the development of more effective and sustainable grazing- and wildlife management practices on a transnational scale. Human-wildlife conflicts are particular common close to borders of protected areas, where land use contrasts and related edge effects are significant. Therefore, we selected grazing systems / study sites in close vicinity to protected areas on both continents. The study is based on a combined approach comprising environmental and social sciences and including the analysis of case studies to address different protected areas in central Europe (Internationalpark Lower Odra Valley, Westhavelland Nature Park) and Sub-Sahara Africa (Serengeti-Mara Ecosystem, Kavango-Zambesi Transfrontier Conservation Area). Problem centered interviews with different stakeholders (cattle farmers, conservationists and hunters) provide qualitative data to gain a comprehensive insight into the specific situation associated with each case study. At the same time, data on the activity, occurrence and relative abundance of wildlife species are collected as part of camera trap surveys conducted in each research area. The first case study focussed on the southwestern border of the Internationalpark Lower Odra Valley. Preliminary results revealed cattle grazing systems affecting the behavior of several wildlife species (increasing relative abundance with increasing distance from pasture). The second case study, which is currently conducted close to the research station in Linde, also aims at clarifying, whether this avoidance effect is caused by the presence of livestock, the occurrence of electric fences or a combination of both. Between October and December 2017, the next case study will be conducted in the Mara region in Tanzania. A final case study is planned to take place with a regional focus on Namibian parts of the Kavango-Zambezi Transfrontier Conservation Area in 2018.



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Biodiversity status and human well-being across a gradient of conservation measures in the Maputo Special Reserve, Lubombo Transfrontier Conservation Area (TFCA) in Mozambique

V. Macandza, L. Matos, A. Pondeva, A. Massingue, Mozambique

The Maputo Special Reserve (MSR), Mozambique, is part of the Lubombo TFCA, which also includes conservation areas from Swaziland and South Africa. The primary role of MSR is to conserve biodiversity. However, the reserve should also contribute to the improvement of the well-being or at least not increase the poverty of local communities. MSR is inhabited by humans subject to restrictions on extractive use of natural resources, which might increase poverty unless there are benefits to local communities from ecotourism. In the surroundings of MSR there is a higher human density and weaker enforcement of restrictions for the use of natural resources, which potentially reduces poverty but at the cost of losing biodiversity.

We assessed biodiversity and human well-being across a gradient of biodiversity protection measures from inside (zone of total protection) to outside (zone of multiple use of resources) of the MSR. For biodiversity survey 20 x 20 m plots were established in three vegetation types that occur both inside and outside, namely grassland, dense evergreen forests and open evergreen forests. A stratified and proportional random sampling was used to determine the number of plots in each vegetation type. The total number of plots was 30. Within each plot the following data was recorded: number of individuals of each plant species, diameter at breast height (dbh), height of trees and shrubs. Ninety-four households were interviewed about the main subsistence means, sources of income and ownership of goods; being 49 living inside and 45 living outside of MSR. The following indices and parameters were used to compare biodiversity inside and outside of MSR: Shannon diversity indices for flora species, shrub and tree density, importance value index, tree diameter distribution and similarity index. Qualitative socioeconomic data was analyzed through content analysis and pattern matching. Quantitative data was analyzed using chi-squared test.

For all vegetation types, plant communities have a higher number of species, higher diversity index and higher shrub and tree density inside than outside of the reserve. Both inside and outside of the MSR, diameter distribution has the shape of an inverted J, typical of natural forests. However, inside of MSR trees are larger than outside. There is also a change in the importance value index of species from inside to outside of the reserve, with exotic species gaining ecological importance outside, whereas inside the reserve only native species rank in the ten most important tree species. Households living inside MSR are poorer than those living outside, with higher percentage of houses built using local materials, using wells as the source of water and without access to electricity. Outside of the reserve a higher percentage of households possess more valuable goods including vehicles, bicycles, radios, cellphones and fridges than inside of MSR.



