South African
NATIONAL PARKS

RESEARCH REPORT

SANParks

24/25

Editorial team: Corli Coetsee, Izak Smit, Nerina Kruger, and Stef Freitag-Ronaldson

Section editors: Emma Wright, Graham Durrheim, Johan Baard, Nicola van Wilgen-Bredenkamp, Nikisha Singh, Nkabeng Mzileni, Nthabeliseni Munyai, Roxanne Erusan and Tercia Strydom

Layout: Corli Coetsee

Cover photo: The frontcover is a collage of photos taken by Nicola van Wilgen-Bredenkamp, Alison Kock, Louise Swemmer and Melanie de Morney and symbolises the many facets and faces of conservation within SANParks. The collage is placed on a photo taken in West Coast National Park by Emma Wright.

Special photographs: A special thank you to the following SANParks Scientific Services colleagues for being so generous with their photos; Alison Kock, Charlene Bissett, Emma Wright, Melanie de Morney, Michaell-Jade Meyer, Nicola van Wilgen-Bredenkamp, Ntando Majola, and Wendy Foden.

Contact SANParks: +27 (0)13 735 4000

Cape Research Centre
Cape & Arid Research Centre Tokai: +27 (0)21 713 7500
research.crc@sanparks.org

Garden Route & Frontier Research Unit Rondevlei: +27 (0)44 343 1302
research.gardenroute@sanparks.org

Savanna Research Unit Skukuza: +27 (0)13 735 4235
research.savanna@sanparks.org

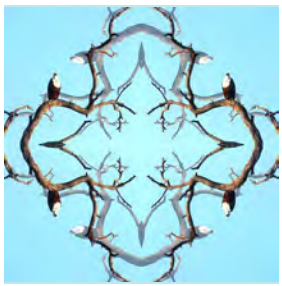
Cite this report as: Coetsee, C., Smit, I.P.J., Kruger, N., and Freitag-Ronaldson, S. 2024/2025. SANParks Research Report. Scientific Services, South African National Parks.

Art in Nature

The patterns lining the top of pages in this report was created by using photographs taken in South African National Parks and combining different symmetric views in multiple layers.

A sea fan in the genus ***Eunicella***, surrounded by anemones, photographed in Table Mountain National Park and Marine Protected Area.

Abalone (***Halotis midae***), here pictured in the Table Mountain National Park and Marine Protected Area, is a highly sought-after delicacy in the East. As a result, this iconic mollusk faces considerable pressure from illegal harvesting. This photo was also used to "pick" the report colours from.



African fish eagle (***Haliaeetus vocifer***) is referred to as the voice of Africa as a result of its distinctive call. This fish eagle was photographed while waiting patiently on a dead tree for prey to appear, next to a dam in Kruger National Park.

A landscape from Marekele National Park. The photo was taken from the top of the Waterberg overlooking the wetlands at the base of the mountain. The park is not only home to thriving and well-protected black -and white-rhino populations, but also protects the endangered Waterberg cycad (***Encephalartos eugene-maraisii***).

A crimson-breasted shrike (***Laniarius atrococcineus***) in Kalahari National Park. The name Laniarius is taken from Latin laniare ("to tear" or "butcher"). Hence the shrike's nickname "butcherbird", reflecting their predatory habits and strong hooked bills.

This tree velvet spider (probably in the genus Gandanameno) was found in the relatively recently proclaimed Meerkat National Park during a Bioblitz. And now some gory bits; female velvet spiders exhibit a remarkable type of maternal care unique among arachnids (eight legs, two main body segments and no wings or antennae). Upon the birth of her brood, the mother spider liquefies her internal organs and regurgitates this material as food. Once her capability to liquefy her insides is exhausted, the young sense this and eats the mother, talk about the ultimate sacrifice!

Contents

While revered for its annual wildflower blooms every Spring, West Coast National Park is also internationally sought-after for its abundant birdlife. Although born grey, Flamingos, seen here at the Seeberg bird hide, turn pink as they mature due to their diet.

From past to future

30 years of science discovery, partnerships and growth towards Vision 2040

Text by Stef Freitag-Ronaldson & Izak Smit

In 2024, as South Africa marked three decades of democracy, SANParks reflected on thirty years of scientific growth.

The story of South Africa's national parks and its science stretch back more than a century. Over thirty years of scientific growth, science has matured into a key SANParks asset — a bridge between science, policy, people and nature – transforming how the country's national parks are studied, managed, and contribute to global conservation discourse.

From game preservation to social-ecological systems

The early colonial years (1910–1960) focussed on **preserving game and establishing national parks**. Establishment of Kruger National Park in 1926 was followed by other national parks with names which often reflected a single-species perspective like Mountain Zebra, Bontebok and Addo Elephant National Parks. Research was largely descriptive, uncoordinated and ad hoc. The first official biologists were hired in Kruger in the early 1950s which resulted in establishment of long-term fire experiments in 1954.

During the apartheid era (1960–1990), national parks such as Golden Gate Highlands, Tsitsikamma Coastal and Forest and Augrabies Falls were declared, reflecting a broader **ecosystem- and landscape-scale vision** of conservation. Science became more systematic, entrenching strong links with decision-making as some scientists rose into leadership roles. Research focus expanded beyond species to ecosystems and the staff complement grew, also beyond Kruger. While the science was rigorous, it remained largely insular, nevertheless laying a foundation for learning and insights over significant timeframes as key experiments and datasets were initiated and have been maintained to this day.

Democracy catalysed change as the 1990s and 2000s ushered in a **philosophy of integration, innovation, and internationalisation**. National parks expanded, new parks were established on cultural grounds (e.g. Mapungubwe), marine protected areas expanded significantly and communities living around parks were increasingly recognized as important partners. Scientific focus broadened from ecology to social-ecological studies, exploring intersections between conservation and people's livelihoods, wellbeing, and heritage. These years were the beginning of the shift towards an expanded vision of integrated conservation landscapes taking a social-ecological perspective, in line with where SANParks is heading with Vision 2040.

Facing criticism, embracing change

A turning point came in 1994 when the Bell Report criticized SANParks' science for being isolated, too focused on data collection, and weak on peer-reviewed publications. The sharp critique sparked a period of major change as SANParks shifted towards collaboration, integration across departments, and international partnerships post 1994. Today, SANParks scientists are no longer hidden specialists — they act as **connectors, knowledge brokers, and collaborators in global research networks**. Their work has informed progressive legislation like South Africa's National Water Act of 1998 and shaped adaptive management approaches that underpin learning-by-doing and keep parks responsive to change.

The Mellon Foundation's transformative legacy

One of the most influential partners in the transformation was the Mellon Foundation, beginning in the late 1990s. In 15 years over $4 million was invested into SANParks' science, funding research infrastructure and science support, supporting international collaborations and training the next generation of scientists.

Key Mellon-supported achievements include the ***Kruger Ecosystems Research Support*** programme, which expanded human capital and facilities, and internationalised SANParks' collaborations and science for a decade. Further, it helped establish new research hubs, like the Cape Research Centre, and improved research infrastructure in remote Kalahari Gemsbok and Addo Elephant National Parks, and helped launch SANParks' ***Junior Scientist Programme***. This small but purposeful initiative has trained 17 young scientists from underrepresented backgrounds, with eight now appointed in SANParks. In addition, landmark publications, such as ***The Kruger Experience (2003)*** and National Park Science (2017) were supported, and the ***Skukuza Science Leadership Initiative*** was catalysed to demonstrate green design and to contribute to upskilling and training aspiring youth and scientists.

Mellon's support culminated in the creation of a ***Research Endowment Fund***, ensuring that the initial gains could be sustained indefinitely. Few partnerships in South African conservation science history have been as strategic or transformative.

Expanding horizons: marine conservation, social-ecological science and global change

In the last decade, SANParks' science has continued to expand its breadth and reach. The expansion or proclamation of new marine protected areas have spurred growth in **marine and estuarine science** capacity, with SANParks now employing a small team of dedicated marine biologists and technicians.

Equally important has been the integration of **social science perspectives** into conservation. From the early 2000s onwards, researchers began to focus on topics such as benefit-sharing, human-wildlife conflict, and cultural heritage. While the shift was gradual, SANParks now recognises that conserving biodiversity is inseparable from engaging with people's values, economies, and histories. The seminal Kruger Benefits Report (2016) and report on the history of social research in SANParks (2018) laid the foundation for SANParks' expanded capacity which now includes social-ecological, cultural heritage and tourism scientists.

SANParks produced its first **Global Environmental Change Assessment** in 2017, analysing threats and synthesizing understanding on topics such as climate change, invasive species, and land-use pressures. Reports on extreme events, like the Kruger drought of 2015–2016, show how science helps parks make sense of and adapt to crises while learning for the future.

Building credibility and sharing knowledge

Another striking change over the past 30 years is SANParks' enhanced **scientific credibility**. From a handful of publications in the 1990s, the organisation has produced or co-authored over 700 peer-reviewed papers

since 2012 in leading journals, including contributions in Nature and Science. External collaborators have published almost 1,000 additional papers based on research within SANParks, showing how national parks has become shared spaces of co-learning.

The in-house scientific journal **Koedoe**, first launched in 1958, has become an internationally accredited open-access publication, with over 1.8 million article downloads since 2018. Meanwhile, building on strengthened **science communication** efforts and training, the annual SANParks Research Report, published since 2012, showcases science in an engaging and accessible style for various audiences.

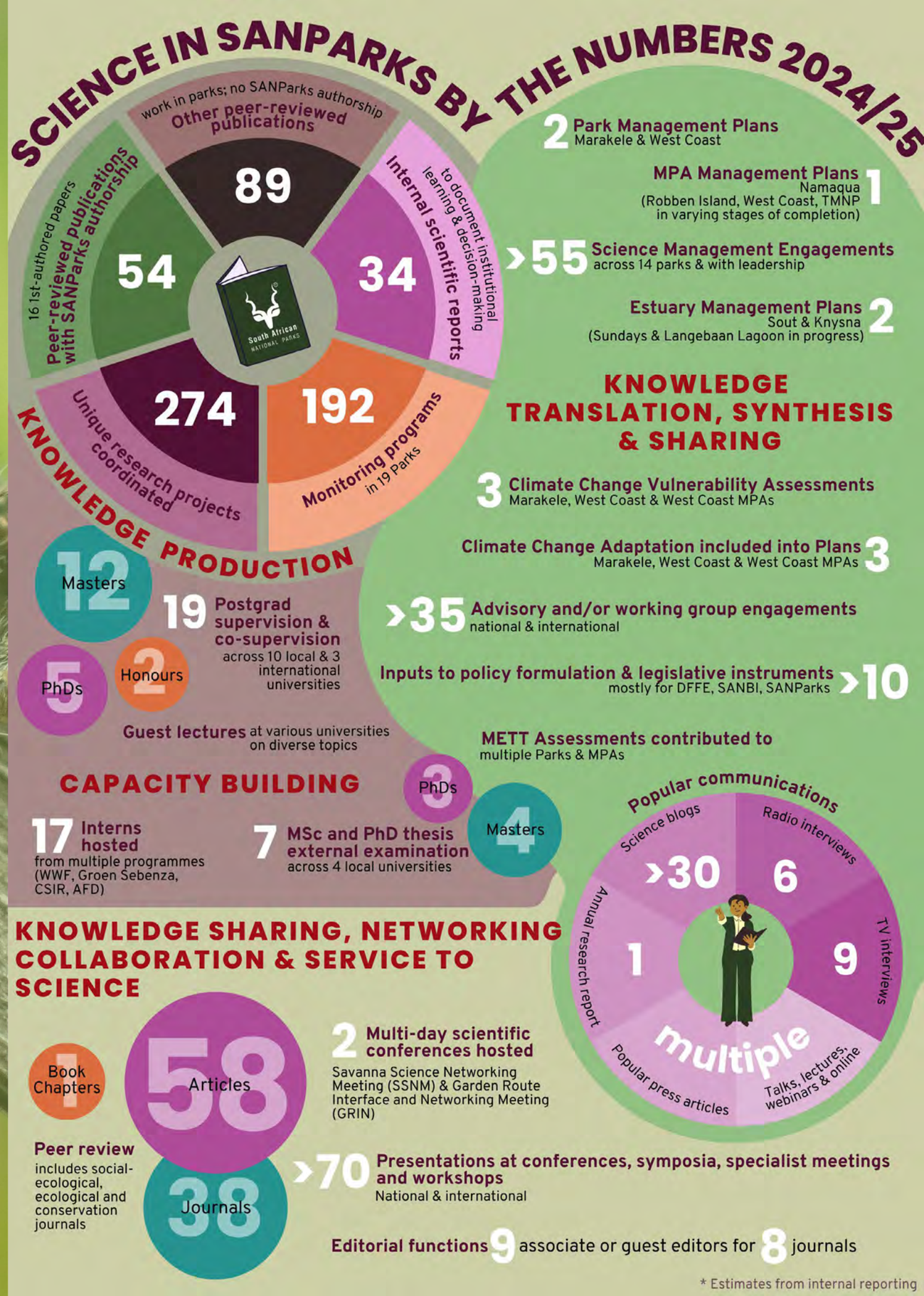
SANParks has also become a convener of global conservation research and practice communities. **The Savanna Science Networking Meeting** (hosted annually in Kruger since 2002) draws many researchers from more than 19 countries, while the **Garden Route Interface and Networking meeting** connects social-ecological researchers with practitioners tackling complex sustainability challenges since 2017.

Looking ahead: innovation and capacity

As SANParks looks to the future through the lens of Vision 2040, its science function is strong, more diverse, and more collaborative and inclusive than ever. Building on its past, it contributes significantly to the four primary spheres of (i) knowledge production, (ii) knowledge translation, synthesis and sharing, (iii) capacity building, and (iv) knowledge sharing, networking, collaboration and service to science. These domains are wide-ranging, built on initiatives established and nurtured over the past 30 years, and contribute critically to the dual worlds of conservation agency and global science. Investments in data management, technological advances and co-learning are modernising how knowledge is generated and shared. The focus on investing in and growing and grooming **human capacity** (including training young scientists, supportive mentorship, and diversifying the team and its capabilities) and the unique **science culture** with its relational capital within the organisation ensures the health and vibrancy of SANParks' science.

An important reflection from this 30-year journey is that conservation science is not just about collecting or analysing data. From long-term fire experiments in Kruger to marine surveys off the Cape, from place-based social-ecological research to international conferences, **SANParks' science is one bridge between society and nature that is locally relevant and internationally recognised**. It connects people, ideas, and values to sustain parks, biodiversity and communities in a rapidly changing world.

A jumping spider (Family: Salticidae) photographed in Harkerville, Garden Route National Park. Unlike other spiders, jumping spiders do not spin webs but instead actively pursue their prey. They are also able to jump up to 50x their body length!



Conservation Works — And Here's the Data to Prove It

Text by Wendy Foden
Photos by Fenton Cotterill and Nicola van Wilgen-Bredenkamp

A new global study, published in Science, presents the most comprehensive evidence to date that conservation actions are effective in improving biodiversity outcomes.

A STUDY ON THE EFFECTIVENESS OF A CONSERVATION INTERVENTION TO REDUCE HUMAN-LEOPARD CONFLICT IN PHINDA PRIVATE GAME RESERVE (BALME ET AL, 2009) WAS INCLUDED IN THE GLOBAL META-ANALYSIS. THE STUDY FOUND THAT, OVER THREE YEARS, LEOPARD MORTALITY RATES DECREASED, AND REPRODUCTIVE RATES INCREASED, WITH FEWER LEOPARDS KILLED BY HUMANS AND IN INTRASPECIFIC CLASHES. THE META-ANALYSIS PROVIDES COMPELLING EVIDENCE THAT CONSERVATION INTERVENTIONS DO, ON AVERAGE, IMPROVE BIODIVERSITY OUTCOMES.

Globally, over 44,000 species are currently at risk of extinction. In addition to the intrinsic loss of biodiversity, the loss of these species poses serious threats to the capacity of ecosystems to regulate climate and support people with essential ecosystem services. In response, governments have committed to new global targets aimed at halting and reversing biodiversity loss, which makes assessing the effectiveness of conservation efforts more urgent than ever.

A landmark study published in Science offers robust evidence that conservation interventions are making a significant difference, though not yet at the scale needed to reverse global biodiversity loss. The research, led by Penny Langhammer (re: Wild and Arizona State University) and a global team of conservation scientists, including SANParks scientist Wendy Foden, synthesised data from 186 peer-reviewed studies, incorporating **665 studies** across terrestrial and marine systems. They found that in two-thirds of cases, conservation efforts either improved the state of biodiversity or slowed its decline.

Evaluating What Might Have Been

Conservation outcomes are often difficult to quantify, as gains may not be immediately visible, and declines may still occur even with interventions. This study addressed those challenges by using counterfactual comparisons, enabling the team to isolate the effects of conservation from broader environmental trends. Counterfactuals — scenarios in which no intervention was undertaken — served as the benchmark. Positive conservation outcomes were classified as either absolute (biodiversity improved under intervention) or relative (biodiversity still declined, but less so than without intervention). Negative outcomes also emerged, including cases where conservation actions inadvertently caused harm or underperformed compared to the counterfactual.

What Works Best?

Among the intervention types examined, several were found to be particularly effective: Eradicating invasive species had the biggest positive impact. On islands, especially, removing non-native predators like rats or cats allowed native wildlife to bounce back dramatically.

Sustainable management of ecosystems, such as responsible forestry or farming, also showed strong benefits, helping to preserve species while supporting human livelihoods. Examples include stewardship agreements for biodiversity-friendly management of private land.

Habitat restoration and protection, including the creation of protected areas, proved effective at safeguarding ecosystems and reducing biodiversity loss. Well-managed protected areas helped prevent deforestation, limited coral reef damage, reduced species extinction risk, and increased the abundance of marine life.

Across these categories, positive effects were observed at multiple levels of biodiversity, including species, ecosystems, and genetic diversity. However, interventions related to the sustainable use of species (e.g. regulated hunting or fishing) produced mixed results, and there were too few studies on pollution control and climate change adaptation to assess their effectiveness robustly, highlighting critical evidence gaps.

When Conservation Backfires

Despite the largely positive findings, the study reported that in approximately **20% of trials, biodiversity outcomes under intervention were worse than under no action**. These "absolute negative impacts" were often linked to unintended ecological consequences. For example, the removal of invasive algae in an Indian reef encouraged further establishment of the species, ultimately harming native coral communities. Similarly, poorly managed protected areas sometimes failed to prevent poaching or deforestation, especially where enforcement capacity was limited. These examples reinforce the need for adaptive management and evidence-based design of interventions as well as monitoring and evaluation.

Geographic and Taxonomic Biases

The study also revealed substantial geographic and taxonomic biases. To qualify for inclusion, studies needed to be published in English and express the rate of change under the intervention compared with the rate of change without it. Nearly half the studies focused on high-income regions (primarily Western Europe, North America, Australia, and New Zealand), and only twenty (11%) African studies were included. This uneven distribution of data points highlighted significant evidence gaps in tropical regions where biodiversity is highest, as well as in the Global South. Carrying out such research in Africa is essential for building a more complete understanding of conservation effectiveness on the continent and worldwide.

Implications for Policy and Global Targets

The findings arrive at a pivotal time for biodiversity policy. Following the adoption of the Kunming-Montreal Global Biodiversity Framework in 2022, countries have committed to halting and reversing biodiversity loss by 2030. Achieving these goals will require not only ambitious policy commitments but also demonstrably effective action on the ground.

Conclusion: Scaling Up What Works

Our study provides compelling evidence that conservation interventions do, on average, improve biodiversity outcomes. They do not always succeed, but they are far more effective than inaction. Many efforts remain too limited in scope and scale to be effective. Current global investment in conservation is estimated at $121 billion annually, far short of the $178–524 billion required to meet international targets. **We argue that conservation should be viewed as an investment, not a cost.** Healthy ecosystems provide vital services that far outweigh the financial input required for their protection and restoration. Conservation actions must be deployed more widely, more equitably, and with stronger financial and political support, particularly in areas of the world where biodiversity is most diverse, at risk and where current investment is lowest. As the global community works toward halting and reversing biodiversity loss, this study offers both reassurance and a call to action: We now know what works. The task ahead is to do more of it—and to do it better.

HABITAT LOSS IN THE CAPE TOWN METROPOLE HAS DISPLACED CAPE SPURFOWL, WHICH FIND PROTECTION IN TABLE MOUNTAIN NATIONAL PARK.

To read more about this meta-analysis on the outcomes of conservation interventions, use the QR code below:

References:

Langhammer PF, Bull JW, Bicknell JE, Oakley JL, Brown MH, Bruford MW, Butchart SH, Carr JA, Church D, Cooney R, Cutajar S, Foden W....& Brooks TM. 2024. The positive impact of conservation action. Science, 384(6694): 453-458.

Balme GA, Slotow R & Hunter LTB. 2009. Impact of conservation interventions on the dynamics and persistence of a persecuted leopard (Panthera pardus) population. Biological Conservation, Volume 142 (11): 2681-2690. https://doi.org/10.1016/j.biocon.2009.06.020

MEGA-LIVING
SEASCAPES

Beaches such as Clifton provide beach-goers wwith both recreational activities as well as the opportunity to engage with the highly diverse local marine biodiversity conserved within the Table Mountain and Robben Island Marine Protected Areas.

How can we save the African penguin?

Text by Cloverley Lawrence & Alison Kock, photo by Alison Kock

The African penguin is in crisis. Decades of research, policy and conservation actions must guide SANParks' response in saving the African penguin

The African penguin (*Spheniscus demersus*), endemic to the southern African coastline and found only in South Africa and Namibia, is in crisis. Once numbering in the millions, the population has declined by more than 97% since the early 20th century. In just the past 30 years, numbers have plummeted by over 70%. If current trends continue, extinction in the wild is predicted by 2035. In response, the species was uplisted to Critically Endangered on the IUCN Red List in 2024.

Beyond its charismatic appeal, the African penguin is an indicator of ocean health, and holds ecological, cultural, and economic value. Recent research highlights both the urgency of action and the progress already achieved. SANParks plays a central role in this response, actively managing colonies in Addo Elephant, Table Mountain and West Coast National Parks and their associated Marine Protected Areas (MPAs). Conservation efforts include habitat restoration, predator control, and mitigating threats such as prey scarcity, disease, extreme weather events, and disturbances.

The African Penguin Biodiversity Management Plan (BMP), gazetted in 2013, provided a major framework guiding conservation efforts. A 10-year review (Pichegru et al., 2025) evaluated its implementation across 22 objectives and 65 actions. Based on interviews, meeting records, and scientific assessments, the review found that the BMP strengthened inter-agency collaboration and formalised core conservation actions. SANParks was recognised as a key implementing authority, especially in predator management, chick rescue and rehabilitation, and nest site enhancement. However, the review also highlighted a persistent failure to resolve a central issue: food limitation due to declining availability of sardines and anchovies, the penguins' primary prey.

Following years of advocacy, research, and negotiation involving scientists, conservation organisations and the fishing industry, the Minister of Forestry, Fisheries, and the Environment appointed an international expert panel to evaluate the science behind fishing closures. Their recommendations informed a study by McInnes et al. (2024), which assessed the effectiveness of no-take zones surrounding six key penguin colonies. The aim is to reduce direct competition between penguins and the purse-seine fishery, which targets small pelagic fish. The study found that existing closures protected less than half of the penguins' core foraging areas. Revised closures proposed by the study's authors, including SANParks scientists, better reflect foraging behaviour and ecological needs, while still accommodating industry considerations.

Importantly, the scientific work fed into a landmark out-of-court settlement between BirdLife South Africa, Southern African Foundation for the Conservation of Coastal Birds (SANCCOB, supported by the Biodiversity Law Centre), the small pelagic fishing industry, and the Department of Forestry, Fisheries, and the Environment (DFFE). The agreement secured the implementation of revised closures for a period of 10 years, representing two penguin generations, allowing time to measure conservation outcomes. While the final boundaries were shaped through negotiation and compromise, they mark a significant advance in science-based policy. The process also reaffirmed the importance of transparent, evidence-informed decision-making in complex resource management. Moving forward, continued cooperation between scientists, SANParks, CapeNature, DFFE, NGOs and the fishing industry will be essential. Careful monitoring of the closures' implementation effectiveness and impact on both penguins and fishery dynamics will determine whether these efforts deliver measurable conservation gains.

BOULDERS AFRICAN PENGUIN COLONY: PENGUIN SURVIVAL DEPENDS ON REDUCED COMPETITION BETWEEN PENGUINS AND THE PURSE-SEINE FISHERY, WHICH TARGETS SMALL PELAGIC FISH.

In addition, a long-term study by Pichegru et al. (2024) evaluated the use of artificial nests at eight colonies over 14 years. Artificial nests improved breeding success by an average of 16.5% compared to surface nests. However, performance varied by location and design, highlighting the need for context-specific solutions. SANParks has played a leading role in deploying and monitoring artificial nests and worked in partnership with the African Penguin Nest Project (AZA SAFE, Dyer Island Conservation Trust and Dallas Zoo) to trial improved double-layered ceramic nest designs at Bird Island and Boulders Beach. While promising, researchers stress that artificial nests must be integrated with broader strategies to address food limitation and climate-driven stressors.

Together, these studies mark a pivotal moment for African penguin conservation. They reflect more than a decade of collaborative science, adaptive management, and evidence-informed policymaking. SANParks remains a critical partner in these efforts, not only as a land manager but also as a contributor to national conservation strategy, field-based research, and policy implementation. The path forward is clear: sustained investment in prey security, breeding habitat, and science-driven management is essential. The next decade must deliver results, not just for the African penguin, but for the overall resilience of South Africa's marine ecosystems and the industries dependent on it.

References:

Pichegru L, Makoala M, Barham BJ, Barham PJ, Dalton D, Ludynia K, Freeman M, Geldenhuys D, Hagen C, Harris G, Kock A, Lawrence C, ... & Waller LJ. 2025. A decade of implementing the Biodiversity Management Plan for African penguins – successes, failures and lessons learnt. Journal for Nature Conservation 86, 126919. https://doi.org/10.1016/j.jnc.2025.126919

McInnes AM, Weideman EA, Carpenter-Kling T, Barham P, Christian M, Day K, Glencross JS, Hagen C, Kock A, Lawrence C, ... & Waller, L. 2024. Commercial fishery no-take zones for African penguins minimise fisheries losses at the expense of conservation gains. ICES Journal of Marine Science, fsac109: 1–15. https://doi.org/10.1093/icesjms/fsae109

Pichegru L, Sherley RB, Malan T, Barham BJ, Ludynia K, Geldenhuys D, Amos K, Barham PJ, Drost E, Hahndiek V, Hufke A, Hugo C, Lawrence C, ..., van Wilgen NJ & Waller L. 2024. Decades of artificial nests towards African penguin conservation—Have they made a difference? Ecological Solutions and Evidence 5(4): e12388. https://doi.org/10.1002/2688-8319.12388

MEGA-LIVING SEASCAPES

Eyes beneath our seas

Establishing an ecological baseline at Robben Island Marine Protected Area using Baited Remote Underwater Videos

Since 2022, SANParks' Cape marine team has been conducting seasonal Baited Remote Underwater Video Surveys (BRUVS) to monitor the inshore fish community around Robben Island. These surveys establish a baseline for species diversity, abundance and size structure, which are key indicators for assessing MPA effectiveness and understanding long-term ecological trends.

TText by Aseeqah Davids, Russell Dixon, Rushdi Ariefdien & Alison Kock

Significant for its role in the country's political history, Robben Island was designated as a Marine Protected Area (MPA) in 2019. In addition to preserving cultural heritage, this MPA provides refuge for marine life by protecting critical marine species.

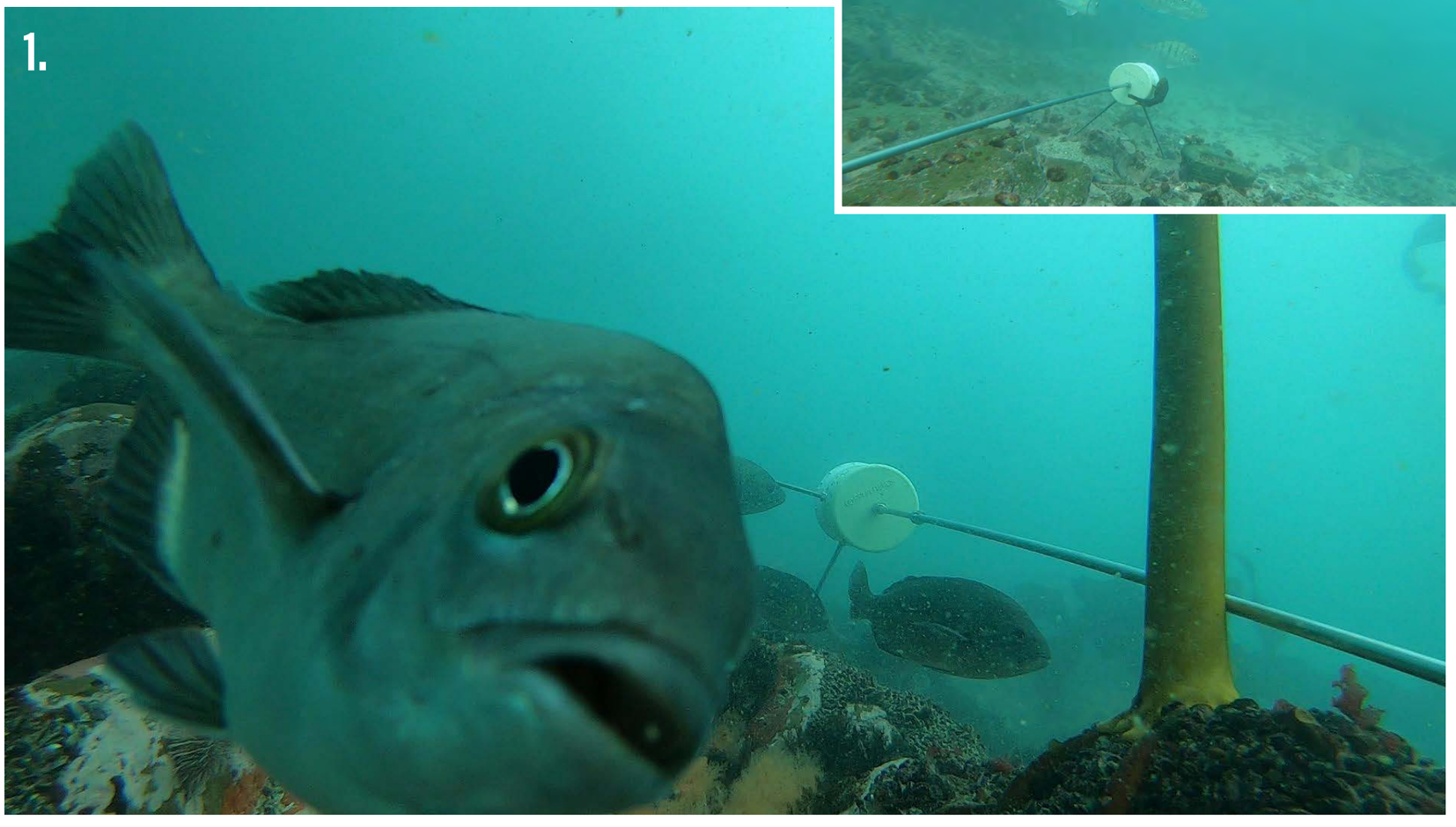
Unlike terrestrial environments, where wildlife surveys can be conducted by road, foot, or air, monitoring marine ecosystems is a complex task that requires specialised methods and equipment. To address the challenge of observing and counting fish communities, the SANParks marine research team began conducting Baited Remote Underwater Video Surveys (BRUVs) during 2022.

BRUVs have allowed scientists to build a robust baseline dataset on species diversity, relative abundance, and size structure of the inshore fish community. Such data are crucial for monitoring the impacts of fishing on this community, assessing MPA effectiveness, and understanding ecological trends over time. Mono-BRUVs were used in 2022 but these were upgraded to stereo-BRUVs in 2023 through a collaboration with the Shallow Marine and Coastal Research Infrastructure node of SAEON. Stereo-BRUVs enable accurate fish length measurements and provide improved insights into population size structure within the MPA.

The depths at the sampling sites ranged between 3.8 m and 17.1 m (mean = 8.82 m; SD = 3.14 m). The BRUVs were deployed between 08:15 and 14:04 with water visibility varying between 0.5 m and 23 m. With three years of footage (52 deployments) already analysed and the fourth year underway, a total of 22 species across 18 genera have been recorded. A species accumulation curve shows signs of levelling off, indicating that most of the fish community has likely been captured through sampling. Although some rare or cryptic species may remain undetected, the curve suggests that sampling effort has been adequate, with half of the total species recorded within the first 12 deployments.

These early insights are helping us understand not only which species are present but also how the ecosystem respond to conservation measures. With ongoing data collection, the team will be able to detect ecological changes over time, ultimately informing adaptive management practices in the Robben Island MPA.

1. A CAPE SEABREAM INVESTIGATING, AND 2. WHITE STUMPNOSE CAPTURED ON THE BAITED REMOTE UNDERWATER VIDEO SURVEY CAMERA (BRUV). BRUV MONITORING INFORMS SPECIES DIVERSITY, RELATIVE ABUNDANCE, AND SIZE STRUCTURE OF THE INSHORE FISH COMMUNITY.



Cape fur seal rabies outbreak and response

Text by Alison Kock, Photo by Infinity Environmental

In May 2024, a Cape fur seal attacked six surfers in Muizenberg, Cape Town, marking the first confirmed case of rabies in a South African marine mammal. Between June 2024 and January 2025, the Western Cape Department of Agriculture's Veterinary Services reported 55 laboratory-confirmed cases of rabies in seals across South Africa. Genetic analysis conducted by departmental scientists indicates a single source of infection, likely originating from black-backed jackals in Namibia, where jackals are known to prey on seals at land-based colonies.

In response to concerns about seal health, aggressive behaviour, and the rabies outbreak, a multi-agency workshop was held in July 2024, convened by the City of Cape Town and Department of Forestry, Fisheries and Environment (DFFE). The workshop brought together local authorities, veterinarians, and scientists to share information and develop standard operating procedures for rabies response and broader seal health management. Participants also agreed on joint media communication strategies. Rangers and field staff working closely with seals have been advised to receive rabies vaccinations, and SANParks has extended this support to some small-scale fishers through its Social-Economic Transformation-led fisheries support programme. WhatsApp groups have been set up for authorities to facilitate rapid information sharing and coordination in response to aggressive seal incidents.

In addition to negative human-seal encounters, the outbreak has harmed seal snorkelling tourism, with some local businesses in Cape Town forced to close or adjust their operations significantly. Ongoing surveillance and response efforts are being led by state authorities and NGOs such as Sea Search, with SANParks supporting research, field sampling, monitoring of aggressive seal behaviour, and the removal of carcasses from popular public beaches within its mandate. A follow-up workshop will review progress and strengthen coordination.

Landmark conviction for illegal fishing in a Marine Protected Area

Text by Alison Kock

On 27 November 2024, the Bredasdorp Regional Court delivered a landmark ruling against Gqeberha-based company Unathi-Wena Fishing, marking the first successful conviction for environmental harm caused by illegal fishing in a Marine Protected Area (MPA) under the National Environmental Management Act (NEMA). The case focused on unlawful fishing activities in the De Hoop MPA, one of South Africa's most ecologically important no-take reserves. The court found that the company's actions violated legal protections and resulted in measurable ecological damage.

I was honoured to be one of three expert witnesses called by the state. I shared scientific evidence on the critical role MPAs play in maintaining biodiversity, ecosystem health and services, and the importance of shark species that were affected by the illegal activity. It was encouraging to see the court take the scientific evidence seriously and recognise the broader environmental implications of the offence. This case sets an important precedent: illegal fishing in MPAs can lead to real ecological harm and perpetrators will be held accountable through the legal system. It also showed the value of collaboration between scientists, law enforcement and conservation authorities. I'm grateful to have been part of a team effort that strengthens the protection of our marine ecosystems.

Working together for better seascapes

SANParks' marine capacity enhanced through the South Africa – France Partnership for biodiversity and marine conservation

Text by Sinothando Shibe, Stef Freitag-Ronaldson & Alison Kock

The South African - French quadripartite cooperation agreement on biodiversity was signed into effect in June 2022 with the MoU between SANParks and Office Français de la Biodiversité (OFB) finalised in May 2024. Financed by Agence Française de Développement (AFD), it enables exchange of technical knowledge, expertise and capacity between OFB and SANParks on diverse issues relating to marine protected areas (MPAs). These include governance and co-governance approaches, development of MPA management and/or effectiveness assessments, monitoring approaches and tools, understanding ecosystem services and social-ecological trade-offs, supporting SANParks' marine science capacity and enabling attendance at international events of significance for marine conservation.

This international cooperation has enabled recruitment of Sinothando Shibe as 3-year contract marine scientist to provide capacity to SANParks to address its marine conservation mandate, facilitate and advance the OFB-SANParks peer-to-peer exchanges and ensure delivery on the 3-year programme.

Key initiatives and knowledge exchanges in the past year included:

Global ranger engagement: Two SANParks marine rangers presented at the 10th International Ranger Federation World Ranger Congress (Hyères, France, 7-11 October 2024).

Scientific Leadership: Seven SANParks scientists delivered multiple papers and presentations at the 7th International Marine Conservation Congress (Cape Town, October 2024).

Peer-to-pear learning: Two in-person, peer-to-peer exchanges between SANParks and OFB scientists and managers hosted in South Africa in Addo Elephant (November 2024) and West Coast (March 2025) National Parks.

The additional critical science capacity within SANParks has:

Supported MPA management planning: Supported development and/or review of Robben Island, West Coast and Table Mountain MPA management plans;

Advanced monitoring and evaluation: Contributed to monitoring and evaluation of MPA objectives and strengthening the conservation evidence base, including long-term monitoring of fish and sharks in Table Mountain MPA using Stereo Baited Remote Underwater Video Systems and Cape fur seal mortality surveys;

Communicating socio-economic benefits: Assisted in better understanding and communicating socio-economic benefits of MPAs through preparation of a case study on SANParks' Marine Economy Program for the IUCN green listing of Namaqua MPA;

Facilitated knowledge exchange: Facilitated co-learning on MPA management and governance through knowledge exchange at the South African MPA Forum (KwaZulu-Natal, September 2024) to discuss MPA effectiveness;

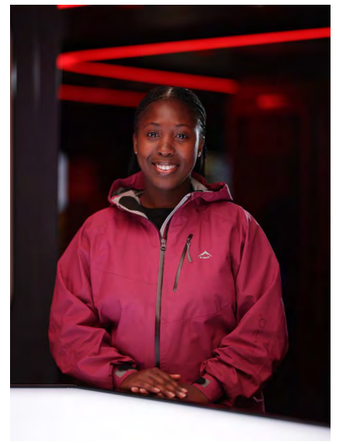
Contributed to policy development: Provided input to the SANBI-led science-to-policy workshop aimed at reviewing progress against previous priority actions and co-develop new priority management and policy actions for the National Biodiversity Assessment;

Enhanced marine science communication: Contributed to diverse marine science communications, including SANParks blog posts, student outreach with SAEON and OceanQuest aboard the OceanXplorer, and a presentation at the Around Africa Expedition 2025 Workshop with OceanXplorer and OceanQuest.

Supporting assessments and reporting: Facilitated engagement of consultants to draft the mandatory Situational Assessment Report for two estuaries and State of Knowledge Reports for three MPAs under SANParks' custodianship.

Strengthened planning: Supported the development of the marine and estuary monitoring and research plan.

This valuable and productive partnership has enabled global showcasing of SANParks' marine and estuarine science and management efforts while contributing significantly to capacity development within SANParks and co-learning between the institutions.



