Symposium 30.-31st October 2025

25 Years Studying Small Mammal Socio-Ecology in a Biodiversity Hotspot

The Succulent Karoo Research Station (SKRS) was founded in 2001 as a base for organismal research in the Succulent Karoo biodiversity hotspot. For a quarter of a century, it increased our ecological understanding of the Succulent Karoo via its ground-breaking research in eco-physiology and behavioural ecology of small mammals. During a two days symposium we want to review past, current and future research at SKRS (day 1) and show how this contributes to a better understanding of the ecology, evolution, and management of this biodiversity hotspot (day2).

Location: Conference facility in Goegap Nature Reserve.

Please note that **there is no wifi and no cellphone reception.**

Date: Thursday 30th October and Friday 31st October (2 days).

Entrance and exist of the Nature Reserve: Attendees of the symposium do not have to pay a conservation fee to enter Goegap. A list of attendees will be at the gate, which opens at 7:30. The gate will be officially closed at 16:30. Please be in time at the gate. On Friday, the gate will also be opened at 22:30 to allow people to leave after the braai.

Day 1 (Thursday 30th October): Presentations by researchers and students working at SKRS. We will present the most important research that was conducted in the fields of behavioural ecology on small mammals and its impact on the international scientific community.

Day 2 (Friday 31st October): Presentations by researchers and by nature conservationists about the Succulent Karoo biodiversity hotspot with a focus on small mammals and their impact on this ecosystem.

Duration of talks: Talks are either 20 or 40min, always followed by 5min of discussion. Please see the schedule below for how long you talk will be. The duration is strictly enforced.

Braai: On Friday evening we will have a braai at SKRS for people who registered for it. Registration for the braai is closed now.

Food, Information, and Costs: To make the symposium accessible to everyone, we are not charging a registration fee. But since every Rand spent here is one Rand less for research, we're keeping the budget modest. We will provide free coffee breaks and lunches. Note: no dinner will be served on Thursday and no breakfast on any day. The symposium program will be sent to you digitally and displayed at the venue, but to save costs, we won't print individual copies. Name stickers will be available for you to write your name and affiliation — these will serve as informal name tags. Finally, although we're proud of this event, we will not be printing banners or other decorations in order to prioritize funding for research.

Our Caterer:

Sponsors

Goegap Nature Reserve provides free access to its conference facilities.
The Département d'Ecologie Physiologie et Ethologie of the CNRS in Strasbourg France sponsors the coffee breaks and lunches.
All other costs are covered by the Succulent Karoo Research Station.

More information

https://www.stripedmouse.com/symposium-25-years-skrs.html
https://www.facebook.com/groups/stripedmouse

Program

Day 1: Science (talk + discussion)

Time	Topic	Presenter
8:30	**Coffee Break**	
9:00	Welcome	Dr. Lindelani Makuya, SKRS, Wits and CNRS
9:15 (40+5)	History of SKRS	Dr. Carsten Schradin, SKRS, Wits and CNRS
10:00 (10+5)	SKRS in a South African context	Dr. Carsten Schradin / Prof. Neville Pillay, SKRS and Wits
10:15	**Coffee Break**	
10:45 (20+5)	Why to live solitarily: Lessons from the bush Karoo rat	Dr. Lindelani Makuya, SKRS, Wits and CNRS
11:10 (20+5)	The structure of bush Karoo rat lodges	Nkululeko Mbanjwa, SKRS
11:35 (20+5)	The function of plants collected by bush Karoo rats (*Otomys unisulcatus*)	Siyabonga Sangweni SKRS and Wits
12:00	**Lunch break: Traditional Namaqua Potjiekos with Roosterbread and desert**	
13:15 (20+5)	Engineering ecosystems: How bush Karoo rats influence soil carbon sequestration	Dr. Christine Hatté, Université Paris-Saclay
13:40 (20+5)	Bush Karoo rats as eco-system engineers	Perfect Dlamini, SKRS
14:05	**Coffee Break**	
14:30 (20+5)	Ecto-parasites and sociality	Nkululeko Nyawo, SKRS
14:55 (20+5)	Spatial kinship structure and dispersal patterns in a population of South African bush Karoo rats	Chiara Guerra, H.G. Rödel & C. Poteaux University Sorbonne Paris Nord
15:20 (20+5)	Personality differences in bush Karoo rats born early and late in the breeding season	Prof. Heiko G. Rödel, University Sorbonne Paris Nord
15:45	**Coffee Break**	
16:15 (40+5)	Harshness is not stress: Lessons from the striped mouse	Dr. Carsten Schradin, SKRS, Wits and CNRS
17:00	**End of Day 1** **We will open the side gate for you.** **Please exit by 17:30**	