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The restriction on the use of natural resources is strongly enforced than in the surrounding of the reserve. Outside of the reserve, the production and trade of charcoal is an important source of income, an activity not permitted inside the reserve. Human-elephant conflicts are more frequent inside the reserve, where cultivated fields and houses are destroyed by elephants without any compensation to the households. The conservation measures applied in the management of the MSR are effective in the protection of biodiversity. However, restrictions in the use of natural resources, human-elephant conflicts and scarce benefits from ecotourism to local communities exacerbate poverty.



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The Greater Sossusvlei-Namib Landscape Association and the NamibRand Nature Reserve – an example for connecting biodiversity and improving human livelihood beyond boundaries

N. Odendaal, Namibia

This presentation provides background on the history, aims and objectives and conservation success of the NamibRand Nature Reserve and delves into the work being done by the Greater Sossusvlei-Namib Landscape Association as an example for connecting biodiversity and improving human livelihood. The NamibRand Nature Reserve, located in southern Namibia, is a private nature reserve established to help protect and conserve the unique ecology and wildlife of the south-west Namib Desert. Conserving the pro-Namib, the area along the eastern edge of the Namib Desert, is critically important in order to facilitate seasonal migratory wildlife routes and to protect biodiversity.

The NamibRand Nature Reserve is the largest private nature reserve in Southern Africa, extending over an area of 215,000 ha. The Reserve shares a 100 km border with the Namib-Naukluft National Park in the west and is bordered in the east by the imposing Nubib Mountains. Virtually all facets of the Namib Desert are represented on the Reserve – sand and gravel plains and stretches of savanna alternate with mountain ranges and vegetated dune belts. The NamibRand Nature Reserve is a non-profit private nature reserve. All landowners belonging to the Reserve have signed agreements and adopted a constitution which sets aside the land for conservation – now and in the future. The Reserve is financially self-sustaining mainly through high quality, low impact tourism. The aims of the NamibRand Nature Reserve are:

1. To conserve for the benefit of future generations and to protect the sensitive and fragile environment and its rich biodiversity
2. To create a nature reserve with a healthy and functioning ecosystem, providing a sanctuary for flora and fauna and to facilitate seasonal migratory routes in partnership with neighbours (National Parks, etc.).
3. To promote sustainable utilisation – through ecologically sustainable and high-quality level tourism products and other projects and
4. To achieve a commercially viable operation to ensure continuance and financial independence.

Monitoring systems have been introduced which include population census methods. A road count is conducted annually to monitor game populations. This method has been specially adapted for use on the NamibRand Nature Reserve from the well-known census technique as developed by the Natural Resource Working Group, a joint venture between the Ministry of Environment and Tourism, the World Wildlife Fund and the Namibia Nature Foundation.



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The 2016 game census indicated that there were 6,650 oryx and 2,944 springbok on the Reserve. These numbers seem high, but are appropriate when taken in the context of the total area of the Reserve.

NamibRand Nature Reserve supports the sustainable utilisation of its resources through the following activities:

- High quality, low impact tourism including accommodation, photographic safaris, walking trails and hot air ballooning,
- NaDEET (Namib Desert Environmental Education Trust), an environmental education and sustainable living centre, and
- Capture and sale of live game for management purposes.

The Greater Sossusvlei-Namib Landscape Association consists of land owners and custodians, representing organisations, and individuals, who are actively involved in the custodianship, management and administration of land within the Greater Sossusvlei-Namib Landscape. The Vision of the Association is to co-manage the Greater Sossusvlei-Namib Landscape for enhanced landscape and biodiversity conservation, and socio-economic development, for the sustained benefit of the people within the Landscape and the Region. The Purpose of the Association is to foster and enhance collaboration and cooperation by the members, and where relevant and agreed, to harmonise their planning, management and development at a landscape level, to effectively implement the Vision, Objectives and Principles contained in this Constitution and in the Collaborative management and Development Plan, as may be revised and updated from time to time, within the area comprising the Greater Sossusvlei Namib Landscape, and to work effectively with its neighbours.