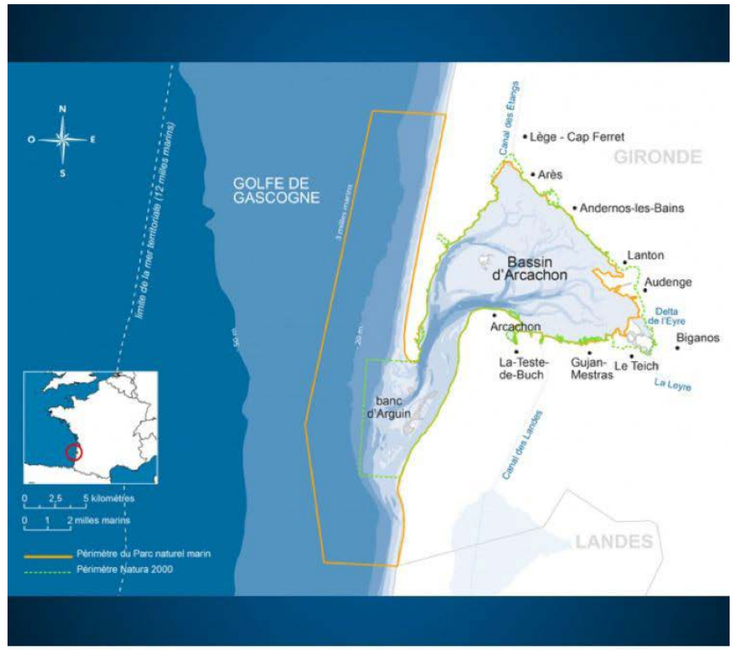
THE SANPARKS-OFB RELATIONSHIP HAS DELIVERED SOME GOOD OUTCOMES; INLCUDING SINOTHANDO SHIBE HAS BEEN EMPLOYED ON COTRACT AS MARINE SCIENTIST AND TWO SANPARKS MARINE RANGERS, EZEKIEL KOZA AND PIERRE NEL, PRESENTED AT THE 10TH INTERNATIONAL RANGER FEDERATION WORLD RANGER CONGRESS IN HYÈRES, FRANCE

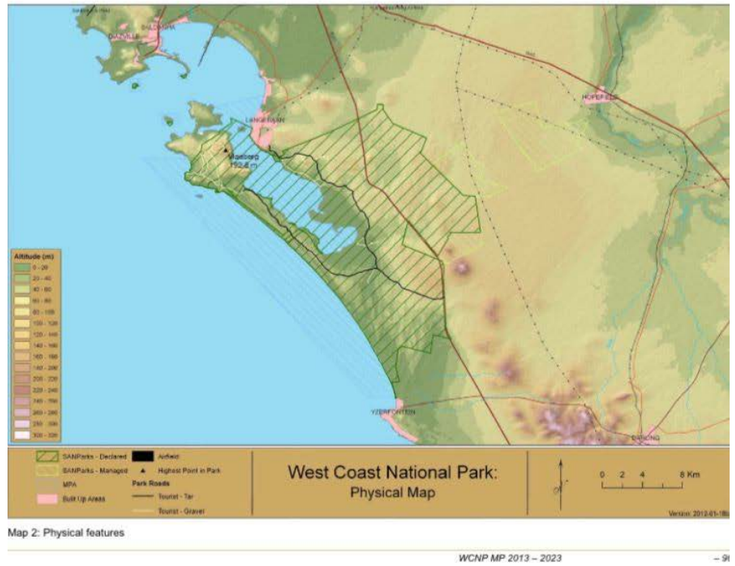
MEGA-LIVING SEASCAPES

Strengthening Marine Conservation

Text by Sinothando Shibe, photos by Alice Lureau & map by Thomas Fauvel

SANPARKS AND FRENCH MARINE DELEGATES MET IN WEST COAST NATIONAL PARK FOR A BILATERAL DISCUSSION BETWEEN WEST COAST NATIONAL PARK MPA AND BASSIN D'ARCACHON MARINE NATURE PARK, FRANCE.





Map 2: Physical features

MAP OF BASSIN D'ARCACHON MARINE NATURE PARK AND WEST COAST NATIONAL PARK SHOWING THE GEOGRAPHIC SIMILARITIES OF THE TWO PARKS, INCLUDING LARGE LAGOONS.

As part of the South Africa-France partnership, SANParks hosted a bilateral exchange at West Coast National Park (WCNP; 10-14 March 2025). This collaboration, supported by the OFB and the AFD, brought together six French delegates and ten SANParks representatives to share knowledge on the management and monitoring of WCNP Marine Protected Area (MPA) and Bassin d'Arcachon Marine Nature Park (French MPA).

Both WCNP MPA and Bassin d'Arcachon are home to diverse marine and coastal habitats, including tidal flats, salt marshes, and lagoons. These ecosystems serve as critical breeding and feeding grounds for fish, shellfish, and migratory bird species. The objective of the exchange was to foster knowledge sharing, identify research opportunities, and explore the potential for a staff exchange program between SANParks and OFB park managers.

Discussions focused on seagrass restoration, the protection of vulnerable species, stakeholder engagement, and innovative tools for monitoring habitats and human activity. The workshop included a field mission to explore WCNP MPA firsthand, where the SANParks science team demonstrated the deployment of a Baited Remote Underwater System (BRUVs) in the lagoon, visited bird hides to observe bird diversity and examined the park's terrestrial landscape and conservation strategies. These field activities provided valuable insights into contractual agreements with landowners, lagoon zonation, human-wildlife conflict, and conservation challenges posed by tourism and other activities. Experiencing the similarities and differences between the two parks allowed for deeper discussions on best practices.

While WCNP MPA and Bassin d'Arcachon operate under different legal frameworks, their shared ecological features created a strong foundation for meaningful technical exchanges. The next in-person workshop will follow the United Nations Ocean Conference (UNOC3). SANParks colleagues will travel to France, where the focus will be on monitoring strategies, conservation indicators, and stakeholder engagement processes.

Exploring African Seamounts on the OceanXplorer

Text by Sinothando Shibe, photos by OceanX

The first leg of the Around Africa Expedition explored deep-sea ecosystems in the Southern Indian Ocean, uncovering vital data for marine biodiversity and ocean mapping. The mission empowered the next generation of African marine scientists through hands-on research and technology.

SINOTHANDO SHIBE INSIDE THE RESEARCH SUBMERSIBLE, NEPTUNE, WHERE SHE WAS PART OF AN EXPEDITION THAT STUDIED SEAMOUNTS (UNDERWATER MOUNTAINS) IN THE SOUTHERN INDIAN OCEAN.

OceanXplorer and OceanQuest hosted 18 visiting scientists from nine different nations on the first Science Leg of the "Around Africa Expedition." Led by a South African scientist from the South African Environmental Observation Network (NRF-SAEON), Dr Lara Atkinson, the expedition aimed to improve our understanding of seamount biodiversity and geological features in the largely unexplored Southern Indian Ocean. Seamounts are underwater mountains that rise from the seafloor but do not reach the ocean's surface. Additionally, it sought to provide valuable data for marine science, conservation planning, and sustainable management of oceanic resources.

I had the incredible opportunity of being one of the 13 Early Career Ocean Professionals (ECOPs) on the science team, 12 of which were from six African countries. My participation was funded by POGO (Partnership for Observation of the Global Ocean). We sailed from Comoros to Cape Town, spending 27 days exploring Waters Shoal, the Madagascan Ridge and the Africana Seamount. During the expedition we deployed a Remotely Operated Vehicle (ROV), two submersibles and a CTD (conductivity, temperature and depth) sensor, from which we collected over 200 biological samples (sponges, soft and hard corals, brittle stars, feather stars, polychaetes, squat lobsters and more), hundreds of litres of water, sediment cores, and even rocks! Additionally, a total area of 33 137 km2 was mapped using high-resolution multibeam sonar.

SINOTHANDO SHIBE COLLECTING WATER SAMPLES FROM THE CTD (CONDUCTIVITY, TEMPERATURE AND DEPTH SEONSOR).

The science team focused on various aspects of marine research such as environmental DNA (eDNA), nutrient analyses, zooplankton sampling, microbial ecology, soft and hard coral taxonomy, seafloor mapping, geology and fish identification. Each teammate found their niche on the vessel, which made learning from each other (ECOPs, experienced scientists, and OceanX crew) a rich and rewarding experience. I was able to assist in every aspect of research, including being a ROV lead, where I worked with the ROV pilots to achieve the objectives of a specific dive, and spending eight hours in a research submersible that descended to a depth of 500 m! Investigating Walters Shoal from this lens was both humbling and inspiring. This once-in-a-lifetime experience will remain the highlight of my career for years to come.

OceanX advocates using media to educate and connect the world with the ocean. During this expedition, I also formed part of the ship-to-shore live-streaming outreach event coordinated by the NRF-SAEON Egagasini Node. During this event, students from five Cape Town high schools could participate in a live ROV dive at Walters Shoal and ask the scientists and pilots questions about operations and research. I then took the students on a virtual vessel tour, showing them the equipment, labs and mission control room. This provided a rare opportunity for students to experience and engage in deep-sea exploration in real-time and be part of collecting biological samples while on land. In addition, it allowed me to connect with the next generation of African explorers.

THE VISITING SCIENCE TEAM AND OCEANX CREW ON THE 1ST DAY OF THE EXPEDITION.

The experience was more than just a scientific mission; it was a journey of discovery, collaboration and experiencing what technology can help us achieve. It was an honour to represent SANParks on this expedition, and I am excited to see how the findings of the expedition will contribute to the future of deep-sea marine conservation and research in Africa.

Conserving Algoa Bay's Marine and Coastal Biodiversity: Insights from the 2024 Addo Marine Symposium

Text by Cloverley Lawrence

Comment from Addo Conservation Manager, Mr Anban Padayachee:

"The AENP MPA symposium is an excellent opportunity for Park management to engage first hand with the researchers and scientific community at large. Current research and monitoring projects are discussed and their progress noted. This symposium allows for broader networking to take place and often new research projects are developed from this MPA symposium. I believe that the AENP MPA is large enough to make this an annual event"

The Addo Marine Symposium, held on 13 June 2024 at the Addo Elephant National Park, brought together scientists and conservation managers to share research and strengthen collaboration around the Addo Marine Protected Area (MPA) and Algoa Bay. After a six-year gap since the last meeting in 2018, Anban Padayachee, Conservation Manager, opened the event by stressing the need for renewed dialogue on ocean and coastal conservation.

Marine Fauna

Dr Greg Hofmeyr (Bayworld) presented over a decade of marine mammal stranding data, strengthened since 2014 by systematic beach surveys. Strandings peaked in summer, with Cape fur seals and bottlenose dolphins most affected. Evidence of gunshot wounds on seals highlighted conflict with squid fisheries. **Prof. Lorien Pichegru** (Nelson Mandela University, NMU) reviewed a decade of the Biodiversity Management Plan for African penguins. Despite interventions, penguin numbers continue to fall, risking extinction in the wild by 2035 due to prey scarcity and governance challenges. **Dr Maëlle Connan** (NMU) demonstrated how DNA metabarcoding of penguin faeces provides detailed insights into diet, in turn improving understanding of ecological pressures. **Ms Ruth Wright** (Bayworld) closed the session with results from acoustic tagging of rehabilitated sea turtles, showing how tracking identifies key habitats and informs post-release success.

Marine Flora, Reefs, Fish Telemetry

Research by **Ms Debbie du Preez** (NMU) revealed the diel cycles of surf diatoms off Sundays River, influenced by nutrient inputs. **Emily Whitfield** (NMU) examined harmful algal blooms caused by *Heterosigma akashiwo*, using artificial intelligence models to link blooms to environmental conditions. **Dr Paul-Pierre Steyn** (NMU) presented long-term vegetation monitoring on Algoa Bay islands, highlighting ecological changes shaped by human and natural drivers. **Dr Shirley Parker-Nance** (SAEON) shared progress on benthic ecosystem research using seabed cameras to classify habitats, critical for marine spatial planning. **Dr Tarryn Murray** (South African Institute for Aquatic Biodiversity) summarised 15 years of acoustic telemetry in Algoa Bay, with nearly 2000 tagged animals producing over 6.5 million detections, greatly advancing knowledge of species' movements.

Remote Sensing, Climate Change, Education

In the last session, **Prof. Tommy Bornman** (SAEON) showcased airborne LiDAR and imaging surveys for mapping coastlines and estuaries. **Dr Gary Koekemoer** (Wildlife and Environment Society of South Africa, WESSA) highlighted the need for climate resilience strategies in Algoa Bay to address flooding, sea-level rise, and extreme events. **Mr Kevin Taylor** (WESSA) closed by emphasising the impact of public education and ocean stewardship in strengthening marine conservation.

The symposium concluded with a collaborative discussion led by SANParks' **Mr Anban Padayachee** and **Dr Cloverley Lawrence** to shape a future research agenda. Overall, the event reinforced that innovation, long-term monitoring, and cross-sector collaboration are essential for safeguarding Addo MPA's marine and coastal biodiversity in the face of climate change and biodiversity loss.

Marine Alien Invasive Species workshop

Text by Kyle Smith & Clement Arendse, photo by Kyle Smith

Early in December, a group of 24 people from SANParks, Cape-Nature, Stellenbosch University and the Knysna municipality came together for a one-day workshop to learn about and share knowledge of marine alien invasive species. Prof. Tammy Robinson-Smythe from Stellenbosch University led the workshop which included a variety of topics such as drivers of marine invasions, the impacts that they can have, what we know from South Africa, and what management approaches might and might not work.

Theory was followed by a practical where workshop participants could examine a range of marine alien invasive species collected from Knysna Estuary by the Stellenbosch team. Some of these are fairly common in the estuary, and quite distinctive, like the light bulb ascidian (*Clavelina lepadiformis*). Others such as the spaghetti bryozoan (*Amathia verticillata*) are more difficult to identify and has been "hiding" under our noses. Being able to see, touch, and find key identifying features was hugely beneficial for the workshop participants.

Unfortunately, limited knowledge and identification skills of marine alien invasive species is a national concern and limits early identification. Workshops such as this one will hopefully start to address this issue.

The 7th International Marine Conservation Congress (IMCC7)

Text by Alison Kock

TEAM PHOTO AT IMCC7, THE CONFERENCE THEME WAS "MAKING MARINE SCIENCE MATTER!" FROM LEFT TO RIGHT: SINOTHANDO SHIBE (SANPARKS), ASEEQAH DAVIDS (SANPARKS), RUSHDI ARIEFDIEN (SANPARKS), ALICE LUREAU (OFB), ALISON KOCK (SANPARKS), NICOLA VAN WILGEN-BREDENKAMP (SANPARKS), CLEMENT ARENDSE (SANPARKS), PHENIA MARRAS (OFB), KYLE SMITH (SANPARKS).

The IMCC7, organized by the Society for Conservation Biology's Global Marine Program, was held in Cape Town from October 13–18, 2024, making this the first time the congress took place on African soil. The event brought together over 800 researchers, policymakers, resource managers, educators, and students from 72 countries. Ideas were exchanged, research shared, and tools and experiences discussed on topics such as marine governance, communication and outreach, traditional ecological knowledge, and the blue economy. SANParks staff actively contributed with 12 presentations and posters, and participation was made possible through collaboration with the French Biodiversity Agency (OFB) and Agence Française de Développement (AFD).

SANParks staff shared work spanning Marine Protected Area (MPA) effectiveness and planning, conservation of species of special concern, rocky shore monitoring, and estuarine management. Presentations emphasised the importance of data-driven decision-making in guiding actions such as managing estuarine mouth openings, responding to seahorse strandings, and conserving African penguins, abalone, and rock lobster. The growing impact of killer whales and climate change on marine ecosystems was also covered. Across talks, the focus remained on translating socio-ecological data into practical conservation strategies. Together, the presentations reflected SANParks' commitment to conserving biodiversity and sustaining ocean health in the face of mounting environmental pressures.

A container ship waits in Table Bay to offload its cargo (which unfortunately also often includes unwanted invasive species). Balancing the needs of recreational users, endangered biodiversity and maritime trade within a major port city requires broad engagement, partnerships and collaboration.

OUR LIVING COASTS

AND ESTUARIES

While its scenic beauty has afforded Boulders Beach (Table Mountain National Park and marine protected area) a place in the Top 10 beaches of the world, it also supports an important breeding colony of critically endanged African penguin. Together with living on a world famous tourist attraction, penguins also face chronic food shortages.

Diving into the 17th Annual State of the Bay

Text by Alison Kock, photo by Rushdi Ariefdien

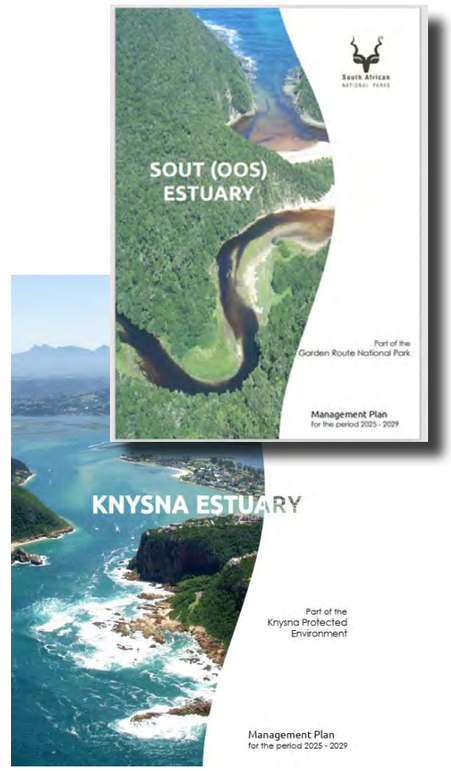
THE ANNUAL STATE OF THE BAY OPEN DAY CONNECTS SCIENCE AND COMMUNITY BY SHARING UP-TO-DATE RESEARCH AND MONITORING FINDINGS FROM SALDANHA BAY, INCLUDING THE MARINE PROTECTED AREA WITHIN THE WEST COAST NATIONAL PARK, WITH THE BROADER PUBLIC.

THE SANPARKS TEAM THAT ATTENDED INCLUDED: ALISON KOCK, TASREEQAH NERO, RUSHDI ARIEFDIEN, ASEEQAH DAVIDS AND SINOTHANDO SHIBE.

On 8 November 2024, the SANParks Cape Marine Team attended the State of the Bay Open Day in Langebaan, hosted by the Saldanha Bay Water Quality Forum Trust. Dr Alison Kock presented recent marine research from Saldanha Bay and Langebaan, followed by Dr Barry Clark (Anchor Environmental), who shared key ecosystem indicators, including water and sediment quality and biological assessments. The event highlighted ongoing environmental pressures and shared responsibility among industries, water users, and residents. A supporting technical report outlines practical recommendations for safeguarding the ecological health of Saldanha Bay and the Langebaan Lagoon. For more information visit https://sbwqft.org.za/

Tides of Progress: Estuary Management Plans

Text by Jessica Hayes



South African National Parks (SANParks) has made notable progress in developing Estuary Management Plans (EMPs) for estuarine systems under its jurisdiction since it initiated the process in 2021. This rollout is guided by the Integrated Coastal Management Act and the National Estuarine Management Protocol, which require the preparation and implementation of management plans for estuaries across the country. Of South Africa's approximately 300 functional estuaries, 36 are managed by SANParks, and encompass a range from largely intact to significantly impacted systems.

To streamline the process, smaller, similar estuaries will be consolidated in single EMPs. SANParks aims to complete 12 EMPs over the course of a decade and will align these with overarching park management objectives and national environmental priorities. These plans are developed through participatory processes, grounded in science and designed to balance ecological priorities with the social and economic needs of surrounding communities.

The Knysna Estuary EMP (2025–2029), approved in March 2025 by the Minister of Forestry, Fisheries and the Environment, is the product of a three-year process involving extensive public consultation, scientific input and inter-agency collaboration. Recognised as South Africa's most important estuary for biodiversity and ecosystem services, the Knysna Estuary can now benefit from an EMP that articulates a clear vision of a healthy, functional system that provides lasting benefits through shared ownership. The plan outlines eleven strategic objectives and forty-three corresponding management actions, which address key issues including habitat conservation, resource use, water quality management, land and water use planning, climate change adaptation, governance, and education. Zonation was used to safeguard habitats by designating areas for leisure activities while ensuring protection of sensitive habitats, such as eelgrass beds and saltmarshes. An integrated monitoring programme provides ecological, physical, and socio-economic indicators to support adaptive management. In addition, the establishment of the Knysna Estuary Advisory Forum aims to enhance stakeholder engagement and foster collaborative governance.

The Sout (Oos) Estuary EMP, completed in 2022, also received formal approval in March 2025. While less complex than Knysna's, it follows the same inclusive and adaptive approach and provides a strong model for smaller systems.

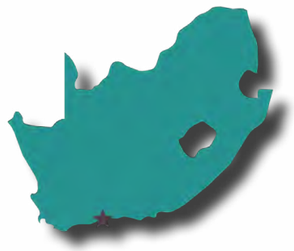
Meanwhile, the Groot (West) Estuary EMP in Tsitsikamma is progressing through its public participation phase, with the final plan anticipated in 2026. This planning process is already benefitting from lessons learned during the development of the Knysna and Sout (Oos) EMPs.

These EMPs represent an important step towards integrated estuarine management in SANParks. With built-in five-year review cycles and monitoring programmes, they are designed to ensure the long-term ecological health and socio-economic value of the country's estuaries for present and future generations.

Science in Partnership

Biodiversity in Exploring Fauna, Seagrass and Fish in the Swartvlei Estuary

Text by Cloverley Lawrence, Clement Arendse and Kyle Smith, photos by Cloverley Lawrence & Frank Eckardt



The Swartvlei Estuary, located within the Garden Route National Park, is a vibrant and ecologically significant environment supporting a diverse range of estuarine plants and animals. In December 2024, a collaborative team led by SANParks' Scientific Services at Rondevlei and involving the University of Cape Town (UCT), the South African Environmental Observation Network (SAEON), and Professor Richard Barnes (University of Cambridge/ Rhodes University), set out to investigate the lesser-known inhabitants of this estuarine system; the benthic macrofauna and fish associated with submerged aquatic vegetation.

Conducted in early summer, the fieldwork formed part of a research project aimed at mapping and understanding macrofaunal and fish communities associated with two co-occurring submerged macrophytes— ***Zostera capensis*** (eelgrass) and ***Ruppia cirrhosa*** (spiral ditchgrass). These aquatic plants display an interesting dynamic – where *Z. capensis* spreads up the estuary and replaces ***R. cirrhosa*** when the mouth is open to the sea and salinity is increased, whereas ***R. cirrhosa*** spreads towards the river mouth when the estuary is closed off from the sea. They also act as vital habitat-forming species and are considered ecosystem engineers due to the structure and shelter they provide for other organisms. The project seeks to determine whether these plant species host similar faunal communities and how factors such as salinity influence biodiversity patterns in the estuary.

Macrofauna and water quality sampling

Although not always visible to the casual observer, macrofauna—small invertebrates such as crustaceans, worms, and molluscs—are essential to estuarine functioning. These organisms contribute to sediment health, nutrient cycling, and serve as an important food source for fish, including seahorses, birds, and other estuarine fauna. By focusing on macrofaunal communities, we can gain insight into the ecological health, productivity, and resilience of these habitats.

Over the sampling period, we collected a total of 96 sediment core samples across five sampling sites, which were strategically chosen along the estuary's natural salinity gradient. At each site, macrophytes (roots and leaves) were first separated, and sediments sieved using a fine 710 µm mesh to retain macrofaunal specimens. These animals, often only a few millimetres in size, were taken to the laboratory for sorting and identification under a microscope. In total, over 40 macrofaunal species and just over 30,000 individual organisms were recorded. After analysis, nearly all animals were returned alive to their collection sites, with a few specimens preserved for reference purposes.

Water quality measurements, including salinity, temperature, pH, and turbidity, were also recorded at each sampling location using a handheld multiprobe. These data, together with archived environmental records, will allow us to assess how abiotic conditions may influence the presence and distribution of macrofauna across the estuary.

Fish Sampling for Habitat Comparison

In addition to macrofauna sampling, the project also included targeted fish surveys to assess species diversity associated with the two submerged plant habitats. Using a 5 m fine mesh seine net, fish communities within three habitat types, ***Z. capensis***, ***R. cirrhosa*** and bare sand were assessed at six sites set longitudinally up the estuary. Captured fish were carefully identified, measured, and then released. A total of 20 species and almost 20 000 fish were sampled of which close to 5 000 were measured to obtain size class information. This component of the study will help determine how fish communities differ between the two macrophyte habitats and contributes to a broader understanding of the ecological roles these plants play in supporting higher trophic levels.

Conservation Value and Ecological Insights

Preliminary findings from the macroinvertebrate data aligned with results from studies conducted in the estuary and the broader region within the last few years. Notably, species previously considered characteristic of the Knysna Estuary were found in high abundance at Swartvlei, suggesting a broader regional distribution than formerly understood. Such findings highlight the need for continued research in lesser-studied estuarine systems, as well as the potential for Swartvlei to support regionally significant biodiversity.

Data collected through this project will inform broader conservation and management strategies. Understanding the ecological roles of macrophytes and their associated faunal communities allows for better planning in terms of habitat protection and estuarine monitoring. For SANParks, this may mean identifying zones that require additional conservation focus or adjusting existing management actions to account for shifting ecological patterns, especially in light of climate-driven changes.

A COLLABORATIVE TEAM CONSISTING OF SANPARKS, UNIVERSITY OF CAPE TOWN, SAEON, AND UNIVERSITY OF CAMBRIDGE/RHODES UNIVERSITY (PROFESSOR RICHARD BARNES), CAME TOGETHER TO INVESTIGATE THE LESSER-KNOWN INHABITANTS OF THE SWARTVLEI SYSTEM; I.E. THE BENTHIC MACROFAUNA AND FISH ASSOCIATED WITH SUBMERGED AQUATIC VEGETATION.

Lessons from Two Estuaries

Protecting South Africa's Endangered White Steenbras

Text by Kyle Smith & Alan Whitfield, photos by Kyle Smith

DESPITE FISHERY REGULATIONS INCLUDING A MINIMUM SIZE LIMIT OF 60 CM TOTAL LENGTH AND A DAILY BAG LIMIT OF ONE, HIGH RETENTION RATES (I.E. FISH KEPT AND NOT RELEASED) BY FISHERS OF UNDERSIZED FISH PERSIST.

The white steenbras (*Lithognathus lithognathus*) is an important species targeted and caught by recreational and livelihood fishers in coastal and estuarine environments. Unfortunately, due to overfishing and environmental pressures, white steenbras populations have plummeted, resulting in the species being rated as Endangered on the IUCN's Red List for Threatened Species. Focusing on case studies from the Swartkops and Knysna estuaries, we explored the challenges facing white steenbras conservation. Through these case studies unique aspects of the problem are highlighted, offering valuable lessons for conservation efforts.

White steenbras are categorised as an estuarine-dependent marine species. This mean that the larval and early juvenile fish recruit in estuaries where they remain for the first three to four years before the subadults migrate back out to sea. Similarly to many other fish species, white steenbras rely on the shallow, sheltered and food-rich habitats found within estuaries for feeding and protection from predators.

Although white steenbras occur in all types of estuaries, the Swartkops and Knysna estuaries are key nursery areas within their 'core' distribution range. Both estuaries are relatively large and have mouths permanently open to the sea, enabling unrestricted recruitment into, and migration out of the estuaries. However, these ecosystems face intense pressure, threatening the long-term survival of this already vulnerable fish.

Case Study 1: Swartkops Estuary

White steenbras catches in the Swartkops Estuary, located within the Eastern Cape Province, have declined significantly over time, reflecting increased fishing pressure and environmental changes. The estuary has a long fishing history, with evidence of intensive angling and netting going back over a century.

Historical records from the 1900s indicate white steenbras were common. A single seine net haul in 1915 captured 120 individuals, including large adults up to 15.4 kg. By the 1970s, studies reported a stark decline, with fewer than ten white steenbras caught in over 50 gillnetting events between 1975 and 1979. Furthermore, angler surveys from 1972 to 1978 recorded just 339 white steenbras compared to almost 9000 of the similarly sized spotted grunter.

Continuous pollution from nearby urban and industrial areas has further degraded the estuary and is compounding pressures on the fish populations. Today Swartkops is a stark example of a collapsed fishery, where adult white steenbras are practically absent and juveniles are rare. As a result, it seems spotted grunter has taken over as the dominant fish in the estuary, filling the ecological niche once occupied by white steenbras.

A RELATIVELY RARE CATCH OF AN ADULT WHITE STEENBRAS IN THE KNYSNA ESTUARY. THE HIGH FISHING MORTALITY OF UNDERSIZED FISH PREVENTS POPULATION RECOVERY, AND SUB-ADULT AND ADULT FISH ARE NOW RARELY CAUGHT.

Case Study 2: Knysna Estuary

Knysna Estuary, located along South Africa's Garden Route, is one of only two systems within the white steenbras distribution range classified as a marine bay. The large and deep mouth enables a huge volume of water to move in and out on each tide and consequently water temperature and salinity in the lower sections of the system are very similar to the adjacent ocean.

During 1978-1980 seine net surveys recorded white steenbras as the third most abundant marine fish species, with catches dominated by juveniles that recruited seasonally and grew rapidly. However, subsequent surveys have revealed declines in abundance. In 1994, 29 white steenbras were caught from 26 hauls, representing 1.1% of the total catch, and by 2023, this had decreased to 56 individuals from 60 hauls, representing 0.2% of the total catch. In all surveys, juveniles dominated catches, with no significant representation of larger adults. The species now constitutes a small proportion of total biomass and abundance compared to historical levels. The contrasting states of white steenbras populations in the Swartkops and Knysna estuaries reflect differences in local environmental conditions and levels of fishery regulation enforcement. A total collapse of its white steenbras population is evident in Swartkops, with no adult fish, and few juveniles recorded in recent decades. A viable, albeit declining, juvenile population still exists in Knysna. Significant industrial pollution in Swartkops combined with nutrient overload from agricultural runoff, has degraded the water quality, further impacting fish populations. In contrast, Knysna has a smaller human population and less industrial activity, resulting in lower pollution levels. However, both systems face chronic nutrient inputs from failing wastewater treatment works.

The story of the white steenbras in South Africa's estuaries is a cautionary tale about the consequences of overfishing and environmental degradation. While the Swartkops and Knysna estuaries differ in their current population dynamics and environmental pressures, both require urgent conservation actions to ensure the survival of this iconic species. To protect and restore white steenbras populations, we recommend a multi-faceted approach. By dealing with chronic pollution issues, limiting further habitat degradation, establishing no-take Estuarine Protected Areas, improving engagement and collaboration with fishers, strengthening fishing regulation enforcement, and fostering local support for conservation, South Africa has a chance to protect and revive white steenbras populations.

Monitoring pollution in Knysna Estuary

Inadequate wastewater service infrastructure, a poor maintenance history, failing wastewater treatment works, and runoff from poorly managed urban areas and rivers, have resulted in chronic sewerage pollution entering the Knysna Estuary.

Co-design, collaboration and water quality monitoring on Knysna Estuary

Text by Kyle Smith, Janine Adams & Lucienne Human

Due in part to its size, overall biodiversity—including endangered species—and the variety of habitat types found in the estuary, including the largest seagrass beds of all South Africa's estuaries, the Knysna Estuary is the most important estuarine biodiversity conservation area in South Africa. However, like many other systems, the Knysna Estuary faces various growing pressures on the system, including municipal and private infrastructure development to support a rapidly growing permanent local human population. Inadequate wastewater service infrastructure, a poor maintenance history, failing wastewater treatment works, and runoff from poorly managed urban areas and rivers, have resulted in chronic sewerage pollution entering the Knysna Estuary. Improving water quality is listed as a key management objective within the Knysna Estuary Management Plan, but this relies on monitoring key variables, followed by adequate action to remedy issues. It is important to highlight that the Knysna Estuary Management Plan, including the vision, management objectives, and actions, were co-developed through stakeholder workshops. As such, they represent the desires and concerns of citizens and not only the management authorities.

Based on this background it was fortuitous when researchers from Nelson Mandela University and the South African Environmental Observation Network (SAEON) approached SANParks with a project proposal looking at Nature-based SOlutions for Mitigation of WATershed pollution (SOMWAT for short). The SOMWAT research, which focused on seagrass as a buffer for nutrients and pathogens that would otherwise enter the Knysna Estuary and influence subsistence and recreational activities, had direct relevance to addressing the concerns reflected in the management plan.

It was funded through the MEER-WISSEN initiative, a German Federal Ministry for Economic Cooperation and Development programme, which seeks to provide policymakers with relevant scientific information to enable decision-making for the effective management and conservation of Africa's oceans and coasts. The Initiative followed a strong partnership and co-design approach that ensured priorities were jointly set, the results would meet local needs and, importantly, were usable by both partners and decision-makers.

A key objective of the project was to disseminate research findings through stakeholder interactions. In this regard, a report emanating from the project entitled "Sustainable co-management of the Knysna Estuary – Proposed water quality management programme and state of water quality 2023" was presented and discussed during a two-day stakeholder workshop. The report consists of two main sections: it provided an update on pollution levels and the state of water quality in Knysna Estuary during 2023 and provided clear guidance and recommendations in establishing a robust water quality monitoring programme for the system.

Covering three components, the proposed SOMWAT monitoring programme first examines known pollution sources, including the wastewater treatment works, rivers flowing into the estuary, and the urban stormwater system. The second component assesses estuarine ecosystem water quality, while the third primarily focuses on microbiological data to evaluate the suitability of the water for recreational use. For each component, the report provides recommendations on the parameters to monitor, the frequency of monitoring, sampling procedures, and appropriate analytical techniques.

The Knysna Estuary is experiencing pollution problems, particularly in the Ashmead Channel, a weakly flushed area that can't properly handle excess nutrients. However, the SOMWAT results indicate that since May 2023, nutrient levels have worsened, which are likely to lead to occasional algal blooms. While the main channel of the estuary generally meets water quality standards due to good water circulation, parts like the Ashmead Channel and upper estuary show signs of oxygen loss and possible metal pollution. Recreational water quality is still good in most areas, but the northeastern section is unsafe for swimming or seafood collection due to high bacteria levels.

In developing the monitoring programme, previous and current monitoring programs undertaken on the Knysna Estuary by a variety of organisations and individuals were collated and synthesised. This not only enabled the identification of monitoring gaps and the development of a more formal, cohesive, and inclusive water quality monitoring program, but also provides a reference for locating historic data. It's clear that in moving forward, it would be beneficial for these historic data sets, along with any metadata files, to be housed within one data repository. Furthermore, implementing the proposed programme will require adequate budgets and allocated resources. But this doesn't need to be incumbent on a single organisation. With strategic and collaborative partnerships between relevant role players, the responsibility for monitoring various aspects and the required resource allocation can and should be shared. Collation, sense making, and providing recommendations based on the monitoring results will be crucial, followed by adequate dissemination and response.

The SOMWAT project has provided a blueprint for ongoing monitoring and a template for reporting. Collaboration and implementation of a cohesive monitoring programme has been partially realised. However, an adequate response to reduce pollution issues is still awaited.

New alien marine species

Amathia verticillata discovered in Langebaan Lagoon Marine Protected Area

Text by Rushdi Ariefdien & Alison Kock, photo by Alison Kock

Langebaan Lagoon Marine Protected Area (MPA), located within the West Coast National Park (WCNP), is susceptible to the introduction of marine invasive alien species due to a combination of ecological, environmental, and human activities. Langebaan Lagoon MPA is linked to Saldanha Bay where a large commercial port and hub for international shipping are situated. Marine alien species are introduced into this area through ballast water discharge and biofouling (build-up of marine life on submerged parts), from ships, making Saldanha Bay and Langebaan Lagoon hotspots for alien species. There are currently 29 known marine alien species in the area, including the recently discovered *Amathia verticillata*.

Amathia verticillata is a soft bryozoan, a sessile invertebrate that forms colonies. It is commonly known as "spaghetti bryozoan" and resembles glass noodles. ***A. verticillata*** individuals has both male and female organs and thrives in a broad range of temperatures and salinities, which contributes to them being highly invasive, with peak reproduction occurring in the summer. ***A. verticillata*** is native to the Caribbean Sea and was previously misidentified as filamentous algae in the Langebaan Lagoon MPA.

In late November 2023, scientists from Stellenbosch University identified these organisms at Kraalbaai in the Langebaan lagoon as the alien species ***A. verticillata***. The species thrive on artificial surfaces and in other countries where they have become established, they block intake pipes, foul fishing and aquaculture gear, block turtle exclusion devices, and cause a decline in seagrass.

After scientists raised concerns with SANParks, a summer baseline survey was conducted on 26th-28th February 2024 to determine the distribution of this alien species and assess the feasibility of removal. The lagoon was sectioned into 15 zones. Researchers sampled non-sensitive zones (areas with minimal seagrass cover) by walking 1km adjacent to the shoreline in the intertidal and shallow subtidal (<2m depth). A high abundance of ***A. verticillata*** was found in zones close to the Geelbek area. The shipwreck in the lagoon and the hulls of houseboats at Kraalbaai also had a high abundance of colonies attached to them. The survey revealed that the species was seemingly already established in the Langebaan Lagoon, and plans were made for further monitoring.

A follow-up winter survey was conducted on 26 August 2024. SANParks and Stellenbosch University scientists resurveyed zones 8, 9, 10, 11, and 13. Consistent with previous work elsewhere, no ***A. verticillata*** was observed during the winter sampling, even at the zones with the highest abundance during the previous survey. Moreover, nothing was found on the hulls of the houseboats at Kraalbaai. During a summer field trip in February 2025, scientists from SANParks confirmed the presence of ***A. verticillata*** in the lagoon once again, suggesting the highly seasonal nature of the species.

A HIGH ABUNDANCE OF A. VERTICILLATA WAS FOUND IN ZONES CLOSE TO THE GEELBEK AREA IN THE LANGEBAAN LAGOOD AND CAN BE SEEN COVERING LARGE SURFACE AREAS OF SEAGRASS.

Reference:
Ackland SJ, Andersen MN, Kock A, van Blerk D, Ariefdien R & Robinson TB. 2025. First record of the marine alien bryozoan *Amathia verticillata* (delle Chiaje, 1822) in South Africa. BioInvasions Records 14(1): 183–196, https://doi.org/10.3391/bir.2025.14.1.15

Our coast at risk

Developing Coastal Management Lines for South African National Parks – a work in progress

Text by Clement Arendse, Fahiema Daniels & Deen Shade

COASTAL MANAGEMENT LINES WILL ALLOW SANPARKS TO IDENTIFY EXISTING INFRASTRUCTURE THAT COULD BE AT RISK TO DYNAMIC COASTAL PROCESSES AND TO DEVELOP APPROPRIATE MANAGEMENT INTERVENTIONS.

The National Environmental Management: Integrated Coastal Management Act requires that Coastal Management Lines (CMLs), aimed at protecting coastal assets such as coastal public property and to preserve the aesthetic value of the coastal zone, be developed for the entire South African coastline. The development of these lines is the responsibility of the provincial MEC, or, where the area is deemed a national competency (e.g., it falls a national park or when it straddles provincial or national boundaries), the National Minister responsible for Environmental Affairs. Further, in National Parks, these coastal management lines are developed cooperatively between SANParks and the Department of Forestry, Fisheries and the Environment (DFFE), the latter representing the National Minister.

To date, one CML, within the Garden Route National Park, has been gazetted for implementation. The CML is restricted to property managed or owned by SANParks and is based on areas identified as at risk from dynamic coastal processes such as erosion, flooding and movement of coastal dune systems, as well as sea level rise and other climate change related impacts like storm surges. The GRNP CML was based largely on modelling done for the Western Cape Government as part of their CML delineation, but also includes other data sources such as proxies along estuaries (the 5 m contour, a proxy for the 1:100 year flood line) and along the rugged Tsitsikamma coastline in the Eastern Cape where no modelled data was available (the 10 m contour, which aligns with modelled data along the Harkerville coastline in the Western Cape).

Following the successful gazetting of the Garden Route CML, SANParks and DFFE have embarked on establishing similar lines within the Namaqua, West Coast and Table Mountain National Parks. Each of these Parks have presented their own challenges, overcome by incorporating more broad-scale modelled data where finer-scale data is lacking, to inter-governmental discussions and agreements on how private property situated within National Parks should be treated. Although not significantly deviating from the Garden Route CML process, the adaptions have allowed us more flexibility in establishing the CMLs, making them locally relevant and adaptable.

The CMLs will allow SANParks to identify existing infrastructure that could be at risk to dynamic coastal processes and to develop appropriate management interventions for such structures, ranging from protection to modification to managed retreat. By identifying at-risk areas, SANParks will also be able to effectively plan for new infrastructure development, protecting SANParks assets and the environment while simultaneously reducing possible impacts on the tourism value of our coastal Parks.

LAKES, PANS, WETLANDS AND RIVERS

LIFE BLOOD AND CONNECTORS

Wetlands are a very important habitat feature in the park Bontebok National Park where they cover approximately 17% of land . Here grey rhebok dash through the water. These antelope are experiencing declining populations across their range, and researchers and managers grapple to understand the cause.

A life's work

Three Decades of Monitoring Waterbirds in the Wilderness Lakes System: Dr Ian Russell's Legacy

Text by Cloverley Lawrence, Jessica Hayes & Melanie de Morney, photos by Cloverley Lawrence & Jessica Hayes

After 33 years of consistent monitoring, Dr Ian Russell retired in July 2024, leaving behind one of South Africa's most remarkable long-term waterbird datasets. His work in the Wilderness Lakes Complex (WLC) – a network of estuaries and lakes in the Garden Route National Park – has not only deepened our understanding of wetland bird dynamics but also informed national conservation efforts in this globally recognised Ramsar site. Dr Russell led a biannual, boat-based survey that tracked changes in waterbird abundance and distribution across six key waterbodies, including the Touw and Swartvlei estuaries. His recent publications summarising these decades of work reveal major shifts in bird populations, highlighting both concerning declines and encouraging increases.

Among shorebirds, seven species, including Curlew Sandpiper and Ruff, have declined significantly. At the same time, three species, including the African Spoonbill, have increased. These changes, observed across multiple lakes and estuaries, point to broad-scale pressures such as habitat loss, alien fish invasions, and changes in aquatic vegetation. Herbivorous waterbirds also experienced shifts, with the Red-knobbed Coot and Yellow-billed Duck in decline, while Spur-winged and Egyptian Geese have increased. Likely causes stem from changing hydrology, habitat transformation, increased recreational activity and disturbance. Piscivorous and scavenging birds showed similarly mixed results: while Common Tern and Black-necked Grebe have declined, Cape Cormorant and Great Crested Grebe are on the rise, responding to changes in prey availability and levels of disturbance.