Day 2: Conservation

Time	Topic	Presenter
8:30	**Coffee Break**	
9:00 (10+5)	Basic science and conservation	Dr. Carsten Schradin / Prof. Neville Pillay, SKRS and Wits
09:15 (20+5)	Biodiversity monitoring by SKRS: plants and mammals	Dr. Lindelani Makuya, SKRS, Wits and CNRS
09:40 (20+5)	Long-term vegetation monitoring on Goegap Nature Reserve: a concise overview of the network and observations to date	Conrad Geldenhuys, Northern Cape Department of Agriculture, Environmental Affairs, Rural Development and Land Reform
10:05	**Coffee Break**	
10:45 (20+5)	Socio-genetics and conservation	Dr. Chantal Poteaux, University Sorbonne Paris Nord
11:10 (20+5)	Habitat utilization of Hartmann's mountain zebra on Goegap Nature Reserve	Marnus Smit, Northern Cape Department of Agriculture, Environmental Affairs, Rural Development and Land Reform
11:35 (20+5)	Strategic Conservation in the Succulent Karoo: The Power of Funding, Partnerships, and Innovative Mechanisms for Protected Area Expansion	Phakamile Zungu, WWF and Leslie Hill Succulent Karoo Trust
12:00	**Lunch break: Pizza and desert**	
13:30 (20+5)	Responding to the illegal succulent trade crisis in South Africa	Emily Kudze, WWF /SANBI: Senior Scientific Coordinator: Illegal Succulent Trade
13:55 (20+5)	Linking Goegap and Namaqua National Parks – Establishing the Melkrivier Corridor	Maxie Jonk, Reserve Manager Goegap
14:20 (20+5)	Biodiversity and conservation of the Succulent Karoo during the last decades	Annelise le Roux, Elmarie Heyns and Mierietjie Landman, Wilderness Foundation, Nelson Mandela University
14:45	**Coffee Break**	
15:15 (40+5)	Reptiles of Namaqualand	Johan Marais, Kokerboom Biological Research Station
16:00 End of symposium (Exit gate open until 16:30)		
17:00-18:00	Visit of the Succulent Karoo Research Station and the field site (registration for this event is closed).	
18:30	Braai at SKRS (registration for the braai is closed): Chicken, lamb and gemsbok steak with pap.	
22:00-22:30	**End of braai. Gate opens last time at 22:30**	

Abstracts

Day 1

Carsten Schradin
Succulent Karoo Research Station
IPHC, UNISTRA, CNRS, 23 rue du Loess, 67200 Strasbourg, France
School of Animal, Plant & Environmental Sciences, University of the Witwatersrand, Private Bag 3, WITS 2050, Johannesburg, South Africa
*E-mail: carsten.schradin@iphc.cnrs.fr

History of SKRS

The Succulent Karoo Research Station SKRS was founded in 2001, when I started my field work on striped mice (*Rhabdomys pumilio*) as a postdoc at the University of the Witwatersrand. Originally, only short field studies were planned to show that paternal care occurs in striped mice under natural conditions. However, I immediately realised that this is the perfect place for long-term field studies on a mouse like rodent, which changed my career path. 40% of all mammals are rodents, most mouse like, but my study is the only one on a free-living mouse that is observed directly in its natural habitat. In 2006, I started a contract position as group-leader at the University of Zurich, Switzerland, and in 2012 as permanent researcher at the CNRS in Strasbourg, France. In 2013, SKRS was registered as a South African non-profit organisation. Long term studies on the striped mouse continued throughout the years. Studies focussed on paternal care, social flexibility, and adaptations to drought with more than 100 peer-reviewed publications revolutionising our understanding of social evolution and of how animals cope with drought. The closure of Goegap Nature Reserve in 2020 due to the Covid pandemic lead to a change of research focus from the socially flexibly but most often group-living striped mouse to the socially flexible but most often solitary living bush Karoo rat. These studies revolutionised our understanding of the mechanisms leading to and the evolutionary consequences of solitary living. Over the 25 years of field studies at Goegap, more than 150 volunteers, research assistants, students and researchers from all over the world worked at SKRS. Multiple collaborations were done with researchers from France, Germany, South Africa, Spain, Switzerland, UK and USA. Since 2024, three research assistants are employed by SKRS. Striped mice from Goegap were exported the first time in 2006. In the meantime, five colonies exist at research institutions worldwide, in France, the UK, Italy and the USA, with a wide variety of studies such as vocal communication, molecular and neural basis of social behaviour, chronobiology and evolutionary developmental biology being conducted on them, all based on our results obtained at SKRS. In sum, the research conducted at SKRS over the last 25 years had a significant impact on multiple research fields worldwide.

Neville Pillay
Succulent Karoo Research Station
School of Animal, Plant & Environmental Sciences, University of the Witwatersrand, Private Bag 3, WITS 2050, Johannesburg, South Africa
*E-mail: Neville.Pillay@wits.ac.za

SKRS in a South African context

The Succulent Karoo Research Station (SKRS) is situated in one of the world's most unique biodiversity hotspots. SKRS provides an exceptional platform for understanding the ecology and conservation of arid environments. The Succulent Karoo biome is renowned for its extraordinary plant diversity and endemism and is also home to a rich of animal and plant life, much of which is poorly studied. Over the past two decades, SKRS has become a hub for long-term ecological and behavioural research, particularly on small mammals such as striped mice and bush Karoo rats. In this talk, I will highlight the scientific contributions emerging from the station, from studies of social evolution and communication to responses to environmental change. I will also reflect on SKRS's role in building research capacity in South Africa, training students and supporting interdisciplinary collaborations. As arid ecosystems face numerous challenges, SKRS offers an important model for how field-based, long-term science can inform broader conservation efforts while enriching our understanding of life in extreme environments.