The main Objectives of the Association are:

- To conserve and wisely manage the biomes, landscapes, ecosystems, catchments and biological diversity of the Greater Sossusvlei-Namib Landscape (GSNL) and, where necessary and feasible, to restore and rehabilitate degraded systems to their natural, productive states.
- To manage wildlife populations and ecosystems to maintain healthy biological diversity and ecosystem stability under hyper-arid and variable climatic conditions and different land-use practices, and to reintroduce and rebuild wildlife populations indigenous to the area within historic times, as might be appropriate under current and changing conditions. To promote socio-economic development opportunities through creation of appropriate enterprises, partnerships and other relevant mechanisms to foster economic growth and thereby, promote job creation and rural development.



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- To promote and support appropriate land and natural resource uses that are compatible with the above objectives, with emphasis on sustainable land management practices, well managed tourism, marketing of flagship species, environmental education, awareness and outreach initiatives and research, and to create strategic and focused economic opportunities without compromising on sound conservation principles and practices.
- To establish strong collaborative management partnerships and an appropriate institutional mechanism between the various land custodians, administrators, managers, holders and owners within the Landscape, so as to enhance the management of ecological and socioeconomic aspects within the GSNL to the mutual benefit of all partners.
- To harness the ecological, social, cultural and economic viability, sustainability and competitiveness of the GSNL as a model of collaborative management that could be further replicated elsewhere.
- To explore ways of jointly marketing the GSNL and create synergies between the individual economic and financial activities and initiatives of the partners to enhance the development of the overall Landscape to the mutual benefit of all partners.
- To explore the further expansion of the current GSNL as new potential partners seek to join the Landscape and the Association, within the agreed Principles of co-management, and to help potential neighbouring Landscapes become established as may be appropriate.



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Bears without borders: managing transboundary populations of large carnivores

N. Selva, Poland

Large carnivore species have a key role in the maintenance of ecosystem services, processes and biodiversity. Although they are charismatic and important for tourism, their large spatial requirements and predatory habits have brought them often into conflict with humans. Most large carnivores have suffered big declines throughout the world in the last centuries and still face threats, mostly from habitat loss and degradation and persecution. Their conservation should be based on large spatial scales, often spanning country borders. The current system of protected areas may not be enough to protect many of the large carnivore populations. For instance, in Europe 88 % of the large carnivore populations are transboundary; some of those span eight countries.

To illustrate the importance of transboundary cooperation for carnivore conservation, I will focus on the brown bear populations in Europe. Countries differ in their attitudes to bears and how they are perceived. The same bears are often under different rules depending on the side of the border they are. These discrepancies among neighbor countries refer to aspects, such as the legal status (protected vs game), population monitoring methods and estimates, management of human-bear conflicts (including damage compensation and prevention schemes), prevention of habituation and nuisance bears, protocol for bear interventions and information and data sharing. Border fences, whose numbers are on the rise in Europe, also represent a barrier to movements and even a threat to some bear populations. The development of roads, wildlife passages and related infrastructure are not always coordinated among countries sharing bears. Maintaining functional connectivity among populations is essential for their persistence. Managing transboundary populations of large carnivores is difficult everywhere and takes long time, but there are positive examples also. Good communication, data sharing, meetings among managers and joint research represent a first step at the technical level of cooperation. As a second step, political support on a permanent basis is needed to consolidate the joint management of large carnivore populations.



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Global Geoparks Network: Exchange and collaboration “on eye-level” for a sustainable development

M.L. Frey, N. Zouros, G. Martini, Germany

The Global Geoparks Network (GGN) came in 2004 into existence in Beijing on the International Geological Conference. After four successful years of the European Geoparks Network (EGN), which was founded in 2000 by four members: Réserve Géologique de Haute Provence (France), Lesvos Petrified Forest (Greece), Maestrazgo Terruel Cultural Park (Spain) and Geopark Gerolstein/Vulkaneifel (Germany), this network had already eight new members. It is interesting to find out that the four members came together to develop on the basis of the geo-heritage of their territories a new holistic perspective for a sustainable future of residents, political decision takers, people visiting and the territory itself. On the other hand, the new members were interested to find collaboration partners and exchange of experience. Up to that time this did not exist as the topics connected with the work of the geoparks, up to that time were not on the screen of any scientific discipline. However, there were earth scientists who initiated the use of geoheritage for science transfer. But already at that time the situation having scientists being confronted with reality of political bodies and tourism etc. led not to a welcome of these necessities. Hierarchies that existed that step by step have been convinced that for a successful development they need to open.