These findings highlight the complex interplay of local, regional and global drivers shaping bird communities – from sandbank erosion and invasive species to broader environmental change , with many species being migratory and only spending part of their life cycle within the WLC. Despite these challenges, the Wilderness Lakes remain a stronghold for many species, including those of global conservation concern.

Recent updates to BirdLife South Africa's Red List have reinforced the urgency of long-term monitoring programmes like this. Several of the species documented as declining in this study now hold threatened or near-threatened status. For example, the Curlew Sandpiper is listed as Near Threatened globally and Vulnerable in South Africa, while the Cape Cormorant, although increasing locally, is globally Endangered. The continued presence and in some cases the decline, of species like the Common Tern (Vulnerable in South Africa) and Black-necked Grebe (Least Concern) underscores the importance of regular monitoring to detect early warning signs and inform conservation strategies. These local trends offer critical insight into broader population trajectories and highlight the Wilderness Lakes as a priority site for waterbird conservation under national and international frameworks.

As Dr Russell steps away from the helm, the programme is passed to capable hands. Dr Cloverley Lawrence, Jessica Hayes, and Melanie De Morney, who worked closely with Ian over recent years, learning much from his quiet dedication and deep knowledge, have now taken over. Their stewardship ensures that this vital monitoring effort will continue to inform wetland conservation for years to come, building on the solid foundation laid by one of South Africa most committed field ecologists.

THE WATERBIRD MONITORING TEAM; LONG-TERM PATTERNS IN WATERBIRD POPULATIONS ARE DRIVEN BY THE COMPLEX INTERPLAY OF LOCAL, REGIONAL AND GLOBAL DRIVERS – FROM SANDBANK EROSION AND INVASIVE SPECIES TO BROADER ENVIRONMENTAL CHANGE.

References:

Russell IA. 2023. Waterbird community changes in the Wilderness Lakes, South Africa (Part 1 of 3): Herbivores and omnivores. Koedoe 65(1): a1770.

Russell IA. 2023. Waterbird community changes in the Wilderness Lakes, South Africa (Part 2 of 3): Shorebirds. Koedoe 65(1): a1771.

Russell IA. 2023. Waterbird community changes in the Wilderness Lakes, South Africa (Part 3 of 3): Diving piscivores and scavengers. Koedoe 65 (1): a1772.

Avian Botulism in the Wilderness Lakes

THERE ARE FEW REPORTED BOTULISM CASES IN WILD WATERBIRD COMMUNITIES IN SOUTH AFRICA. MASS DIE-OFFS OF WATERBIRDS IN THE WILDERNESS LAKES WERE FIRST OBSERVED IN JANUARY 2015.

Outbreaks, Impacts, and Management (2015–2025)

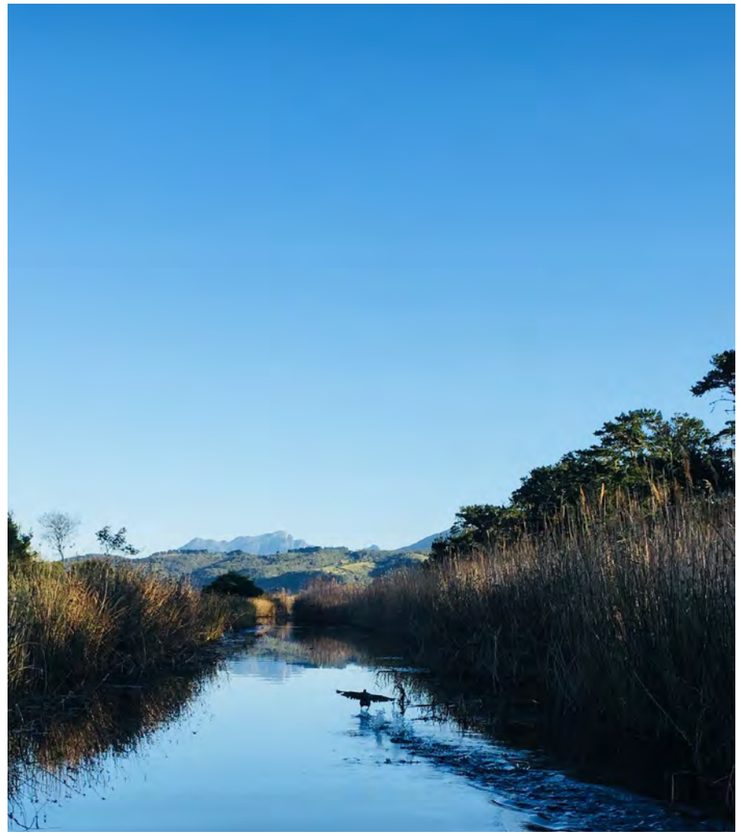
Text by Jessica Hayes & Cloverley Lawrence, photos by Jessica Hayes

Avian botulism, caused by toxins produced by *Clostridium botulinum*, has become a significant concern for waterbird populations in the Wilderness Lakes system of the Garden Route National Park since 2015. This wetland complex, comprising Rondevlei, Langvlei, and Eilandvlei, is internationally recognised as a Ramsar site. It supports large numbers of waterbirds, including several species of conservation concern.

Between 2015 and 2017, mass die-offs affected more than 1,000 birds across 23 species. By 2022, that total had risen to 1,676 birds from 29 species. Monitoring of these outbreaks was initiated by Dr Ian Russell in 2015, forming the basis for one of South Africa's first detailed studies on avian botulism in natural wetland systems. Symptoms observed included paralysis, inability to walk or fly, and birds found with eyes closed and necks limp. The Cape shoveler and red-knobbed coot were particularly susceptible, accounting for 18% and 60% of mortalities, respectively, during the initial three-year study. Most deaths occurred during November to April. Despite these losses, many waterbird species appeared unaffected.

The environmental drivers of avian botulism outbreaks remain complex and poorly understood. While water quality parameters such as salinity, pH, and temperature remained within long-term averages during outbreaks, the presence of invasive carp and nutrient-enriched sediments may have indirectly supported favourable conditions for toxin production.

Avian botulism primarily spreads when maggots feeding on infected carcasses accumulate toxins that can then poison filter-feeding and dabbling waterbirds. No outbreaks were reported between 2022 and the end of 2024. However, in January 2025, the disease re-emerged, resulting in the deaths of 199 birds across 10 species. The 2025 outbreak raised concerns around possible links to low water levels and elevated summer temperatures observed in preceding months. Management focuses on breaking the carcass–maggot cycle to reduce transmission. Protocols recommend daily removal of all carcasses and off-site disposal of dead birds and fish.



LANGVLEI LAKE - WHERE A LARGE PERCENTAGE OF AVIAN BOTULISM BIRD DEATHS HAVE OCCURRED.

A notable development in 2025 was the successful treatment of several sick birds and their release by a local wildlife rehabilitation centre. Early capture and supportive care, such as rehydration and warmth, can improve survival in some cases, demonstrating that timely intervention is a valuable addition to disease management efforts.

Repeated outbreaks have serious conservation implications, as the Wilderness Lakes' Ramsar status depends largely on supporting key duck populations. Continued high mortality, particularly among species like the Cape shoveler, threatens this role and could impact regional populations that rely on the lakes as a seasonal refuge during the dry summer period.

Avian botulism remains a persistent threat to waterbirds in the Wilderness Lakes. The 2025 outbreak underscores the importance of sustained surveillance, rapid carcass removal, and rehabilitation efforts. Together, these actions are vital to mitigate disease impacts to this important South African wetland system.

Reference:

Russell, I.A., Randall, R.M., Zimmerman, D. & Govender, D., 2019, 'Outbreak of avian botulism and its effect on waterbirds in the Wilderness Lakes, South Africa', Koedoe 61(1), a1553. https://doi.org/10.4102/koedoe.v61i1.1553

What's croaking in Kruger's Pumbe Pans?

Although the Pumbe pans dry up completely in the dry season, a diversity of aquatic species occur in these pans during the wet season, including the small and colourful "killifish", which survive the long dry periods as eggs in the mud.

Rapid biodiversity assessment of Pumbe Sandveld Pans, Kruger National Park

Text by Nikisha Singh, Dumisani Khosa & Tercia Strydom , photos by Nikisha Singh & Tercia Strydom

The Pumbe Sandveld is a unique and ecologically distinct area within the Kruger National Park (KNP), covering approximately 2,875 hectares. This small portion of sandveld within KNP (less than 0.2% of KNP) represents the westernmost extension of a much larger sandveld system that lies predominantly in Mozambique. Only about one kilometre of this habitat extends westward into Kruger. The area is geologically characterised by deep sandy soils, often reaching depths of around two metres, underlain by a hard rocky substrate, typically conglomerate.

During the summer period of 2024–2025, a remarkable observation by Michael Paxton, the local Section Ranger in the Nwanetsi section, highlighted the potential biodiversity significance of the area. The discovery of freshwater shrimp and a horseshoe crab in one of the pans prompted a targeted follow-up survey. A rapid biodiversity assessment was conducted with the aim of documenting the aquatic biodiversity present in the Pumbe Sandveld pans. All species encountered during the fieldwork were recorded and voucher specimens were taken to provide baseline data that could inform future research and conservation management strategies for this unique habitat. The assessment took place at three pans in total, with one surveyed on 28 February 2025 and two additional pans assessed on 7 April 2025. A combination of sampling techniques was used to maximise species detection across different aquatic habitats. These included electroshocking and dip-netting, cast and seine netting and active searching.

These abiotic characteristics allowed for the establishment of a special network of localised pans which are home to some unique biota (see photo above). The most famous of which is the killifish, a colourful fish with two species (***Nothobranchius rachovii*** and ***N. orthonotus***), known for their fascinating life cycle adapted to the pans' drying and wetting cycles. These short-lived fishes lay their eggs in the mud as the pans dry up which hatches once the pans fill with water again in following rainy seasons. This way the fish has adapted to survive as eggs for many months in the dry pans.

This rapid assessment provided valuable initial data on the aquatic biodiversity of the Pumbe Sandveld pans. We found two new records for Pumbe pans, i.e. the banded rubber frog (***Phrynomatis bifasciatus***) and Muller's Platanna (***Xenopus muellerli***). Future surveys are planned for earlier in the wet season in the hope of finding the elusive killifish.

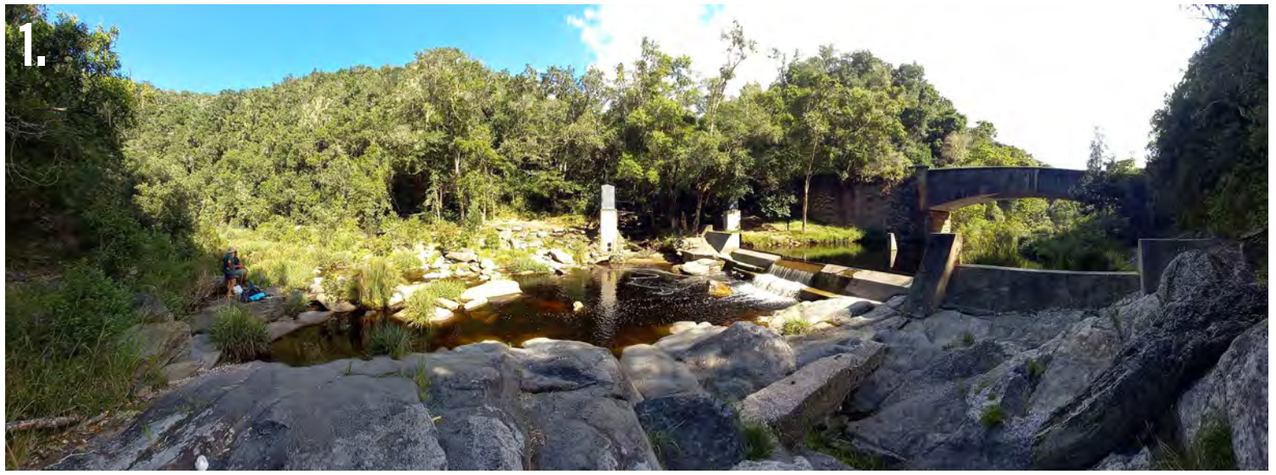
1. DUMISANI KHOSA CASTS A NET AT ONE OF THE PUMBE PANS, IN AN EFFORT TO SAMPLE THE UNIQUE BIODIVERSITY OF THESE SANDVELD PANS, A RELATIVELY RARE HABITAT TYPE WITHIN KRUGER NATIONAL PARK. 2. SOME OF THE RICH BIODIVERSITY OF THE PANS. 3. PULLING A SEINE NET TO CAPTURE FISH AND ALL OTHER FAUNA PRESENT.

Rivers of the Garden Route

Are our rivers thriving or just treading water? Insights from our 2024 Garden Route River Surveys

Text by Robin Petersen, Melanie de Morney & Michael-Jade Meyer, photos by Michael-Jade Meyer & Melanie de Morney

Our surveys indicate that the rivers in the Garden Route are in a A/AB ecological condition (A representing the best or healthiest condition and AB a slightly lower, but still relatively good, condition). However, some rivers are showing signs of stress from invasive alien plants, sedimentation and nutrient enrichment, such as the lower reaches of the Duiwe and Knysna Rivers.



1. RIVER SURVEYS ALONG THE KAAIMANS RIVER HAVE REVEALED SEVERAL SENSITIVE MACROINVERTEBRATE SPECIES. 2. MEASURING THE FLOW VELOCITY ALONG THE SILWER RIVER, ONE OF THE DRIVERS OF FISH AND MACROINVERTEBRATE DYNAMICS. THE WAY IN WHICH THESE RESPOND IS A INDICATOR OF ECOLOGICAL HEALTH OF THE RIVER.

SENSITIVE SPECIES THAT ARE INDICATORS OF GOOD WATER QUALITY.
1. A FINGER-NET CADDISFLY (PHILOPOTAMIDAE, LEFT), FLATHEADED MAYFLY (HEPTAGENIIDAE, MIDDLE) AND SPINY CRAWLER MAYFLY TELOGANODIDAE (TOP RIGHT) FROM THE LOWER REACHES OF THE KNYSNA RIVER.
2. A BUSHTAILED CASED CADDISFLY (SERICOSTOMATIDAE, LEFT) WITH A SPINY CRAWLER MAYFLY (TELOGANODIDAE, RIGHT) FROM THE UPPER REACHES OF THE HOMTINI RIVER.

Several factors determine the health of river ecosystems and their ability to provide various goods and services. These range from geomorphological characteristics, hydrological regimes, water quality and the nature of the in-stream and riparian habitats. Unfortunately, water resources in South Africa are deteriorating at unprecedented rates due to pressures such as excessive water abstraction, impoundments, pollution, and invasive species. These threats negatively impact ecosystem processes and services that rivers provide.

The rivers flowing through the Garden Route National Park flow through varied landscapes, from the steep mountain catchments of the Outeniqua and Tsitsikamma mountain ranges to the gentle coastal plains. These rivers often seem to have “dark water” due to the influenced of the vegetation and geology, making them naturally acidic and low in nutrients. Despite this, they support a remarkable diversity of life, including rare and endemic fish, birds, amphibians, and invertebrates.

In 2024, our team launched a comprehensive survey to assess the current ecological health of the Garden Route rivers. During our surveys, we measured both the “Drivers” such as flow rate, water quality, and geomorphology (habitats), and the “Responders” such as fish and macroinvertebrates which, due to their sensitivity to water quality changes, are excellent indicators of river health. Several sensitive macroinvertebrate species were recorded, including stoneflies (Notonemouridae), mayflies (Heptageniidae; Teloganodidae), caddisflies (Barbarochthonidae; Philopotamidae; Sericostomatidae), beetles (Helodidae) and true flies (Blephariceridae).

To enhance our monitoring, we also did a trial run using drone technology to capture aerial images of the rivers. We hope that this innovative approach will help us track long-term changes in river geomorphology, such as erosion and sediment build-up, providing valuable insights for future river management.

The data collected during this survey provides a vital baseline, a reference point against which future changes can be measured to guide adaptive management strategies to protect and restore the Garden Route’s precious aquatic ecosystems.

Unseen pollutants in Kruger

Unseen pollutants in Kruger: microplastics in the Sabie and Olifants Rivers

Text by Llewellyn Foxcroft & Purvance Shikwambana

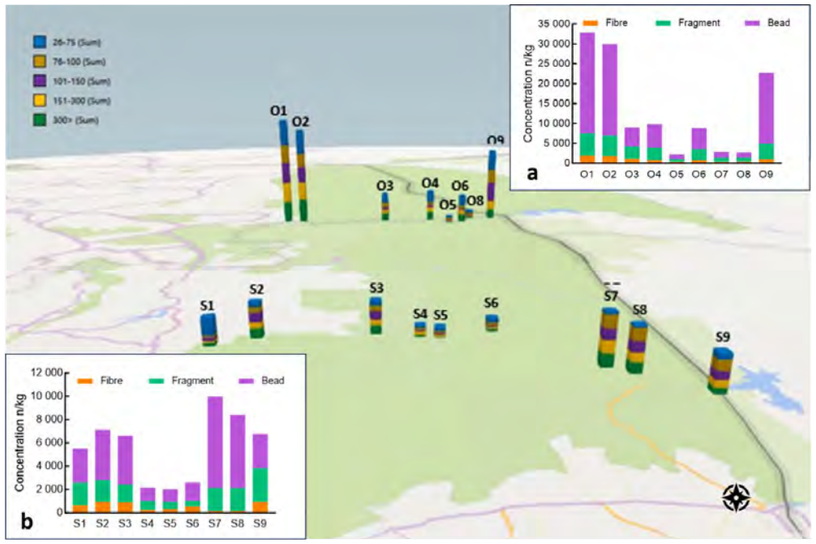


FIGURE 1. RIVERBED SEDIMENT MICROPLASTIC PARTICLE DISTRIBUTION ACROSS DIFFERENT SAMPLE SITES ALONG THE SABIE (O1 TO O9) AND OLIFANTS (S1 TO S9) RIVERS. BAR GRAPHS ILLUSTRATING RIVERBED SEDIMENT MICROPLASTICS PER MORPHOTYPE (FIBRE, FRAGMENT, BEAD) AT DIFFERENT SAMPLE SITES ALONG THE (A) OLIFANTS AND (B) SABIE RIVERS. NOTE THE HIGH MICROPLASTIC LEVELS, EVEN WHERE RIVERS ARE ABOUT TO LEAVE THE PARK AND SHOULD BE MORE PRISTINE.

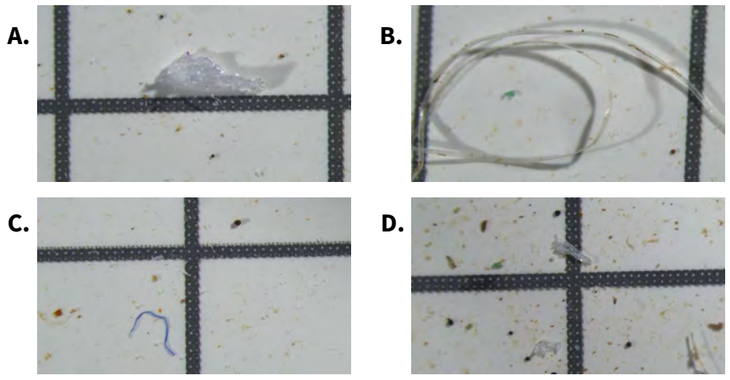


FIGURE 2. IMAGES OF MICROPLASTIC PARTICLES VIEWED UNDER MICROSCOPE, (A) WHITE FRAGMENT, (B) LONG WHITE FIBRE, (C) BLUE FIBRE, AND (D) WHITE MICROBEAD. MAGNIFICATION = 35 TIMES.

Tiny plastics, big problem: what do two rivers in Kruger tell us about pollution in protected areas? When most people think of Kruger National Park, they picture pristine savanna with iconic herds of animals. But within the Olifants and Sabie rivers, which wind through this landscape, scientists have studied the hidden and growing threat of tiny plastic particles less than 5 mm in size. Although often too small to see with the naked eye, they are everywhere. The Olifants and Sabie rivers both originate outside Kruger National Park. As they journey through towns, farms, mines, and cities, they collect more than just water. Along the way, they pick up plastic particles from wastewater treatment plants, industrial runoff, road dust, and informal dumping. Scientists were interested in the state of Kruger's microplastic pollution problem, and whether the rivers could "clean or filter themselves" as they flowed through the park? To find out, sediment samples were collected during the dry season (September) and water samples during the wet season (January) from nine sites along each river. The goal was to measure microplastic concentrations and establish if those concentrations decrease as the rivers traverse the protected area.

What they found was surprising. Microplastic levels didn't decrease and, in some cases, even increased. For example, some of the highest sediment microplastic concentrations along the Olifants River were at the furthest point from where the river enters the park (Fig. 1 at sample point O9). The sediment samples taken from the riverbed where heavier particles settle, revealed substantial amounts of microplastics. In the Sabie River, concentrations ranged from around 2,000 to nearly 10,000 particles per kilogram of dry sediment. The Olifants River had even higher values at some sites, peaking at over 27,000 particles per kilogram (Fig. 1). Water samples also showed microplastics floating in suspension, ranging from 11 to 50 particles per litre in the Olifants, and 4 to 41 per litre in the Sabie. Compared to other microplastics studies in South Africa, Kruger's rivers are among the most microplastic-contaminated rivers in the country.

Researchers found that the microplastics came in many forms including tiny synthetic fibres, microbeads from cosmetics or industrial processes, and even particles that looked like rubber. Most of the plastics were made of polyester (PET), the same material used in plastic bottles and synthetic clothing, but others were made from polyethylene, polypropylene, and rubber-based polymers, which are often associated with tyres and road runoff (Fig. 2). This diversity points to multiple pollution sources including urban waste, agricultural runoff, industrial debris, and possibly even tourist activities within the park.

Many people assume that rivers naturally flush out pollutants as they flow. While that might be true for some chemicals or nutrients, it is not always the case for microplastics. Once these particles enter the water, some float because they are lighter than water thus moving around in the water column. Others sink and get trapped in sediment and are only slowly moved downstream during floods or seasonal changes. However, microplastics don't just float around harmlessly. They are increasingly found in aquatic animals, from insects and fish to birds and hippos, which can eventually in some cases cause health issues ranging from internal injury to hormone disruption. Even humans are not immune - as plastics enter the food web, we too may be consuming them.

Since the Olifants and Sabie rivers flow through Mozambique into the Indian Ocean, the plastic pollution problem is transboundary and affects global ecosystems, from rivers and wetlands to estuaries and coral reefs. If we want to protect places like Kruger, we must look beyond the park's borders to the cities, farms, and factories that feed its rivers. That includes better plastic waste management, upgrades to wastewater treatment plants, education campaigns, and possibly even international agreements on river pollution. This calls on us, the public, to reconsider our relationship with plastic. From the products we buy to the waste we discard; our choices have knock-on effects through the environment in ways we can't anticipate.

Reference:
Shikwambana S, Foxcroft LC, Taylor JC & Bouwman H. 2024. Microplastic concentrations in sediments and waters do not decrease in two rivers flowing through the Kruger National Park, South Africa. Water, Air 235:675. https://doi.org/10.1007/s11270-024-07499-2

LAKES, PANS, WETLANDS AND RIVERS

Rivers under pressure

The journey so far - has the Riet River recovered from the 2022 tailings accident?

Text by Hendrik Sithole, Roxanne Erusan, Tsholofelo Wechoemang & Naledi Sebonesho

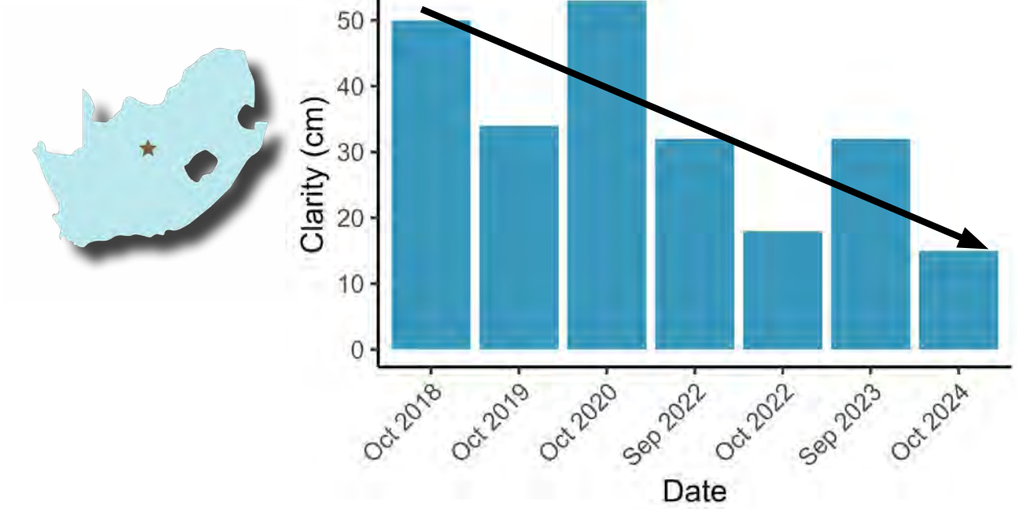


FIGURE 1. THE WATER CLARITY MEASUREMENTS SAMPLED FROM THE RIET RIVER AT THE DE KRANZE SITE IN MOKALA NATIONAL PARK SHOWING LOWER CLARITY AFTER A MINE TAILINGS DAM COLLAPSED AND POLLUTED THE RIVER IN SEPTEMBER 2022.

The Riet River is the only perennial river that flows through the Mokala National Park. However, a stretch of only 9 km flows through the park with the result that a very small portion of the river (3% of its 300 km) is formally protected. Regardless of the relative lack of protection, we nevertheless expected that the river will not be so vulnerable to pollution associated with human settlements because settlements along the Riet are mainly small towns with small populations.

Alas, we were wrong! On the 11th of September 2022 a tailings dam near Jagersfontein collapsed and negatively affected river macroinvertebrate communities and water quality. The tailing dam was situated on a near-dormant mine that was not even located directly on the Riet, but on one of her tributaries. The negative ecological consequences, however, reached Mokala, 220 km downstream of Jagersfontein. Water clarity decreased (Fig. 1), the concentrations of dissolved solids increased, and seven macroinvertebrate families decreased.

It is now almost three years since the disaster and the Riet is still struggling to recover. Water clarity is less than half that of the pre-tailing dam collapse values, and macroinvertebrate families remain around 15 to 17 compared to the 18 to 21 taxa once found. None of the post-tailing collapse macroinvertebrate communities are similar to the pre-tailing collapse ones. Like Laura Weaver alludes to in her poem 'Sacred Wound, in Riet lives a wound. Time will tell if she completely heals.

THE ORANGE RIVER WHERE IT PASSES THROUGH THE AUGRABIES NATIONAL PARK. THE RIVER HAS EXPERIENCED DETERIORATING WATER QUALITY OVER TIME.

The Orange River water quality - unbefitting her majestic status

Text by Hendrik Sithole & Dawid Pienaar

No South African river is as regal as the Orange. She stands 2,432 km tall carrying most of the Lesotho catchment in her crown, wearing all the South African Vaal system as her robe with Botswana's Molopo and Namibia's Fish catchments as ornaments. To match her royal status, the Orange is the only river in South Africa with four national parks in her basin. In addition, the mighty Augrabies Falls, one of the largest falls in Africa in terms of volume of water, is situated on the river's lower reaches.

However, a flea in her royal regalia is poor water quality. Since sampling started in 2020, water quality has continued to deteriorate with increasing salinity concentrations (Fig. 1). Although low water flows could have resulted in the high salinity concentrations, high flows were also associated with high contamination levels. For instance, in 2023 and 2024 the Orange River had higher flows than in 2020, but also higher contamination as measured through increased salinity. The relatively low water flows in the Orange River appears insufficient to flush out or significantly reduce pollutants.

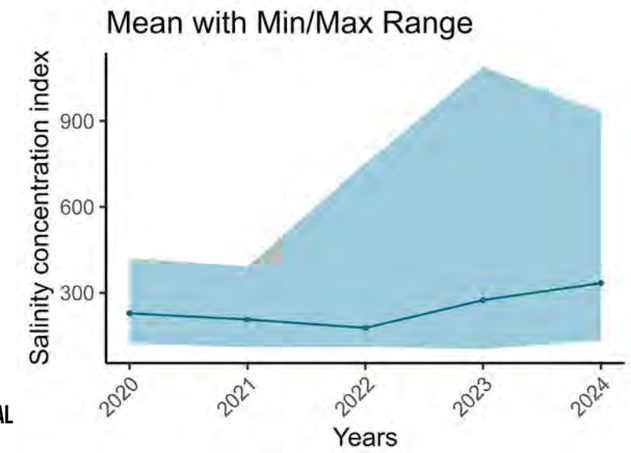
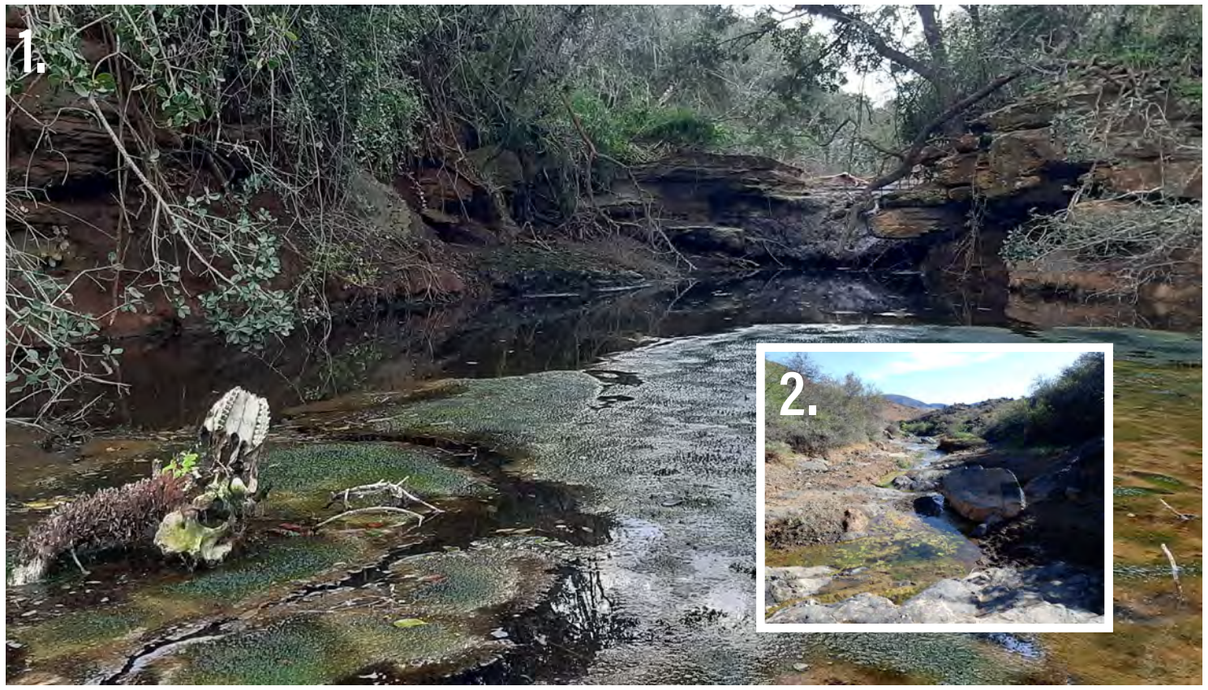


FIGURE 1. THE TREND IN SALINITY CONDITIONS OF THE ORANGE RIVER WATERS FROM THE AUGRABIES FALLS NATIONAL PARK.

A New Inventory of Rivers and Wetlands

Exploring Freshwater Ecosystems of Addo Elephant National Park

Text by Robin Petersen, Nicholas Cole & Dirk Roux, photos by Dirk Roux



RIPARIAN HABITATS AND SPRINGS AS ECOSYSTEM TYPES ARE GENERALLY POORLY DOCUMENTED BUT ABUNDANT IN ADDO ELEPHANT NATIONAL PARK. 1. NATURAL GROUNDWATER FED SPRING IN THE COLCHESTER SECTION OF ADDO ELEPHANT NP. 2. TYPICAL SEASONAL STREAM IN THE ARID DARLINGTON SECTION OF ADDO ELEPHANT NP.

Addo Elephant National Park (Addo Elephant) has an exceptional variety of ecosystems, covering five of South Africa's nine biomes, including terrestrial, freshwater, and marine ecosystems. Until recently, the diversity of inland aquatic ecosystems associated with the high ecosystem diversity remained under-documented. In 2022, we set out to undertake a comprehensive inventory, the first of its kind, for Addo Elephant's rivers and wetlands, aiming to fill critical knowledge gaps that will guide park management decisions, support national biodiversity assessments, and shape future research priorities.

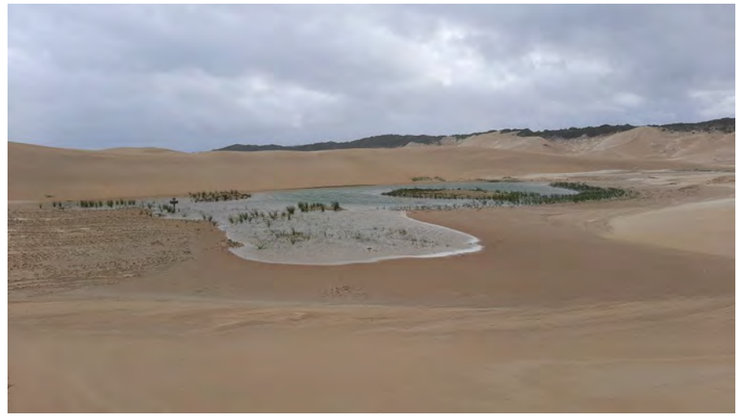
The project used a multidisciplinary approach, combining expertise in GIS mapping, ecology, geology, and botany. Collaboration was key, and the South African Biodiversity Institute (SANBI), SANParks' Scientific Services, Biodiversity Social Projects, park managers, and rangers were involved. Over 22 rivers and 1,300 potential wetlands were mapped, using desktop GIS tools, which were then refined through four field visits between September 2022 and November 2023. Ultimately, 16 rivers and 437 wetlands were assessed ross seven sections in the park.

Key Findings: Rivers

Few rivers have their entire length within or on the boundary of the park, making conservation management of rivers challenging. For example, the Sundays River has only 22% of its length inside Addo Elephant and is heavily impacted by irrigation and water transfers outside of the park. Of the 16 rivers assessed, those that have more than 50% of their length within or bordering the park, including the Goura (100%), Kabouga (60%) and Courney (58%) rivers, remain largely in good ecological condition. The continued protection of these rivers is important, e.g., the Kabouga River is designated as a Freshwater Ecosystem Priority Area, a strategic designation for rivers, where conservation and careful management are most needed, and the Courney River holds Fish Support Area status. Management concerns include invasive fish species and numerous instream barriers like bridges and culverts.

Key Findings: Wetlands

Out of 437 recorded wetlands, few remain in a good ecological condition. The majority have been degraded, primarily due to historical farming practices that deliberately altered surface-water availability through the construction of earthen dams and pumped boreholes. This is particularly evident in the Darlington, Main Camp and Colchester sections. Further, elephants have a remarkable ability to transform landscapes – and wetlands. The ever-increasing population and relatively restricted movement of elephants in especially Main Camp and Colchester Sections makes it hard to imagine a return to natural wetland conditions in these landscapes.



THE UNIQUE DUNE-SLACK WETLAND TYPE FOUND IN THE WOODY CAPE SECTION OF ADDO ELEPHANT NP. DUNE-SLACK WETLANDS ARE WATER-FILLED DEPRESSIONS TYPICALLY FOUND IN THE LOW-LYING AREAS BETWEEN COASTAL SAND DUNES, WHERE THE GROUNDWATER TABLE REMAINS AT OR NEAR THE GROUND SURFACE. THESE WETLAND TYPES ARE RARE IN SOUTH AFRICA AS THEY ARE ONLY FOUND WITHIN THE CAPE FLATS DUNE STRANDVELD AND ALEXANDRIA DUNE HABITATS.

However, a huge highlight of this study was the mapping of several aquifer-linked wetlands occurring along the coastal Alexandria Section of the park. These wetlands are unique and therefore of national significance. Importantly, they were not captured in National Biodiversity Assessment (NBA) 2018 and this report therefore provides important feedback for their inclusion in the next NBA, as part of a focus on the national occurrence of coastal dune-slack wetlands. In addition to the dune-slack wetlands, our study highlights riparian habitats and springs as ecosystem types that are generally poorly documented but abundant in Addo Elephant.

Moving forward:

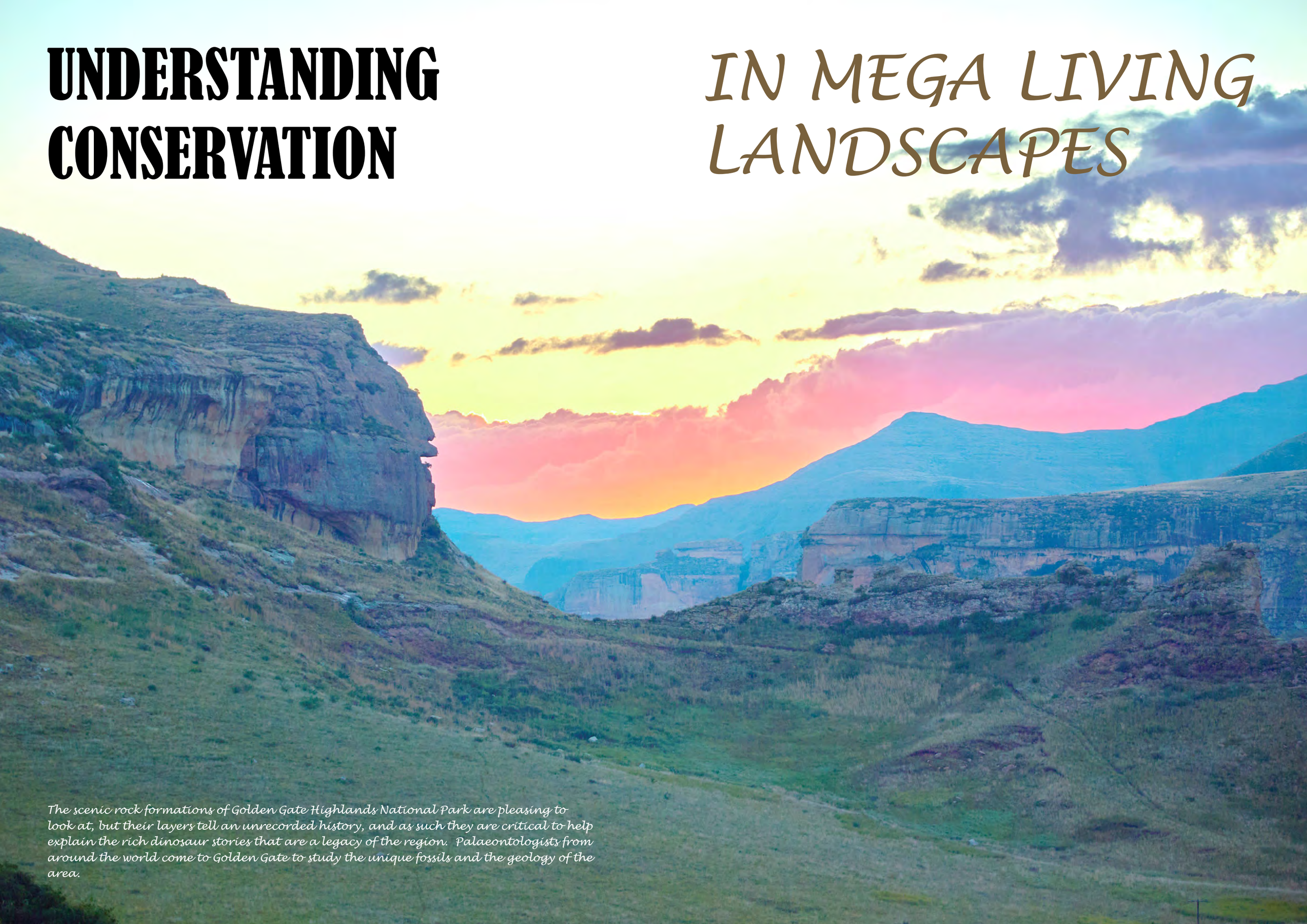
This inventory lays the groundwork for improved management of Addo Elephant's aquatic ecosystems and encourages further research. The collaboration between SANParks and SANBI ensures that local findings will inform national biodiversity efforts, including updates to the National Wetland Map and future biodiversity assessments.

Reference:
Cole NS, Job N, Petersen R, Bezuidenhout H & Roux DJ. 2024. An inventory of the wetlands and rivers of Addo Elephant National Park. Scientific Report 01/2024, South African National Parks, Skukuza. SANBI Report FW2024/1, South African National Biodiversity Institute, Cape Town.