Lindelani Makuya
Succulent Karoo Research Station
IPHC, UNISTRA, CNRS, 23 rue du Loess, 67200 Strasbourg, France
School of Animal, Plant & Environmental Sciences, University of the Witwatersrand, Private Bag 3, WITS 2050, Johannesburg, South Africa
*E-mail: lindelani.makuya@iphc.cnrs.fr

Why to live solitarily: Lessons from the bush Karoo rat

Solitary living has traditionally been regarded as the ancestral as well as most common and most primitive form of social organisation in mammals. However, recent comparative studies indicate that solitary living is not ancestral for all mammalian orders, and that solitary living is an adaptation to the environment. To reach a better understating of solitary living, I studied the social system of free-living bush Karoo rats (*Otomys unisulcatus*) in the Succulent Karoo semi-desert of South Africa. I used trapping and marking, focal animal observations and mini-GPS dataloggers that I fitted simultaneously to neighbouring females. I found that 96% of female bush Karoo rats were solitary living, with social groups of two or three individuals occurring occasionally. Groups always consisted of close kin, typically females. The home ranges of kin neighbours overlapped more than those of non-kin. Neighbours were, however, attracted to the same foraging grounds, irrespective of relatedness. Females tolerated one another at shared foraging grounds, which could be interpreted as by-product mutualism, a simple form of cooperation. I recorded interactions between neighbouring bush Karoo rats both in a neutral test arena and in the field to investigate whether solitary living was due to aggression and social intolerance. Social interactions between neighbours were rare and aggression was rare in neutral arena tests. However, female bush Karoo rats were more aggressive towards non-kin intruders in the field tests. Finally, the relationship between mother and offspring remained amicable even after the offspring had dispersed from the lodges, indicating that maternal aggression was not the mechanism that led to offspring dispersal and solitary living. In conclusion, I showed that solitary living is not always characterised by aggression and avoidance, but rather that solitary species can have non-random and individualised social interactions that are influenced by kinship.

Nkululeko Mbanjwa
Succulent Karoo Research Station
*E-mail: nkululekomb2000@gmail.com

The structure of bush Karoo rat lodges

The extensive stick lodges built by bush Karoo rats are regarded as one key example of animal architecture. However, detailed studies on the lodge structure are missing. Here I present data on the external and internal structure of 106 bush Karoo rat lodges on our field site next to the Succulent Karoo Research Station. Lodges were sampled in the moist and the dry seasonLodge height increase significantly from the moist to the dry season from 38 ± 12 to 39 ± 12cm, while circumference decreased significantly from 366 ± 111cm to 325 ± 137cm, and there was no seasonal effect on lodge diameter. Surprisingly, there were more entrances in the moist than in the dry season, while there was no seasonal difference in the number of platforms. These platforms can be used for basking, eating or as latrines. *Tetraena retrofracta* and *Lycium*. *cinerum* were two most common shrub species used for lodge construction. Lodges were primarily built by sticks though other objects such as dung and stones were also used. Our data shows that bush Karoo rat lodges represent complex animal architecture and future studies will test how these components lead to a favourite microclimate inside the lodges

Siyabonga Sangweni
Succulent Karoo Research Station
School of Animal, Plant & Environmental Sciences, University of the Witwatersrand, Private Bag 3, WITS 2050, Johannesburg, South Africa
E-mail: Siyasangweni2@gmail.com

The function of plants collected by bush Karoo rats (*Otomys unisulcatus*)

Food storing to cope with food reduction during winter has been observed in many rodents in the northern hemisphere. Food storing could also be adaptive in semi-deserts of the southern hemisphere, which experience food-restricted dry seasons. We studied the function of dried food plants found at the stick lodges of bush Karoo rats in a semi-desert in South Africa. We performed 998 focal animal observations and monitored 12 lodges to record the fate of plant pieces carried back to the lodges. Collected plant species were eaten green (68%), eaten as plantong (12%), incorporated into the structure of the lodge (11%), or their fate was unknown (9%). Especially succulents carried back to the lodge dried out, forming what we refer to as plantong. This happened mainly in the food rich moist season. However, plantong was not stored from the moist to the dry season but was consumed within 6±5 days. Bush Karoo rats readily ate plantong presented to them experimentally. We regard plantong as leftover from food freshly consumed at the lodge, but not as food collected in the moist season to be stored for later consumption during the dry season.