Right from the beginning the members started an approach to get to learn from each other by exchanging experience in the fields of geo-heritage plus other disciplines connected, conservation, management, education, tourism and sustainable development. This was done by visits into the territories and by developing collaboration projects in which each partner has a role (Fig. 1). The discussion were led on an eye-to-eye level and not from having more knowledge of some to those who have no knowledge. Right from the beginning onwards it was a real partnership relationship. The EGN was founded across LEADER IIC and it can be observed that many other geoparks have used European Funding Programmes to go ahead for a rural development at that time. As one result the European Geoparks Magazin was realised that up to today is the main magazine for the EGN, as the continental network for Europe in the GGN. It serves the promotion and information for the political levels and has created a basic pride and understanding for the value of this collaboration and exchange network, worldwide since November 2015 as GGN.

For all territories who since then have become members of the GGN it is important to consider the long-term development of the different fields and topics that form the heart of geoparks, especially those that seem to be difficult to develop and to deal with. The aim is to identify new measures and possibilities, which lead to a rural development giving a future perspective to the territory and for its residents. In this context, the Global Geoparks Network takes on a pivotal role and has an important task. The function of the regional networks is demonstrated by the activities of the European Geopark Network especially.



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Examples of the Asian-Pacific Global Geopark Network are given. Currently next to these two active networks within the GGN in South America, a Latin-America and Caribbean Geoparks Network has been formed in 2017.



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Yellowstone to Yukon: twenty-five years of large-landscape transboundary conservation

C.C. Chester, United States

Although Europe was home to some of the earliest conceptions of transboundary conservation, the world's first formally designated transboundary protected area was established in North America in 1932, when Canada and the United States of America created the Waterton-Glacier International Peace Park (WGIPP). Replicated and refashioned in many parts of the world, peace parks (and associated designations such as transfrontier conservation areas) have become a standard—if neither familiar nor common—implement in the global conservation toolbox.

Some sixty years after the establishment of WGIPP, another type of transboundary conservation was introduced to both North America and the world. This proposal not only encompassed the WGIPP and its surrounding Crown-of-the-Continent Ecosystem, but would also occur over a vastly more expansive geographic scale. Specifically, in 1993 the idea of a Yellowstone to Yukon region was put forth, thus unveiling one of the world's earliest transboundary “large landscape” conservation efforts. Today, the region of “Y2Y” stretches nearly 3,000 km from its southern edge in Wyoming's Wind River Range to its northernmost boundaries in the MacKenzie Mountains of the Northern Yukon and the Northwest Territories of the Canadian boreal biome. In addition to WGIPP, the Y2Y region encompasses many of North America's most well-known protected areas, including Yellowstone National Park (the first designated national park in the world, 1872) and Banff National Park (the third designated national park in the world and the first so designated in Canada, 1885). But these are only two out of hundreds of designated protected areas, and as of 2013 a minimum of 14% of the Yellowstone to Yukon region was under a protected area designation.

In addition to designating a vast transboundary area, Y2Y has also manifested itself as (1) a broad conservation network with participants from throughout the region and beyond, as well as (2) a nongovernmental organization based in Canmore, Alberta. While the shape and form of this community has evolved dramatically over the quarter-century of Y2Y's existence, those working under the Y2Y aegis have been drawn together by a common vision for protecting a large portion of North America's extant wildland areas, with a focus on ensuring the persistence of iconic wildlife species inhabiting this transborder landscape. In terms of the governance structure of Y2Y, what perhaps most stands out is the lack of government participation; while government decision-making has been an advocacy target for Y2Y, direct government involvement in Y2Y has been minimal. Instead, from its conception in 1993 to the present day, the Y2Y network and organization has consisted of coordinating and networking amongst nongovernmental actors.



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Due to its purposeful ideation through the iconic terms “Yellowstone” and “Yukon”—both of which carry complex and meaningful connotations in the North American context—Y2Y has drawn a wide audience throughout the conservation arena.