LAKES, PANS, WETLANDS AND RIVERS

UNDERSTANDING CONSERVATION

IN MEGA LIVING LANDSCAPES



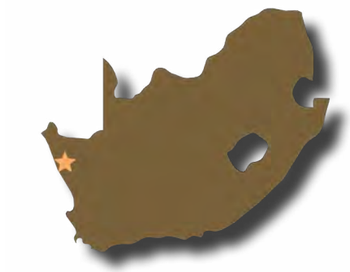
The scenic rock formations of Golden Gate Highlands National Park are pleasing to look at, but their layers tell an unrecorded history, and as such they are critical to help explain the rich dinosaur stories that are a legacy of the region. Palaeontologists from around the world come to Golden Gate to study the unique fossils and the geology of the area.

ARID LANDSCAPES

Widespread evidence of Conophytum succulent poaching was found in Namaqua National Park, even in remote areas far from roads. Sustained efforts in monitoring, surveillance, capacity building, and cross-sectoral partnerships will be essential to ensure the long-term conservation of this irreplaceable succulent flora.

Monitoring Endangered Succulents in Namaqua National Park

Text and photos by Trevor Adams & Emma Wright



CONOPHYTUM SPECIES ARE DIVERSE IN LOOKS AND HABITATS, FROM THE BOLDNESS OF C. CONCAVUM (1.) TO THE ROUNDNESS OF C. PAGEA (2. BOTTOM LEFT) AND THE PAINTED TIPS OF C. BILOBUM SSP BILOBUM (2. BOTTOM RIGHT).

Namaqua National Park, situated within the Succulent Karoo biome, conserves one of the richest succulent flora communities in South Africa. The region is famous for its spectacular spring floral displays and exceptional diversity of succulent species, many of which are endemic and threatened. The threat posed by illegal plant harvesting is of growing concern, particularly for rare and endangered succulents. National and provincial legislation strictly prohibits the collection, possession, and/or sale of endangered plants without a permit. However, the international demand from specialist collectors and the expanding ornamental plant trade has made many succulents, especially species in the genus *Conophytum*, a target for poachers. These small, button-like succulents (photo above) commonly referred to as “knopies” or “toontjies” have recently been experiencing alarming rates of decline due to overcollection.

To understand the severity of this decline within the park, a specific *Conophytum* species of special concern monitoring project was initiated in 2023. The objectives were to validate historical population records, map current occurrences in remote locations, and to visually assess if there were any signs of illegal harvesting. At the same time, field rangers and EMs received training, which resulted in enhanced capacity to identify, monitor, and protect vulnerable plant populations.

3. SIGNS OF ILLEGAL HARVESTING SUCH AS DIGGING ARE PRESENT ACROSS MANY SITES.
4. MONITORING CAPACITY IS BEING EXPANDED THROUGH TRAINING OF RANGERS AND ENVIRONMENTAL MONITORS.

Preliminary findings from the monitoring indicate that many areas previously thought to be remote (far from roads) and relatively undisturbed have, in fact, been accessed and impacted by illegal collectors. Evidence of poaching was widespread in known *Conophytum* habitats within the park, and it is suspected that other succulent species are also being targeted. This highlights the urgent need for continued vigilance, surveillance and species monitoring across the park, to improve measures to combat the poaching scourge and support conservation actions and enforcement strategies to safeguard the park’s succulent flora. Sustained efforts, capacity building, and cross-sector partnerships will be essential to ensure the long-term conservation of Namaqua’s irreplaceable succulent flora.

Meerkat National Park BioBlitz – new Bristletail species discovered

A POTENTIAL NEW SPECIES OF BRISTLETAIL FROM THE GENUS MACHILIS, FOUND IN MEERKAT NP BY MARTIN VILLET AND TERENCE BELLINGAN AT THE SITE ON THE LEFT.

Text by Melanie de Morney, Martin Villet & Terence Bellingan, photos by Terence Bellingan

There is much more to the Meerkat National Park than meets the 'satellite' eye. Only declared in 2020 and thus the latest addition to the South African National Parks park-network, more baseline information and ground-truthing was needed to beef up the Park's biodiversity databases. To assist, several experts, researchers, and citizen scientists came together to conduct a BioBlitz; a concentrated biological survey effort over a short period of time to look for and document as many species as possible. Taxonomic groups covered included birds, plants and mammals, but it was the invertebrates that stole the show!

The most unexpected find was a couple of bristletails (*Microcoryphia*), which represent a 'pre-dinosaur' insect lineage that first appeared in the fossil record over 300 million years ago. This is the first report of bristletails from the entire Northern Cape, and almost certainly also a new species of the genus *Machilis*. Suggestions for a scientific name are welcome!

Bristletails are more typically found in moister habitats, such as forests and woodlands, and are often associated with boulders. They appear to feed on lichens and mosses and the arid Nama Karoo is certainly not the most likely place to find them. This discovery gives us a brand-new insight into bristletail biology (we have not looked in enough places), and into the value of exploring under-explored South African environments, especially considering trends in climate change.

Other invertebrates found included some wormlion larvae that have added valuable distribution information to what was previously known for the genus *Perianthomyia* (Diptera: Vermileonidae). The larvae of these flies build traps in loose dust beneath rocky overhangs that protect them from rain – another insect that likes very dry conditions. These new observations highlight the special role of the Meerkat National Park in expanding our appreciation of insect biodiversity in South Africa, and of which species can deal with the extreme climates encountered throughout the Northern Cape region of our country.

SSS SYMPOSIUM PROUDLY STANDS FOR THE THREE ORGANISATIONS AT ITS HEART: SANPARKS, THE SOUTH AFRICAN ENVIRONMENTAL OBSERVATION NETWORK AND SOL PLAATJE UNIVERSITY.

Breaking New Ground: The First SSS Symposium in the Arid Node

Text by Roxanne Erusan

On 26 August 2024, **the Arid Node made history by hosting its first-ever mini symposium** – celebrating, sharing, and strengthening science in some of South Africa's driest landscapes. This event was organised, facilitated, and brought to life by the dedicated Arid team of Scientific Services, together with the South African Environmental Observation Network, and Sol Plaatje University. Together, they brought an impressive range of expertise to the table – from student-led research projects to long-term environmental monitoring.

The audience was treated to a mix of ecological insights, conservation challenges, and innovative approaches to environmental management. Each talk was followed by lively discussions, with participants exchanging questions, ideas, and—importantly—contact details for future collaborations.

One of the most exciting developments came during a session on groundwater research. Both SAEON and SANParks have been working independently on this critical resource in the arid zone. During the symposium, it became clear that by pooling their efforts, the two organisations could both strengthen their own scientific outcomes and deliver greater benefits to the communities who rely on water which is a precious resource in these arid landscapes.

Community connections were another theme running through the day. Socio Economic Transformation Officer Tshepiso Lephera shared an inspiring perspective on how the scientific work showcased does more than fill reports or journals—it directly benefits local communities. For many attendees, this was a powerful reminder that conservation science isn't just about species and ecosystems—it's also about people, livelihoods, and hope for the future.

The success of the day aligns strongly with SANParks' Vision 2040, which places emphasis on building partnerships, fostering stakeholder engagement, and inspiring the next generation of conservationists. What began as an experiment in scientific connection may well have planted the seeds for a long-term tradition.

So, was this inaugural SSS Symposium just a "one-hit wonder"? Or is it the start of an annual gathering that will grow in size, scope, and influence—complete with its own slogan, banner, and an ever-expanding network of collaborators? Judging by the enthusiasm in the room on that winter day in Kimberley, the smart money is on the latter.

CAPE LANDSCAPES

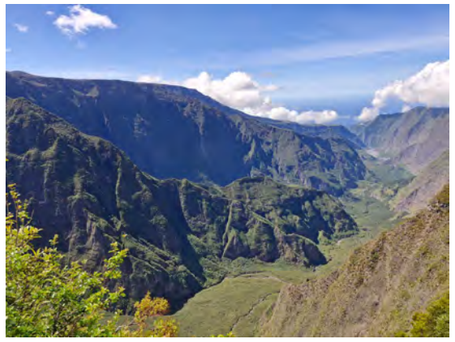
From one island to another: using scenarios to plan for the future

TText by Emma Wright & Nicola van Wilgen-Bredenkamp, photos by Nicola van Wilgen-Bredenkamp

A recent learning exchange between Réunion and Table Mountain National Parks showcased how scenario-based climate adaptation planning can help address shared challenges like invasive species, marking a conservation first for both countries.

Réunion National Park and Table Mountain National Park (Table Mountain) may seem worlds apart, a volcanic island in the western Indian Ocean and a mountain at Africa's south-western tip. Yet both are World Heritage Sites, function as islands (Table Mountain is bordered by sea and a hard urban boundary) and experience similar pressures, particularly from invasive species.

A SANParks team joined managers and experts in Réunion for a learning exchange funded by the Agence Francaise de Developpement. The exchange focused on trialling scenario-based adaptation planning for plant invasions under climate change, building on work piloted in Table Mountain. The SANParks team led participants through the scenario-based planning approach and Resist-Accept-Direct (RAD) framework, within the context and climate projections outlined by the Reunion team. Using collaborative exercises, groups assessed the vulnerabilities of different ecosystems and resultant management implications under different climate scenarios.



REUNION NATIONAL PARK'S CREATES CHALLENGES FOR MANAGING ALIEN INVASIVE SPECIES, A CHALLENGE SHARED WITH TABLE MOUNTAIN NATIONAL PARK.

A FIELD EXCURSION TO THE VOLCANO IN REUNION NATIONAL PARK. THERE ARE SURPRISING SIMILARITIES BETWEEN THIS PARK AND TABLE MOUNTAIN NATIONAL PARK, WHICH WAS EXPLORED THROUGH JOINT SCENARIO-BASED PLANNING.

Discussions underscored the importance of integrating fire, erosion, and invasion management simultaneously. Key takeaways emphasized the power of diverse perspectives and clear goalsetting before starting to plan what actions to take next. Applying scenario-based climate change adaptation planning is a conservation first for both countries, presenting a great opportunity to learn from each other throughout the process.

CAPE LANDSCAPES

Tackling Invasive Alien Species in the Cape's Protected Areas: Lessons for the Future

TText by Emma Wright & Nicola van Wilgen-Bredenkamp, photos by Nicola van Wilgen-Bredenkamp

Despite nearly R1 billion being spent to tackle invasive alien species in the Cape Floristic Region's protected areas over the past three decades, progress is patchy and often falls short of global biodiversity targets. Smarter, outcomes-based monitoring, diversification of funding mechanisms, and wider use of tools like prescribed burning and biological control are urgently needed to protect this globally important biodiversity hotspot.

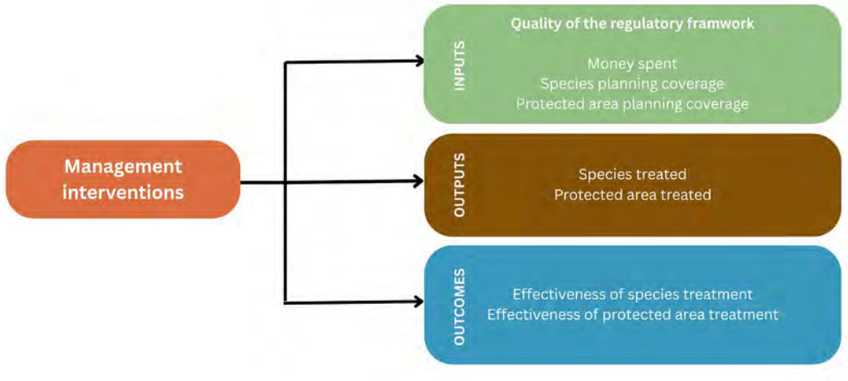


FIGURE 1. INDICATORS USED TO TRACK MANAGEMENT INTERVENTIONS FOR CONTROLLING INVASIVE SPECIES IN PROTECTED AREAS IN TERMS OF INPUTS, OUTPUTS AND OUTCOMES, ADAPTED FROM VAN WILGEN ET AL. (2025).

Invasive alien species are one of the biggest threats to biodiversity globally, and the Cape Floristic Region (CFR) is no exception. This biodiversity hotspot has been the focus of major efforts to combat invasive species for nearly three decades. With the world now aligning efforts behind the Kunming-Montreal Global Biodiversity Framework, which aims to halve the introduction and spread of invasive species by 2030 through management of pathways as well as eradicating or controlling established alien species in priority sites (Target 6), insights into how this can be achieved are required. Because protected areas are amongst the main priority sites, leaders in protected area invasions convened in Stellenbosch at a specialist workshop in April 2024 to assess progress towards this target. Our study, led by Brian van Wilgen along with local scientists from SANParks, CapeNature and DFFE reviewed how the CFR's protected areas are doing, and what must improve. We did this by examining seven indicators of relating to the inputs, outputs and outcomes of management (Figure 1).

A Large Investment with Mixed Results

Since 1995, the South African government, primarily through the Working for Water programme, has invested heavily in the control of invasive alien species across the CFR's protected areas. Between 2010 and 2022, nearly R1 billion (R976 million, adjusted to 2022-rand values) was spent on managing invasions in these parks, though funding was not equally distributed and ranged between R1.3 and R367 million across individual parks. Despite this impressive investment, the study found that real progress remains uneven and, in many cases, insufficient to meet national and global targets.

Most of the money, over 60%, was spent on just a handful of invasive tree species, especially Australian wattles (genus ***Acacia***). Acacia species are fast-growing plants that outcompete native vegetation and fuel intense wildfires. They typically invade low-lying areas and water courses. While targeting these species makes sense due to their wide distribution and the availability of biological control agents, the dominance of spending on these few species has come at the cost of addressing other long-term threats, such as pines (***Pinus*** sp.) and hakeas (***Hakea*** sp.), which are able to spread much further than wattles, thus reaching into more remote and far less accessible areas. Species-level management plans have been developed for only six of the regulated species, thus covering only 2.6% of the 227 regulated species.

A total of 567 alien species have been recorded in the CFR's PAs, of which 226 were regulated species. One-hundred-and-twenty-six (55.8%) of the regulated species received treatment (121 plants, 5 animals) and 45 unregulated species were managed. On average during the period of the study, each national park in the CFR managed around 78 alien species (23 to 147 across parks), with more than 95% of funding concentrated on just 15 of these, and over 90% in the five national parks (Agulhas, Bontebok, Garden Route, Table Mountain and West Coast). While national parks achieved higher treatment coverage than provincial reserves (on average 60% compared to only 9% for CapeNature reserves, Table 1), this was largely because they received the bulk of the funding. Compared to other national parks, Garden Route had a much lower proportion of area where alien species had been managed (34%). The Garden Route is the largest, and youngest national park in the CFR, with substantial areas that are not accessible by control teams.

Treatment alone does not however equate to success. When the effectiveness of control efforts was evaluated, only 29 species were considered to be effectively managed. For the majority, either no management had taken place, or the outcomes could not be assessed due to insufficient monitoring.
In Table Mountain National Park, over 22,000 hectares were cleared between 2002 and 2020, with repeated follow-ups and relatively short intervals between treatments, thus preventing reinvasion. Thanks to persistent effort, 79% of the invaded area is now considered to be in a maintenance phase. This means the invasions have been reduced to manageable levels, and can be kept there affordably, which is a major win for long-term biodiversity conservation. Yet, the picture is uneven. Many parks lack the resources to do systematic follow-up or monitoring.

We need smarter adaptive management

A major gap in current management efforts is the lack of structured outcome monitoring. Without data on effectiveness of different approaches, park management cannot adapt or justify continued investment. Despite the large investment to date, it is unclear what the long-term outcome will be and whether lasting success is achievable, particularly in larger, more remote protected areas. Developing and implementing monitoring systems that track treatment success is essential to improve planning and demonstrate return on investment and prioritise methods and species and areas for clearing.

The study emphasises the potential of integrated fire management and biological control, two tools that have proven to be effective, but which remain underutilised. While veldfires are a natural occurrence of fynbos ecosystems, much more control can be achieved by integrating alien plant control with planned prescribed burning, rather than allowing unplanned wildfires to affect areas indiscriminately and promote the spread of alien plants. When used strategically and combined with follow-up clearing, prescribed burning can suppress fire-adapted alien plants and reduce seed banks.

Similarly, biological control, which uses the natural enemies of plants, such as insects or pathogens, to reduce the production of seeds has been particularly effective for species like ***Acacia saligna***. Control for around 20 of the 29 effectively managed species owes its success to biological control. Yet, funding for research and implementation in biological control has recently been discontinued. We strongly recommend re-instating and even increasing investment in this cost-effective, long-term solution, especially given the challenges of accessing and clearing remote terrain.
With climate change likely to exacerbate invasions and increase fire risk, proactive and coordinated efforts are crucial.

Between 2010 and 2022, nearly **R1 billion** was spent on managing invasions in parks
Of the **227** regulated species, only **29** have been effectively managed (mostly as a result of biological control).
Almost **80%** of invaded area in Table Mountain NP is in a maintenance phase.
Alien species have only been managed on **34%** of Garden Route NP.

TABLE 1. PROPORTION OF EACH PROTECTED AREA THAT RECEIVED ALIEN CLEARING TREATMENT DURING THE STUDY PERIOD (2010-2022).

Protected area	Extent to protected area (ha)	Alien clearing management (%)
Agulhas National Park	21,693	97
Bontebok National Park	2,432	100
Garden Route National Park	115,782	34
Table Mountain NP	26,554	90
West Coast National Park	34,177	93
All national parks	200,638	60
All provincial nature reserves	476,946	9
All protected areas (CFR)	677,584	24

SANParks and provincial authorities have the experience to drive positive change but require investment in systems to enable outcomes-driven management, and collaboration beyond protected area borders. While good progress has been made in some areas, invasive alien species remain a major threat to the ecological integrity of the CFR's protected areas. Lack of strategic planning of continuous follow-up also means that past progress can be eliminated within a short time. The cost of not following up clearing should be considered carefully by funders, to prevent situations that not only nullify progress, but may require managers to restart from even worse baselines in the future. Unless we address key limitations such as declining funding, poor monitoring, and inadequate use of tools such as biocontrol and prescribed burning, it is unlikely that the global obligations we have under Target 6 of the Biodiversity Framework will be met.

Reference:
Van Wilgen BW, Cole NS, Baard J, Cheney C, Engelbrecht K, Stafford L, Turner AA, van Wilgen NJ & Wannenburgh AM. 2025. Progress towards the control of invasive alien species in the Cape Floristic Region's protected areas. Biological Invasions 27. https://doi.org/10.1007/s10530-024-03459-3

Piloting thermal drones for monitoring alien Sambar deer in Table Mountain National Park

Text by Deborah Winterton

A 2025 pilot study in Table Mountain National Park tested thermal drones to monitor elusive sambar deer. Over four-night flights, 114 deer were detected, mostly in open fynbos, demonstrating the value of this method in steep, inaccessible terrain. Winter surveys and dual-sensor cameras are recommended to improve detection and species identification.

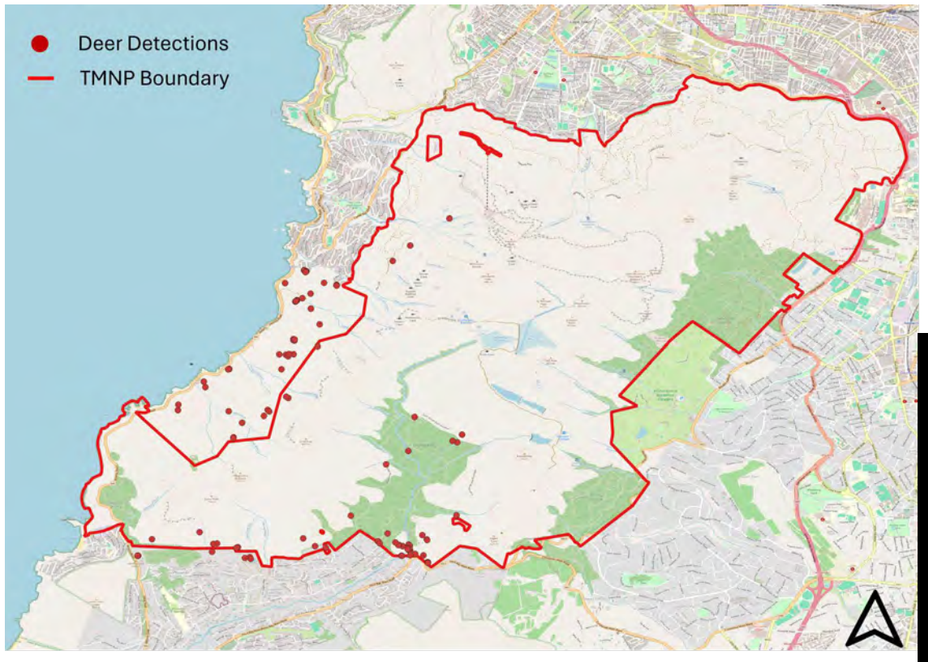


FIGURE 1. LOCATIONS OF ALL CONFIRMED SAMBAR DEER DETECTIONS ACROSS THE ORANGEKLOOF AND TWELVE APOSTLES SECTIONS OF TABLE MOUNTAIN NATIONAL PARK (MARCH–APRIL 2025).

Sambar deer (*Rusa unicolor*), an alien species of concern in Table Mountain National Park (Table Mountain), pose significant monitoring challenges due to their nocturnal behaviour and their frequent use of dense forest. In response, a pilot study was conducted in March and April 2025 to evaluate the use of thermal imaging drones as a method to detect and count sambar deer at night.

Surveys were conducted on four nights in the Orangekloof and Twelve Apostles sections of Table Mountain. These areas encompass steep slopes, dense Afromontane Forest, and open fynbos. The drone was flown over the area following transects 50m apart, at an altitude of 50 metres, travelling at approximately 6 km/h and using terrain-following capabilities to maintain a consistent height above the ground.

Certified operators monitored a live thermal feed during flight, pausing when heat signatures were observed to investigate and confirm the presence of deer before logging the sighting.

A total of 114 individual sambar deer were detected (Fig. 1). Most detections occurred in open fynbos or disturbed areas, where thermal contrast was high and visibility unobstructed (Fig. 2). Dense forest canopies, in contrast, severely limited the ability to detect animals and in such habitats, deer were seldom detected. Several operational challenges were encountered. On warm nights, residual heat in rocks, water bodies, and tree canopies created background noise that reduced detection clarity.

Furthermore, environmental conditions such as strong winds and fog proved to be major limiting factors: on two occasions, surveys had to be curtailed early due to unsafe or impractical flying conditions caused by these factors. Despite the limitations, the pilot study demonstrated that thermal drones can be a powerful monitoring tool under the right conditions for certain habitat types. They allow for rapid, non-invasive surveying of large and difficult-to-access areas, significantly enhancing the spatial coverage and temporal flexibility of wildlife monitoring efforts.

The study recommends refining flight paths to prioritise open habitats and conducting surveys during winter, when daytime temperatures are low enough for the use of dual-sensor drones, allowing operators to switch from thermal to visual imaging once a heat signature is detected. This will support more confident species identification in real time. This trial provided valuable insight for developing a long-term monitoring strategy for alien ungulates and contributes to broader efforts to manage and protect biodiversity in Table Mountain National Park.

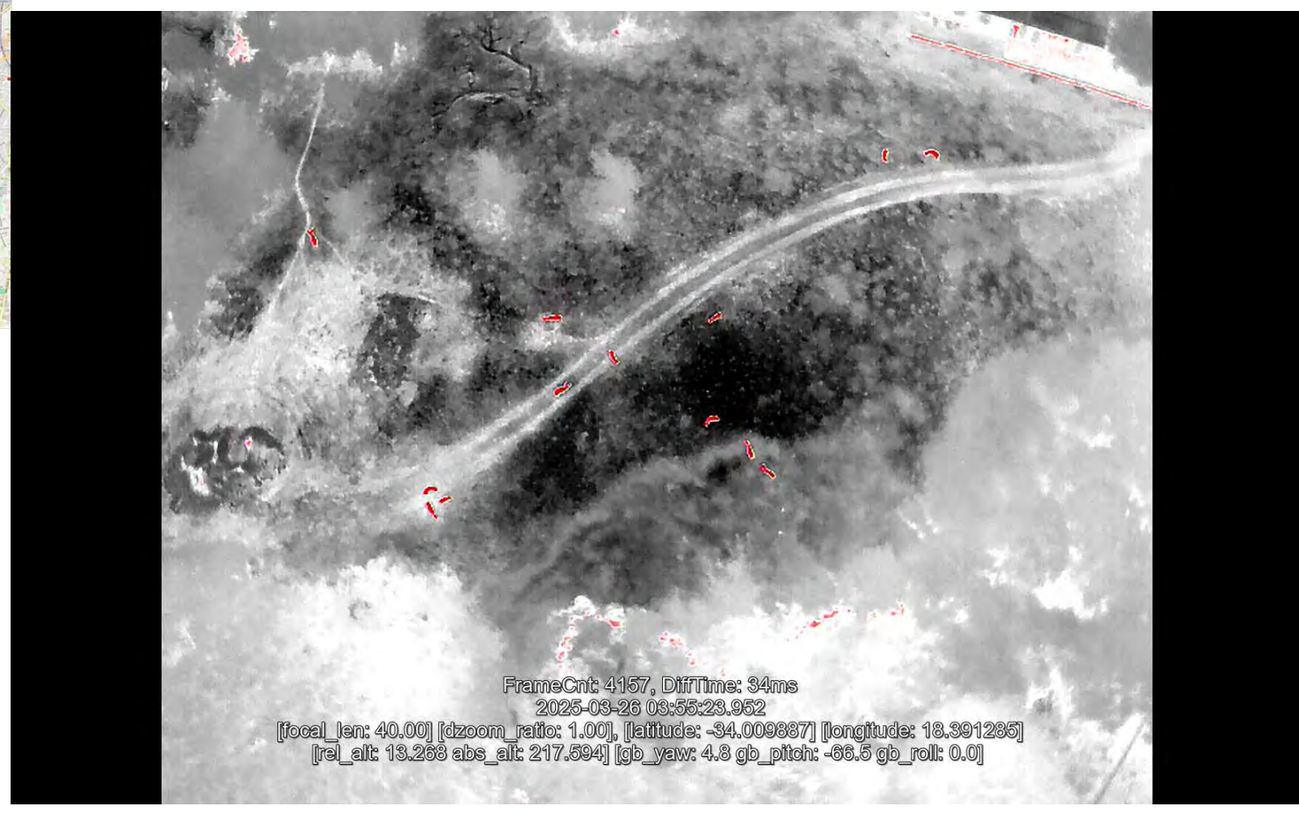
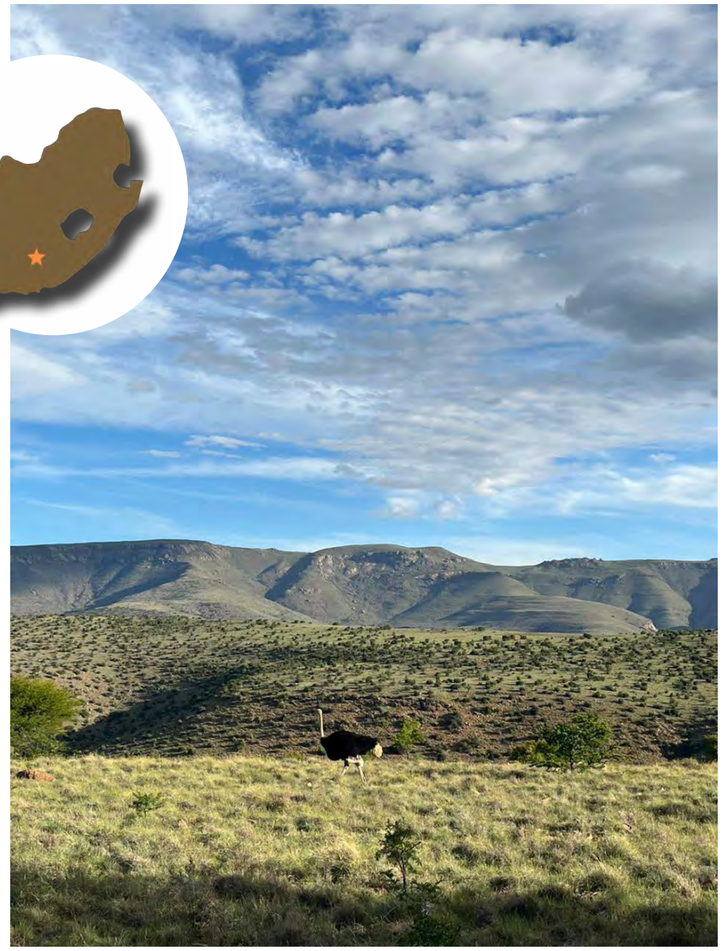


FIGURE 2. STILL FRAME FROM DRONE FOOTAGE SHOWING 13 INDIVIDUAL SAMBAR DEER AS HIGH-CONTRAST HEAT SIGNATURES DURING A NIGHT-TIME SURVEY.

FRONTIER LANDSCAPES

Reflection, deliberation and co-learning in Mountain Zebra National Park

Text by Stef Freitag-Ronaldson, Charlene Bissett, Evans Mkansi & Wonga Pama



Mountain Zebra National Park is known for the strong science-management relationships which underpin decision-making. Thus, at the annual science-management meeting of December 2024, discussions focused on topics or actions outlined in the park management plan and feedback on deliberations initiated at the previous year's science-management forum. At the regional scale, this included park expansion opportunities towards Rockdale with its thriving mountain reedbuck population, and discussion on innovative low impact overnight mountain trail opportunities on SANParks' Groenfontein properties to the west of the park. Further, an in-depth social-ecological discussion ensued around the opportunities and divergent benefit possibilities for fishing in Doornhoek Dam with its exotic carp and catfish populations, situated in the otherwise naturally fishless Wilgerboom River.

Water availability is a key issue in arid karoo parks such as Mountain Zebra and borehole monitoring was discussed in the context of both water for game and human consumption. Discussion around the observed 2-3 meter drop in water table at one supply borehole is speculated to be a lag effect from the 2019/20 drought conditions and provided impetus to initiate aquifer level monitoring on boreholes identified in the 2021 hydro census. Further, extensive discussion and revisiting the findings of Izak Smit et al.'s analyses and report on surface water provision and distribution over time, led to a decision to experimentally restore a more natural water availability gradient across the north-eastern part of the park. Closure of three identified boreholes at the height of the 'wet season' will allow animals to respond naturally to these artificial waterholes drying up. On-the-ground monitoring will assist in identifying unintended effects or unacceptable impacts and enable reversibility of the experiment if needed. This rich discussion combined long-term data, scientific analysis and critical experiential knowledge of park staff. The group was energised and excited to arrive at a firm decision, within an adaptive management ethos, to immediately embark on this small-scale trial to close some water points and maximize learning as the natural system responds.

The collegial nature of this annual two-day event is a testament to the long-term committed and respectful engagement of park management and scientists, valuing one another's perspectives, experience, backgrounds and diverse skills. Bound by a common interest in the conservation of biodiversity and landscapes, and ensuring a sustainable flow of benefits from these, colleagues enthusiastically and robustly debate, cooperate and co-learn. These social processes are facilitated and strengthened through investment of time in shared experiences that further build relationships and trust – the evening braai and field visits.

A HIGHLIGHT DURING THE SCIENCE MANAGEMENT MEETING IN MOUNTAIN ZEBRA NATIONAL PARK WAS THE CHEETAH TRACKING FIELD TRIP IN THE NORTH-WESTERN SECTION OF THE PARK.

Addo Elephant National Park – Genetic Profiling Project

Text and photos by Ester van der Merwe & Charlene Bissett

PILOT ANGUS TANNER FLYING THE SPOTTER AIRCRAFT DURING A NOTCHING OPERATION IN AENP; FIX-WINGED AIRCRAFT IS USED TO SPOT RHINOS TO SAVE ON EXPENSIVE HELICOPTER TIME.

The Addo Elephant National Park's (Addo) South-Western black rhino (***Diceros bicornis bicornis***) population is rated as "Key 1". This rating means that it is the cornerstone of genetics for the South African South-Western black rhino metapopulation and a fundamental social and national treasure in Southern Africa. Addo's genetic profiling project, which started in October 2020, is crucial to the management of the metapopulation. The project aims to establish parameters for genetic diversity, determine genetic relatedness, sex ratio, population structure and assist in the genetic variation of the metapopulation within South Africa.

Additionally, the DNA results also assist in determining the identity of carcasses found within the park.

Since the start of the Addo Elephant Genetic Profiling project, a total of 277 DNA samples has been analysed. With the help of Debbie Stanbridge, the project's geneticist, 97 positive maternal linkages and 63 tentative maternal linkages have been confirmed, bringing clarity to the genealogy of individuals within the population, of which very little was known previously. Tentative maternal linkages were due to the uncertainty of the date of birth in some individuals, because independent animals notched at the start of the Rhino Impact Bond project were often given an estimated date of birth based on size of the animal, rather than the actual date of birth. The positive number of confirmed maternal linkages will rise significantly in the next few months as we work on the social structures and adjust the estimated date of birth of some of these individuals in question. DNA analysis has given us the opportunity to clarify and understand the social dynamics within the Addo black rhino population and social connections observed in the field can now be linked to genealogy.

These results are starting to take shape, showing that intricate social dynamics exist within this black rhino population. Furthermore, DNA extraction and genetic analysis, as used in this project, provide a detailed understanding of individual relatedness and genetic diversity, allowing managers to construct full genealogies or family trees of their populations, and this information is vital for metapopulation management as it enables informed translocations or reintroductions that maintain genetic diversity, prevent inbreeding and support long-term population viability across metapopulation parks.

DNA SAMPLES ARE COLLECTED FROM A RHINO CALF'S EAR WHILE NOTCHING IN AENP. NOTCHING CREATES UNIQUE PATTERNS IN THE EARS OF RHINOS AND IS A VALUABLE AND NON-HARMFUL WAY OF DISTINGUISHING BETWEEN INDIVIDUAL RHINOS, AND A CRUCIAL PART OF THE RHINO MONITORING PROGRAMME.

Genomic data informs success of elephant tusk reintroduction effort

Text By Madison Lichak, Heston McCabe, Charlene Bissett, Shane Campbell-Staton, photos by Heston McCabe & Maddie Lausted

Observational and genomic data helps us understand the impacts of a conservation effort on the prevalence of tusklessness in Addo Elephant National Park.

A BREEDING HERD IN ADDO ELEPHANT NATIONAL PARK THAT SHOWS THE HIGH PREVALENCE OF TUSKLESS ELEPHANT COWS.

Elephant populations across Africa are threatened by poaching and human-wildlife conflict which have in many cases resulted in population declines. Humans have been hunting elephants for centuries but, when hunting or poaching is particularly intense, populations can undergo relatively rapid changes. In several such populations, there has been a documented increase in the number of elephants born without tusks. Because elephant tusks are important tools for foraging and defence, the genetic underpinnings of this "tusklessness", and the genomic consequences of hunting and poaching in these populations are of research and conservation interest.

The elephant population of Addo Elephant National Park (Addo), in the Eastern Cape, contains the greatest proportion of tuskless elephants of any known population in Africa (at one point, over 90% of all females). The history of the elephant population in Addo may help explain the high prevalence of tusklessness. In 1919, the Eastern Cape Province called for the extermination of the remaining free-ranging elephants in the area. By 1920, the population had been reduced to just 16 elephants, and over half of the remaining females were tuskless. Addo was proclaimed only a decade later to conserve this small remaining population. Through intensive management, the population has recovered and now contains over 800 elephants, though most females are still born tuskless. In the early 2000s, the park introduced eight bull elephants from Kruger National Park in an attempt to increase genetic diversity and increase the number of female elephants born with tusks.

MADDIE LAUSTED AND MADISON LICHAK COLLECT BODY MEASUREMENT DATA DURING ELEPHANT RELOCATIONS. MEASUREMENTS WILL BE USED TO ASSESS WHETHER TUSKED AND TUSKLESS ELEPHANTS EXHIBIT DIFFERENT MORPHOLOGICAL CHARACTERISTICS.

We used an observational pedigree and whole genome sequencing to determine changes to the population and its genomes over time. With the assistance of two SANParks Honorary Rangers, long-term data on births and deaths in the population were compiled and tusk status among mother-daughter pairs determined. Additionally, more than 250 elephants were biopsy darted to collect tissue samples. From these samples we sequenced the entire genomes of nearly 100 elephants. We also collected biometric data from photographs of elephants and measurements of individuals anaesthetised for relocation, as well as dung samples for diet and microbiome analyses.

We began by using the observational and genomic data to determine how tusklessness is inherited in Addo. We found that, in Addo, tusklessness is specific to females, but its pattern of inheritance does not necessarily suggest the simple underlying genetic architecture often characteristic of female-specific traits. This is surprising, not only because the genetic mechanism seems to be more complex, but also because the patterns in Addo don't match those of tuskless elephants in Gorongosa National Park, Mozambique. The genes associated with tusklessness in Addo are also different from those associated with tusklessness in Gorongosa. This suggests that the genetic variants responsible for tusklessness may vary across different populations, and that tusklessness may have arisen independently several times across different regions.

The findings were promising because they suggested that the conservation effort aimed at increasing tusked elephants in the Addo population may have been successful. The introduction of males from Kruger would only be able to increase tusked female births if tusk status can be inherited from fathers, which is not the case in Gorongosa. However, we found that births of tusked cows increased significantly following the introduction of the Kruger males. Prior to this introduction, less than 4% of all female elephants born in the park were born with tusks. The introduction of just eight new males into the Addo population was enough to more than quadruple the births of tusked females. After 2005, the proportion of females born with tusks in Addo increased to nearly 20%.

Thus far our analyses have revealed that tusklessness in Addo has a unique mechanism of inheritance and, potentially, a unique genetic architecture. The characteristics of the Addo population meant that tusk prevalence could be effectively altered through the introduction of tusked bulls. The work is ongoing, but the initial findings highlight the importance of collecting and maintaining observational datasets in assessing the long-term impacts of conservation actions, as well as underscore the benefit of including genomic data in assessments of the success of reintroductions.

Collars assist with megaherbivore monitoring in Addo Elephant National Park

Text by Joshua Rogers, Chanelize Swart & Heston McCabe, photos by Charlene Bissett, Joshua Rogers & Angela Daly

Addo Elephant National Park (Addo) has introduced a very exciting new collar system in the park. These collars, developed by Rouxcel Technology, provide cutting edge technology to assist the park with monitoring its black rhino and elephant populations.

A NEW STYLE OF COLLAR FITTED ONTO A RHINO ANKLE. THE DESIGN ALLOWS FOR FREE MOVEMENT OF THE UNIT, WHICH PREVENTS THE BUILDUP OF MUD, A BIG PROBLEM IN CONVENTIONAL COLLARS, AND CONTAINS A SMALL SOLAR PANEL FOR CHARGING. THE UNITS ARE ALSO EQUIPPED WITH ARTIFICIAL INTELLIGENCE CAPABILITIES, WITH THE COLLAR SENDING ALERTS TO MANAGEMENT IF ABNORMAL BEHAVIOUR IS DETECTED.

The rhino collar system consists of an artificial intelligence (AI) tracking unit with a solar panel that allows for solar charging. Collars are fitted onto a strap that allows for the unit to swivel around the rhino's ankle, allowing the collar to clean itself of mud and debris while attached to the animal, thereby decreasing rubbing and chafing. The units can be remotely configured once deployed and are able to learn each individual rhino's behaviour through its AI learning software. The collars connect and transmit data daily through a gateway system and if abnormal behaviour is detected, an alert is generated and sent to the relevant SANParks staff members. The alerts are colour coded, based on the "severity" of the event as determined by the collar itself. The collars are quick and easy to deploy, saving time on the ground and limiting risk to the animals.

The rhino collars have provided insights into the intricate behaviour of Addo's rhino population. We have been able to accurately detect births, fights, scent marking activity, large spatial movements and mating activities as they happen.

In addition to the rhino collars, Rouxcel elephant collars were originally tested on elephants within the Darlington section. They have also been fitted onto the elephants introduced into the Kabouga section of Addo to enable post-release monitoring. The elephant collar uses the same technology and is fitted with a counterweight that prevents the collar from swivelling upside down, ensuring the tracking unit remains on top of the animal's neck. The built-in solar panel extends the battery life of these collars, thus allowing the collars to take GPS fixes every 20 minutes. The elephant collars, likewise, provide valuable insights into the daily movements of the newly translocated elephants in the Kabouga section, as well as the movements of elephants within the Darlington section, thus allowing for effective monitoring and to inform future management decisions.

A GATEWAY SYSTEM TO WHICH THE NEW STYLE, ARTIFICIAL INTELLIGENCE CAPACITATED, ELEPHANT AND RHINO COLLARS DOWNLOAD DATA IN ADDO ELEPHANT NATIONAL PARK.

NEW GENERATION AI ENABLED COLLARS ARE ALSO USED ON ELEPHANTS WHERE THE UNIQUE DESIGN KEEP THE COLLAR FROM SWIVELING UPSIDE DOWN. THE COLLAR FIXES THE ELEPHANT'S POSITION EVERY 20 MINUTES.