Christine Hatté
Université Paris-Saclay, France
*E-mail: Christine.Hatte@lsce.ipsl.fr

Engineering Ecosystems: How Bush Karoo Rats Influence Soil Carbon Sequestration

The role of Bush Karoo Rats in shaping ecosystem dynamics, particularly in soil carbon sequestration, remains poorly understood. While their lodges are expected to provide protection against predators and weather, their potential impact on soil health and carbon dynamics has received little empirical attention. Bush Karoo Rats' constructions significantly influence their surroundings including soils by concentrating organic matter, such as wood, vegetation, and feces. This addition of carbon to soil might (i) enhance biodiversity by creating favorable conditions for plant species unable to thrive in nutrient-poor soils, and (ii) contribute to a sustainable soil carbon reservoir. However, robust data to support these dynamics remain scarce. This study presents preliminary results from soil core samples collected at the Succulent Karoo Research Station in November 2024. Soil cores were sampled in paired settings: under lodges vs. outside under the same shrub species without lodge (*Zygophyllum*, *Lycium*) and unvegetated areas. Lodges had been occupied for varying durations (inc. abandoned lodges). Using isotopic geochemistry, we analyze soil organic matter through ^{14}C dating, carbon and nitrogen content, and isotopic signatures. $\delta^{13}C$ reveals the contributions of C3 and C4 plants, while $\delta^{15}N$ provides insights into the role of legumes in nitrogen cycling. The objectives are threefold: (i) quantify the carbon stock added by lodges, (ii) evaluate its sustainability, and (iii) identify factors influencing the magnitude of this additional carbon stock. These findings aim to inform conservation policies by emphasizing the overlooked role of small mammals in carbon cycling and soil health.

Perfect Dlamini
Succulent Karoo Research Station
*E-mail: dlaminiperfect1@gmail.com

Bush Karoo rats as eco-system engineers

Eco-system engineers are species believed to have a significant impact on their habitat and other species living in it. The bush Karoo rat might be such an eco-system engineer, but a detailed review about their impact on their ecosystem is so far missing. Here I summarise how bush Karoo rats influence their habitat by lodge building, i.e. the carrying away of plant material to construct lodges which influences the overall appearance of their habitat. Lodges offer shelter for many other species and impact the soil ecology, while the preferences of bush Karoo rats to forage on dominant plant species is believed to explain the higher plant biodiversity around occupied than unoccupied lodges. These results are important for both nature conservation and farming, because they show that bush Karoo rats are eco-system engineers that help to maintain a high biodiversity and healthy soils.

Nkululeko Nyawo
Succulent Karoo Research Station
*E-mail: nkululekonyawo0@gmail.com

Ecto-parasites and sociality

Solitary living has often been suggested to have the benefit of a lower risk to get infected with ecto-parasites. However, previous comparisons were always between small and large groups and did not include solitary individuals. It is possible that small groups are more effective in removing ecto-parasites than large groups. Thus, so far it is unknown whether solitary living had the benefit of a lower

ecto-parasite load. Here I show that solitary bush Karoo rats have a less ecto-parasites than group-living striped mice and I will present a comparison between solitary and pair-living bush Karoo rats. This study shows that solitary living can have the benefit of lower ecto-parasite load.

Chiara Guerra, Heiko G. Rödel & C. Poteaux
Laboratoire d'Ethologie Expérimentale et Comparée UR 4443 (LEEC), Université Sorbonne Paris Nord, F-93430 Villetaneuse, France

Spatial kinship structure and dispersal patterns in a population of South African bush Karoo rats

Dispersal is one of the fundamental life history traits and can shape animal population structures. Although in general still not much is known about individual-based drivers of dispersal decisions. The genetic kinship structure can affect dispersal behavior to avoid inbreeding, although kinship relations may also serve as an attractor – possibly even in a mainly solitary species such as in the bush Karoo rat (Otomys unisulcatus). Furthermore, dispersal can be influenced by environmental factors, such as resource availability, and by individual traits, including sex, body mass and age. In our study, the multilevel interplay of such possible drivers of dispersal patterns of the bush Karoo rat will be investigated using a comprehensive 7-year genetic and ecological dataset. We predict that the spatio-temporal kinship distribution within the female population will help explain the dynamics underlying natal dispersal. The results will expectantly contribute to a better understanding of how dispersal dynamics are shaped in space and time.

Heiko G. Rödel[1], Jingyu Qiu[2,3]
[1] Laboratoire d'Ethologie Expérimentale et Comparée UR 4443 (LEEC), Université Sorbonne Paris Nord, F-93430 Villetaneuse, France
[2] School of Animal, Plant and Environmental Sciences, University of the Witwatersrand, South Africa
[3] IPHC, UNISTRA, CNRS, 23 rue du Loess, 67200 Strasbourg, France
*E-mail: rodel@univ-paris13.fr

Personality differences in bush Karoo rats born early and late in the breeding season