From a global perspective, perhaps Y2Y’s most significant contribution to conservation has been in its role as a transformative conservation model or vision about humanity’s relationship with wildlife, wildness, and wilderness. To some degree, however, Y2Y’s utility as a model for transborder cooperation is questionable: the Canada-USA border is comparatively strife-free, and both Canada and the USA can be fairly described as having highly idiosyncratic national characters. But from a conservation resourcing perspective, the question can also be posed as such: if two of the planet’s wealthiest countries cannot effectively work together to conserve large transboundary landscapes, where can transborder conservation succeed?



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Spatial behavior and feeding ecology of mammalian predators in the Special Protection Area (SPA) “Mittlere Havelniederung” with special focus on ground breeding bird communities

C. Fiderer, U. Zeller, Germany

As a result of increasing agricultural intensification, many ground-breeding bird species in Europe have undergone severe population declines owing to low reproductive success. Previous studies show that predation by mammalian predators (carnivores) plays an important role in this context. On the species level however, the predatory potential of carnivores on ground breeding birds is still poorly understood.

The main objective of this study is to assess the impact of different carnivore species – particularly red foxes (*Vulpes vulpes*) and raccoons (*Procyon lotor*) - on ground breeding bird communities in the SPA “Mittlere Havelniederung”. This protected area is an important resting and breeding site for many endangered ground-breeding bird species.

In spring 2016 and 2017, several bird mapping surveys were conducted to compare local occurrences of ground breeding birds with spatial behavior of mammalian predators. Therefore, a year-round camera trap monitoring survey was conducted in different habitat types. A total of 6 foxes and 9 raccoons were equipped with GPS-tags. In order to reveal habitat preferences of the equipped predators, a detailed habitat mapping was conducted. In addition to the spatial analyses, feeding behavior of both carnivore species was investigated by the analysis of fecal contents.

Home-ranges of raccoons averaged 82.6 hectares (LoCoH 95%) and were much smaller than red foxes’ home-ranges (average: 186 hectares). However, home-ranges of raccoons showed a very high intra-specific overlap (median=33%, max=83%), while red fox home-ranges did not overlap at all. Spatial analyses suggest that foxes are more likely to hunt in open grassland and forests than raccoons, which showed a clear preference for water bodies all year round. Raccoons clearly preferred reed beds and bushes near water bodies and avoided open fields and forests. In general, red foxes showed a much higher intraspecific variation concerning their habitat preferences. Foxes preferred pagans and forest habitats while they avoided arable fields. In woodlands, they preferred glades, carrs and deciduous wood and avoided coniferous wood. In addition, and contrary to previous assumptions, the findings of this study assume that in general, raccoons have a higher impact on birds than red foxes. Foxes seem to pose a threat specially to ground breeding birds in grassland areas and forests. In grassland areas, domestic cats (*Felis silvestris* f. *catus*) and raccoon dogs (*Nyctereutes procyonoides*) occurred in high numbers and should not be underestimated.

Raccoons seem to pose a threat especially onground breeding birds near water bodies. This becomes especially apparent in view of very high population densities recorded.



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This result is confirmed by the findings of the dietary analyses: Red foxes showed a clear preference for small mammals (30%). Remains of larger mammals (18%) and insects (18%) were also commonly found, while remains of birds made up only 5% of the diet. Raccoons showed a more balanced feeding behavior with a preference for fish (15%), birds (14%), insects (13%), mussels (13%) and plants (11%).

The results of this study will help to get a better understanding of the complex interrelations between mammalian predators and ground breeding bird communities in the special protection area "Mittlere Havelniederung" in order to improve preservation of ground breeding birds and derive management recommendations for sustainable land use strategies in the future.



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Rewilding: opportunities for boosting large-scale biodiversity restoration

N. Fernandez, Germany

The application of rewilding principles for ecological restoration has gained strong adepts and contentious critics in recent years. Contrasting perspectives on the goals of rewilding, as well as misinterpretations of its ecological foundations, have conditioned the debate about whether or not it is a sensitive tool in restoration. Here I will discuss the benefits of a pragmatic approach to rewilding for boosting large-scale and long-term visions for biodiversity restoration, while taking advantage of the opportunities provided by socio-economic processes such as land abandonment, as well as by the on-going recovery of many wildlife populations. Furthermore, I will present rewilding as a suitable approach to promote a more ambitious restoration agenda for Europe and to strengthen the ecological relevance of *Green Infrastructure* policies across borders.