Spotted hyaenas in Addo Elephant National Park: Scavengers or skilled hunters?

Text by Raffaele Morisoli, Craig Tambling, Vincent Naude, Charlene Bissett & Frans Radloff, photo by Raffaele Morisoli

Spotted hyaenas, once considered to be mainly scavengers, are actively hunting up to 95% of the large prey in their diet across Addo Elephant National Park. They have also shifted their targeted prey species since 2007, likely due to decreased lion presence and increasing spotted hyaena density.

Large carnivores are important for maintaining the complex integrity of ecosystems. As apex predators, large carnivores regulate food webs and shape the behaviour of many other species that they interact with. Herbivores and smaller predators may change how they move, what they eat, and even when they are active. However, large predators are notoriously difficult to study and manage. They live a long time, roam across vast areas, are hard to observe and are mostly active at night. Many of the large carnivores are also declining across the globe due to habitat loss and fragmentation, declining prey numbers, and human-wildlife conflict. Africa remains one of the last places where a full set of large carnivores still exists in the wild. Among these, the spotted hyaena (further just hyaena) stands out not only as the most numerous, but also as one of the most misunderstood. Often seen as scavengers, hyaenas are highly adaptable hunters that can switch between a remarkable variety of prey species and sizes.

In 2003, after an absence of over 100 years, hyaenas were reintroduced into Addo Elephant National Park (Addo) in South Africa. Since then, their numbers have increased and they currently form three distinct groups or clans. However, their impact on Addo's wildlife is not clear. To adequately manage the predator and prey populations in this fenced system, management needs to know what the hyaenas eat, how they obtain their prey and, importantly, do they scavenge from lions or actively hunt for their own food?

A study carried out in 2007–2008 identified parts of prey remain present in the scats of hyenas (scat analysis) to provide some insights into their diet. However, the study could not shed light on whether they were killing their own food or scavenging from the remains of lion kills. At that stage there was also only one clan present within Addo, making it impossible to predict if the diet might change as hyena numbers increase and more clans establish.

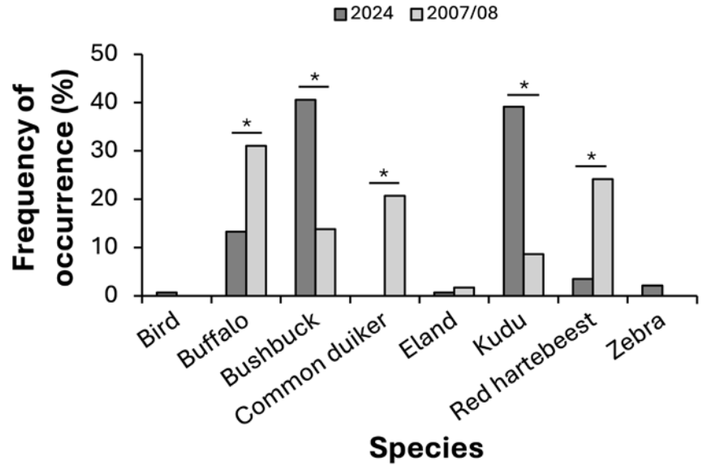


FIGURE 1. A COMPARISON OF THE RELATIVE OCCURRENCE OF PREY SPECIES REMAINS FOUND IN HYAENA SCATS AT DIFFERENT TIMES IN ADDO ELEPHANT NATIONAL PARK, SOUTH AFRICA. THE GRAPH REFLECTS A COMPARISON OF THE 2007/08 COLLECTION RESULTS (LIGHT GREY BARS; N = 58) WITH THAT COLLECTED IN 2024 (DARK GREY BARS; N = 143). ASTERISKS INDICATE STATISTICALLY SIGNIFICANT DIFFERENCES IN THE PROPORTIONAL OCCURRENCE OF A PARTICULAR SPECIES IN THE SCATS BETWEEN THE TWO STUDY PERIODS.

To fill these knowledge gaps, we used several methods, mixing scat analysis with more advanced Global Positioning System (GPS) cluster follow-up approaches, an exciting field of movement analyses research, based on collar movement data. We tracked five hyaenas (two males and three females) in this way and mapped out their movements to identify potential feeding sites. The potential feeding sites were visited by the field research team to search for prey remains. In addition, to replicate the traditional approaches, scat samples were collected. To check for possible scavenging from the resident lions, we also tracked the movements of three collared lions (one male and two females) to see if the activity of lions and hyenas overlapped.
We found a major shift in what Addo hyaenas were eating in 2007 and what they were eating at present (Fig. 1). We could also establish that hyaenas are now killing 95% of the prey which we detected at the feeding sites. The hyaenas favour medium- to large-sized ungulates, particularly bushbuck and kudu which, when combined, make up 80% of their overall diet. In comparison, during the earlier study, buffalo, red hartebeest and common duiker made up three quarters of hyaena diet. Interestingly, hyaenas are currently not frequently preying on red hartebeest and plains zebra which are the 2nd and 3rd most abundant prey species respectively.

The change in diet may be in response to some ecological changes: since the 2007-2008 study the lion population in the park has decreased from 9 to 5 adults, while the number of hyaenas has increased from 14 to around 50. With fewer carcasses from lion kills available per hyaena to scavenge from, hyaenas must hunt for themselves and they seem to prefer browsers, occurring in denser areas, to grazers occurring in open habitats. We also found that the three hyaena clans, despite occupying different areas, preyed on similar species, with a preference for bushbuck and kudu.

Our findings have several important implications. First, the realisation that hyaenas in AENP are active hunters enables managers to better understand the pressure hyaenas have on specific prey species, such as kudu, and how they may influence the "landscape of fear" for these species. This, in turn, can inform strategies to ensure sufficient prey is available for the predators in the park and avoid prey declines that might push predators to seek food beyond the park boundary where they will come into conflict with people.

Secondly, hyaena are adaptable to changing conditions and can change both their feeding strategy, and what they feed on. Such flexibility shows that continuous monitoring of the hyaena diet is necessary as this will respond to changing conditions. Management decisions might be made using outdated information that could ultimately lead to consequences for prey populations.

Thirdly, this study helps to challenge misperceptions about animals like the hyaena, which are often negatively perceived and not understood as true apex predators. Sharing our insights with the public should foster a greater appreciation for the ecological role of these large carnivores and encourage support for their conservation.

GARDEN ROUTE

Stability of forests in the Garden Route: Little change found in the Lilyvlei Forest over 30 years

Text and photos by Graham Durrheim

Long-term monitoring in the Lilyvlei Forest has shown that forest tree species composition and biomass have not changed significantly over a period of 30 years, unlike declines reported for some other Southern Hemisphere forests.

THIRTY YEARS OF MONITORING HAS ESTABLISHED THAT HIGH ABOVE GROUND BIOMASS IN THE FOREST RESULTS FROM VERY LOW MORTALITY RATES, LONG RESIDENCE TIMES, AS WELL AS RAPID RECOVERY RATES.

The Lilyvlei Forest forms part of the largest indigenous forest complex in South Africa. It is considered marginal for tall forest, having a mean annual rainfall of only about 1000 mm and occurring on nutrient poor soils, so it could be sensitive to the impacts of climate change. The Lilyvlei Virgin Forest is an area of 84 ha where timber harvesting has never taken place. It contains 108 permanent sample plots, each 0.04 ha in size, which form part of a larger long-term indigenous forest dynamics monitoring programme established between 1984 and 1991. The results of thirty years of monitoring provide insights into tree population dynamics. The last re-measurement (2001) also provided an opportunity to evaluate the status and population trends of *Faurea macnaughtonii*, a rare forest tree species with a small and fragmented population.

In the PSPs, diameters of all trees with a diameter at breast height (DBH) ≥ 10 cm are measured. This produced about 12000 measurements of 3379 different individuals across 28 species. Local climatic changes were found to be minimal over this 30-year period.

In contrast to many studies of other forests globally, we found little change in overall biomass and only minor changes at the species level. Recruitment and mortality rates of stems were low. Mortality occurred in all size classes but was proportionally higher in the larger size classes for most speciess. This suggests that senescence rather than external disturbances determines the low mortality and thus the low dynamism and the high biomass of the forest (approximately 600 Mg/ha above ground biomass or 41 m2/ha basal area). Mortality exceeded recruitment in some species, accompanied by non-significant declines in biomass. Of the most common species, only *Olea capensis* (ironwood) had much larger mortality than recruitment.

The stasis in biomass implies growth rapidly recovers losses due to mortality and therefore that the forest is close to carrying capacity. There is abundant in situ regeneration of all species, which may rapidly take up extra resources such as light on the demise of larger trees. Small and large stems of many species occur together due to the dominance of many shade-tolerant species. Growth rates per species and per unit area were also extremely low, due to low mortality rates and thus the infrequent release of space and other resources.

Faurea macnaughtonii E.Phillips (Family Proteaceae), known locally as Terblans, is a tall tree usually found in isolated patches of dense natural forest, from the Wolkberg in Limpopo Province southwards to the Amathole Mountains in the Eastern Cape. The isolated subpopulation in the Lilyvlei Forest is the largest. Trees can reach 20-25 m in height and have stem diameters exceeding 80 cm. It has a national status of “Rare” in the Red List of South African Plants. The core Lilyvlei population is stable and appears to be increasing slowly. Significantly, it is currently the fourth most plentiful canopy tree species (stems with DBH ≥ 30cm) in the Lilyvlei Virgin Forest in terms of both stems per hectare and basal area per hectare. Seed production, germination and seedling and sapling survival appear to be sufficient to maintain and increase the population of *F. macnaughtonii*. Several trees occur in scattered locations at Gouna, outside the core area, and the presence of young trees, saplings and seedlings at some sites indicates that the population’s range is expanding slowly.

The planting of *F. macnaughtonii* seedlings in the Diepwalle Forest during the 1920s and 1930s has effectively extended the range of the species in the Garden Route forests. Many of the planted trees have survived to maturity and are producing abundant germinating seeds, suggesting that the species would occupy a larger area if it could spread more effectively. Seed dispersal thus appears to be a limiting factor.

In conclusion, neither species composition nor biomass has changed significantly in these forests over a period of 30 years, unlike declines reported for some other Southern Hemisphere forests. These long-term monitoring results provide a baseline to evaluate the impacts of climate change over coming decades.

References:

Durrheim G. 2023. Status of Terblans (*Faurea macnaughtonii* E. Phillips) in the Garden Route forests. Internal Report 12 / 2023. Scientific Services, South African National Parks.

Midgley JJ, Cramer MD & Durrheim G. 2024. Thirty years of stasis in the dynamics of the Knysna Afro-montane forest, South Africa. Austral Ecology 49: e13594. Available from: https://doi.org/10.1111/aec.13594

Buzz in the Canopy: How Small Forest Flowers Attract a Cast of Insect Pollinators

Text by Rudi Crispin Swart & Melanie de Morney, photos by Rudi Crispin Swart

Hidden high in the forest canopy of South Africa's southern Cape, a fascinating drama plays out each spring and summer. Tiny white flowers, barely noticed by human eyes from the forest floor, quietly beckon to a wide variety of insects; these aerial visitors could hold the key to the forest's survival.

MORE THAN 100 INSECT SPECIES POLLINATE JUST FOUR TREE SPECIES IN THE AFROTEMPERATE FORESTS OF THE GARDEN ROUTE NATIONAL PARK. EVEN THOUGH ALL FOUR HAD SMALL, WHITE, INCONSPICUOUS FLOWERS, THEY SUPPORTED A VAST ARRAY OF INSECT BIODIVERSITY.

In a new study published in Austral Ecology, researchers climbed into the canopy of the Groenkop Forest, next to the George Campus of Nelson Mandela University. They were investigating the pollination of four tree species: White pear (*Apodytes dimidiata*), assegai (*Curtisia dentata*), saffron (*Elaeodendron croceum*), and Cape holly (*Ilex mitis*). All these trees bear small, white, open blossoms. Despite their modest flowers, the trees turned out to host a surprisingly rich community of insect visitors, with over 100 different species from seven insect orders observed over 144 hours of meticulous canopy-level fieldwork.

The results challenged the common assumption that trees that seem to be pollination generalists (those pollinated by insects that visit many different plant species as opposed to one or a few) share the same insect visitors. In reality, even among these trees with seemingly similar flowers, each species had its own unique mix of pollinators. And while one insect clearly stole the show (the endemic Cape honeybee, *Apis mellifera capensis*, accounting for 57% of all visits across tree species) many smaller players were important. Two new hoverfly species were described subsequent to this study, including a species which requires stagnant water in old trees (ecologically termed 'phytotelmata') for its larval development.

So, what sets these trees apart in the eyes (and antennae) of their insect visitors? The answer lies in the flowers' subtle differences: not just in size and scent, but in how they appear to insects. Although all the tree species studied, bear small, pale blossoms, their floral traits differ in ways that insects can detect. Differences in scent strength, nectar production, and even how petal colours reflect under forest shade influence which insects visit the flowers.
Interestingly, white pear attracted the most specialised visitors - certain bees and hoverflies almost exclusively visited its flowers, while Cape holly, the only dioecious species (with separate male and female trees), had the highest overall number of visits. This species is known to produce abundant nectar in small flowers.

More species of flower visitors were observed during crepuscular and nocturnal time periods compared to diurnal, although activity was lower compared to the diurnal time period. This suggests that nocturnal pollination, particularly by moths, may be more important than previously thought, and that our indigenous trees support a rich diversity of moth species via their flowers. Nocturnal observations only lasted until two hours after sunset, so we still know very little about the true extent of nocturnal pollination of forest trees.
Why does all this matter? Forest canopies may be biodiversity hotspots, but they're hard to study. Using rope-climbing methods, we managed to directly observe insect community and behaviour at treetop level, something rarely done in southern hemisphere forests. The work sheds light on how generalist pollination systems can still result in specific, structured relationships between trees and insects. This research also challenges the notion that generalist pollination is chaotic or unstructured. Instead, it shows how even generalist systems can be 'organised ', driven by flower traits that influence insect preferences and promote certain relationships over others.

As climate change and habitat loss continue to reshape ecosystems, understanding how trees and their pollinators interact is more important than ever. National parks and other protected areas act as refugia for a variety of species and protect the diversity needed to create resilient ecosystems. This creates a ripple effect that benefits surrounding landscapes, especially through thriving insect populations and their crucial roles in pollination. This study highlights that there is still much to discover in our indigenous forests and emphasizes the need to study, protect and responsibly manage these systems.

Reference:
Swart, R.C., Geerts, S., Pryke, J.S. and Coetzee, A., 2024. Generalist southern African temperate forest canopy tree species have distinct pollinator communities partially predicted by floral traits. Austral Ecology, 49(5). https://doi.org/10.1111/aec.13523

Effects of canopy gaps on growth and regeneration of forest trees

Text and photos by Graham Durrheim

Forest canopy gaps of different sizes play a vital role in forest ecosystem dynamics, affecting tree regeneration and understory vegetation, thus influencing the future composition and structure of the forest.

GAPS ARE IMPORTANT FOR FOREST REGENERATION. DENSE GROUND FLORA INHIBITS TREE SEEDLING GROWTH IN A LARGE FOREST GAP.

Gaps are created in the canopies of forests by various disturbances, including windthrow, tree mortality and forest management practices like selective logging. These gaps play a vital role in forest ecosystem dynamics. They increase the amount of sunlight, water, and nutrients reaching the forest floor, affecting tree regeneration and understory vegetation, thus influencing the future composition and structure of the forest.

In the Garden Route, large landscape-scale fires have occasionally burnt through significant areas of indigenous forest, most recently in 2017 and 2018. However, most parts of the forest have remained relatively undisturbed. Therefore, many trees die standing, creating small gaps in the forest canopy which are colonised mainly from an existing seedling / sapling bank. Gaps of different sizes occur naturally in these forests and are important for forest diversity.

Eighteen gaps were created in the forest at Diepwalle and Lottering in 1995 by felling groups of trees of various sizes and removing the stems and crown debris. The gaps ranged in size from 79 m^2 to 829 m^2. Half of each gap was cleared of the dominant understory shrubs known as onderbos (***Trichocladus crinitus***). Seedlings and saplings occurring in the gaps and adjacent forest were counted and measured. All trees and saplings taller than 2 m remaining in the gap were tagged and measured. In 1997 the stem diameter and lateral crown expansion was measured of gap edge trees, with stem diameters of selected trees in adjacent undisturbed forest also measured.

In 2019, twenty-four years after gap creation, not even the smallest gaps have closed completely, with some of the largest gaps showing little recovery, and some even growing larger due to the death of trees on the edges of the gaps. More than 40 ground flora species were recorded, with more species observed in gaps than in canopy plots. Ground flora is often denser and more diverse on disturbed sites, suggesting the importance of disturbance for the proliferation of some ground flora species. Dense groundcovera suppresses tree seedling growth but also protects small seedlings from climatic conditions. Bushpigs sometimes cause significant disturbance to ground flora and tree regeneration.

The total number of tree seedlings (30 cm – 2.0 m height), saplings (> 2.0 m height and stem diameter < 5 cm) and trees increased from 1995 to 2013 for most species, with little change in species dominance. Most of the common canopy and subcanopy tree species occurring in the surrounding forest were present as seedlings. Some species appear to be favoured by larger gaps while others are more successful in smaller gaps. Some light-demanding species more commonly associated with forest margins were also found in some of the big and medium gaps. About 17 species were common in both canopy and gap plots, but some species were more common in gap plots, reflecting a preference for more light, while others apparently need more shade under the canopy, and occurred more frequently in small gaps or plots with sufficient shrub and understory cover. The total number of seedlings increased for most species but decreased for a few dominant canopy species such as real yellowwood (***Podocarpus latifolius***), stinkwood (***Ocotea bullata***), common saffron (***Elaeodendron croceum***) and black ironwood (***Olea capensis subsp. macrocarpa***). Real yellowwood increased in uncleared canopy plots and decreased in cleared gap plots, reflecting its preference for shade. Stinkwood decreased at all sites; the implications of this are still unclear as the species regenerates well by coppicing. Black ironwood increased in cleared gap plots and decreased in uncleared canopy and gap plots, reflecting a preference for more light.

Trees at the edge of the gaps grow faster than trees in the intact canopy, but the effects varied significantly according to gap size, tree size and tree functional group. Smaller diameter trees of species that usually dominate the upper canopy benefitted the most from gap creation, while trees already established in the canopy showed little benefit. The effect on the growth of gap edge trees has decreased over time since gap creation. Mortality occurred in most species and all diameter classes, with higher mortality rates in the larger sizes. Mortality rates varied significantly between species and were slightly higher in the gap edge trees than the canopy trees, probably due to increased exposure to heat and wind.

The lack of pioneer species and the large numbers of advanced regeneration of most canopy tree species in the Garden Route forests indicates that the current management regime is unlikely to lead to a long-term change in tree species composition. The impacts of long-term climate change are, however, difficult to predict. Long-term impacts on regeneration and forest succession will be revealed by future re-measurements.

References:

Durrheim G. 2024. Monitoring the effects of forest canopy gaps of different sizes on subsequent growth and establishment patterns of regeneration in the Garden Route National Park: Report on results 1995 - 2022. Internal report. Scientific Services, Garden Route National Park, SANParks.

Pretzsch H, Schätzl A, Rais A, Hilmers T & Durrheim G. 2022. CARE4C – Analysing the gap dynamics in the temperate and subtropical rain forest in Knysna and Tsitsikamma, South Africa. Final research report, South African National Parks. Pp 13.

Recovering slowly but surely: Insights from Forest Tree Fern monitoring in the Garden Route National Park

Text by Diba Rikhotso, photos by George Sass

Observations since 2013 have shown alarming dieback among tree fern populations in the Garden Route National Park's Southern Afrotemperate forests, where many individuals were found wilting or dead, but without obvious signs of pests or diseases.

1. MORTALITY OF TREE FERN IN THE GARDEN ROUTE NATIONAL PARK MAY HAVE BEEN ASSOCIATED WITH A PERIOD OF LOW WATER AVAILABILITY AS INDIVIDUALS CLOSER TO A STREAM HAD HIGHER SURVIVAL. 2. HERE, BIOTECHNICIAN, DIBA RIKHOTSO IS BUSY CONDUCTING ANNUAL TREE FERN MONITORING. 3. SOME DEAD TREE FERN STEMS AWAY FROM THE STREAM.

Forest tree ferns (*Cyathea capensis*) are typically found in rain forests of tropical and subtropical climates. Some species are economically very important and are illegally collected, which has resulted in the decrease of their populations. As a result, they are listed on both the National and International Red Lists and are protected by the Convention on International Trade in Endangered Species (CITES). Observations since 2013 have shown alarming dieback among tree fern populations.

Monitoring commenced in 2017 in the Diepwalle Forest. The aims include understanding the dynamics in forest tree fern populations, with particular focus on identifying the possible causes of the decline and evaluating possible recovery of populations. Data on *Cyathea capensis* plant health and distribution were gathered on a transect of 50 m long, 10m on either side of a forest stream.

The number of living plants declined from 2017 to 2020, after which little further mortality was recorded. Survival rates were highest within 0 to 3 meters from the stream, decreasing with distance to the stream. Where forest canopies thinned and portions of the forest was exposed to increased sunlight, mortality rates were higher, particularly for ferns further from the stream. These factors suggested that reduced moisture availability may be associated with mortality.

From 2021 to 2024, tree fern seedlings were noted closer to the streams, suggesting a slow recovery of forest tree ferns. This trend may be indicating a positive response in the population dynamics of *Cyathea capensis*, potentially reflecting improved water availability. The findings emphasise the critical need for ongoing research to determine the cause of the decline in these iconic plants and conservation efforts to manage tree fern populations in the face of changing environmental conditions and to promote ecosystem stability.

SANParks joining hands with SANBI, Stellenbosch University Botanical Gardens and Kew Millennium Seed Bank project to ensure the future of two endangered Disa species

Disa procera and Disa newdigateae are two orchid species that only occur in the Garden Route. These orchids have very limited distributions and measures were put in place to safeguard these species.

Text and photos by Johan Baard

Disa procera and Disa newdigateae are both ground orchid species that only occur in the Garden Route National Park or have a core protected population inside the park. ***Disa procera*** is Endangered and ***Disa newdigateae*** is Critically Endangered. Both species have limited distributions of less than 4km² each. ***Disa procera*** occurs in the Sedgefield area in two distinct populations, cumulatively < 300 plants, while ***Disa newdigateae*** occur close to Nature's Valley, with all the plants occurring in one population of about 30 plants. The Stellenbosch University (SU) Botanical Garden and the South African National Biodiversity Institute (SANBI) reached out to SANParks and more specifically the Garden Route National Park, to assist in the conservation of these two species.

Disa procera

One of the two ***Disa procera*** populations occurs on a property belonging to The South African National Roads Agency SOC Ltd (SANRAL). This property has huge development pressure. Knysna Municipality initiated talks between SU, SANBI and SANParks with the aim of testing the possibility and success of relocating this population to the better protected population within the Garden Route National Park. Covered by permits from SANParks and CapeNature, 24 plants from the at-risk population were transplanted to the national park in April 2024. By late October 2024, during the annual ***D. procera*** monitoring, 30% of these transplanted orchids were observed in bloom, with the possibility of more of these plants surviving through their underground bulbs even though they were not flowering. It is foreseen that the remaining population at Sedgefield will be transplanted to the park. Seed was collected by SU for germination trials and for storage at the Royal Botanical Gardens' KEW Millennium Seed Bank project, in Sussex, England. The Garden Route National Park ***D. procera*** population has been monitored for 15 years, showing yearly fluctuations, yet overall stability.

1. A WELL-DEVELOPED SEED POD OF THE ENDANGERED DISA NEWDIGATEAE ORCHID.
2. STELLENBOSCH UNIVERSITY AND SANBI PERSONNEL REPLANTING DISA PROCERA, ONE OF THE ORCHID SPECIES WITH A LIMITED DISTRIBUTION IN THE GARDEN ROUTE.
3. RESEARCHER HARVESTING DISA NEWDIGATEAE SEED POD. SEEDS ARE HARVESTED FOR GERMINATION TRAILS AND PRESERVATION.

Disa newdigateae

Disa newdigateae was last seen in 1935 and thought to be extinct before its rediscovery in 2018. In January 2025 SU and SANBI personnel, accompanied by SANParks and The Custodians of Rare and Endangered Wildflowers (CREW) Programme collected seed pods of ***Disa newdigateae*** for germination trials and preservation at KEW Gardens Millennium Seed Bank project. Pods were scarce and most were poorly developed. However, one well developed pod had >10 000 seeds. Seeds from one pod are genetically the same, so it is important to collect pods from different plants to have genetic variability.

"The Straw That Broke the Camel's Back": Can Biological Control Tip the Balance Against Invasive Trees in the Garden Route?

Text and photos by Thabang Sibiya

Chainsaws, herbicides and budgets are struggling to keep pace with the relentless spread of invasive alien plants. Could tiny insects be the missing link in managing invasive Acacia species? It depends on the region, the environmental conditions, and the agent's ability to establish and persist in the field. In the case of the Garden Route National Park, they just might. But as we're learning, not all acacias are equally vulnerable.

To answer this question, we are conducting a post-release evaluation of gall-inducing insects that suppress seed output in three invasive Australian acacias (*Acacia mearnsii, A. longifolia, and A. stricta*). These species are among the most aggressive invaders of fynbos in the Garden Route. Yet, their response to seed-reducing biological control needs to be quantified in the park through post-release evaluations.

The study focuses on three key indicators of reproductive suppression: galling intensity, seed rain, and seed bank accumulation. The goal is to determine whether these tiny insect agents are meaningfully reducing the seed output of acacias, which should drastically slow their spread.

So, are these tiny insects making a dent?

Our preliminary results suggest a mixed picture. In *Acacia mearnsii* and *A. longifolia*, we found clear signs that galling can suppress reproduction. This was reflected in branches with high gall intensity, compared to flower or pod production. This reduction was also reflected in both lower seed rain and a lower seed count in leaf litter. Yet even in these species, large soil-stored banks remain, meaning that reinvasion risk remains despite reduced seed input.

Acacia stricta told a different story. Despite the presence of galls, reproductive output was much higher than the number of galls. We observed a high incidence of seed rain and accumulation of seeds in the leaf litter and seed bank, suggesting little control by this agent.

These results offer both encouragement and caveats. Where biological control works, it can complement manual clearing and herbicide use, potentially reducing the frequency or intensity of follow-up interventions for these species and redirecting resources to priority sites. In this way, biocontrol can help buy time and allow dwindling resources to be used more efficiently. However, significant reinvasion risks remain due to the large soil seed banks and the continued, albeit reduced, seed production of these acacias. This means that the value of biocontrol lies in easing the dual burden of propagule pressure and follow-up clearing, helping to slow reinvasion while reducing management intensity. Biocontrol should thus be seen as one tool in the toolbox: valuable, but only effective when combined with other interventions in an integrated management framework.

1. SOIL SAMPLING FOR SEED LOADS WITHIN A DENSE STAND OF ACACIA STRICTA AT KARATARA, GARDEN ROUTE NATIONAL PARK.
2. DEFORMED FLORAL STRUCTURES AND GALLING ON ACACIA MEARNSII INDUCED BY DASINEURA RUBIFORMIS, BUFFELSNEK 2024.
3. A BIOTECHNICIAN IS SETTING UP SEED TRAPS TO MEASURE SEED RAIN BELOW ACACIA LONGIFOLIA. GALLING INDUCED BU BIOLOGICAL CONTROL APPEAR TO SUPPRESS SEED PRODUCTION IN THIS SPECIES.

SAVANNAS AND GRASSLANDS

Using poop to track Pachyderms

Text by Erin Crowhurst, Obert Mathebula & Philip Mhlava

1. ELEPHANT DUNG IN VARIOUS STAGES OF DECAY. A STUDY IS FIGURING OUT WHERE ELEPHANTS SPENT TIME BY TRACKING WHERE THEY LEAVE THEIR DUNG.2. DECAYED DUNG, YOU NEED TO KNOW HOW LONG DUNG TAKES BEFORE IT DECAYS TO KNOW WHEN LAST ELEPHANTS WERE AROUND.

This story follows the messy, magical trail of elephants—through their dung! It's not just about how many elephants roam an area, but where and how intensely they use it. To uncover how frequently elephants visit a spot, our team tackled some key questions including how many boli are dropped by an elephant at a time, and how long does it take for dung to fully decay? Without knowing these crucial aspects, it is hard to relate the presence of elephant dung to the number of elephants that visited an area or from how long ago that visit was.

We are currently monitoring 30 sites across three zones within the Kruger National Park (Kruger): the Sabie and Nwatswitshaka rivers as well as Skukuza. Of course, understanding elephant dung starts with knowing how much they produce—but that's easier said than done. Tracking boli might sound simple, but in reality, it's a game of patience. Elephants move in bustling herds, weaving through bushes and blocking each other from view. Some even wander off mid-defaecation or linger in the area, leaving us waiting for the perfect moment to count. To date, we've only had four instances where the timing aligned perfectly—and the elephant was cooperative enough—for us to record a complete defaecation event.

Once the dung hits the ground, the real magic begins. From August to October 2024, we recorded 120 fresh dung piles and tracked their decay weekly. Many were conveniently located in the staff village—until some well-meaning verge-cleaners swept away 23 of them! That left us with 97 to monitor. So far, 52 have fully decayed, with the quickest taking just 99 days. The oldest? A resilient 289-day-old pile still holding strong!

As we continue to follow the trail—both literal and ecological—left by elephants, we are reminded that even the smallest clues can reveal big insights into how these giants shape the landscape. The journey is far from over, and we're excited to see what the next season uncovers.

Honorary Rangers adds modern flair to the Skukuza Biological Reference Collection

Text and photos by Nikisha Singh

The Skukuza Biological Reference Collection stands as an invaluable and irreplaceable resource within the Kruger National Park (Kruger), contributing significantly to biodiversity research, conservation management, and environmental education. Established in the 1950s, the collection has steadily grown over the decades and now houses over 25,000 carefully curated plant and animal specimens. These specimens are a broad representation of the park's diverse ecosystems, ranging from insects and plants to vertebrates and invertebrates.

Natural history collections like the one in Skukuza require extensive resources, time, and ongoing expertise to maintain their scientific value. Proper curation, care, and environmental control are essential to ensure that specimens remain in optimal condition for research, education, and conservation decision-making. The collection plays a critical role in documenting the park's natural heritage and provides a historical baseline against which future ecological changes can be measured.

For many years, the SANParks Honorary Rangers have played a pivotal role in supporting, funding, and expanding the Skukuza collection. Their volunteer contributions have ranged from data capture to assisting with facility upgrades to align the collection facility with national and international standards for biodiversity repositories. One of the most notable developments was the acquisition of modern, pest-resistant insect storage cabinets thanks to generous support from the SANParks Honorary Rangers. The monumental task of relocating insect specimens from outdated storage units into the new cabinets began in February 2025, with hands-on assistance from the Bankenveld Region Honorary Rangers. To date, more than 1,000 insect specimens have been carefully transferred, and their label data digitised.

Once the datasets have been fully cleaned and standardised, they will be published on the Global Biodiversity Information Facility (GBIF), making the collection accessible to researchers and interested persons worldwide. This ongoing development not only safeguards decades of irreplaceable ecological data but also strengthens the scientific foundation for biodiversity research and conservation management within Kruger National Park and beyond.

BANKENVELD HONORARY RANGERS HAVE BEEN INSTRUMENTAL IN TRANSFERRING INSECT COLLECTIONS IN THE SKUKUZA BIOLOGICAL REFERENCE COLLECTION TO NEW PEST-RESISTANT INSECT STORAGE CABINETS.

Mastering the strange habits of trees

Text by Corli Coetsee & Benjamin Wigley , photo by Ted Woods

Masting refers to the infrequent but synchronised mass seed production in plants. These years of massive flowering events that result in large harvests of fruits and seeds are important for insects and animals and have pronounced consequences that reverberate throught trophic levels.

Masting, in modern English, refers to the infrequent but synchronised mass seed production in plants. The seeds of plants have long been an important source of food for people and animals, and more so before large-scale agriculture. “Mast” comes from the Old English word “meast” which means an accumulation of nuts on the ground. The word “mast” has been used since the Middle Ages to describe the occasional heavy seeding of forest trees, such as oak and chestnut which gave rise to the practise of fattening pigs during this food bonanza in a practise called pannage.

There have been many theories on why trees mast. One theory is that trees mast when conditions are ideal, so trees make the most of the extra resources at hand (i.e. they make hay when the sun shines). After the mast year, trees must wait several years for the next perfect period or until they can build up enough resources again.

Another theory involves predation and dispersal of seeds. Plants either produce a massive number of seeds to overwhelm seed predators and give some seeds a chance of being dispersed or they starve their seed predators by not producing much seed and then have a good seed year when predator numbers are low. Alternatively, massive flowering years (which include those species which are wind pollinated) may increase the chances of flowers being pollinated because there is so much pollen around.

MASTING REFERS TO YEARS WHEN THE HARVEST OF SEEDS AND NUTS ARE EXCEPTIONALLY LARGE, ESPECIALLY THOSE OF OAK TREES (ACORNS). HISTORICALLY, PANNAGE (COMMON OF MAST) IS THE LEGAL RIGHT TO PASTURE PIGS IN WOODLAND, PANNAGE HAS BEEN PRACTISED FOR A THOUSAND YEARS ACROSS MUCH OF EUROPE. THIS ANCIENT FORM OF FOREST MANAGEMENT – VIRTUALLY EXTINCT NOW OUTSIDE THE NEW FOREST IN BRITAIN- BEGAN IN THE NEW FOREST WHEN WILLIAM THE CONQUEROR PROCLAIMED THE FOREST A ROYAL FOREST IN 1079. THE PIGS (AND EVERYONE ELSE EATING THEM) WERE VERY HAPPY DURING MASTING YEARS. THIS ARTWORK IS “MEN KNOCKING DOWN ACORNS TO FEED SWINE”, FROM THE 14TH CENTURY ENGLISH QUEEN MARY PSALTER, MS. ROYAL 2 B VII F.81V, CC BY-SA 4.0

These cycles of boom and bust have many knock-on effects in ecosystems. For example, in the northeastern United States, masting is a keystone component of ecological communities and acorn crop size drives a chain reaction linking deer populations, ticks and Lyme disease along with mouse populations, ground-nesting birds and gypsy moths. Masting may also affect human health; for instance, where excessive pollen loads stimulate respiratory allergies.

We conducted a study in a southern African savanna in the Kruger National Park where we followed the phenological behaviour (leafing out, flowering and fruiting) of 18 common savanna tree species over 8 years. Masting has been measured using many different metrices, which often includes coefficient of variation as it gives an idea of synchrony (i.e. to what extent everyone in a population is doing the same thing at the same time) of flowering or fruiting but unfortunately it is not sensitive to temporal dependencies (e.g., it does not take the length of gaps between masting events into account).

As a result, we combined coefficient of variation with intensity (the mean abundance of leaves, flowers or seeds produced in a time period), volatility which is a metric that increases with variation in phenological intensity and with lags in phenological activity, synchrony and the proportion of years in which the phenological event did not take place (i.e. true masting species will not fruit or seed for a number of years and then have a massive fruiting event).

Being such a prominent characteristic of phenology in some systems, such as temperate forests, masting has not really been studied in tropical savanna trees. Of our 18 species, only four (***Vachellia grandicornuta, Vachellia tortilis, Combretum zeyher***i, ***Terminalia sericea***) were potentially masting species. We further found that a resource-based model of plant growth that included carbon and nitrogen dynamics, forced by reanalysis of climate data, could reproduce the flowering and fruiting patterns of most of our study species. This indicated that masting, when it happened, was driven by resources and not by dynamics with predators, pollinators or dispersers.

VACHELLIA TORTILIS MAY BE ONE OF A FEW SAVANNA TREE SPECIES THAT SYNCHRONISES FLOWERING IN A PROCESS CALLED MASTING.

The limited evidence for masting found in this study raises the question of whether masting is expected in savanna ecosystems. Temperate systems often have short growing seasons limited by extremely cold winters, are nutrient-poor, and have specialised pollinators and dispersers. Tropical environments on the other hand are characterised by high plant productivity, low year-to-year climatic variability, and generalist animal pollination and dispersal. All of these factors would select against masting. For example, animal pollinators and dispersers are often not very species specific in savannas and may just move onto the next species if there are not enough seeds or flowers of one species available. Furthermore, in African savannas, animal dispersal of fleshy fruits or nutritious pods aid in spreading seeds far and wide and may decrease seed predation by invertebrates. So, it won’t make sense to swamp the disperser species to such an extent that some fruits are not eaten.

In conclusion, after 8 years of monitoring 290 individual trees spread across 18 species and 27 840 observations, we found limited evidence for masting in savanna trees. Although we could not say definitively why this was so, we suggest that the many positive interactions between large generalist herbivores (e.g., which may eat flowers but also pollinate them, or eat seeds and, in the process, also disperse them) and savanna trees have contributed to making masting mostly unnecessary.

Reference:
Coetsee C, Wigley BJ & Higgins SI. 2025. Do savanna trees mast? Phenological dynamics of flowering and fruiting in savanna tree species. Oecologia 207(6): 85.

Kruger's experimental burn plots turn 70!

Text by Tercia Strydom & Nokukhanya Mpanza, photos by Tercia Strydom & Cathy Greaver

Kruger National Park has been at the forefront of pioneering scientific research in our national parks for many decades, making it famous for more than just the Big 5. The park is home to one of the largest and longest running fire experiments in the world – the Kruger Experimental Burn Plots. These fire plots were initiated in 1954 and recently celebrated its 70th anniversary.

The experiment began during a time in which not much was known about how fires affect the savanna landscape and its diverse wildlife. Kruger's managers and scientists decided to investigate by setting up this monumental experiment which includes 208 burn plots scattered across four different vegetation types, two geologies and along a rainfall gradient. These plots, each about 7 hectares in size, receive a range of fire treatments with different fire frequencies and seasons in which they burn.

Over the last seven decades, we have confirmed the essential role that fires play in the savanna landscape, through learning how fires (1) change vegetation structure and composition, (2) influence how animals use the landscape, (3) affect soils and the carbon cycle, (4) behave and move through the landscape during burns, and (5) can be better detected and mapped using satellite imagery, amongst a host of other things. While initially aimed at addressing concerns around the impact of fires on savanna vegetation, this experiment has found renewed purpose and relevance in addressing contemporary issues. It now serves as a unique long-term research site for understanding the role of fire in emissions and climate change as well as advancing cutting-edge satellite mapping techniques.

AERIAL PICTURE OF A RECENTLY BURNED EXPERIMENTAL BURN PLOT NEAR PRETORIUSKOP.

EXPERIMENTAL FIRE APPLIED AT THE BURN PLOTS NEAR SKUKUZA.

Not only do these lessons facilitate better decision making for park management, but they have far-reaching benefits beyond the park's boundaries. The experiment has been the subject of nearly 100 scientific papers and reports published in the formal literature, thereby advancing the fields of savanna fire ecology on a global scale. Furthermore, it has served as a vital platform for hundreds of students to achieve formal qualifications in the form of undergraduate degrees as well as Master's and PhD qualifications. The sites are also often used during field excursions to give students, scientists, fire managers and others a real-life perspective on the effects of fire in savanna landscapes. The provision of essential funding and support from Kruger's management, coupled with crucial buy-in from departments such as Conservation Management, Ranger Services, and Technical Services, has allowed Scientific Services to create the globally sought-after research platform that it is today.

THE SCIENTIFIC SERVICES FIRE TEAM FOLLOWING THE APPLICATION OF A SUCCESSFUL BURN ON THE EXPERIMENTAL BURN PLOTS AT PRETORIUSKOP. THE EXPERIMENTAL BURN PLOTS ARE 70 YEARS OLD AND THE EXPERIMENT IS ONE OF THE LONGEST RUNNING FIRE EXPERIMENTS GLOBALLY.

Time, veldfires and soils: How long after burning are fire impacts on soils still visible?

Text and photos y Tercia Strydom & Izak Smit

Fires and the impact they have on our environment have been a burning topic for the longest time. Within SANParks, the crucial role they play in maintaining ecosystem health and biodiversity is widely acknowledged. In Kruger National Park, fires have been used as a management tool to safe-guard people and infrastructure, maintain biodiversity and ensure fire's ecological role in the park for many decades.

Kruger's long and rich history of fire-related management and research makes it a sought-after study site for researchers interested in fire ecology.

Nearly a century of research has shown how important fires are for maintaining certain vegetation states, animal dynamics and their use of a landscape, atmospheric patterns and processes, and the interaction between people and fire. Yet little is known about how fires impact soil properties in fire-prone savanna ecosystems. Long held assumptions popularise the believe that fires are detrimental to soils and that it leads to soil degradation and ultimately, soil erosion. South Africa even had national legislation in the 1940s – the Soil Conservation Act No. 45 of 1946 – which prohibited the use of prescribed fire because it was assumed that it would damage the soil. We wanted to test this assumption and if soils were indeed impacted by fires, how long did this impact last?

How did we test this?