In short-lived small mammals, individuals born earlier in the breeding season frequently reproduce within their season of birth. Consequently, it has been proposed that those born early benefit from a more proactive behavioral type to compete for reproductive opportunities, whereas later-borns adopt a more reactive personality to conserve energy to survive through the non-breeding season thus postponing reproduction to the following year. However, being proactive could also benefit later-borns in acquiring resources in the late breeding season essential for survival. We investigated personality differences depending on the date of birth, in relation to resource variation in a free-living population of the bush Karoo rat (*Otomys unisulcatus*). This species constructs stick lodges, a critical resource protecting the rats from the harsh semi-desert environments, whereas the availability of vacant lodges decreases with the deterministic increase in population density along the breeding season. We predicted an increased occurrence of proactive phenotypes during the later breeding season, contrasting with the commonly assumed decrease in proactive phenotypes in late season due to lack of reproductive opportunity. Behavioral testing of wild-caught individuals revealed that later-borns showed greater activity, boldness and exploration tendencies, indicating a more proactive personality. Furthermore, early-born females which reproduced within the same season showed no notable differences in personality compared to those which did not reproduce. Taken together, our results indicate that seasonal differences in personality types in the bush Karoo rat may be driven by resource constraints in the late season rather than by differences in reproduction opportunities.
This study has been published in Qui et al. (2024) Behav Ecol Sociobiol 78

Carsten Schradin
Succulent Karoo Research Station
IPHC, UNISTRA, CNRS, 23 rue du Loess, 67200 Strasbourg, France
School of Animal, Plant & Environmental Sciences, University of the Witwatersrand, Private Bag 3, WITS 2050, Johannesburg, South Africa
*E-mail: carsten.schradin@iphc.cnrs.fr

Harshness is not stress: Lessons from the striped mouse

Animals are adapted to cope with harsh environments characterised by persistent and long-lasting factors that threaten homeostasis and survival such as reduced food availability, reduced water availability, and seasonal cold or heat. Understanding these adaptations is crucial to understand species resilience to global change. Over two decades of field studies I investigated how African striped mice (*Rhabdomys pumilio*) are adapted to harshness in the Succulent Karoo semi-desert characterised by hot, dry and food restricted summers and moist benign winters. Striped mice are adapted to harshness via multiple behavioural and physiological mechanisms, which reduce energy consumption and increase water retention. Mechanisms include social flexibility, communal huddling, sun-basking, reducing activity, broad range of blood glucose regulation, decrease of metabolic hormone levels, decrease of resting metabolic rate and by this an overall reduction of daily energy expenditure. These studies indicate that to endure harshness, animals decrease energy expenditure, which is the opposite to the physiological stress response which is characterised by a significant increase in energy expenditure. It is important to recognise that stressful environments are not synonymous with harsh environments. The stress response leads to increased energy expenditure to overcome stress, while the harshness response leads to reduced energy expenditure to endure harshness. I thus conclude that the harshness response is fundamentally different from the stress response.

Day 2

Neville Pillay
Succulent Karoo Research Station
School of Animal, Plant & Environmental Sciences, University of the Witwatersrand, Private Bag 3, WITS 2050, Johannesburg, South Africa
*E-mail: Neville.Pillay@wits.ac.za

Basic science and conservation

Basic science involves research aimed at understanding how nature works and is often seems far removed from the urgent work of conserving species and ecosystems. But in reality, it plays a crucial role in informing conservation decisions. This talk explores how studies in animal behaviour, ecology and evolution provide the foundation for many of the tools and strategies we use in conservation today. I will share examples from South Africa and beyond, showing how long-term research and curiosity-driven studies have helped guide reserve design, species recovery and habitat management. From understanding how animals adapt to changing environments to revealing hidden species through genetic work, basic science helps us make better choices in protecting biodiversity. I will also reflect on the need to support this kind of research and to build stronger links between scientists, conservationists and communities to address the challenges we face in conserving nature in a changing world.

Lindelani Makuya
Succulent Karoo Research Station
IPHC, UNISTRA, CNRS, 23 rue du Loess, 67200 Strasbourg, France
School of Animal, Plant & Environmental Sciences, University of the Witwatersrand, Private Bag 3, WITS 2050, Johannesburg, South Africa
*E-mail: lindelani.makuya@iphc.cnrs.fr

Biodiversity monitoring by SKRS: plants and mammals

The Succulent Karoo contains a biodiversity hotspot in Namaqualand, that is home to over 6000 plant species, 40% of which are endemic to the region. Although extensive studies have been conducted in the area to understand the plant diversity, little is known about the animals such as reptiles and mammals. Furthermore, only a small section of 3.5 % of the area is formally protected. At SKRS we conduct long-term monitoring of small mammals. We contributed to the South African Mammal Red Data List for five small mammal species which are the bush Karoo rat, Brants and Littledale´s whistling rat, striped mice and the round eared elephant shrew. We have 8 monitoring plots in which we measure the plant diversity every month. This allows have to also have seasonal estimates of the plan cover throughout the years. These monitoring activities contribute to the better understanding the Succulent Karoo biome and in turn can advise on authorities for its better conservation and management.