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Corridors: no borders for protected areas?

B. Coutinho, Brazil

Despite the wide-ranging discussion on transboundary protected areas, their advantages to nature and challenges to political and social systems; this study aimed to verify the status of legal protection of the Amazon biome in relation to the Brazilian border as well as to identify gaps for the conservation of forest remnants.

The Amazon biome was delimited according to the legislation and conventions of the nine Pan-Amazon countries (Brazil, Bolivia, Colombia, Ecuador, Guyana, French Guyana, Peru, Suriname and Venezuela). Data collection was carried out at the public databases available on protected areas at national and global levels. The protected areas were classified according to the categories proposed by the IUCN and the indigenous lands were incorporated into this geodatabase.

For biological communities' level forest remnants were considered as indicators of persistence, data from 2010 and 2014 were used to quantify areas of forest remnants and to identify areas that are most vulnerable to deforestation. Data on species distribution (1,057 amphibians, 144 reptiles, 743 mammals and 2,276 birds, totalizing 4,220 species) were also used for measurements of species richness and endemism.

The data were obtained by territorial cut-offs (protected areas, indigenous land and distance to the Brazilian border line, about 11,000 km) and these were intersected with the layers of priority areas for conservation of the countries studied, biosphere reserves, world natural heritages and national or transnational projects of landscape corridors.

The results indicate that the Amazon forest is more conserved near the Brazilian border, and that the gaps found can be filled by additional protection to national conservation systems, including global biodiversity management instruments and large landscape corridors projects.



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Parque Nacional do Limpopo: An introduction to the vision and critical programs driving the development of a trans-frontier park

C. Miguel, P. Leitner, Mosambique

The establishment of a mega park straddling the borders of South Africa, Zimbabwe and Mozambique was floated as far back as 1938. This dream was able to move forward in the 1990's after the return of political stability in southern Africa. LNP (10,123 km²) was declared a National Park in 2001 followed by the establishment of the Greater Limpopo Transfrontier Park (37,572 km²) in 2002 joining Kruger National Park in South Africa, Gonarezhou National Park in Zimbabwe and Parque Nacional do Limpopo (PNL) in Mozambique. Further expansion plans incorporating Banhine and Zinave National Parks are in the planning.

The development of the PNL to achieve conservation and socio-economic objectives requires large capital investments and robust internal and multi-national governance mechanisms. After the park administrative capacity and key infrastructure were established, attention turned to the resettlement of the eight communities living inside PNL. Due to a multitude of challenges since 2008, the resettlement program is only 30% complete and remains the highest priority program. The resettlement program follows international standards and is aimed at improving livelihoods and unlocking the tourism potential once the wildlife product has restored. Tourism development addresses overall sustainability issues as it brings capital investment, jobs and revenues to cover operational costs as well as benefitting communities who receive 20% of revenues generated. The wildlife protection program has also received much attention due to the unrelenting poaching activities conducted especially from the villages inside PNL.

Despite the many challenges PNL is making progress. Much of the progress can be attributed to focus on priority programs and strong collaboration with partner countries and the donor community.



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Improving livelihoods in the face of global change – insights from South Africa’s Limpopo Province and beyond

A.S.K. Frank, L. Kindermann, E. Mudongo, J.C. Ruppert, A. Linstädter, Germany

Ecosystems provide key ecosystem services, such as biodiversity, and the supply of food, clean water and air. These services can be seriously threatened by various agents of global change, particularly changes in precipitation and disturbance regimes.

Here, we first present the results from our interdisciplinary project “Limpopo Living Landscapes” which aims at understanding the dynamics of ecological and cultural landscapes in the face of global change. We specifically give insights from a combined drought-grazing experiment (DroughtAct). In this experiment, we investigated grazing and drought effects on ecosystem functions and services, including the functional plant diversity and aboveground net primary production. The experiment revealed that one season rest under both, drought and non-drought conditions, significantly stimulated plant production. However, resting for more than one season resulted in an accumulation of moribund material which lead to shading, reduced plant fitness and individual production. Thus, we recommend resting period to be attuned to rangeland condition. In a parallel study, we assessed the functional diversity at a landscape level, focussing on various taxonomic groups (plants, invertebrates and vertebrates).