Kruger's long-term fire experiment presents a unique opportunity to investigate the impact of burning on soil properties. Both short-term, immediately after burning impacts can be studied as well as longer term impacts of applying the same treatment over 70 years. **Essentially, we asked (1) what happens to the soil immediately after burning while ash is still present on the soil surface? And (2) what are the long-term effects of burning the soil annually for 70 years versus not burning it at all?**

Our study focused on sandy, granite-derived soils in southern KNP and compared pre- and post-burn soil infiltration (how easily water moves through the soil), and soil carbon and nitrogen to investigate short-term fire impacts one month after burning. We also compared annually burned soils with unburned plots to understand long-term fire impacts.

What did we learn?

When it comes to soil infiltration, fires affected soils both in the short- and long-term, and this was influenced by the size of the pore spaces. Shortly after burning, fires affected small pore spaces (< 1mm in diameter) by reducing infiltration from roughly 20 mm/hr to 14mm/hr. However, this effect did not last very long and may be linked to the presence of ash on the soil surface blocking tiny pore spaces. Within just nine months — after ash had disappeared from the surface — soil infiltration rates were back to pre-fire conditions. Over decadal scales, fire exclusion reduces infiltration rates in the small pore spaces, which we believe may be due to bioclogging of these tiny spaces by microbes such as bacteria, fungi and lichens.

ASSESSING THE EFFECTS OF AN EXPERIMENTAL BURN IN KRUGER NATIONAL PARK ON VARIOUS SOIL PROPERTIES.

> Decades of fire exclusion have not reduced infiltration rates into soils

Both soil carbon and nitrogen increased a month post-fire compared to pre-fire concentrations. The ash which results after vegetation burning provides an immediate nutrient input into the soil, thereby increasing soil carbon and nitrogen. After seven decades, granite soils from areas where fire was excluded had roughly 1.5 times more carbon and twice as much nitrogen as soil that was burned annually. But some soil carbon and nitrogen are labile – meaning it is unstable and easily decomposes, like those measured shortly after burning – while others are considered as recalcitrant because they do not break down as easily and forms a more stable pool.

> When compared to annual burns, fire exclusion plots had 1.5 times more carbon and twice as much nitrogen

Ultimately, fires have varying effects on soil infiltration, total carbon and nitrogen depending on time since last fire and vegetation structure. The fact that the negative effects on water infiltration are so short-lived shows that these granitic soils in KNP are able to recover quickly.

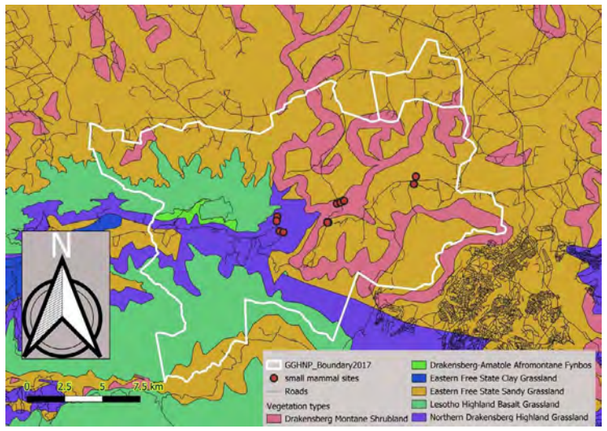
References:

Strydom T, Smit IPJ & van Tol JJ. 2024. The effect of time since last fire occurrence on selected soil hydrological properties in a South African savanna. Plant and Soil: 1-13.

Strydom T, Smit IPJ & van Tol JJ. 2024. Short and long-term fire effects on soil C and N in an African savanna. Geoderma Regional 37: p.e00802.

Rodent diversity in Golden Gate Highlands National Park

Text by Nkabeng Mzileni, photos by Roxanne Erusan



MAP 1: SMALL MAMMAL TRAPPING SITES IN GOLDEN GATE NATIONAL PARK FOR MONITORING CONDUCTED FROM 2022-2024.

1. COMBINATION OF PEANUT BUTTER AND OATS ROLLED INTO BAIT BALLS AND WRAPPED IN WAX PAPER, IN PREPARATION FOR SETTING RODENT TRAPS.
2. A CONCEALED SHERMAN TRAP. THE FOUR-STRIPED FIELD MOUSE WAS THE MOST COMMONLY ENCOUNTERED RODENT.
3. TWO RODENTS IN ONE TRAP WERE COMMON.

Between 2022 and 2024, a small mammal biodiversity survey was conducted in Golden Gate Highlands National Park (Golden Gate) situated within the Drakensberg Grassland and Mesic Highveld Grassland Bioregions. Eleven sites across varied habitats—Eastern Free State Sandy Grassland, North Drakensberg Highland Grassland, and Montane Shrubland—were surveyed using Sherman live traps. These were baited and monitored over five-day periods to assess seasonal and spatial variation in small mammal assemblages, with a focus on understanding the impact of fire, land use, and climate change.

A total of twelve species were recorded, including shrews, rats, mice, and gerbils.

The four-striped field mouse (***Rhabdomys pumilio***) was the most frequently encountered species, particularly in disturbed areas. Although this species may occur from time to time in high numbers, it is not a reliable marker of ecological integrity. In contrast, climbing mice (***Dendromus spp.***), which are more indicative of healthy ecosystems, were rarely captured and only found furthest from roads.

Rodent species richness varied across habitats. The Montane Shrubland exhibited the highest diversity, while the Eastern Free State Sandy Grassland was the only habitat with Highveld Gerbils (***Tatera afra***), a gregarious species that may reflect habitat modification and disturbance. The North Drakensberg Highland Grassland had the highest diversity of shrews, associated with higher elevation. Seasonal trends showed the greatest number of captures between January and March, likely due to peak vegetation productivity. When ***R. pumilio*** was excluded, capture rates across seasons were relatively even. Shrews and gerbils were active throughout the year, with shrews especially dominant between October and December.

The findings highlight how small mammals are responsive to climate and land use changes. Their resident nature and ecological specificity make them ideal bioindicators for monitoring ecological integrity and disturbance recovery. Ongoing monitoring, including camera traps and phenological data collection, is essential to track long-term biodiversity responses in fire-prone and climate-sensitive ecosystems like GGHNP.

Beyond *fences*

Protected areas are a key component of our conservation strategy, but as human populations grow, they are increasingly becoming islands of natural ecosystems in a sea of land that has been converted to agricultural crops, forestry plantations, dammed rivers, mines and urban areas. This puts them at considerable risk. As conservation scientists, we often study what happens inside protected areas (PAs)—and for good reason. These are the strongholds of biodiversity, where management practices are carefully designed to protect ecosystems and species. But increasingly we've come to realise that what happens outside protected areas is just as important—not only to reduce human impacts within the parks, but also to enable positive spillover effects from the parks into the surrounding landscapes, and for supporting broader goals for a sustainable planet.

Articles in this section forms part of the bigger vision SANParks is helping to shape—the idea of Mega Living Landscapes. These are landscapes where protected areas serve as ecological anchors in a landscape, but where conservation outcomes extend beyond the park boundaries through partnerships, sustainable land use, and stewardship across a variety of landowners.

The Sabie River on Kruger National Park's western boundary. The sharp boundaries between conservation and land uses such as agriculture create additional conservation management challenges which include increased human-wildlife conflict.

What Happens Beyond the Fence also Matters: Land Cover Change in and around Protected Areas in the context of Mega Living Landscapes

Text by Izak Smit, Kristal Maze & Brian van Wilgen

We recently set out to understand how natural land cover has been transformed both inside and around South Africa's PA network, and what this means for conservation more broadly at the landscape level.

Why Land Cover Matters

Natural land cover provides habitat for species and delivers essential ecosystem services that support human wellbeing, such as regulating climate, providing clean water, reducing flood risk, and pollinating crops. When natural cover is lost or degraded, biodiversity declines, and ecosystems become less capable of providing these services on which our livelihoods depend.

That's why we wanted to assess not only how well South Africa's PAs are protecting natural land within their boundaries, but also how the surrounding landscapes are faring. Are they remaining intact, or are they being transformed?

What We Did

We analysed South Africa's national land cover dataset, derived from high resolution satellite imagery, to track land cover changes across the entire protected area estate of South Africa. We examined changes not just within the boundaries of the parks, but also in the 5 km buffer zones surrounding the parks.

Key Findings

1. Protected areas are holding the line—mostly.

Overall, most of the natural land cover was maintained within the borders of protected areas, with relatively little loss compared to the surrounding areas. This is an encouraging result that indicates that formal protection makes a real difference in conserving natural land. However, the picture wasn't uniform. Smaller PAs and PAs in higher rainfall areas experienced on average more land cover loss than larger parks and those in drier regions.

2. Land cover loss happens right up to the boundaries of parks.

We found that natural land cover dropped sharply - by 14.8% - within the first kilometre outside park boundaries. This mirrors the national trend in land cover transformation and suggest that, on average, parks do not have a "soft boundary" or buffer with surrounding areas.

3. Land cover change patterns are highly variable.

Land cover transformation – both within and around PAs – was highest in high rainfall areas, in and around smaller parks, and in specific biomes such as grasslands, fynbos and Indian Ocean Coastal Belt. These findings highlight the strategic importance of the proposed Grasslands National Park in the Eastern Cape, which is a grassland park in higher rainfall areas, as a priority area for future conservation efforts.

Implications for Mega Living Landscapes

Our findings reinforce the need to move beyond the idea that conservation ends at the fence line. If SANParks is serious about realising Mega Living Landscapes, we need to continue building partnerships with landowners, communities and other stakeholders around our parks. Conservation organisations and their strategic partners need to influence and catalyse conservation-compatible land uses across the broader landscape. The goal is to create large, interconnected landscapes where different land uses – agriculture, tourism, and more - are conducted in ways that support both conservation and local economies.

South Africa is also party to the Kunming-Montreal Global Biodiversity Framework, adopted in December 2022, which includes a target known as "30 by 30" (Target 3), which aims to effectively conserve and manage at least 30% of the Earth's terrestrial, inland water, and coastal and marine areas by the year 2030. This is really ambitious, and clearly traditional protected areas alone will not be enough to achieve it. Protected areas are essential hubs and ecological anchors, but their long-term integrity—and the wellbeing of the people who depend on them-also depends on the surrounding landscape.

Making Conservation More Collaborative

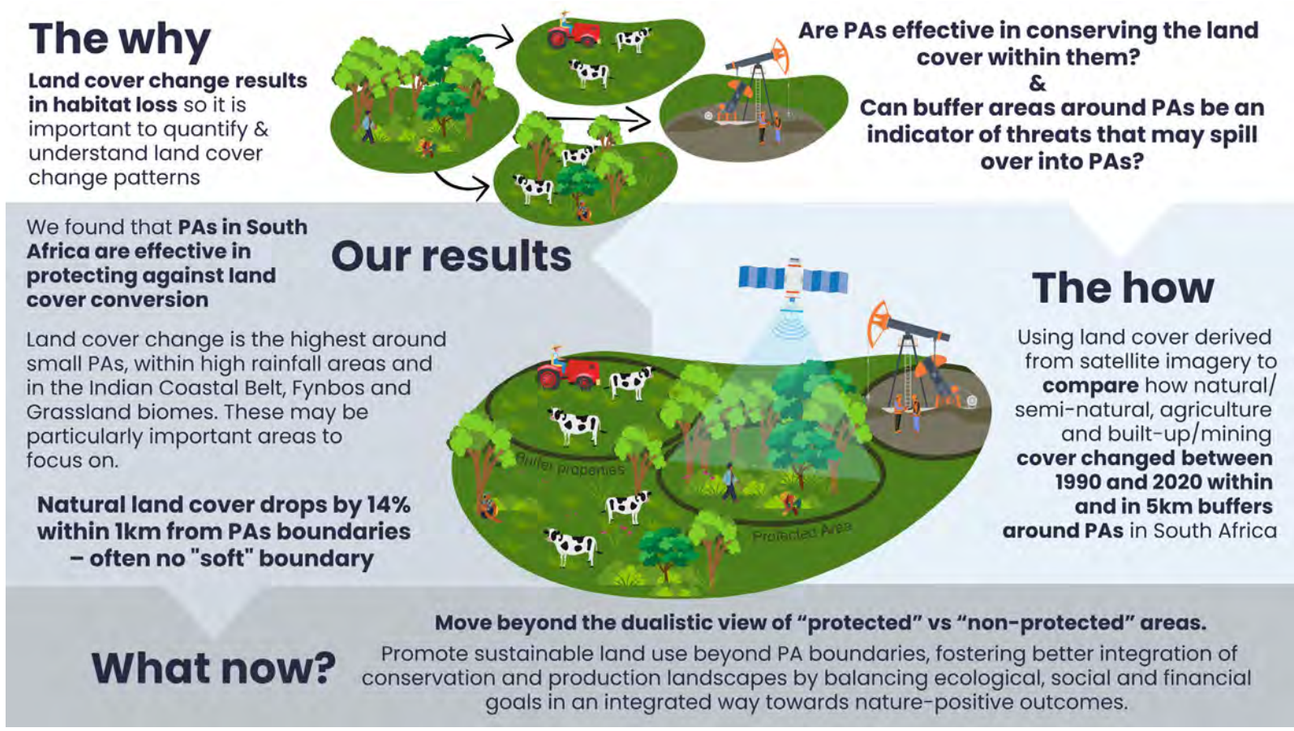
Protected areas cannot function in isolation. We must co-create strategies and build on and expand existing good relationships with neighbours. In some places, this may involve expanding protected area networks by acquiring land, as was done traditionally, or expanding through biodiversity stewardship. In others, it could mean encouraging and supporting regenerative agriculture and sustainable grazing systems, or other land uses that align with conservation goals.

Looking Ahead

This study is part of a growing body of work that helps us understand not only how well our protected areas are performing, but also how we can extend their influence into the broader landscape. As South Africa moves toward building connected, resilient, and socially inclusive Mega Living Landscapes, research like this provides essential context and building blocks for these endeavours.

We believe these insights can help SANParks to shape living, working, and transformative landscapes that support both biodiversity and people. Because in the end, building a sustainable future will depend on how well we connect people to each other and to nature, for the benefit of both.

Reference:
Smit, I.P.J., Maze, K. and van Wilgen, B.W., 2024. Land cover change in and around South African protected areas. Biological Conservation, 300, p.110844.



Beyond The Park Fence: Drivers of bird communities both within and outside Kruger National Park

Text by Sharon Thompson & Rion Lerm

The study revealed that while species richness appeared similar between Kruger and the surrounding mosaic, the composition and ecological roles of bird communities differed substantially. The findings also highlighted the influence of infrastructure, water, and tree cover in shaping savanna bird diversity.

A MALE RED-BACKED SHRIKE (LANIUS COLLURIO) OVERWINTERING IN THE KRUGER NATIONAL PARK DURING THE EURASIAN WINTER; ONE OF THE 500+ BIRD SPECIES USED IN THIS STUDY THAT INVESTIGATED VARIOUS ASPECTS OF BIRD DIVERSITY AND ITS DRIVERS ACROSS AND BEYOND KRUGER NATIONAL PARK.

Protected areas (PAs) like South Africa's iconic Kruger National Park (Kruger) play a vital role in buffering biodiversity from global threats such as habitat loss, climate change, and human pressure. However, the landscape surrounding Kruger is rapidly changing, shaped by urban expansion, agriculture, alien plant invasions, and shifting climate. This raises key questions: How do bird communities inside Kruger compare to those in the surrounding human-modified areas? What drives bird diversity across this landscape? And how can this information guide conservation planning? Despite being one of southern Africa's most intensively studied PAs, avian research in Kruger remains surprisingly underrepresented in the scientific literature. Fewer than 3% of registered projects focus on birds, and most of these are single-species studies. Consequently, there is limited understanding of how the park contributes to regional bird community structure, and how bird communities are shaped by environmental factors.

To fill this gap, Dr Rion Lerm from the South African Environmental Observation Network (SAEON) used the Southern African Bird Atlas Project (SABAP2) to examine how bird diversity was driven by environmental factors such as vegetation types, infrastructure, water availability, and distance from the park. This is one of the continent's largest citizen science initiatives and has collected over 20 million bird records thanks to thousands of dedicated birders.

Surprising Similarities and Subtle Differences

Contrary to expectation, overall bird species richness did not differ significantly between the PA and the human-modified mosaic (i.e. almost complete overlap of species in ordination space). However, Kruger exhibited a broader range of richness values (i.e. the species in the PA occupied much more space in the ordination) in contrast to the more uniform patterns outside the park. This suggests that while both areas support a similar number of species, bird communities inside the park are ecologically distinct (at least half of the bird community of the PA was distinct from the mosaic outside of the PA), a reflection of relatively intact habitats and complex ecological processes. The surrounding mosaic, shaped by agriculture, urbanisation and other human pressures supports more homogenous bird communities.

Infrastructure: A Double-Edged Sword

One of the most striking findings was the role infrastructure played on bird diversity. Within Kruger, areas with infrastructure supported higher species richness than the surrounding mosaic. However, this came at the expense of specialist species that play unique ecological roles. Tourist rest camps inside Kruger acted as oases for generalist species like laughing doves, which benefit from food, water, and nesting sites associated with human presence. This highlights how the type and intensity of human presence on the landscape strongly influence biodiversity outcomes.

The Power of Water

Seasonal water availability emerged as a second key driver of bird species richness. Though limited in extent, aquatic habitats contributed significantly to avian diversity by offering food resources and varied microhabitats. Large seasonal rivers create dynamic environments that support different bird species. Shallow water late in the rainfall season favoured wading birds, while deeper water earlier in the season supported fish-eating species. In contrast, permanent water bodies provided more stable but less seasonally diverse habitats. These findings emphasise the critical role of freshwater systems, however small in extent, in maintaining bird diversity. Their protection from pollution, invasive alien plants, and encroaching infrastructure is essential across the broader catchment.

Trees: Shade with Trade-Offs

In Kruger, natural processes like disturbance by elephants and fire regimes shape tree cover, while outside the park, human activities such as wood harvesting, bush encroachment and subsistence agriculture dominate. Despite these different drivers, overall tree cover was similar across the two areas where it also influenced bird communities. Surprisingly, increased tree cover was negatively associated with bird diversity in both Kruger and the surrounding mosaic. This likely reflects the loss of open grassy habitats that support a wider variety of seed-eating birds and those with diverse nesting strategies and life histories.

Implications for Conservation

While bird species richness may appear similar across protected and human-modified landscapes, this study reveals critical differences in community structure, function, and evolutionary history. Kruger's intact, dynamic habitats support more varied and ecologically distinctive bird communities. Outside the park, simplified landscapes and intensified land use favour generalists, often at the expense of specialist species.

Drivers such as infrastructure type, seasonal water, and vegetation patterns are central to understanding and managing savanna avian diversity. These findings reinforce the need to conserve not only total numbers of species but also the ecological complexity that underpins biodiversity. As pressures on landscapes intensify, integrating this knowledge into conservation strategies will be vital for sustaining bird communities and the ecosystem processes these fauna support.

Reference:
Lerm RE, Ehlers Smith DA, Thomspon DI, Downs CT. 2023. Human infrastructure, surface water and tree cover are important drivers of bird diversity across a savanna protected area-mosaic landscape. Landscape Ecology 38:1991–2004.

WITHIN AND BEYOND PARKS

Resource use within SANParks- another year of sustainably sharing the benefits

Text by Louise Swemmer, photos by Munzhedzi Muhanelwa, Louise Swemmer, Brent Whittington & Dhiraj Nariandas

The sustainable use of a wide variety of natural resources within national parks allows parks to manage ecosystems, generate revenue, and enhance the scale and scope of benefit-sharing in the context of environmental justice.

Benefit-sharing not only impacts positively on human wellbeing, but also promotes pro-conservation attitudes and behaviour, and the subsequent building of vested interest; an essential ingredient for protected area sustainability. Several terrestrial and aquatic, biotic and abiotic natural resources are currently harvested from national parks, under controlled conditions. Between 1 April 2024 and 31 March 2025, 15 out of 21 national parks (NPs) recorded formalised resource use, of which 10 parks harvested terrestrial resources only and 5 harvested both terrestrial and aquatic resources. A total of 466 species were harvested, of which a large number were for the Richtersveld plant collection project, with the purpose of propagation and conservation. Live game sales contribute about half of the revenue generated, followed by animal by-products (including meat and hides), and plants harvested for community benefits, sales, timber and firewood. For species where conservation status information was available, most are classified as "least concern".

ALOE FEROX HARVESTING PILOT PROJECT IN CAMDEBOO NATIONAL PARK, ONE OF 466 SPECIES THAT WERE HARVESTED ACROSS TERRESTRIAL AND MARINE NATIONAL PARKS DURING THE 2024/2025 FINANCIAL YEAR. BENEFIT-SHARING ENHANCES HUMAN WELLBEING AND PROMOTES PRO-CONSERVATION ATTITUDES AND BEHAVIOUR.

THATCH HARVESTING IN GOLDEN GATE HIGHLANDS NATIONAL PARK. THESE AND OTHER INITIATIVES WHICH INCLUDE BROOM HARVESTING AND GRAZING FOR CATTLE, SUPPORT LOCAL LIVELIHOODS.

Over and above these resources, this past year included the sustainable harvesting and donation of elephant fat that became available as a by-product from damage causing animal control in the Kruger NP. The fat is donated to traditional healers living and working adjacent to the park (next story), providing a new opportunity for community benefit sharing.

The effective management of wildlife across parks enables opportunities for the sustainable harvesting of live game for sales, donations and loans, especially in some of the smaller parks where offtakes are an ecological requirement for ecosystem management. Venison is harvested through registered facilities (e.g., Wildlife Products Section in Skukuza), generating revenue and providing a much-needed form of protein for local community groups including schools, orphanages, home-based care facilities as well as supporting important cultural celebrations. The latter is done with the aim of sharing conservation benefits locally, contributing to relationship building, and the wellbeing of people and nature.

Some parks, like Agulhas NP share benefits by supporting the collecting of sour figs and wildflowers. Others like Golden Gate Highlands NP, support community livelihoods by facilitating thatch and broom harvesting and grazing for cattle. Richtersveld NP enables sheep and goats to graze and browse. Mushroom, pine wood and eucalyptus leaf harvesting take place with approval from Table Mountain NP, providing important social and economic benefits including supporting local craft enterprises. The marine environments in various NPs continue to provide important livelihood and well-being benefits. The collection of alien timber species provides employment and revenue for communities in rural areas while also controlling the spread and facilitating the eradication of these species from some NPs.

A TRADITIONAL HEALER FROM MPUMALANGA, HOLDING HER PEPPERBARK TREE AND WILD GINGER BULB DONATED AS PART OF THE KRUGER NATIONAL PARK TRADITIONAL MEDICINE PROGRAMME.

Sharing the benefits of elephant fat with traditional healers

Text by Louise Swemmer, Lucia Hlatswayo, Januario Fernandes, Juzzy Mashele[1], Lin-Mari De Klerk Lorist & April Lukhele , photos by Louise Swemmer

"We are very happy...it was long ago that we mentioned the fats, we are very happy that today some of the requests we have made have been heard"
– Traditional Health Practitioner, Mpumalanga.

TRADITIONAL HEALER RECIPIENT GROUP FROM SALUBINDZA VILLAGE, AND SURROUNDING AREAS, WHO ARE PARTICIPATING IN THE ELEPHANT FAT PILOT PROJECT, AS PART OF THE ONGOING KRUGER TRADITIONAL MEDICINE PROGRAMME.

In 2024, 53kg of frozen elephant fat was shared with traditional healers living and working adjacent to the Kruger National Park (Kruger). This was part of a pilot project to assess the feasibility and impact of sharing sustainably and ethically sourced mafurwa (Xitsonga for animal fat). Animal fats are used in traditional medicine for a number of health and wellbeing-related purposes. Along with fat from various other species which includes impala, eland, buffalo and giraffe, elephant fat is particularly popular but is not easy to obtain. On the other hand, the visceral fat from elephants that had been humanely euthanised in Kruger in accordance with the legally required management of damage causing animals has, until recently, remained unused.

SANParks-Kruger (Social Economic Transformation, Scientific Services and Conservation Management), the Department of Agriculture (DoA) and Mpumalanga Tourism and Parks Agency (MTPA) embarked on an innovative partnership in order to assist traditional healers. The fat that is used for traditional medicine is the thin layer that surrounds the heart, liver and intestines, also called the omentum. Two recipient community groups, from the existing Kruger Traditional Medicine Programme that started in 2009, were invited to participate. The elephant fat pilot distribution was part of a larger programme that aims to support local traditional healers accessing sustainably sourced traditional medicine products. The elephant fat distribution event was combined with the sharing of elephant dung, wild ginger (***Siphonochilus aethiopicus***), fever tree (***Vachellia xanthophloea***), pepperbark (***Warburgia salutaris***) and climbing onion (***Bowiea volubilis***), in compliance with the required permits from the DoA[2].

In cases where elephant fat can be legally collected and safely stored it can be put to good use in supporting essential conservation objectives including benefit sharing, social justice and relationship building. Although still early days, the elephant fat pilot project is promoting a fairer way of sharing the benefits of biodiversity within the context of environmental justice and honouring local cultures and value systems within the broader Kruger social-ecological landscape.

[1] Mr Juzzy Mashele, Skukuza Abattoir supervisor, sadly passed away on 25 March 2025.

[2] The movement of animal dung and fat is controlled under the Animal Diseases Act, with use at own risk.

1. GOGO DINAH MLIMI FROM SALUBINDZA VILLAGE, WITH HER PACKAGE OF ELEPHANT DUNG AND ELEPHANT FAT, AS PART OF THE ELEPHANT FAT PILOT PROJECT. SANPARKS PROMOTES THE SUSTAINABLE USE OF A WIDE VARIERY OF NATURAL RESOURCES FROM WITHIN PARKS. THIS IS DONE AS 1) A CONSERVATION MANAGEMENT TOOL TO MAINTAIN ECOLOGICAL INTEGRITY, 2) TO GENERATE REVENUE TOWARDS ECONOMIC VIABILITY, AND 3) TO SHARE BENEFITS WITH A VARIETY OF STAKEHOLDERS, FOCUSING ON PEOPLE LIVING ADJACENT TO PARKS, TO BUILD SUPPORT FOR CONSERVATION AND ENSURE THAT PARKS ARE SOCIALLY RELEVANT TO THE PEOPLE, ESPECIALLY THOSE LIVING ALONG THEIR BOUNDARIES.
2. FRESHLY HARVESTED ELEPHANT FAT (MAFURWA YENDLOPFU – XITSONGA; MAFUTHA YENDLOVU – SESWATI).

It's not just about the cash: the impacts of conservation based employment on human wellbeing

Text by Louise Swemmer, Innocent Buthelezi, Kutullo M. Buthelezi, Thembi Marshall, Kgaugelo Morale, Marie-Tinka Uys, Wayne Twine & Anthony Swemmer

WITHIN AND BEYOND PARKS

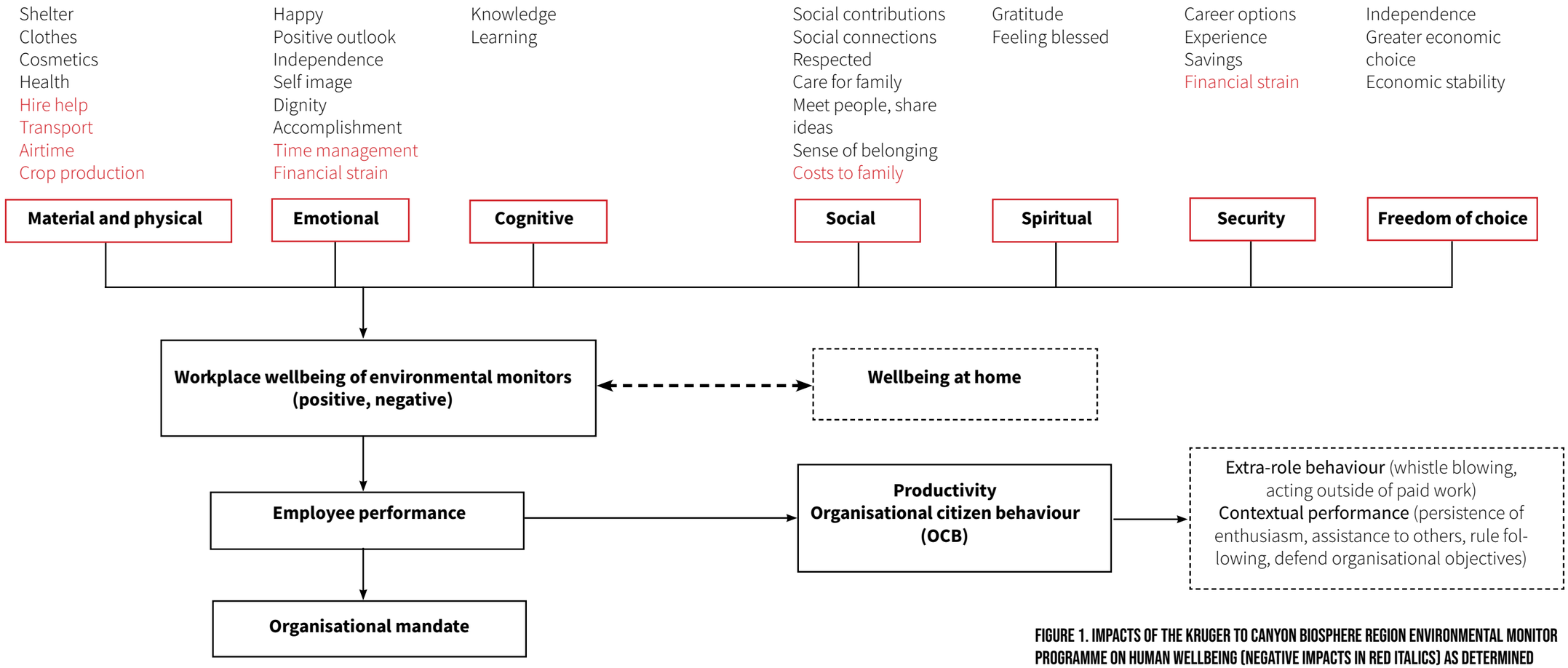


FIGURE 1. IMPACTS OF THE KRUGER TO CANYON BIOSPHERE REGION ENVIRONMENTAL MONITOR PROGRAMME ON HUMAN WELLBEING (NEGATIVE IMPACTS IN RED ITALICS) AS DETERMINED USING CODED DATA COLLECTED USING A STRUCTURED QUESTIONNAIRE.

Employment is a much sought after conservation-based benefit. Understanding the impact of conservation-based employment on the multiple dimensions of human wellbeing is important for enabling more accurate and holistic reporting on Protected Area benefits and their value, which facilitates reflection on who is benefitting and how. This in turn, ensures benefit distribution is fair and just with a local focus. Most conservation areas focus on jobs created and/or income accrued due to the relative ease of measuring these metrics. However, this is only part of the picture, and does not take costs, indirect or psychological impacts into account. Our study evaluated employment impacts (positive and negative) on tangible and intangible dimensions of human wellbeing at an individual, family and community level. We used the Environmental Monitor (EM) Programme as a case study and explored what this may mean to conservation more broadly.

A total of 105 EMs who were working for one of 38 partner organisations (game reserves, socio-ecological research organisations, environmental non-governmental organisations and community-conservation based organisations) within the Kruger to Canyons Biosphere Reserve were interviewed. Our study revealed a wide array of tangible and intangible, positive and negative impacts on seven dimensions of human wellbeing (material and physical, emotional, cognitive, social, spiritual, security and freedom of choice) (Fig. 1).

Salaries contributed towards material, physical, security and freedom of choice dimensions of wellbeing by having cash, being able to save and enabling expenditure choices. Most respondents made improvements to their homes, such as extensions or building new houses. Other impacts included buying in property, furniture and appliances. A positive impact of the household improvements was attributed to a feeling of independence that had positive impacts on the EMs themselves and an indirect positive impact on family wellbeing.

"[because of my job] I'm currently renovating my parents' house and built a room for myself. This had a positive impact on me and my family because I now have my own room. I no longer share with my mother".

Respondents experienced impacts on livestock and crop production, some of the positive impacts were due to having cash to take better care of their animals and crops, while others incurred costs of hiring help to care for their farms in their absence.

A TOTAL OF 105 EMS WHO WERE WORKING ACROSS 38 PARTNER ORGANISATIONS WITHIN THE KRUGER TO CANYONS BIOSPHERE RESERVE WERE INTERVIEWED FOR THIS STUDY. THE STUDY REVEALED A WIDE ARRAY OF TANGIBLE AND INTANGIBLE, MOSTLY POSITIVE IMPACTS, ON SEVEN DIMENSIONS OF HUMAN WELLBEING (MATERIAL AND PHYSICAL, EMOTIONAL, COGNITIVE, SOCIAL, SPIRITUAL, SECURITY AND FREEDOM OF CHOICE).

Psychological wellbeing impacts included having a happy and positive outlook and feeling more confident, with most respondents indicating that since being employed, they could voice their opinion if it differed from that of a larger group (not something they felt they could do before). Respondents also noted an improved physical self-image (linked in part to being able to buy nice clothes), greater dignity and a sense of accomplishment.

"[as a result of my job] I am a happy person, confident and beautiful always"

Benefits associated with learning and knowledge contributed positively to workplace wellbeing, and although not widely acknowledged as a "stand alone" wellbeing dimension, our study referred to this as "cognitive wellbeing" with most EMs valuing both formal and informal training and hoping for more.

"[I would like more] EE Training [so that] I can teach family, community and learners about the environment".

We used respondents' perceptions of the value of biodiversity, prior to and after being employed as an additional proxy for cognitive wellbeing, with most EMs feeling that they did not value biodiversity prior to being employed but felt that their perceptions of biodiversity had changed since employment. This included valuing biodiversity for provisioning services such as food, shelter and furniture, to sustain life, for ecological reasons, for current and future generations to experience and learn from, as a contributor to mental wellbeing, regulating services and economic and health benefits.

"It didn't mean anything to me, I didn't know the importance of it"

We noted that EMs found mundane repetitive tasks that lacked meaning as least enjoyable compared to learning and contributing to something of broader importance.

"[the part I like least about my job is] doing [the] same thing over and over again. I like doing different things that challenges my mind"

Respondents noted various positive impacts on their emotional wellbeing due to being able to help their families and the subsequent respect, appreciation and value that their families projected towards them as a result. Although we did not interview families directly, most EMs perceived their family's wellbeing had improved due to the changing role that they played in their households since being employed. This was due to increasing tangible (e.g. food, clothing, electricity, furniture, housing) and intangible contributions, e.g. families being able to depend on the EM, having EMs as role models, being financially stable, with stronger family ties, having more knowledge, EMs working in the place of parents, having someone to fix things that were no longer working and being able to contribute to funeral schemes and open accounts.

"They [my family] are happy because I am working and able to take care of them".

The EMs perceived that their households were seen differently by their communities since they were employed. Most noted an improvement in how the family was perceived and treated, including families perceived to being treated with dignity, respect and being appreciated by their communities. In addition, communities were supportive and happy for respondents' families as they no longer needed to ask for assistance, the community was comfortable to lend various items to the family and the family being perceived by the community as having a positive future and no longer being categorised as "poor".

Although most impacts noted were positive, negative impacts included not being able to do family chores as a result of having an income.

"I used to babysit my siblings, but now there is no one to (do the) babysitting".

Most respondents recorded positive impacts on six, five and four wellbeing dimensions at an individual, family and community level respectively. Some were direct, others came about as a result of a secondary impact.

"[it gives me] great fulfillment that I can help my family financially".

Conservation implications

Understanding workplace wellbeing in the conservation sector is not only important for ensuring legitimate net benefit flow at a personal, family and community level, but net positive workplace wellbeing facilitates productivity in the workplace, both as a result of increased performance and through stimulating organisational citizenship behaviour. This pertains to behaviour that goes beyond existing role expectations (beyond what employees are paid to do) and includes the persistence of enthusiasm, assistance to others, following and adhering to rules and procedures, openly defending organisational objectives and whistle blowing (reporting unethical or illegal activities of one employee by another). These findings have direct implications for people and wildlife globally in a context of increasing pressure for Protected Areas to demonstrate their societal contributions, with diminishing financial resources, and increasing threats linked to the illegal wildlife trade.

Reference:
Swemmer LK, Buthelezi IL, Buthelezi KM, Marshall T, Morale K, Uys M-T, Twine W & Swemmer AM. 2025. It's not just about the cash: The impact of conservation-based employment on human well-being. Koedoe 67(1): a1808. https://doi.org/10.4102/koedoe. v67i1.1808.

We thank The Kruger to Canyon Biosphere, specifically the participating environmental monitors, the associated host institutes, and in particular Suzan Muroa, Tandi Mahanga, Shoki Mafogo and Vusi Tshabalala.

WITHIN AND BEYOND PARKS

Duty of care: Why allowing death in nature can be part of caring

Text by Sam Ferreira & Li Tanneback, photo by Nicola van Wiglen-Bredenkamp

Conservation is increasingly imagined as a mission carried out with a purpose to save every single creature. But is this conservation or rather a principle of preservation? The public has watched many documentaries of daring rescues or releases of wildlife individuals back to freedom. Yet, the reality is more complex, and at times far harsher. Nature is built on a cycle of life and death, and death is the everyday reality of many wild animals. Managers with wildlife in their care, will invariably face a difficult decision at some point regarding the death of an animal. This may be likened to making a difficult decision on shortening the life of an aged, well-loved pet. The principle of "duty of care" is a core element of the above. Ecosystems however are not made up of single individuals but are filled with countless species and many environmental processes, including fire, disease outbreaks, floods, and droughts. A duty of care means taking reasonable steps to care for and prevent harm to biodiversity, and where harm is unavoidable, minimising it and cater for such systems to recover. Duty of care is not just about saving lives; it is also about letting natural processes play their part in this cycle of life and death.

From an evolutionary perspective, survival of the fittest depends on death of the weakest. Animals evolve coping strategies—behaviours that allow them to deal with hunger, predators, disease, or environmental and mental stress. Populations only remain strong because many individuals, often the weaker or older, do not survive. Predation, competition, and environmental stress like droughts are not tragedies to be erased but instead are acknowledged as forces that shape species' resilience in the long term. In open ecosystems, these dynamics play out naturally. First, juvenile deaths increase when conditions get tougher, followed by delayed breeding and, in extreme cases, early adult mortality. Such patterns maintain balance. But in confined areas—zoos, breeding centres, or small reserves—natural checks cannot operate fully. Managers then face tough decisions: should they manipulate births, control ageing populations, or allow euthanasia?

In the wild, avoiding death can lead to equally damaging results. Interventions like birth control may appear humane, but they can disrupt social systems, delay natural processes and create silent suffering through pathological side effects and irreversibility. Managing strictly to avoid death risks undermines the very evolutionary strategies that keep long-term persistence and adaptability of species robust.

A more realistic, respectful approach is to let nature lead where possible. Deaths from predation, disease, or old age should be allowed to occur with minimal interference. Where human intervention is necessary—whether through euthanasia or controlled culling—this should be done with respect, thankfulness and transparency. By embracing death as part of duty of care, conservation shifts from sentimental rescue to ecological stewardship. Managers are not simply protectors of individual lives, but guardians of whole, intact systems. Allowing death, when guided by science and compassion, is a form of progression and creating a space for something new to take its place.

In this way, the duty of care, even when including deaths, becomes a pillar that strengthens conservation. It acknowledges the dignity of natural processes, the responsibility of human intervention, and the truth that thriving ecosystems are built not on avoiding death, but on accepting it as part of life.

References:

Clauss M, Roller M, Bertelsen MF, Rudolf von Rohr C, Müller DW, Schiffmann C, Kummrow M, Encke D, Ferreira S, Duvall ES & Maré C. 2025. Zoos must embrace animal death for education and conservation. Proceedings of the National Academy of Sciences 122(1): p.e2414565121.

Tanneback L, Lubbe WD, Alberts RC & Ferreira SM. 2025. Universal duty of care for biodiversity. Unpublished Report 17/2025, SANParks, Skukuza,

A rhino without a horn is better than a dead one

Text by Sam Ferreira & Tim Kuiper

Dehorning is not perfect, but it's flipping the odds—saving rhinos at a fraction of the cost of traditional protection measures, but needs to be supported by traditional anti-poaching tactics

Across southern Africa, millions of dollars have been poured anti-poaching in an effort to keep rhinos safe. Each new layer of protection aims to stay one step ahead of poachers. And yet, poaching keeps charging on. The fight has been expensive, dangerous, and often heartbreaking. Now, a surprising twist is reshaping the rhino story - and it involves chainsaws. Conservationists are using them to remove rhino horns safely, under veterinary supervision. This bold strategy, called dehorning, is rewriting the script on rhino protection—and the latest science suggests it works.

The Scale of the Challenge

Between 2017 and 2023, poachers killed nearly 2,000 rhinos across 11 reserves in the Greater Kruger ecosystem—home to one of the world's largest remaining rhino populations. That amounts to about 6.5% of the population each year, a rate that threatens the future of both black and white rhinos. Roughly USD 74 million was invested in anti-poaching operations over this period. The measures included ranger patrols, tracking dogs, fences, detection cameras, and centralised control through control rooms. Although it helped arrest more than 700 poachers, the study found no clear statistical evidence that these law enforcement measures reduced overall poaching rates. The reasons are complex. Poachers operate within networks of organised crime, supported by demand from distant global markets. Also, corruption and a weak justice system means that many poachers are quickly released on bail or never serve their sentences.