Conrad Geldenhuys [a], M.W. van Rooyen [a,d], N. Van Rooyen [e], A. Le Roux [f] and H. Van der Merwe [a,b]
[a] *Northern Cape Department of Agriculture, Environmental Affairs, Rural Development and Land Reform, PO Box 325, Springbok, South Africa*
[b] *South African Environmental Observation Network (SAEON), Arid Lands Node, Kimberley, South Africa*
[c] *Department of Biological Sciences, University of Cape Town, Cape Town, South Africa*
[d] *Department of Plant & Soil Science, University of Pretoria, Pretoria, South Africa*
[e] *Private, 7 St George Street, Somerset West, South Africa*
[f] *CapeNature, Assegaaibosch Nature Reserve, Jonkershoek, Stellenbosch, South Africa*

Long-term vegetation monitoring on Goegap Nature Reserve: a concise overview of the network and observations to date

Grazing pressure and climate are important drivers of semi-arid rangelands. Although this principle is generally accepted in the ecological framework of drylands functioning, there is a lack of continuous long-term monitoring data sets in South Africa to validate this. The Goegap Nature Reserve was established in 1966 and from 1974 vegetation monitoring has been conducted annually on the reserve. The *in situ* vegetation monitoring has continued until today through the efforts of a succession of field workers and researchers over the years. The main purpose of the monitoring has always been to inform rangeland management on the reserve. The network of monitoring sites has expanded as the nature reserve gradually grew, with the same survey methodology being applied to expansion sites as well as other external, private conservation areas. The consistent monitoring program has enabled an unbiased and valuable overview of trends in vegetation dynamics over decades and important drivers of change. The oldest sections of the reserve, with the longest monitoring history, had a history of overgrazing from agriculture related land uses prior to proclamation. The perennial vegetation component in these sections had slowly and steadily recovered over a period of decades. This was enabled through persistent low stocking density and generally good rainfall periods. From the mid-2000s the upward trend slowed or a reversal in rangeland condition was observed in some habitats due to increased grazing pressure. From 2015 the onset of a multi-year drought also impacted rangeland greatly, but with variable severity depending on habitat. The annual/ephemeral vegetation

component has always been extremely variable, reacting primarily to rainfall. The long-term monitoring project has been a valuable research asset to assist with the management of the reserve but has also provided valuable insights into the ecology of the Succulent Karoo.

Chantal Poteaux
Laboratoire d'Ethologie Expérimentale et Comparée UR 4443 (LEEC), Université Sorbonne Paris Nord, F-93430 Villetaneuse, France

Socio-genetics and conservation

Human activities are causing climate change and a global decline in biodiversity, which could affect ecosystem services. In order to address this issue, it is crucial to quantify biodiversity trends, identify the drivers of biodiversity loss, measure how biological systems respond to human interventions, and establish policies for managing and restoring biodiversity, particularly in small populations. In this context, molecular biology plays a key role by revealing the spatial and temporal patterns of genetic variation in natural populations, offering multiple evolutionary measures that are fundamental to the assessment and conservation of genetic diversity. Molecular genetics can elucidate gene flow and population connectivity, inform adaptive potential through genomic analyses, and guide interventions such as translocation. At a finer scale, it can also focus on genetic diversity, population structure, sociogenetic systems and demography history. We will present examples to illustrate how these genetic measures can contribute to the development of conservation actions.

Marnus Smit & Maxie Jonk
PRODUCTION SCIENTIST: MAMMALOGIST
Department of Agriculture, Environmental Affairs, Rural Development and Land reform
Department of Environment and Nature Conservation
Kimberley 8300
*E-mail: zmsmit.denc@gmail.com

Habitat utilization of Hartmann's mountain zebra on Goegap Nature Reserve

Historically Hartmann's Mountain Zebra's (HMZ, *Equus zebra hartmannae*) ranged from southern Angola, across Namibia, and into the north-western portion of the Northern Cape Province in South Africa. In South Africa the species is uncommon, and range restricted. Almost all known habitat and ecology studies on HMZ have been conducted on Namibian populations. In Namibia, HMZ are found in rugged, broken mountainous and escarpment areas with a high abundance of palatable grasses and perennial water sources. The species particularly prefers ecotones that combines mountainous and sandy flat areas. The range of HMZ in South Africa however stretches into the Succulent karoo biome, which greatly differs from the Nama karoo and Savanna biome where the species occurs in Namibia. On Goegap Nature Reserve (GNP), located in the Succulent Karoo, HMZ localities were recorded bi-annually (2005-2023) during the reserves game count and monitoring programme. In 2013 GNP also expanded eastwards and unlocked new habitats more closely associated with the Nama karoo. The locality data provided the ideal opportunity to not only study the habitat preferences of HMZ within the Succulent karoo, but also the potential changes in habitat selection as new habitats became available. It was found that Goegap's HMZ preferred low lying plains adjacent to mountains and ridges while mountain plateaus were also frequently utilized. Interestingly, HMZ only extensively utilised the Nama karoo habitats during an extended period of drought. Further studies are however required to determine the variables that impacted habitat selection of HMZ.