Next, we will share our ideas about methods to assess biodiversity-mediated ecosystem functions in a **fast, inexpensive, non-destructive and easy** way (termed “FINE methods”) which will account for constraints of size of sampling area and sampling duration. Explicitly, we aim to apply these methods to investigate land-use (grazing) and climate change effects (drought) on multi-trophic interactions to unravel top-down and bottom-up controls of ecosystem functioning and subsequently on ecosystem service supply. This approach will be particularly useful for international networks and cross-border studies.



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International cooperation of the Dauria International Protected Area, conservation of biodiversity, climate change and land use

O. Goroshko, Russia

Dauria International Protected Area (DIPA) includes three state nature reserves: Chinese “Dalai Lake”, Mongolian “Mongol-daguur” and Russian “Daursky”. The DIPA was established in 1994 for conservation transboundary steppe and wetlands ecosystems. The total area of DIPA is 195 km². It is located within the global transboundary Daurian Steppe Ecoregion (it is one of the 200 global biogeographical regions in the world was selected by WWF in 2000).

The main directions of international cooperation in DIPA are research and ecological education. Before establishment of the DIPA, information about biodiversity of the Daurian Ecoregion was very limited. 128 joint research expeditions were made; their total duration is more 1,700 days. Territory about 300,000 km² of Daurian transboundary ecoregion is observed and monitored by DIPA. Main aims of international research programs are: study and monitoring of ecosystems and threats, work up of recommendations for conservation of biodiversity. Main directions of ecological education cooperation: international summer children ecological camps, international competitions and exhibitions of children drawings and other.

The DIPA have great importance for conservation of biodiversity in Asia (especially birds and especially waterbirds). 28 globally threatened species of birds inhabit in the DIPA (IUCN Red List; status CR, EN, VU). The DIPA supports internationally important habitats for many of them: White-naped (*Grus vipio*), Siberian (*Grus leucogeranus*), and Hooded Cranes (*Grus monacha*), Swan Goose (*Anser cygnoides*), Great Bustard (*Otis tarda dybowskii*), Relict Gull (*Larus relictus*). These species and also Red-crowned Crane (*Grus japonensis*), Saker Falcon (*Falco cherrug*), Steppe Eagle (*Aquila nipalensis*), and also two species of mammals: Tarbagan marmot (*Marmota sibirica*) and Mongolian Gazelle (*Procapra gutturosa*) are in focus of joint projects of DIPA.

Other important directions of joint scientific works: 1) study and monitoring of migratory and breeding waterbirds; 2) study influence of climate change to Daurian ecosystems and adaptation of national and international politics of using of nature resources in Dauria to climate change and development of conservation of biodiversity and sustainable using of nature resources. The Transboundary Ecological Monitoring Network (TEMN) was created for this. The TEMN includes more than 200 plots on lakes, rivers and steppe grasslands for monitoring of waterbirds, vegetation, water resources, etc.

Detail information about distribution, number and biology of threatened species and about threats for them was collected. Unfortunately, number of populations of White-naped Crane, Red-crowned Crane, Great Bustard, Relict Gull, Swan Goose and many other species declines quickly in Daurian Ecoregion because of many different causes. No significant anthropogenic threats inside DIPA, but a lot of them are outside DIPA.



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There is also one serious natural threat – dramatic change of habitats because of strong long-term drought during 2000-2017: about 95% of wetlands in Dauria are completely dry. Therefore, many globally threatened species need in urgent conservation actions. DIPA prepares and realizes programs of conservation and restoration of biodiversity and sustainable use of nature resources in Daurian Eco-region: 1) establishment of new nature protected areas; 2) preparation of recommendations to governments for regulation of land, water resources, and nature resources use; 3) prevention and reduction of disturbance, grass- and forest-fires, electrocution birds on power lines and other threats around DIPA; 4) solve problem of crop depredation by cranes on farmer lands.