A Different Idea

Instead of raising the risks of being caught, what if you reduce the reward? When a rhino's horn is removed, the value to poachers drops dramatically. It doesn't make rhinos completely safe—poachers may still target the stumps or wait for regrowth—but it does make them far less lucrative and therefore attractive. Across the study's 11 reserves, 2,284 rhinos were dehorned between 2017 and 2023. The results were striking. Dehorning cut poaching risk by about 75% on average. In some cases, the effect was even stronger: dehorned rhinos faced a 0.6% annual risk of poaching compared to 13% for rhinos that kept their horns—a 95% relative reduction. And the cost of this intervention? Just 1.2% of the total anti-poaching budget. At roughly USD 570 per dehorning operation, the intervention was by far the most cost-efficient, single approach tested.

A Study with Teeth

Some reserves introduced dehorning abruptly, others in staggered phases. Combining data from these reserves across seven years allowed the scientists to use quasi-experimental methods—rare in conservation—to track poaching rates before and after dehorning. The results were consistent across multiple models: where dehorning happened, poaching dropped abruptly. The effect was not explained by other interventions. The science was clear, removing horns changes poacher behaviour more than any other intervention. As one reserve manager put it, "You can bribe a ranger, or sabotage a camera. But you can't bribe a rhino's missing horn back into place."

Not a Silver Bullet

Still, dehorning is not flawless. In Kruger National Park, where only about half of the rhino population was dehorned by 2023, poachers continued targeting both horned and dehorned animals. A small but valuable portion of horn remains after cutting, since the horn can only be removed above the growth plate to ensure it is done safely and without any pain and harm to the animal.

There are also concerns about how dehorning affects rhinos' ecology and behaviour. Current research suggests little impact on survival or reproduction, though it may affect how they use space. Horns play roles in digging, foraging, and social interactions, and the long-term ecological effects remain uncertain.

Another challenge is displacement of poaching activity. As more reserves dehorn, poachers may move to areas where rhinos still have horns. For example, there are signs of rising poaching pressure in Hluhluwe-iMfolozi Park, South Africa's second-largest rhino stronghold. This park has subsequently also started dehorning. Additionally, nobody knows what will happen once all rhinos are dehorned?

Lessons Beyond Rhinos

The story of dehorning is part of a wider lesson: sometimes, reducing rewards from crime is more effective than increasing punishments. Economists call this "situational crime prevention." It's been used in many fields—from painting trees to prevent bark stripping, to moving parrot chicks at night to deter nest raiders. For rhinos, dehorning is the clearest example yet of how reducing rewards can shift the odds in favour of survival. It doesn't replace other measures, but it adds a powerful new tool to the conservation toolkit. For rhino conservation, the chainsaw may not be the tool anyone expected. But in the face of relentless criminal pressure, it is buying time—time for rhinos, time for ecosystems, and time for communities who live alongside them.

The Human Side

Behind the statistics are the people living this reality. Rangers walk long patrols, often in dangerous conditions. Communities living near reserves face both the risks of poaching syndicates and the need for livelihoods. Conservationists must balance science with ethics, economics, and human rights. Reactive enforcement strategies often put rangers and poachers in life-threatening conflict. Dehorning, by contrast, lowers the incentive to poach before the chase begins. In this way, it not only saves rhinos, but may also save human lives.

Looking Ahead

The findings present a challenge to governments, NGOs, and funders. Billions of dollars globally are still directed toward surveillance and enforcement. This study shows that sometimes the simpler, cheaper option can yield greater results. The study does not call for abandoning law enforcement. Rather, it urges a rebalance—placing greater weight on reducing the rewards of poaching while maintaining smart, targeted enforcement. It also highlights the need for regular dehorning cycles, careful monitoring of rhino health, and ongoing community engagement.

STATS

2,000 rhinos poached in Greater Kruger (2017–2023) despite USD 74 million spent on protection. 2,284 rhinos dehorned across 8 reserves. 95% reduction in poaching risk for dehorned rhinos (0.6% annual risk vs. 13% for horned).
Around 78% drop in poaching immediately after reserves began dehorning.
$570: average cost per dehorning operation per rhino. Horn regrowth means rhinos need re-dehorning every 18 months.
Dehorning used just 1.2% of the anti-poaching budget yet achieved the largest, clearest impact.

Reference:
Kuiper T, Haussmann S, Whitfield S, Polakow D, Dreyer C, Ferreira S, Hofmeyr M, Shaw J, Bird J, Bourn M, Boyd W, Greeff Z, Hartman Z, Lester K, Nowak I, Olivier I, Pierce E, Rowles C, Snelling S, van Tonder M, Worth E, Zowitsky H, Milner-Gulland EJ & Altwegg R. 2025. Dehorning reduces rhino poaching. Science 368(6702): 1075–1081.

TOURISM

Marakele National Park is one of only three SANParks-run national parks which are home to all of the Big-5 and also one of the best parks to see rhino. Rhino thrives and are well protected in this park due to high tech regional security and excellent relationships and cooperation amongst stakeholders in the area.

Planning for long-term destination attractiveness: Current and anticipated future value perspectives of SANParks-run tourism accommodation

Text by Liandi Slabbert, photos by Joep Stevens & Mario Paul, Wild Africa Photo Safaris

The natural setting is SANParks' strongest tourism asset – regarded by visitors as unique and worthwhile – yet preserving value for money experiences requires thoughtful investment in quality accommodation and price balance.

EXPERIENCES SUCH AS THE "BUSHVELD CINEMA" CREATED BY BRAAI FIRES UNDER THE STARS, OR MOMENTS OF CLARITY INSPIRED BY NATURE'S QUIET, WERE FREQUENTLY MENTIONED AS DEEPLY MEANINGFUL.

SANParks manages over 6 000 formal tourist beds, excluding camping. As travellers become more selective and budgets tighten, ensuring accommodation remains relevant and competitive is essential. This study examined how visitors perceive the value of overnight stays in South Africa's national parks – what attracts them, what deters them, and what they expect in future. From understanding why some stay outside the park, to how sustainability, comfort, and price shape decisions, the research identifies what adds or detracts from the experience. It also explores what national parks uniquely offer, and how this value can be enhanced for current and future generations. The findings provide guidance to improve visitor experiences and inform investment.

Following a desk review of tourism performance and the competitive landscape in four parks, the study adopted a two-phase, mixed-methods approach. Phase 1 involved 148 in-depth interviews with overnight and day visitors in Addo Elephant NP, Golden Gate Highlands NP, Garden Route NP, and Kruger National Park (Kruger). These conversations offered insights into what shapes the park accommodation experience.

Phase 2 included online surveys for visitors to Addo Elephant NP (n=356), Garden Route NP (n=320) and Kruger (n=2 576), that focused on perceived value, perceptions about maintenance, uniqueness, and suitability of accommodation. In Kruger, a discrete choice experiment tested how visitors value specific accommodation attributes and willingness to pay for refurbished or upgraded units, using Skukuza and Satara as case studies. While the considerations and suggestions from visitors (and managers) are unique to each destination, various central themes emerged:

Value for money and uniqueness

Across all three parks in Phase 2, visitors generally agree that staying in a national park offers a unique experience and good value for money. **However, the percentage of Kruger visitors who believed accommodation offers value for money was notably lower (65%) compared to Garden Route NP at 80%.** Only 44% of Kruger respondents felt that the current tariffs are reasonable, pointing to growing price sensitivity and concerns about whether the quality of the offering aligns with the cost.

The distinctiveness of overnighting inside a national park emerged strongly during interviews. Visitors consistently described it as an immersive, restorative experience that far surpasses a typical stay outside a national park. Respondents emphasised the unparalleled proximity to nature, early access to wildlife, and the tranquil, reflective atmosphere as key benefits. Many highlighted the camps' unique atmospheres – particularly in Kruger – where each camp offers its own "vibe", a sense of place, and a communal spirit.

Rest camps in national parks foster autonomy, connection with the natural world, and stronger family engagement – especially through digital detoxing and shared activities like animal checklists. Even when facilities are modest, the natural surroundings often compensate, with nature itself becoming the main attraction. Practical benefits such as reduced travel time, convenience, safety, and supportive staff further enhance the experience. For many, park stays offer not just a holiday, but a memorable journey anchored in reflection, togetherness, and a sense of belonging.

Maintenance and upgrades are essential, but sensitive to visitor preferences

While visitors express a strong desire for improved maintenance and upgraded accommodation, the majority also emphasise preserving the traditional look and feel of park accommodation. Renovations should therefore be carefully designed to modernise interiors and amenities while retaining the distinctive character that defines SANParks experiences.

Price sensitivity remains high, even among enthusiastic visitors

Many visitors to Kruger, Addo Elephant NP, and Garden Route NP expressed reluctance to pay more for upgraded accommodation. Although interest in the newly renovated units at Skukuza and Satara is high, most KNP respondents indicated they are either unwilling to pay more or would only accept a modest increase of 5–10%. SANParks will need to carefully balance product enhancements with affordability to maintain inclusivity, particularly for price-sensitive domestic travellers.

Cleanliness, maintenance, and natural surroundings are core value drivers

Cleanliness, well-maintained units, a veranda for enjoying the outdoors, and access to essential kitchen utensils consistently emerged as the most valued features when selecting accommodation. High-quality beds, a unique camp atmosphere and natural views or settings also played a significant role in shaping visitor preferences. Overall, visitors prioritise comfort, cleanliness, and immersion in nature over stylistic upgrades. While upgraded bathrooms and kitchens and access to WiFi were regarded important, the exterior appearance of units (especially modern designs) ranked low in importance, with a preference for more traditional, park-style aesthetics.

Connectivity expectations vary – but cannot be ignored

Although connectivity (Wi-Fi and mobile signal) is not uniformly expected by all guests, it remains a significant expectation among a growing segment of visitors. SANParks should consider location-specific approaches to improving general connectivity, especially in premium units or busier rest camps.

Competition from external accommodation is a growing concern

A sizeable proportion of visitors have already used or are likely to consider accommodation outside the parks in future. External options are often perceived to offer better quality and value. SANParks should priori-

A COLLAGE SHOWCASING AN UPGRADED BUNGALOW IN THE SKUKUZA REST CAMP, KRUGER NATIONAL PARK. ALTHOUGH INTEREST IN THE NEWLY RENOVATED UNITS AT SKUKUZA AND SATARA IS HIGH, MOST KNP RESPONDENTS INDICATED THEY ARE EITHER UNWILLING TO PAY MORE OR WOULD ONLY ACCEPT A MODEST INCREASE OF 5–10%.

tise product enhancements and consider more flexible pricing and bundled offerings to remain competitive and retain overnight guests inside the parks.

Reasons for choosing accommodation outside the park

Both day and overnight visitors were asked for reasons why they opted for accommodation outside parks. Many cited affordability as a primary reason for staying outside SANParks accommodation, with several perceiving in-park options as overpriced or not offering sufficient value for money. Comfort, modern facilities, and special amenities such as swimming pools, spas, WiFi, and time-share options also influenced decisions, particularly when celebrating special occasions or travelling in larger groups. In Kruger and Garden Route NP, availability and convenience were additional concerns, while in Golden Gate Highland NP, some visitors preferred proximity to town or alternative offerings with higher service quality. Perceptions of outdated facilities, limited awareness about in-park accommodation, and past negative experiences further contributed to the decision to stay outside the parks.

Focus on present issues limits future-oriented feedback

During interviews, visitors tended to focus on immediate concerns such as maintenance and smaller operational issues, with little attention given to long-term accommodation improvements. Despite the general absence of future-oriented suggestions or calls for modernisation, there was an underlying recognition of the importance of sustainability and keeping accommodation relevant for future generations.

Striking the right balance between preserving the essence of the park experience and evolving to meet visitor needs will be central to the future relevance and sustainability of SANParks accommodation.

Exploring brand awareness: Insights from SANParks' first comprehensive assessment of its tourism brand

Text by Liandi Slabbert

One in four South Africans have never heard of SANParks – this landmark study reveals the urgent need to reposition our national parks in the minds of the public to unlock their full tourism potential.

The SANParks Brand Awareness Assessment 2024 marks a significant milestone in establishing a baseline understanding of how South Africans perceive national parks as tourism destinations. This inaugural assessment, conducted by market research firm Ask Afrika, focuses on measuring public awareness, perceptions, and visitation behaviour specifically in relation to the leisure tourism offerings of SANParks. By evaluating how the organisation and its parks are positioned in the minds of current and potential visitors – particularly within non-traditional market segments – the study provides insights to guide marketing, communication, and product development strategies. It offers a foundation for tracking future progress and shaping long-term efforts to broaden the appeal of national parks and grow domestic tourism.

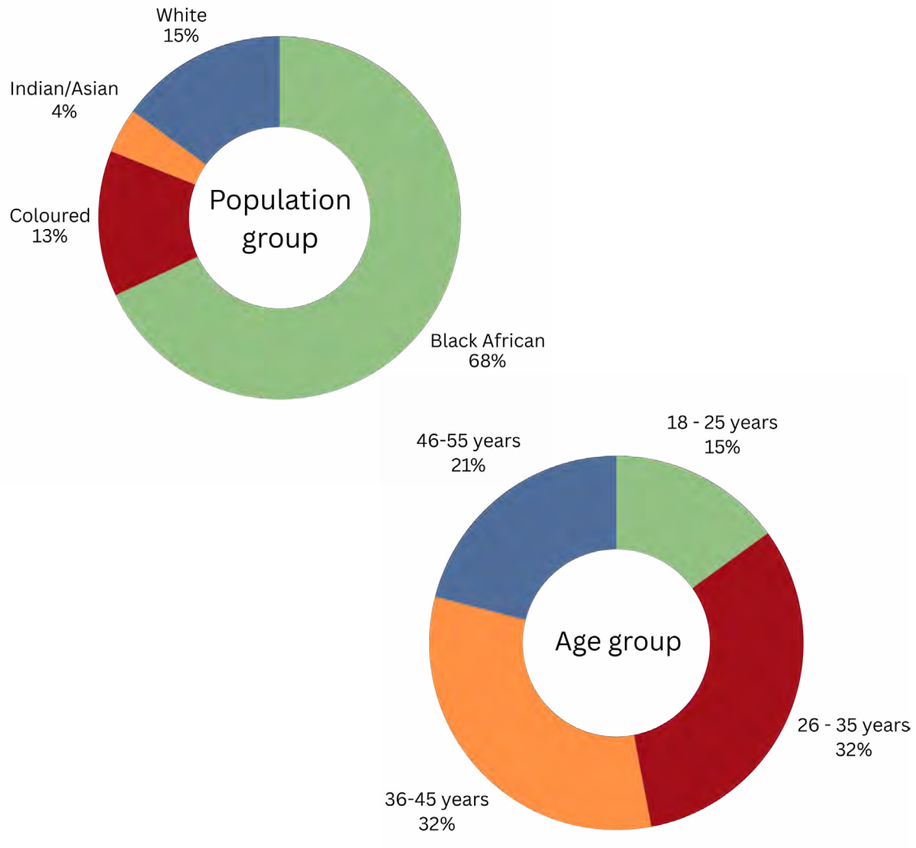


FIGURE 1. BREAKDOWN BY POPULATION GROUP AND AGE OF 8340 SOUTH AFRICANS THAT PARTICIPATED IN STUDY.

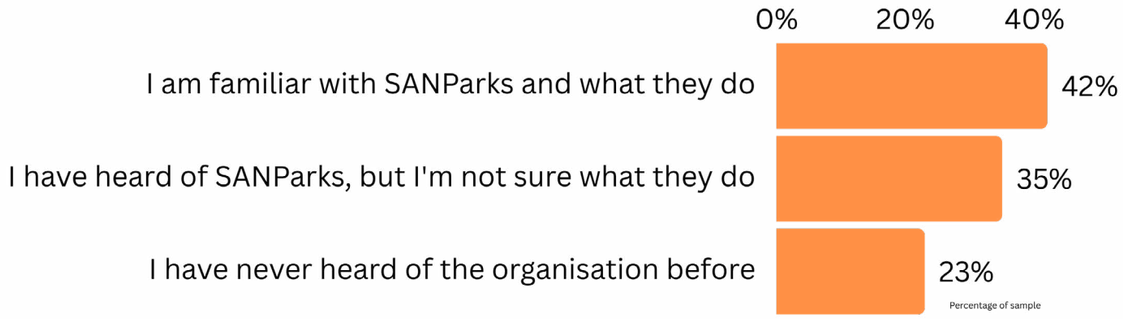


FIGURE 2. PUBLIC AWARENESS OF SANPARKS AS AN ENTITY WAS RELATIVELY LOW AMONGST SOUTH AFRICANS.

A total of 8 340 South Africans participated in the survey, with 5 792 completing online surveys and 2 548 interviewed face-to-face. This mixed-methods approach ensured broad demographic and geographic representation across all nine provinces. Respondents were primarily from Gauteng (36%), followed by Cape Town (19%) and Durban (14%), with the remaining spread across regions such as Gqeberha, Polokwane, Bloemfontein, Mpumalanga, the Bojanala region in the North West province, East London, Kimberley, and the Garden Route, each contributing around 4–5%.
The sample focused on South Africans aged between 18 and 55 years with the financial means to travel for leisure - SANParks' key target market. Quotas were set to reflect the demographic composition of each province, including variables such as population group, age, and gender.

The survey explored brand awareness, visitor perceptions, travel behaviour, and information sources. Recognition of the SANParks logo was high, with 82% of respondents indicating familiarity – demonstrating strong visual awareness. However, this did not fully translate into brand understanding, as fewer than half (42%) were familiar with the organisation and its role. A further 35% said they had heard of SANParks but were unsure of what it does. Alarmingly, nearly a quarter of respondents (23%) had no awareness of SANParks at all, revealing a clear disconnect and highlighting the need for more effective outreach and engagement strategies.

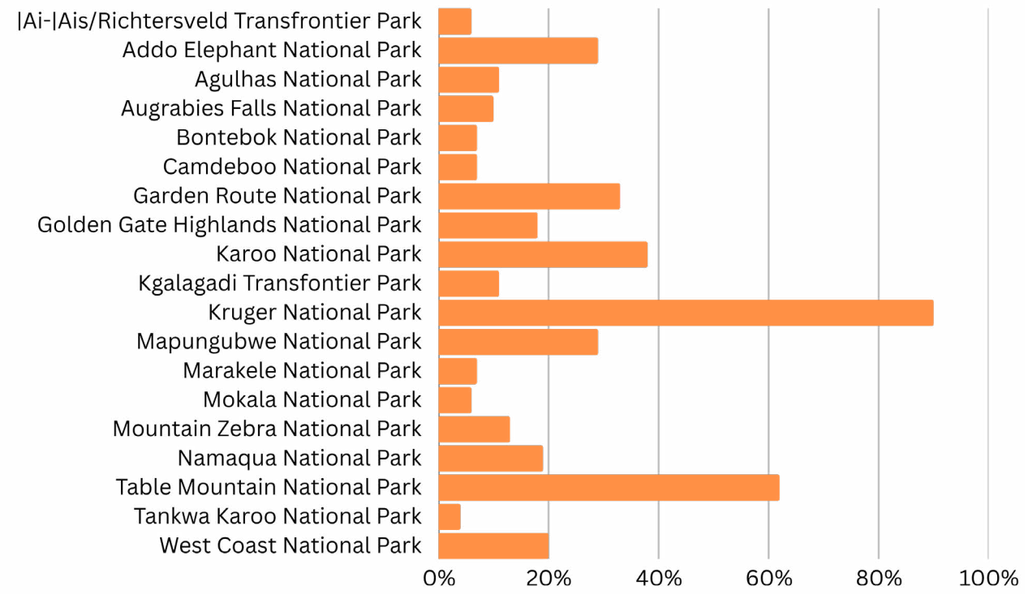


FIGURE 3. AWARENESS LEVELS OF INDIVIDUAL NATIONAL PARKS VARIED WIDELY WITH KRUGER NATIONAL PARKS RECOGNISED BY 90% OF PARTICIPANTS BUT SOME SMALLER AND LESS WELL-KNOWN PARKS ONLY RECOGNISED BY A SMALL PERCENTAGE OF RESPONDENTS. THE LOW LEVELS OF AWARENESS PRESENT AN OPPORTUNITY TO MARKET NATIONAL PARKS IN ORDER TO ATTRACT MORE VISITORS TO THESE PARKS.

Awareness of individual national parks varied widely. Kruger stands out with a commanding 90% recognition rate, firmly establishing its status as a national icon. Table Mountain NP follows with 62% awareness. In contrast, while parks like Karoo (38%) and Garden Route (32%) show moderate levels of recognition, many others remain relatively unknown. For example, only 4% of respondents were aware of Tankwa Karoo NP, and just 6% recognised |Ai-|Ais/Richtersveld Transfrontier Park. These findings suggest that public awareness is heavily centred on a few national icons, with most parks still lacking visibility. An analysis of regional park awareness reveals that respondents tend to be more familiar with parks located within their own province or in adjacent regions. However, proximity did not always translate into strong awareness. For example, only 17% of respondents from Kimberley were aware of Mokala NP.

The low levels of awareness present a valuable opportunity for SANParks to invest in targeted marketing efforts to raise visibility and attract more visitors to these underrepresented destinations. The survey results further indicate that digital media plays a leading role in how travellers plan nature-based holidays, with nearly three-quarters of respondents (73%) turning to social media for information. Platforms like Facebook, Instagram, and Twitter have clearly become central tools in shaping destination choices and travel planning.

Several strategies were proposed to improve SANParks' brand awareness. These include positioning the parks as family-friendly destinations through bundled packages and age-specific activities; offering affordable options for lower-income groups; and promoting the unique value of South Africa's landscapes. Marketing should highlight how visitor contributions support conservation, and under-recognised parks should be promoted for their distinctive features. Emphasising cultural tourism, improving accessibility, and launching loyalty programmes could further boost appeal. Continued focus on popular digital platforms, audience segmentation, and engaging educational content is also recommended.

Platforms like Facebook, Instagram, and Twitter have clearly become central tools in shaping destination choices and travel planning, with 72% of respondents turning to social media for information regarding these.

TOURISM

CULTURAL *heritage*

The Thulamela Ruins which towers over the Levhuvhu River in northern Kruger National Park was once the epicentre of the gold and ivory trade in this region. This ancient Southern African Kingdom which thrived roughly 300-400 years ago is regarded as an important Iron Age, stone-walled archaeological site in Southern Africa due to it's cultural significance and links to Mapungubwe and Great Zimbabwe (photo courtesy of Sian Blackburn and Clive Morris Productions)

Cultural heritage's year in review

Text by Ndukuyakhe Ndlovu , photos by Thabo Kgomommu, Peter Gordon & Tim Forsmann

Reviewing of research projects

SANParks has for a long time been under capacitated in terms of cultural heritage management personnel. The low capacity in this regard impacted the vigour with which research proposals could be scrutinized. **In the last two years as the capacity for cultural heritage management started to increase, the Cultural Heritage Unit started playing a greater role in the review of research projects.**

Research is still largely located within the Kruger National Park (Kruger). While it is encouraging to see a broader scope in proposed projects, it remains a concern that heritage-themed research is still largely focused on one park, while very minimal work takes place in the remainder. Three major projects were proposed during the financial year, two of which have already been approved, with one still under review. The first two both focus on the Letaba region of Kruger, in an area that has received increasing attention since 2021, when ceramics were found. There have been archaeological field seasons held annually since then, which has significantly advanced archaeological knowledge of the park's history. Previous studies have concluded that it was only during the Mapungubwe era that trade networks intensified. However, early project findings have already indicated that trade networks conducted through the Indian Ocean date to a much earlier period. The second project will feature the survey of a much larger area within the Letaba region, with sites along the Letaba River (Le6 and Le7) being the most prominent. This is significant, as it will lead to an intensive study of the Letaba area, something that is not common in archaeological investigations, which tend to concentrate on limited sites where major findings have been made. The project under review is proposing to reinvestigate Thulamela, a site first excavated in the 1990s. The site was declared by the South African Heritage Resources Agency as a National Heritage Site in 2024. Most of the archaeological artifacts are yet to be studied and will be analysed as part of the proposed project. There are also excavations that are proposed for the site, near areas that were previously investigated in the 1990s.

THULAMELA, AN IMPORTANT ARCHAEOLOGICAL SITE IN KRUGER NATIONAL PARK, WITH THE LUVUVHU RIVER IN THE BACKGROUND.

Publication of the Koedoe Special Issue: "Cultural Heritage of our National Parks"

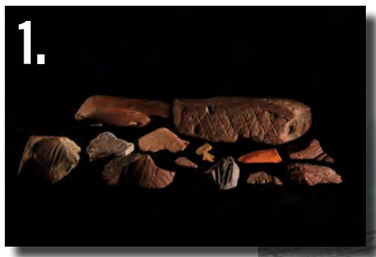
A significant milestone during 2024/2025 was the publication of the Koedoe Special Issue, accompanied by a preface from Ms Hapiloe Sello, CEO of SANParks. The main theme of this open access Special Issue was the Cultural Heritage of our National Parks. It featured publications ranging from palaeontology (fossilized tracks), archaeology (Iron Age, archaeozoology, historical, geoarchaeology), archaeotourism, as well as historical architecture. Most manuscripts focused on Mapungubwe and Kruger National Park, highlighting the research bias that the SANParks Cultural Heritage Unit aims to change, with new projects being at initial stages at various parks, including Karoo and Arid regions, Marakele, Richtersveld, and Golden Gate Highlands. The latter is currently under consideration for an extension of the Maloti Drakensberg Transfrontier Park declared as a World Heritage Site in 2001 on the South African side and subsequently extended in 2013 to include Sehlabathebe National Park in Lesotho. Such an initiative will rely significantly on new research to gain deeper insights about the parks involved, in terms of palaeontology, archaeology, and historical period. Funding attained from Scientific Services and some of the academic institutions in the country whose researchers were part of the Special Issue is highly appreciated.

Cultural Heritage Information Management System (CHIMS)

The CHIMS were launched in 2023/2024 by SANParks as a centralised information management system in which to document and manage the locations and primary site characteristics of cultural heritage sites across all national parks. A few minor tweaks had to be made on a continuous basis, with the aim of improving the functionality of the system. The uploading of cultural heritage inventories onto the CHIMS continued during the current year under review. Such a process shall continue to take place on an ongoing basis as research produce new information and thus inventories needing to be updated. A crucial element of the information management system is the ongoing survey and assessments of cultural heritage in various parks. During the financial year, two more parks were assessed (Karoo and Namaqua). These assessments lead to improvement in the management of cultural heritage in those parks and the improvement of METT scores.

Origins of Early Southern Sapiens Behaviour Display

While the study of human origins has not been extensively undertaken within any of the national parks, this is a subject that is of interest to tourists visiting our protected areas. This was illustrated by the increased number of tourists visiting the the 'Origins of Early Southern Sapiens Behaviour' exhibition at the Buffelsfontein Visitor Centre within the Cape Point section of the Table Mountain National Park. This interactive multimedia display was curated by filmmaker Craig Foster and archaeologist Petro Keene, and it showcases findings from 30 years of archaeological research at sites like Blombos Cave and Klasies River, illustrating early modern human innovations and daily life between 120,000 and 50,000 years ago. Not only is the subject matter of this exhibition important, but it is also presented in a manner that is exciting and interactive to the tourists. The increasing interest in this exhibition has led to the decision to extend it beyond 2026, when it would have been removed, to 2030. There are updates to the content, informed by new research findings, that are proposed, to ensure that the exhibition is current and informative on the latest research output.



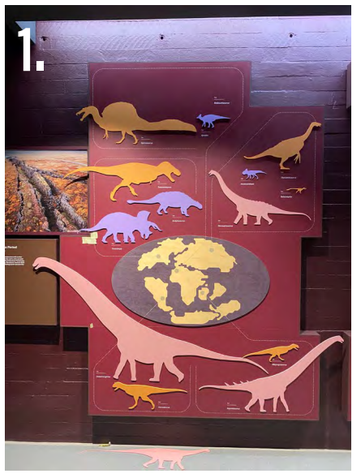
1. AND 2. DISPLAYS IN THE 'ORIGINS OF EARLY SOUTHERN SAPIENS BEHAVIOUR' EXHIBITION THAT PORTRAY FINDINGS FROM ARCHAEOLOGICAL RESEARCH IN THE REGION.

Mapungubwe Lecture Series

SANParks initiated the Mapungubwe Lecture Series a few years ago. This is an opportunity for the organisation to showcase what this World Heritage Site has to offer. After interruptions caused by COVID-19, the event was hosted once again in 2024. Invited guests were exposed to various heritage sites within the park, with the main attraction being the lecture that was delivered by Prof Munyaradzi Manyanga, a Dean of the Faculty of Science at the Great Zimbabwe University.

Kgodumodumo Interpretation Centre

Staff members within the Cultural Heritage Unit continued to share their expertise, serving as technical members of the committee finalising the Kgodumodumo Interpretation Centre. This centre, which is expected to be a major attraction in the area, celebrates the discovery of major palaeontological fossils from the Golden Gate Highlands National Park. The area has proven to be a major source of fossilised rocks from which dinosaurs and notably nestling sites have been found, containing large numbers of fossilized dinosaur eggs. A nomination dossier for one of these sites, Rooidraai, is currently being finalized, for submission to South African Heritage Resources Agency for their consideration in terms of it being graded and declared as National Heritage Site.



1. THE PALEONTOLOGICAL AND GEOLOGICAL INFORMATION IN THE CENTRE IS THE LATEST SCIENTIFIC INFORMATION BY TOP SCIENTISTS GLOBALLY. DISPLAYS SHOW HOW UNIQUE THE SOUTH AFRICAN DINOSAURS ARE RELATIVE TO THE REST OF THE WORLD. 2. THE DINOSAUR MASSOSPONDYLUS NEST WITH 7 EGGS (TWO SHOWING FULL DINOSAUR EMBRYOS); FOSSILS OF INTERNATIONAL INTEREST. 3. THIS DISPLAY SHOWS THE DILEMMA OF PALEONTOLOGISTS - HOW TO BUILD A DINOSAUR YOU'VE NEVER SEEN, IF YOU ONLY HAVE 20 BONES (SHOWED BELOW DINOSAUR).

Uncovering heritage: Archaeology in the far north of Kruger National Park

Text and photos by Jaco van der Spuy & Tim Forssman

The Pafuri region, at the northern tip of Kruger National Park where South Africa meets Zimbabwe and Mozambique, is one of the most archaeologically intriguing yet least understood landscapes in southern Africa. Long celebrated for its wildlife and dramatic scenery, Pafuri also holds a deep human history that stretches from the earliest Stone Age to the modern era. Yet, compared with other regions of Kruger, it remains an archaeological blank spot; a "forgotten landscape".

Over the past two years, a series of surveys led by University of Mpumalanga's Cultural and Heritage Studies department have begun to transform this picture. The work has documented over one hundred archaeological sites across the Pafuri section — the first systematic effort of its kind in this part in the park. These sites span hundreds of thousands of years, from Earlier Stone Age tools eroding out of riverbanks to rock shelters with Later Stone Age deposits and rock art, and extensive Iron Age settlements perched above the floodplains of the Luvuvhu and Limpopo Rivers.

Among the most striking results is the identification of several large walled hilltop settlements contemporary with Thulamela and Makahane, two of the most important palatial sites in southern Africa. Occupied between the thirteenth and seventeenth centuries AD, these centres were part of far-reaching economic and cultural networks that connected the Limpopo Valley to the East African coast and global Indian Ocean trade routes. The rise of Thulamela marked a dramatic transformation in the region's social and political landscape — a shift from small farming communities to powerful, stratified polities that controlled gold production, craft specialisation, and long-distance exchange. Despite its significance, Thulamela has never been properly contextualised within its broader regional setting. The new Pafuri surveys begin to fill that gap, revealing the density of occupation and complexity of settlement that surrounded this once-powerful kingdom.

The results also highlight Pafuri's long and layered past. Stone Age sites include the "Hyena Cave Complex", a cluster of rock shelters with Later Stone Age deposits, and one location showing both hunter-gatherer and early farmer rock art — rare evidence of interaction between forager and farmer communities. Later sites record the occupation of the Makuleke people, whose history is intimately tied to the landscape and whose forced removal from Pafuri in 1969 remains a powerful reminder of the politics of heritage and land in South Africa.

Early findings from a site at Gwalala Hill suggest that Gwalala represents one of the earliest farmer and trading communities in the region, providing crucial insights into how local exchange systems and early trade with the coast developed. Together, the surveys and excavations are helping to "populate the landscape" and understand not only isolated monumental sites but the broader web of everyday life that linked them.

The next phase of the project will employ drone-mounted LiDAR and multispectral analysis to extend the coverage of ground surveys. These technologies can penetrate vegetation and map subtle landscape features, revealing terraces, walls, and pathways hidden from view. Combined with targeted excavation and local collaboration, the aim is to build a comprehensive, multi-scalar reconstruction of how people lived, traded, and transformed this landscape over the last two millennia.

The emerging picture is of a region central, and not peripheral, to the story of southern Africa's past. Pafuri was a crossroads of peoples, technologies, and ideas, a place where hunter-gatherers, farmers, and traders each left their mark. By integrating traditional field archaeology with cutting-edge remote sensing, the project is not only rewriting what we know about Thulamela and its cultural milieu but also setting a new standard for landscape archaeology in southern Africa. As the surveys continue, Pafuri's long ignored history is being uncovered — a testament to the power of archaeology to illuminate forgotten histories and reconnect people with their deep and complex heritage.

OVER THE PAST TWO YEARS, A TEAM FROM UNIVERSITY OF MPUMALANGA'S CULTURAL AND HERITAGE STUDIES DEPARTMENT IS VISITING THULAMELA. THE TEAM HAS DOCUMENTED OVER ONE HUNDRED ARCHAEOLOGICAL SITES ACROSS THE PAFURI SECTION IN NORTHERN KRUGER NATIONAL PARK.

OUTREACH AND *INTERPRETATION*

Trails ranger Chris Muthathi greets an old friend at the Machayi pan in the north of Kruger National Park. Chris has an encyclopedic knowledge of tree names and distributions after accompanying botanic researchers for more than a decade. Photo courtesy of Ted Woods.

Being a "Scientist for a day" with Sinethemba Youth

Text by Michaell-Jade Meyer & Melanie de Morney , photos by George Sass & Melanie de Morney

To end off National Science Week, learners from the Sinethemba Youth Development Centre in Knysna were invited to the Garden Route National Park for some fun in nature. Scientific Services and Socio-Economic Transformation colleagues hosted the group in the Goudveld section where they participated in various biodiversity activities. One activity, "Ecosystem Jenga", was used to illustrate the connectedness of humans and biodiversity, demonstrating the ripple effect of removing pieces of the ecosystem and ultimately leading to collapse. Through this we could explain SANParks' important role in upholding the values and integrity of the natural environment.

The adventure continued as we made our way to Jubilee Creek picnic site. Here, we actively explored freshwater macroinvertebrates to check the health of the river through conducting a MiniSASS assessment. We demonstrated how we, as nature conservationists, investigate and find ways to protect and conserve our ecosystems and biodiversity.

To conclude the day, the learners received tokens of recognition for their enthusiastic participation. Their eagerness to learn and curiosity made the experience rewarding, leaving everyone with a sense of appreciation for caring for nature.

Learning Without Barriers: Kids in Parks brings all abilities together

Text and photos by Roxanne Erusan

In a novel twist on its annual Kids in Parks outreach, the SANParks Arid Team partnered with the Cape Leopard Trust to deliver an experience that went far beyond environmental education while assisting the Socio-Economic Transformation Officer in Mokala National Park. This year, the program brought together two groups who rarely get to learn alongside one another—children with disabilities and their typically developing peers.

The day centred around a visit from Re Tlameleng Special School, where some learners are blind, others are non-verbal, and many communicate using sign language. Joining them were children from mainstream schools.

Activity books and Braille books, generously donated by the Cape Leopard Trust and the Arid Team, ensured that every learner could engage with the material in a way suited to their needs. Scientific Services led an interactive presentation on river ecosystems, accompanied by a sign-language interpreter so that every participant could follow along.

By the end of the day, something remarkable had happened. The lines between "disabled" and "non-disabled" had faded. Children were laughing together, helping each other through activities, and discovering that learning from one another could be as rewarding as learning about rivers or wildlife. This approach reflects a core pillar of SANParks' Vision 2040: to make South Africa's national parks accessible and beneficial to all people, regardless of background or ability. The strategy emphasises social inclusion, community benefit, and fostering relationships across divides—and this program brought all three to life in one joyful, muddy-booted day.

Vision 2040 calls for active engagement with diverse communities and ensuring that national parks are not only conservation spaces but also social assets—places where people connect, heal, and grow. By deliberately mixing children of all abilities, SANParks is challenging outdated notions of who "belongs" in these spaces and proving that parks can be powerful classrooms for empathy and equality.

Perhaps most importantly, the day showed that accessibility isn't just about ramps, Braille, or interpreters (though those are vital)—it's about designing experiences where everyone can participate meaningfully. In this case, that meant adapting activities, thinking on the fly, and valuing each child's contribution. For the learners from Re Tlameleng and their mainstream peers, the day was more than an outing—it was a shared adventure that blurred boundaries and built bridges. For SANParks, it was a living example of Vision 2040 in action: conservation that serves, includes, and inspires all South Africans.

The Skukuza Science Leadership Initiative (SSLI)

Text by Donovan Tye, Laurence Kruger, Thandeka Mathenjwa & Phumlile Simelane, photos by Laurence Kruger, Donovan Tye and Benjamin Drummond

The Skukuza Science Leadership Initiative (SSLI) was established in 2013 as a partnership between SANParks, the Organization for Tropical Studies (OTS) and the Nsasani Trust. The initiative provides a platform for field-based training and research activities in Kruger National Park (Kruger), supporting skills development, applied research and collaboration between SANParks scientists and academic institutions.

Over more than a decade, the SSLI has expanded access to KNP for national and international academic and research institutions, supported sustained multi-level training, and increased participation by South African researchers and students. Since 2014, SSLI-supported programmes have engaged more than 3,000 participants across high school, undergraduate, postgraduate, and professional levels, reflecting the initiative's growing role in human capital development for the biodiversity and conservation sector.

The SSLI Campus: an award-recognized biological field station

A major milestone in the initiative's development was the establishment of the SSLI Campus in Skukuza, which officially opened in 2017. Developed and maintained through partner investment, largely supported through grant and donor funding, the campus provides a dedicated platform for training and research activities within and around the southern Kruger National Park. The campus comprises a purpose-built Science Centre, accommodation for students, researchers and faculty, and supporting infrastructure that enables sustained on-site teaching and research.

Throughout the planning and development of the SSLI Campus, attention was given to low-impact and sustainability principles appropriate to operating within a protected area. This included the incorporation of energy- and water-conservation systems, the use of recycled building materials, and infrastructure design approaches aimed at reducing the facilities' ecological footprint.

The SSLI Campus is registered as a biological field station with the Organization for Biological Field Stations (OBFS). In 2021, the campus received the OBFS Human Diversity Award, recognising its commitment to diversity and inclusivity in field-based programming.

Key Research Themes

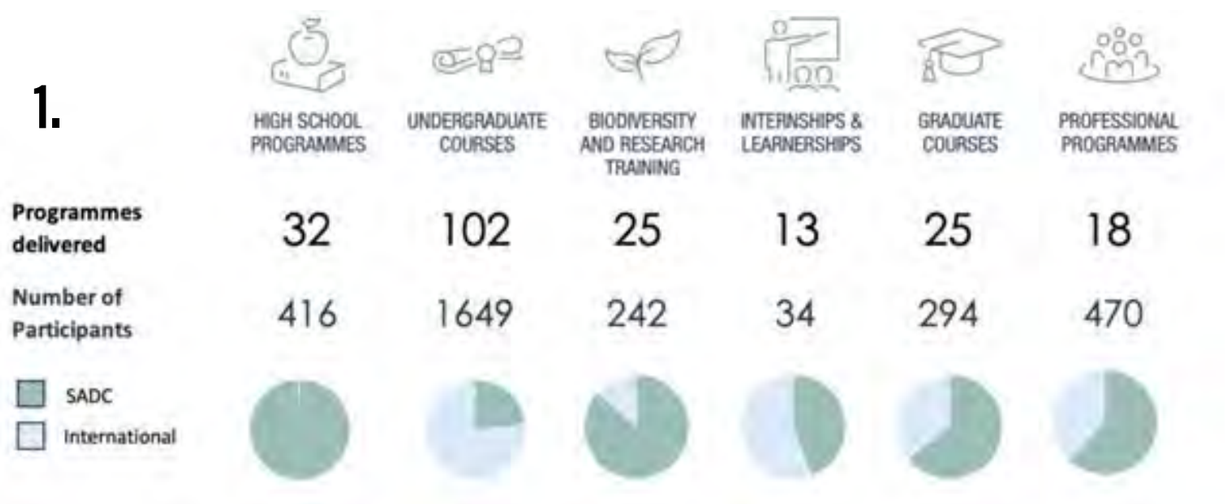
SSLI-supported research activities are intended contribute to management-relevant research in KNP. A substantial proportion of SSLI field-based programmes are linked to ongoing SANParks research and monitoring projects, including long-term vegetation monitoring, savanna ecosystem dynamics, and mega-herbivore impacts on biodiversity, particularly through the BROWSE Project.