Phakamile Zungu
Project Coordinator: Northern Cape/ Arid Zone Landscape, WWF South Africa
*E-mal: Phakamile Zungu <pzungu@wwf.org.za>

Strategic Conservation in the Succulent Karoo: The Power of Funding, Partnerships, and Innovative Mechanisms for Protected Area Expansion

The Succulent Karoo Biome, one of the world's most unique biodiversity hotspots, is home to over 6 000 plant species—40% found nowhere else. Despite its global significance, this fragile landscape faces increasing threats from mining, development, illegal succulent trade, unemployment, and limited conservation capacity. Since 1995, WWF South Africa—through funding from the Leslie Hill Succulent Karoo Trust (LHSKT)—has led an Expanded Programme of Work focused on strategic protected area expansion. What began as a land acquisition initiative in 1995, has evolved into a multi-faceted approach that includes biodiversity stewardship, community conservation, ecological restoration, and threat mitigation. To date, the Programme has formally protected nearly 320 000 ha through land acquisition, secured an additional 61 000 ha via biodiversity stewardship agreements, and improved conservation management across more than 156 000 ha of priority landscapes. These achievements have been made possible through collaboration with a network of committed partners, including government agencies and conservation NGOs. Looking ahead, WWF will continue to collaborate with partners to secure additional ha of ecologically important land, thereby advancing the Biome toward achieving the 30x30 Global Biodiversity Framework target and contributing to the transformation of the landscape into one where both People and Nature can thrive. This presentation will highlight key achievements, lessons learnt, and demonstrate how strategic funding, innovation, and inclusive partnerships are driving conservation success in one of the world's most ecologically valuable regions.

Emily Kudze
South African National Biodiversity Institute, Kirstenbosch National Botanical Gardens, Rhodes Drive, Newlands, P/Bag X7, Claremont, 7735
WWF South Africa, 1st Floor, Bridge House, Boundary Terraces, Mariendahl Lane, Newlands 7700
*E-mail: e.kudze@sanbi.org.za

Responding to the illegal succulent trade crisis in South Africa

The fight against the illegal trade of succulents has been ongoing and has intensified since 2019, when it was noticed that there had been an increase in demand in the ornamental trade of succulents. The succulent Karoo biome shared between South Africa and Namibia is one of the five semi-arid biodiversity hotspots in the world that is being targeted. Because of this, there has been a recent update to the IUCN Red list assessments that revealed an unprecedented decline in a number of succulent species. With most succulents having small global ranges, the possibility of losing an entire species is great. Over the past 5 years there has been numerous confiscations by law enforcements from plant traffickers. This increase in succulent poaching triggered the Department of Forestry, Fisheries and the Environment (DFFE) with the support of the South African National Biodiversity Institute (SANBI) and Worldwide Fund for Nature South Africa (WWF SA) to draft and develop a National Strategic plan to tackle this issue. In February 2022 a National Response Strategic and Action Plan (NRSAP) was finalised from a collaborative effort between government departments, conservation authorities, NGOs, and local communities to ensure the survival of succulents in Southern Africa. Since 2022, there has been progress made in the various objectives outlined in the NRSAP. This presentation will be a report on what the NRSAP is about and give an update on progress, challenges and trends.

Maxie Jonk
Manager of Goegap Nature Reserve
Goegap Nature Reserve, 8240 Springbok
*E-mail: maxiejonk@gmail.com

Linking Goegap and Namaqua National Parks – Establishing the Melkrivier Corridor

South Africa's Protected Area estate has steadily grown over the past three decades, guided by the National Protected Area Expansion Strategy (NPAES). In the Northern Cape, Goegap Nature Reserve, situated in the globally recognized Succulent Karoo Biodiversity Hotspot, has been identified as a priority focus area for expansion. The reserve lies close to Namaqua National Park, yet the two remain ecologically isolated by intervening farmland. The proposed expansion of Goegap eastwards and southwards aims to change this by creating a functional corridor along the Melkrivier and Droëdap River, ultimately linking Goegap to Namaqua National Park and securing one of the most important biodiversity connections in Namaqualand. This corridor will bridge the Succulent Karoo and Nama Karoo biomes, an ecotone where winter and summer rainfall zones overlap, resulting in exceptional species richness. It will also improve protection of underrepresented vegetation types, support climate change adaptation through landscape connectivity, and provide safe movement routes for wildlife. Achieving this vision relies on partnerships between government, conservation NGOs, and private landowners, using tools such as Biodiversity Stewardship agreements, biodiversity offsets, and targeted land acquisition. Establishing the Melkrivier corridor will not only consolidate the conservation estate but also create a lasting ecological link between two flagship protected areas – a step towards resilient and connected landscapes in the Northern Cape.

Annelise le Roux, Elmarie Heyns and Mierietjie Landman
Wilderness Foundation, Nelson Mandela University
*E-mail: anneliseleroux2@gmail.com

Biodiversity and conservation of the Succulent Karoo during the last decades

Johan Marais
Kokerboom Biological Research Station
http://www.kokerboom.org
*E-mail: johan@asiorg.co.za

Reptiles of Namaqualand

The latest Conservation Status of Reptiles of South Africa, Eswatini and Lesotho (Suricata 10) lists 410 reptile species. Two reptile species, *Tetradactylus eastwoodae* and *Scelotes guentheri* are listed as extinct with three listed as Critically Endangered – *Psammobates geometricus*, *Scelotes inornatus* and *Cryptoblepharus africanus*. A further ten endemic reptiles are listed as Endangered – three chameleons, two tortoises, two skinks, one gecko and one adder. Seventeen reptiles are listed as Vulnerable with ten of them endemic to South Africa. Several species that were listed as Least Concerned have now been moved to Near Threatened as we now have better data and a better understanding of certain threats, like the increase in corvids over the past three decades that pose a threat to several reptiles but especially tortoises. Fifteen percent of reptiles globally are considered

Threatened compared with 13% of reptiles in South Africa, if we include both Threatened and Near Threatened species.