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List of participants



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Chester, Charles, Prof. Dr.

Yellowstone to Yukon Conservation Initiative
Brandeis University
Department of Environmental Studies
415 South Street, Waltham, MA 02453, United States

Coutinho, Bruno, Dr.

Conservation International Brazil
Av. Rio Branco, 131
Rio de Janeiro, Brazil

Fernández, Néstor, Dr.

German Centre for Integrative Biodiversity Research (iDiv) Halle-Jena-Leipzig
Deutscher Platz 5e
04103 Leipzig, Germany

Fiderer, Christian

FG Spezielle Zoologie
Lebenswissenschaftliche Fakultät
Humboldt-Universität zu Berlin
Unter den Linden 6
10099 Berlin, Germany

Frank, Anke, Dr.

Universität zu Köln
Botanisches Institut, AG Linstädter
Zülpicher Straße 47b
50674 Köln, Germany

Frey, Marie-Louise, Dr.

Welterbe Grube Messel GmbH
Roßdörfer Strasse 108
64409 Messel, Germany

Göttert, Thomas, Dr.

FG Spezielle Zoologie
Lebenswissenschaftliche Fakultät
Humboldt-Universität zu Berlin
Unter den Linden 6
10099 Berlin, Germany

Goroshko, Oleg A., Dr.

Deputy-director for research work
Daursky State Nature Biosphere Reserve
Post box-66, 76 Komsomolskaya Str., Nizhny Tsasuchey
Chita 674480, Russia



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Hans, Ursula, Dr.

Director of International Office
Humboldt-Universität zu Berlin
Unter den Linden 6
10099 Berlin, Germany

Langgemach, Torsten, Dr.

Landesamt für Umwelt
Staatliche Vogelschutzbehörde Brandenburg
Buckower Dorfstr. 34
14715 Nennhausen, Germany

Leitner, Peter

Project Manager
Parque Nacional do Limpopo
Peace Parks Foundation, Mozambique

Macandza, Valério, Prof. Dr.

Department of Forestry Engineering
Faculty of Agronomy and Forestry Engineering
Universidade Eduardo Mondlane, Mozambique

McCallum, Jamie, Dr.

IUCN Transboundary Conservation Specialist Group
Transfrontier International
17 Hanover Square
London W1S 1BN, United Kingdom

Miguel, Cornélio

Park Administrator
Parque Nacional do Limpopo, Mozambique

Odendaal, Nils

Chief Executive Officer
NamibRand Nature Reserve
76-78 Frans Indongo Street – SAIEA House
PO Box 40707 Windhoek, Namibia

Pistreich, Machla

Zwillenberg-Tietz Stiftung
Richard-Strauss-Straße 4
14193 Berlin, Germany



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Rottstock, Thomas

FG Spezielle Zoologie
Lebenswissenschaftliche Fakultät
Humboldt-Universität zu Berlin
Unter den Linden 6
10099 Berlin, Germany

Selva, Nuria, Dr.

Associate Professor
Poland Institute of Nature Conservation
Polish Academy of Sciences
Poland

Starik, Nicole, Dr.

FG Spezielle Zoologie
Lebenswissenschaftliche Fakultät
Humboldt-Universität zu Berlin
Unter den Linden 6
10099 Berlin, Germany

Taylor, Peter, Prof. Dr.

South African Research Chair on Biodiversity Value & Change
& Core Team Member of the Centre for Invasion Biology
University of Venda,
P Bag X 5050
Thohoyandou 0950, South Africa

Voigt-Kammer, Monika

Zwillenberg-Tietz Stiftung
Richard-Strauss-Straße 4
14193 Berlin, Germany

Wicke, Marcus, Dr.

Zwillenberg-Tietz Stiftung
Forschungsstation Linde
Brunnenweg 2
14715 Märkisch Luch (OT Linde), Germany

Zeller, Ulrich, Prof. Dr.

FG Spezielle Zoologie
Lebenswissenschaftliche Fakultät
Humboldt-Universität zu Berlin
Unter den Linden 6
10099 Berlin, Germany