Namaqualand is a true reptile paradise with 97 reptile species, consisting of 28 snake species, 13 skinks, 29 geckos, 3 agamas, 7 girdled lizards, 3 tortoises, 1 plated lizard, 1 monitor lizard, 2 flat rock lizards, 7 sand and desert lizards and 1 terrapin. The major threats to the herpetofauna of Namaqualand include habitat destruction, the explosion of corvids and the illegal pet trade while many snakes are killed on roads. Two lizards, the Large-scaled Girdled Lizard (*Cordylus macropholis)* and the Armadillo Lizard (*Ouroborus cataphractus*) are listed as near threatened while the Speckled Padloper (*Chersobius signatus*) is listed as Endangered.

List of Participants

	Name	Organisation	Email	Registered	SKRS visit Friday	Braai
Barnes	David	Namaqua Horse Trails	david@namaquahorsetrails.co.za	1	0	2
Burger	Heather	from Springbok	heathermburger@gmail.com	1	1	1
Chuene	Pheladi	Namaqua National Park & Richtersveld National Park	Pheladi.Chuene@sanparks.org	1	0	0
Dhlamini	Perfect	SKRS	dlaminiperfect1@gmail.com	1	0	1
Fernando	Azitu	WWF, Community Conservation Coordinator Knersvlakte	afernando@wwf.org.za	1	1	1
Geldenhuys	Conrad	Department of Agriculture, Environment, Land Reform & Rural Development	conradgeldenhuys@gmail.com	1	0	0
Guerra	Chiara	University Sorbonne Paris Nord	chiaraguerrauni@gmail.com	1	0	1
Hanekom	Karolien	Landowners within the Conservation Context	karolienschade@gmail.com	1	1	2
Hatte	Christine	LSCE, Paris	Christine.Hatte@lsce.ipsl.fr	1	0	1
Heyns	Elmarie	Wilderness Foundation	elmarie@wfa.africa	1	0	1
Jonk	Maxie	Goegap Nature Reserve	maxiejonk@gmail.com	1	0	1
Jonk	Johan	Department of Agriculture, Environment, Land Reform & Rural Development	Johan Jonk <jjjonk2@gmail.com>	1	0	1
Kudze	Emily Norma	WWF /SANBI : Senior Scientific Coordinatior:Illegal Succulent Trade	E.Kudze@sanbi.org.za	1	0	1
le Roux	JP	Department of Agriculture, Environment, Land Reform & Rural Development	jplrx001@gmail.com	1	0	0
le Roux	Annelise	Wilderness Foundation	anneliseleroux2@gmail.com	1	0	0
Long	Emilie	University Sorbonne Paris Nord	emilie.long@univ-paris13.fr	1	1	1
Makuya	Lindelani	SKRS, Wits University, and CNRS Strasbourg	lindelanimakuya@gmail.com	1	0	1
Marais	Johan	African Sankebite Institute	johan@asiorg.co.za	1	1	1
Mawela	Tebego	Department of Agriculture, Environment, Land Reform & Rural Development	mawela.td@gmail.com	1	0	0
Mbanjwa	Nkululeko	SKRS	nkululekomb2000@gmail.com	1	0	1
MacDonald	Neil	Biodiversity Officer Vedanta Zin International Aggeneyse	NMacDonald@vedantaresources.co.za	1	0	0
Monclus	Raquel	University Sorbonne Paris Nord	raquel.monclusburgoa@univ-paris13.fr	1	0	1
Ngcamphalala	Celiwe	University of Cape Town	Celiwe.Ngcamphalala@uct.ac.za	1	0	1
Nyawo	Nkululeko	SKRS	nkululekonyawo0@gmail.com	1	1	1
Poteaux	Chantal	University Sorbonne Paris Nord	chantal.poteaux@univ-paris13.fr	1	1	1
Pretorius	Marica	Biodiversity Officer Vedanta Zin International Aggeneyse	Mpretorius@vendantaresources.co.za	1	0	0
Rödel	Heiko G.	University Sorbonne Paris Nord	rodel@univ-paris13.fr	1	1	1
Sangweni	Siyabonga	Organization for Tropical Studies	siyasangweni2@gmail.com	1	0	1
Schradin	Carsten	SKRS, Wits University, and CNRS Strasbourg	carsten.schradin@iphc.cnrs.fr	1	0	1
Smit	Marnus	Department of Environment and Nature Conservation	zmsmit.denc@gmail.com	1	0	0
Smith	Peter and Jean	Melkrivier Nature Reserve	jeanelssmith@gmail.com	2	2	2
Van Gensen	Andrea	Land Development & Environment, Northern Cape Operating Unit	GenseAL@eskom.co.za	1	0	0
Zungu	Phakamile	WWF, Succulent Karoo Coordinator	pzungu@wwf.org.za	1	1	1
			SUM	**34**	**11**	**27**