Additional areas of focus include disease vector monitoring across land-use gradients and the application of emerging technologies in biodiversity monitoring. Many programmes are repeated over multiple years and contribute data to long-term datasets, supporting continuity in applied ecological research and strengthening collaboration between SANParks scientists and academic partners.

Looking ahead

Building on its establishment, the SSLI is entering a more focused phase of development as a platform for long-term research, training, and partnership-based programmes within a national park context. Ongoing programme refinement and planned facility enhancements are intended to support skills development, long-term monitoring, and data generation relevant to research and ecological observation initiatives in and around the Kruger.

1.



2.

3.

1. THE SSLI HAS DELIVERED OVER 220 PROGRAMMES DELIVERED AND PARTICIPANTS ENGAGED BY PROGRAMME TYPE (2014-2024). PIE CHARTS SHOW THE BALANCE BETWEEN SOUTH AFRICAN (SADC) AND INTERNATIONAL PARTICIPANTS.
2 AND 3. SOME OF THE FACES THAT HAVE PARTICIPATED IN SSLI COURSES OVER TIME.
4. THE SSLI CAMPUS WAS BUILT WITH LOW IMPACT AND SUSTAINABILITY FIRMLY IN MIND.

4.

Birding for Science: BirdLasser as a Monitoring Tool

Text and photo by Sharon Thompson

Citizen science encourages the public to engage in scientific research, by involving them in data collection and monitoring efforts. Citizen science offers individuals the opportunity to contribute meaningfully to avian scientific research, raises awareness of conservation issues and encourages the public to take an active role in bird conservation.

By reporting bird sightings and observing bird behaviour, citizens help scientists better understand population trends, species distributions, migration patterns, and the effects of climate change on bird life. This can be particularly helpful for monitoring birds across large geographic areas and over long periods of time. For example, the Southern African Bird Atlas Project 1 (SABAP 1) and SABAP 2 initiatives span across southern Africa, and date back 30 years. Scientists use this information to understand how birds are affected by habitat loss, alien invasive bird species, disease, climate, and other environmental changes.

Getting involved in bird citizen science is easy and can be a fun, educational activity for individuals or families interested in birdwatching. One of the most widely used tools in this field is BirdLasser, a mobile application that allows individuals to log bird sightings in real time. While not a project itself, BirdLasser supports various conservation causes and enables fine-scale data collection. Your participation can help track migration patterns, monitor nesting success, and detect changes in bird populations over time.

Do you love birding and want to make your sightings count for conservation? SANParks has teamed up with BirdLasser to launch a SANParks Scientific Services cause called “Birding for Science”. Getting started is easy.

1. Download the BirdLasser app – just scan the QR code below or find it in your app store.

2. Create your free account.

3. In the app menu, tap “Causes”, scroll down, and select “Birding for Science” by checking the boxes.

4. When visiting any of South Africa’s National Parks, open BirdLasser, tap the map icon, and choose the park you’re in under the “Birding for Science” cause.

BirdLasser

Spot. Plot. Play a part.

5. Start birding! Each time you spot a bird, record your sighting in the app. Add any extra info when prompted.

6. Want more help? Visit the BirdLasser iOS Quick Guide for step-by-step instructions.

Your contributions will be added to a growing database that is accessible to researchers, including SANParks scientists and managers, to refine monitoring and research programmes. These are used to provide critical insights to inform conservation strategies and management decisions.

YOUNG CITIZEN SCIENTISTS COLLECTING BIRD DATA FOR A CITIZEN SCIENCE PROGRAM CALLED BIRDLASSER.

COLLABORATIVE PLATFORMS AND CO-LEARNING WITH ONE ANOTHER

A KEY INGREDIENT TOWARDS REALISING VISION 2040

The reflection of a full moon shimmers across the Langebaan lagoon in West Coast National Park. To this day, this jewel of the West Coast continues to support traditional fishing practices.

From Helicoptering "in-and-out" to Engaging Local Partnerships

Text by Izak Smit, Roberto Fernández, M. Fernanda Menvielle, Dirk Roux, Nikisha Singh, Samantha Mabuza, Mbali Mthombeni, Nicholas Macgregor, Herve Fritz, Edson Gandiwa, Llewellyn Foxcroft & Carly Cook

When doing conservation research in protected areas (PAs) and national parks (NPs), researchers can fly in and out with little engagement or collaborate meaningfully with park staff and local institutions. In our recent study—a partnership between SANParks, three other national park agencies, and two universities—we explored these two research "modes" and found a hopeful message: collaboration between local and international researchers, and between PA and non-PA staff, is not only possible, but beneficial to all involved.

Our study focused on the concern of parachute science—when external researchers, often from high-income countries, conduct studies without properly involving local collaborators. Surprisingly, we found no previous studies that explored parachute science specifically within a PA context or offered ways to reduce its occurrence in this context. We aimed to fill that gap. We took a case study approach, reviewing about 100 recent papers from each of three iconic national parks: Kruger National Park (South Africa), Nahuel Huapi National Park (Argentina), and Kakadu National Park (Australia). We compared patterns in authorship affiliations, funding sources, citation rates and journal impact factors, not just to examine the prevalence of parachute science, but to also highlight examples of collaborative science and how this may increase the reach and impact of the research. Our analysis revealed some unexpected findings that offer a more nuanced perspective on global research collaboration than the oversimplified one-sided narrative that typically dominate this discussion.

Parachutes and Pitfalls

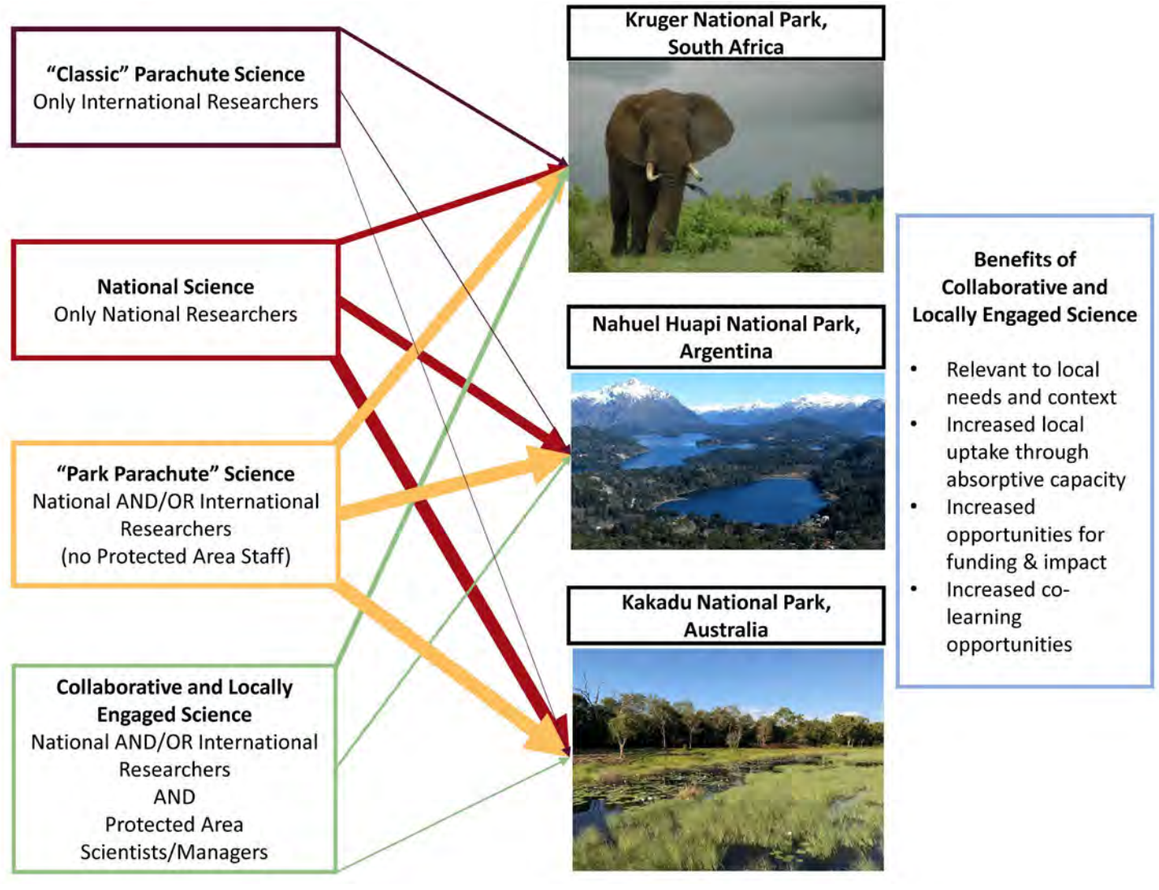
Our results revealed stark contrasts. In Kruger NP, 18% of publications had no South African authors. In Nahuel Huapi NP, this figure was just 4%, and in Kakadu, 2%. While these numbers might suggest external dominance in Kruger, the story doesn't end there. Here's the twist: Kruger also had the highest rate of collaboration—35% of papers included both national and international authors, double the rate seen in Kakadu. While Kruger clearly attracted more international interest and was therefore more at risk of parachute science, however, in this dynamic lies opportunities for collaboration between South African and international researchers.

A more widespread concern was that local park agency staff were often not involved in research outputs. Between 10% (Kakadu) and 32% (Kruger) of papers included authors affiliated with the PA's managing authority, but most of the remaining papers did not even mention park staff, or the support provided by park staff in the acknowledgement section of the paper. We've coined the term "park parachuting" to describe this pattern—when researchers, regardless of nationality, overlook the opportunity to include park staff in their research.

Why Collaboration Matters

PA managers should be one of the prime end-users of research conducted in parks. If the park staff are not part of the research, there is a risk that the research may be irrelevant and/or may not be taken up by the park. Conversely, when park staff, whether scientists or managers, are involved from the start, external researchers will be more likely to identify and address potential practical applications of their work, to earn local support, and to establish communication channels to influence management.

We suggest that co-producing knowledge—not just sharing results afterward—will make a difference in the research being conducted, the way it is contextualised, and its eventual impact and uptake in the parks. We also found that collaborative, internationally funded research tended to be published in higher-impact journals and cited more often,



especially in the case of Kruger and Nahuel Huapi National Parks. Respectful partnerships can therefore amplify both academic influence and local benefit.

Solutions from the Parks

Each case study park offered useful examples of how to reduce parachute science and foster collaboration:
Kruger NP annually hosts the Savanna Science Networking Meeting, which brings together hundreds of local and international researchers and park staff each year, and this has given rise to many productive collaborative projects over the years. SANParks also pairs each new external project with an internal scientist, turning project registration from a bureaucratic process into a platform for co-design and alignment with park priorities.

Nahuel Huapi NP has invested in partnerships with local universities and offers on-site facilities and office space as well as scholarships for Argentinian students—building a vibrant, locally grounded research culture.

Kakadu NP uses advisory committees that include Indigenous representatives and park staff. Projects are co-designed through programs like the National Environmental Science Program and researchers must submit non-technical summaries of their results to ensure accessibility and encourage assimilation by park staff.

Reference:
Smit IPJ, Fernández RJ, Menvielle MF, Roux DJ, Singh N, Mabuza S, Mthombeni BM, Macgregor NA, Fritz H, Gandiwa E & Foxcroft LC. 2025. From parachuting to partnership: Fostering collaborative research in protected areas. Journal of Applied Ecology 62(1): 28-40.

ACCESS THIS PAPER, WHICH WAS ALSO VOTED BEST SANPARKS SCIENTIFIC PAPER OF THE YEAR AT THE QR CODE BELOW:

Making tough decisions in the face of unprecedented change

Text and Infographic by Emma Wright & Nicola van Wilgen-Bredenkamp

At a 2024 workshop in Stellenbosch, experts highlighted the growing threat of extreme climate events, and identified key areas for coordinated national action, improved funding, and proactive adaptation strategies to safeguard biodiversity and infrastructure.

Although storms, heatwaves, fires, and floods have always occurred, these events are becoming more frequent, and their severity and duration is increasing. Experts gathered in Stellenbosch, in May 2024 to discuss integrated responses to Extreme Climate and Weather Events (ECWEs) in developing economies. SANParks engaged in these discussions, presenting on the impact of extreme events on conservation. ECWEs can be devastating for protected areas (PAs), by degrading ecosystems, increasing risks for staff, communities and tourists, and accelerating weathering of cultural heritage sites. Their impact is however felt most on infrastructure such as roads, bridges, camps and staff housing that stretches limited resources, blocks access and diverts funds from conservation management. There are a variety of adaptation options that range from scenario-based planning and protected area expansion to priority clearing of alien invasives and infrastructure and species-specific interventions. However, difficult trade-offs and limited capacity to act swiftly remain a reality.

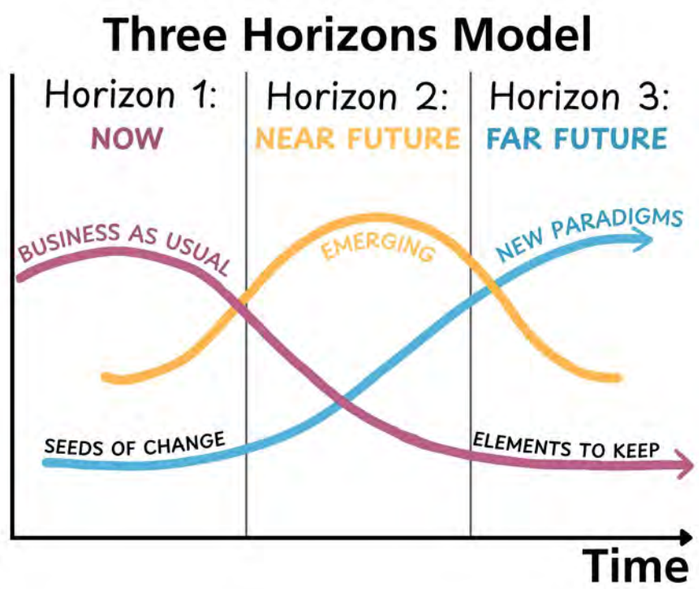
Recommendations were proposed for South Africa, which included establishing a coordinating body, launching a national research program, and improving funding mechanisms for ECWE preparedness and response. These proposed recommendations will contribute to a strategy for effectively managing the impacts of extreme events in South Africa.

THE POSTER PRESENTED BY THE SANPARKS TEAM AT THE CONFERENCE: ALTHOUGH THERE ARE A VARIETY OF ADAPTATION OPTIONS FOR PROTECTED AREAS IN RESPONSE TO IMPACTS FROM CLIMATE EXTREMES, MANAGERS AND PRACTITIONERS STILL FACE DIFFICULT TRADE-OFFS WITH LIMITED CAPACITY TO ACT SWIFTLY.

Exploring Conservation Futures in Africa

By Wendy Foden

Wilderness Foundation Africa's 2024 workshop in Gqeberha gathered African conservation experts to explore future challenges and solutions. Participants developed a shared vision for sustainable conservation, emphasising the integration of ecological, social, and economic factors and the need to strengthen futures-thinking across the sector.



THE THREE HORIZONS FRAMEWORK FACILITATES AN UNDERSTANDING OF HOW CHANGE MAY TAKE PLACE. EACH HORIZON REPRESENTS A POINT IN TIME, INCLUDING THE PRESENT AND FUTURE AND A STATE OF TRANSITION BETWEEN THESE.

Wilderness Foundation Africa (WFA) hosted a landmark workshop in Gqeberha titled "Exploring Conservation Futures in Africa" from 29 September to 1 October 2024. Facilitated by Profs. Nicholas King and Laura Pereira, the event convened leading African experts in conservation and 'futures thinking' to explore how the continent can respond to rapidly evolving global and local environmental challenges.

The workshop centred on understanding the major trends and transformational forces shaping Africa's future, including climate change, urbanisation, demographic shifts, food security, and the use of natural resources like critical minerals. Participants highlighted key knowledge gaps around these drivers and discussed strategies to address them.

A central feature of the workshop was the introduction of the "Three Horizons" framework—a tool for envisioning long-term change while developing realistic, actionable pathways forward. Through this lens, participants collaboratively developed a positive vision for the future of African conservation.

A strong consensus emerged that future conservation efforts must integrate ecological, social, political, and economic considerations. Strengthening futures-thinking capacity across the African conservation sector is crucial for enabling the transformative shifts required for long-term success.

Growing and Grooming at Grantham provided energy and inspiration for Scientific Services through deliberate dialogue and reflection

Text and photos by Stef Freitag-Ronaldson

The seed for a Grow and Groom event for the Garden Route, Frontier & Marine Research Unit was planted and watered in 2024, and finally germinated in mid-February 2025. The purpose of this get-together of a large contingent of colleagues of the unit, was 'learning from the past to energise and inspire us, understanding what motivates and drives us and articulating a positive future for our unit and Scientific Services'. Various colleagues lead sessions which enabled diverse approaches as leaders were drawn from across the unit's diversity spectrum (age, experience, race, gender, and job function). Every attendee was expected to contribute, including some preparation beforehand, in the spirit of non-judgemental and honest dialogue, sharing and learning together.

Seven working sessions were interspersed with various activities that reconnected the colleagues who are usually widely scattered across the Garden Route and Frontier regions, these included a walk, sundowner drive, evening braais and card games. Purposeful reflection through photovoice (i.e. narrating an experience around a photo from a job experience from 2024) generated an appreciation for what motivates and enthuses each of us and allowed the sharing of the joy of our jobs. The value of looking back by reflecting on what we've learned was facilitated through a knowledge harvesting session. Each participant shared something that shifted their perspective or deepened understanding of their work and/or conservation generally over the past year. This could be practical, technical or philosophical, at any scale and from any source - a paper, book, quote, talk, graph, field experience, etc. This recognises that we all learn in different ways and on different occasions.

Two sessions focussed on careers. The first aimed to inspire, energise and motivate one another through shared stories of the events, people and opportunities that have shaped our careers, and to better understand our diverse contexts at work. It highlighted the critical role of mentorship and exposure to transformative events such as symposia (e.g. GRIN) and fieldwork. Staff generally saw themselves in one of three phases: (i) uncertain where to next; (ii) generally satisfied, but wanting more, especially field time (also for office-bound colleagues); (iii) excited, with a contagious passion to be shared and spread. The issue of career advancement is cross-cutting and critical, especially in a cohort of self-motivated, passionate staff with very low turnover. A further group discussion session focussed on what makes staff happy in the workplace, identifying areas for improvement and sharing approaches to individual coping mechanisms.

Two practical sessions followed, namely brainstorming proposed contributions to the 2024/25 research report, and looking ahead to 2025/26 to chart the diverse deliverables and commitments over and above general work schedules. The aim was to generate a shared understanding of what the group's workload looks like ahead, facilitate coordination and assist in prioritising resources in the unit.

The closing session was forward-looking through the lens of "jointly envisaging what a happy and successful 2025 looks like for our unit". "Appreciative enquiry" was used as a technique to stimulate discussion around three questions, whereafter colleagues reflected and articulated their vision for a good year ahead for the unit. 'Grow and Groom at Grantham' was a time of reflection, appreciation and sharing – sharing our humanness, our challenges, our strengths and our weaknesses. It aimed to allow us to inspire and re-motivate ourselves and one another, and build a sense of connection, trust and common vision for the group and our unit. Several simple yet powerful initiatives and opportunities were identified, and each member of the team should feel empowered to take up or lead on any one of these.

Reference:

Freitag-Ronaldson S, Roux D, Smit I, Lawrence C, Hayes J, Mpapane N, de Morney M, Petersen R, Rikhotso D, Durrheim G, Kruger N, Bissett C & McCabe H. 2025. Growing & Grooming SANParks' science function: Garden Route, Frontier & Marine Research Unit's Grow & Groom Event, Karoo National Park, 19-21 February 2025. Internal Report 10/2025, Garden Route, Frontier & Marine Research Unit, South African National Parks, Knysna. 30pp.

FORMAL SESSIONS WERE HELD INSIDE AND OUTSIDE, PREPARED FOR AND LEAD BY DIFFERENT MEMBERS OF THE TEAM. GROW AND GROOM WITHIN SCIENTIFIC SERVICES THE SPACE AND TIME TO REFLECT, TO PLAN, TO DREAM, TO BUILD TRUST, TO BECOME INSPIRED AND TO CONNECT - WITH EACH OTHER, WITH THE PAST AND WITH THE FUTURE.

COLLABORATION AND CO-LEARNING

A vibrant and innovative science function: what are the key ingredients?

Text by Stef Freitag-Ronaldson

What is the Michelin Star?

A michelin star is awared to a restaurant that is serving exceptional cuisine and is assessed on five universal criteria:
1. ingredient quality
2. mastery of flavour and cooking techniques
3. chef's personality in the cuisine
4. flavour harmony
5. consistency

SANParks' diverse science function fulfils many roles within the organisation, and in the wider worlds of science and conservation. This requires individual talent, commitment and hard work from science staff, as well as group cohesion and a mixing of skills, experience and strengths to achieve a wide range of outputs and outcomes. The ideal outcome is like delivering a menu with a diversity of good quality meals – wholesome ingredients prepared by excellent cooks in a fit-for-purpose kitchen with a good dose of flair and personal touch for appreciative diners! Drawing on purposeful reflection and appreciative inquiry at a Grow and Groom event* in early 2025, colleagues surfaced what contributes to a vibrant and innovative science function that serves a menu worthy of Michelin Star status.

The winning recipe:

Basket of quality ingredients:

- ✓ Collegial team with diverse skills
- ✓ Grounded in strong and diverse disciplinary fields and analytical expertise, yet adaptable and flexible
- ✓ Value the privilege to do meaningful work in various national parks surrounded by nature
- ✓ Freedom to operate as a creative science function with time to think, read and follow our enquiring minds
- ✓ Self-motivated, passionate staff with low turnover and inspiring colleagues
- ✓ Exposure to transformative events such as key symposia
- ✓ Workplace culture promoting professional development and ongoing learning, including opportunities to travel and to engage in dialogue that does not necessary agree with the status quo
- ✓ Expert and caring supervision and mentoring enhances work experience and job satisfaction

Method of combining ingredients to produce the Michelin-star menu: :

1. Deliberately creating time together to allow ideas to mix, developing shared understanding and
2. appreciation of different disciplines, strengths, and perspectives.
   Slowly building personal relationships and social capital, recognising these as essential binding agents in how we work and what we achieve.
3. Celebrating scientific discovery, perseverance, collaboration, and personal growth, whether through fieldwork, mentorship, overcoming challenges, or engagement with colleagues.
4. Providing space to let ideas develop, supporting intellectual wellbeing and creative thought.
5. Regular reflection, allowing us to learn from past experience while inspiring and energising future work.
6. Seasoning with respect, positivity, appreciation, support, and clear communication, ensuring a balanced and sustaining environment.

Combining these ingredients and basic recipes in our appropriately resourced kitchens allows us to stimulate and re-motivate ourselves and one another, and build a sense of connection, trust and common vision for our groups, to deliver a truly inspiring and unique menu. Through this carefully crafted menu of abilities, we can ensure that discerning diners enjoy the effectiveness and reach of SANParks' research teams and their endeavours, supporting cutting-edge conservation science and evidence-based management.

Reference:
Freitag-Ronaldson S, Roux D, Smit I, Lawrence C, Hayes J, Mpapane N, de Morney M, Petersen R, Rikhotso D, Durrheim G, Kruger N, Bissett C & McCabe H. 2025. Growing & Grooming SANParks' science function: Garden Route, Frontier & Marine Research Unit's Grow & Groom Event, Karoo National Park, 19-21 February 2025. Internal Report 10/2025, Garden Route, Frontier & Marine Research Unit, South African National Parks, Knysna. 30pp.

COLLABORATION AND CO-LEARNING

Co-producing knowledge with a GRIN - 6th annual Garden Route Interface and Networking (GRIN) symposium

Text by Dirk Roux, Stef Freitag-Ronaldson, Victor Mokoena and Nerina Kruger, photo by Johann Kruger

DELEGATES AT GRIN 2024 (1-3 OCTOBER 2024) WITH THE KNYSNA ESTUARY IN THE BACKGROUND. GRIN'S SOCIAL-ECOLOGICAL SYSTEMS PHILOSOPHY RECOGNISES THE INTERTWINED RELATIONSHIP BETWEEN PEOPLE AND NATURE.

GRIN 2024 brought together more than 90 practitioners and researchers from diverse contexts to share experiences and generate new insights about the management, research and sustainability of social-ecological systems. Held for the first time at Villa Castollini, between Knysna and Brenton-on-Sea, GRIN is a partnership between SANParks, Nelson Mandela University's Sustainability Research Unit, the French Centre National de la Recherche Scientifique (CNRS) and international research laboratory REHABS, and the Southern African Programme on Ecosystem Change and Society.

True to character, GRIN 2024 combined about 50 presentations and five hours of frank dialogue with informal socialisation to blend diverse perspectives into a transformative learning experience. Session themes included pathways to socially just, diverse, equitable and resilient futures, and transformative conservation landscapes, seascapes and urban-scapes as mechanisms towards a Good Anthropocene. A sundowner, GRIN dinner and mid-symposium field excursion created the informal space for further social and relational learning.

GRIN's social-ecological systems philosophy recognises the intertwined relationship between people and nature while acknowledging that they have both positive and negative effects on one another. This aligns with SANParks' recently launched Vision 2040, which envisions further integration of national parks into integrated land- and seascapes through a 'people and nature' perspective on co-existence and equitable sharing of conservation benefits. Various presenters and discussions referred to the newly launched vision throughout the course of the meeting.

TheMuseumsLab 2024 hosted by SANParks

Text by Nkateko Silinda & Nikisha Singh, photo by Nikisha Singh

THE GROUP THAT HOSTED THEMUSEUMSLAB 2024 AT SKUKUZA BIOLOGICAL REFERENCE COLLECTION FACILITY. THEMUSEUMSLAB IS AN INTERNATIONAL EXCHANGE AND LEARNING PLATFORM DESIGNED TO FOSTER COLLABORATION BETWEEN AFRICAN AND EUROPEAN MUSEUM STAFF.

Kruger National Park and Mapungubwe National Park World Heritage Site had the privilege of hosting TheMuseumsLab 2024 residency programme, as part of the growing network of African partner museums. TheMuseumsLab is an international exchange and learning platform designed to foster collaboration between African and European museum professionals. The programme aims to bring people from diverse environments together to share ideas and experiences, and to create dialogue around contemporary museum practices and the shared management of cultural and natural heritage. Furthermore, the event in November 2024 enabled the exploration of innovative approaches to museum practices in protected areas.

TheMuseumsLab residency aims to foster lasting professional relationships and strengthen institutional ties across Africa and Europe. TheMuseumsLab continues to build bridges between individuals, institutions, nations and two continents for an engaged discussion on how museums can confront their past, meet the present needs of society and work towards an equitable future. The successful hosting of TheMuseumsLab 2024 residency at these two iconic South African parks further highlights the important role that protected areas play in cultural heritage preservation, international collaboration, and capacity building for the museum sector.

STAFF NEWS AND *EXPERIENCES*

A researcher takes refuge in the coolness of evening during a survey of Richtersveld National Park's Quiver Trees (Aloidendron dichotomum). Scientists and Rangers have been working side by side to measure the health of the trees since surveys began 25 years ago. The once healthy population of Quiver Trees have plummeted over the years exacerbated by the effects of climate change.

Ian Russell retires after almost four decades of contributions to SANParks

Text by Stef Freitag-Ronaldson

Ian's passion for the management and preservation of SANParks' aquatic ecosystems started as field ecologist, surveying freshwater fish across many national parks. **Now, almost four decades later, Ian has retired from his position as Senior Scientist:** Aquatic Ecology in Scientific Services at the end of July 2024. His talent as field ecologist, extensive aquatic ecosystems knowledge and rigorous yet calm thinking has permeated his long and dedicated career at SANParks.

Based at Rondevlei for over three decades, Ian leaves a legacy of dedication to aquatic conservation. His time in SANParks spans many diverse years – starting as a young conservation student in Addo Elephant National Park, then PhD researcher in Kruger, followed by 34 years of permanent employment as scientist by SANParks. Ian's attention to detail, patience and mentorship have nurtured many young scientists, instilling passion and dedication for aquatic conservation.

Ian's scientific career is characterized by over 30 peer-reviewed journal articles and book chapters, many first-authored. These cover freshwater fish, aquatic birds, water quality and vegetation changes in estuaries, RAMSAR lakes and long-term biodiversity monitoring. Notably, Ian represented South Africa at the international RAMSAR Commission for the Conservation of Wetlands, which is an acknowledgment of his expertise and commitment to global wetland conservation efforts.

We acknowledged and celebrated a lifetime's dedication to aquatic conservation and Ian's steadfast commitment to SANParks and Scientific Services in three phases. A night at Fountain Shack in the wilds of Robberg Nature Reserve, where the land dramatically meets the sea, enabled unhurried time together. The most beautiful sunset and a shared experience at the ocean's edge provided a humble yet meaningful time of reflection and appreciation of Ian's career in SANParks. Then, nourishing Ian's enjoyment of good coffee, research and management colleagues joined Ian for an unhurried collegial 'good cuppa coffee' and chat in Sedgefield, not to say farewell or goodbye, but rather 'till we see you around the Garden Route'. On 31 July, we had another get-together at Rondevlei to send Ian off in celebratory fashion. Colleagues, many of whom have worked closely with Ian for many years in various capacities, toasted his last day at work and very impactful career in conservation.

In December 2024 SANParks also officially honoured and celebrated Ian's long-term impact when he received the coveted Kudu award for a lifetime contribution to the organisation. We say a humble but very sincere thank-you and go well to Dr Ian Russell who leaves a deep spoor in the Garden Route!

IAN'S MONITORING OF WATERBIRDS ON THE GARDEN ROUTE LAKES AND ESTUARIES LEAVES A LEGACY OF LONG-TERM DATA AND POPULATION TRENDS.

Farewell to Dr. Hugo Bezuidenhout: Botanist, Mentor, Legend (and Occasional Plant Whisperer)

By Nkabeng Mzileni

After 35 years of turning dirt and flora into data, Dr. Hugo Bezuidenhout retired from SANParks. While the plants may not miss being classified, the rest of us surely will miss his wit and wisdom.

Dr. Hugo wasn't just a scientist—he was a soil-detective, a cycad crusader, and a taxonomic trail-blazer. Whether he was deep in the veld or writing peer-reviewed journal articles, of which he produced over 90, Hugo approached every challenge with curiosity, integrity, and that unmistakable spark that made botany feel like an adventure. He mentored students, built herbaria, and somehow made taxonomy fun even for a zoologist? A rare feat indeed.

His greatest legacy is the balance he struck—between science and family, rigour and kindness, precision and humour. He showed us that you can make a difference without taking yourself too seriously.

As Hugo moves on to new endeavours, we thank him—for the years of insight, inspiration, and infectious laughter. May your garden always bloom, your wine never run dry, and your grandchildren never mistake a cycad for a weed.

Happy retirement, Hugo! You've earned it.

Two graduations. Well done!

Ruth-Mary Fisher

Pursuing a PhD wasn't originally my plan, but I'm grateful for the journey – one marked by faith, determination, resilience, and plenty of tears. It started smoothly, until COVID changed everything. In August 2021, my supervisor, Prof. Shayne Jacobs, passed away. I didn't realise it at the time, but I was depressed for months after he passed. Thankfully, Prof. David Le Maitre stepped in to guide me and despite his own illness was positive that he would be able to help me complete the work. He made a significant impact before sadly passing away in December 2022. I was heartbroken and sat at my desk and cried when I heard the news. But God was good and sent me Dr. Chad Cheney, who came on board to assist with restructuring the thesis in 2023, and, along with Prof. Francois Roets, helped me push through. I submitted in November 2024 and graduated in March 2025.

It's been a tough road – but Mamma, I made it!

AFTER HARD WORK, DEDICATION AND SADNESS ALONG THE WAY, RUTH-MARY GOT TO WEAR THE RED PHD GOWN IN MARCH 2025.

Nokukhanya Mpanza

Another year, another qualification in the bag. Nokukhanya (Khanyie) Mpanza, a Biotechnician based at Skukuza's Savanna Research Unit has graduated with her Postgraduate Diploma in Nature Conservation. Following her Advanced Diploma qualification awarded in 2024, Khanyie enrolled for her Postgraduate Diploma in Nature Conservation at the University of Mpumalanga (UMP) to further her studies. In her pursuit of knowledge, she is currently enrolled for her Master's degree at UMP.

KHANYIE AT HER POSTGRADUATE DIPLOMA GRADUATION CEREMONY AT THE UNIVERSITY OF MPUMALANGA

Siboniso Thela joins the Arid team

By Nkabeng Mzileni

Siboniso Thela is a dedicated conservationist with a strong background in wildlife research and environmental monitoring. He began his journey with SANParks as a Work-Integrated Learning (WILL) student in 2015 while completing his BTech in Nature Conservation at Tshwane University of Technology.

He went on to pursue a MSc in Zoology at the University of Venda, focusing on the impact of transport infrastructure on wildlife in Balule Nature Reserve. Siboniso has worked with various conservation organisations including the Endangered Wildlife Trust, Transfrontier Africa, and the Inkawu Velvet Project.

He returned to SANParks in 2024 and held roles as an environmental monitor, field ranger, and research assistant in protected areas such as Marakele, Addo, and Kgalagadi. In July 2025, he was appointed as a Biotechnician for the Arid region. Known for his organisational skills and adaptability, Siboniso contributes meaningfully to ecological research and biodiversity monitoring across South Africa's arid landscapes.

Hard work during honours rewarded

By Tsholofelo Wechoemang

I am currently a Skilled Environmental Monitor at Kimberley Scientific Services, Arid Research Node. I joined SANParks in 2024 through the EPWP Environmental Services Programme, and gained valuable experience under Mr Hendrik Sithole (Invertebrate Ecologist).

During the same year, I was awarded my BSc (Hons) Biological Science (Zoology) degree with the title "Investigating the success of ecosystem rehabilitation using ground-dwelling arthropods at Mokala National Park, South Africa". In recognition of academic excellence and dedication to the field of zoology, I was awarded the "Best Performing Student in BSc (Hons) Biological Sciences (Zoology)". This prestigious award underscored my dedication to scientific inquiry, ecological understanding, and my ongoing pursuit of excellence. My current interests are in entomology and land rehabilitation, fields which I intend to pursue further for my master's degree. I aim to contribute to the sustainable management and restoration of South Africa's diverse natural environments and I am looking forward to actively apply my academic background to address real-world environmental challenges as I continue to develop my skills in conservation science.

Next stop, Montreal: Reflections from PECS-3 and the early career researchers' course

By Nelsiwe Mpapane

In August 2024, the Programme on Ecosystem Change and Society (PECS), the Resilience Alliance, and NSERC (Natural Sciences and Engineering Research Council of Canada) ResNet co-hosted a pre-conference course for early-career researchers, alongside the major international social-ecological systems conference, PECS-3, in Montreal. The short course introduced research methods commonly used in studying social-ecological systems, with a special emphasis on participatory and place-based approaches. The conference itself hosted hundreds of researchers, experts, policymakers, practitioners, traditional leaders, and conservation advocates from across the globe.

Under the theme "Pathways to Sustainability", PECS-3 challenged us to reflect on the diverse pathways that can transform sustainable development amid the multiple, intertwined challenges we face today. Among the many exceptional sessions and keynote discussions, some of the most significant highlights for me included presentations on collaborative work involving SANParks, insights into participatory methods for resilience and sustainability science, and globally shared insights from place-based studies in the Garden Route National Park.

Across both events, a powerful reminder echoed across the various spaces of engagement; what once felt like a distant concern is now the very ground shaking beneath all of us. Knowledge will always accumulate, but having all the knowledge does not mean we are shielded. What matters most is how we act on what we know, and for now, the collective spark to act is what we are still missing.

PARTICIPANTS AND COORDINATORS OF THE 2024 COURSE ON SOCIAL-ECOLOGICAL RESILIENCE AND SUSTAINABILITY METHODS IN CANADA. PHOTO BY HANNAH MARLEN.

Two Conferences – two vastly different experiences

Text by Kyle Smith

KYLE SMITH ATTENDED THREE CONFERENCES AND COMPARE TWO OF THEM; ONE SMALLER, LOCAL CONFERENCE AND ONE LARGE INTERNATIONAL CONFERENCE. BOTH HAD POSITIVE AND NEGATIVE ASPECTS, BUT HE CAME TO THE CONCLUSION THAT HE IS MORE OF A SMALL CONFERENCE PERSON!

There are many potential benefits from attending and presenting at academic conferences, including greater exposure of your work and receiving valuable feedback, networking opportunities with specialists in your field, being exposed to new ideas and research trends, and finding opportunities for collaboration. But conferences vary greatly in level of organisation, size, format, and scope, which in combination with how well organised you are before attending the conference, may influence the type and level of benefits gained.

In 2024, I was lucky to attend three academic conferences of vastly different sizes, scopes and approaches. Each was a distinct experience and hit home the benefits each type of conference could provide. I would like to compare two of them.

The first was the 6th Garden Route Interface and Networking (GRIN) Symposium hosted in Knysna at Villa Castollini. The venue was small, picturesque, and all lunch meals and teas were served on site. Held over three days, with around 100 delegates and 50 presentations, the symposium is still relatively small.

Being small meant 1) there were people that I knew (and thankfully liked) with whom I could reconnect and have some good conversations, 2) all the presentations were held within one room, so everyone could listen to each other, 3) the organisers had specifically increased the amount of time available for discussions to enable greater engagement, and 4) spanning social and ecological dimensions and the science-practice interface, delegates and their experiences/knowledge were diverse which promoted engaging and sometimes eye opening dialogue.

On the second day, an afternoon of free outdoor activities was organised, which were led by local delegates. Overall, it felt, and participants acted, like an inclusive and well-knit community.

The second conference was the 7th International Marine Conservation Congress (IMCC). Organised by the Society for Conservation Biology's Global Marine Program and held every two years, it is globally the largest interdisciplinary ocean conservation meeting with a professionally diverse audience of over 800 delegates and hosting more than 40 sub-symposia. Two days of pre-meetings and focus groups were followed by five days of multiple parallel sessions and evening events. There were some amazing presentations, some great discussions, and a huge amount of knowledge shared. But the week was busy, almost frenetic. Even when I was not moving between venues, many others were. It was an environment of speed and rigid time control, which flustered my brain to some degree and contrasted with the desire to slow and engage more deeply with a presentation or topic. It was a nine-

lane highway with no layovers. There was no time for reflection and consolidation of ideas.

I think the venue contributed to my disquiet. The conference was hosted at the Cape Town International Conference Centre. Presentation rooms differed in size, and sometimes the interest generated by a session or talk, resulted in overfilled rooms, queues at doors, and visible frustration for some delegates. Due to the large number of delegates, the size of the venue, and the jam-packed programme, I found it difficult to network and have meaningful conversations with presenters whose work related to mine or that I had found particularly interesting. In contrast, I found the poster sessions refreshing and the presenters keen and willing to engage. A final thought on IMCC was that almost everything (pre-meetings, evening events, excursions etc.) were at an extra cost, which tends to be exclusionary for students and researchers on limited budgets.

The two conferences were vastly different and provided unique experiences. It was fantastic to attend the IMCC and I am grateful for the opportunity. A lesson learnt when attending these larger conferences is the importance of spending time before the conference in scrutinising the programme and getting to grips with the conference app and website. Being adequately prepared and learning how to utilise the app functions to make connections, keep up to date on developments, and plan your conference certainly enables you to benefit more from the experience.

Where would I go next? Large international conferences are exciting and diverse but oh so busy and ultimately, I prefer country roads and smaller conferences like GRIN, which enable greater engagement and don't leave my brain feeling overused and slightly abused.

Association of southern African Professional Archaeologists

Text by Ndukuyakhe Ndlovu

Members of the Cultural Heritage Unit attended the biannual conference of the Association of southern African Professional Archaeologists (ASAPA) that was held at the National University of Lesotho, in Maseru. Such platforms are an opportunity for SANParks to showcase research opportunities, as well as supporting researchers currently working within our national parks with the presentation of their findings. The next ASAPA conference will be held at the University of Mpumalanga, neighbouring the Kruger National Park.

Reflections from the Garden Route's Groen Sebenza Interns

Text by Noxolo Njapha, Ntando Majola and Philasande Mambalu, photos by Cloverley Lawrence

Noxolo Njapha

This internship, undertaken through the SANBI Groen Sebenza Programme which placed me with SANParks Scientific Services, has been a defining experience in shaping my path toward becoming an estuarine ecologist. I was fortunate to be guided by Kyle Smith, an exceptional mentor whose support and leadership fostered both personal and professional growth. I gained hands-on experience in biodiversity and water quality monitoring and contributed to projects that deepened my understanding of estuarine systems. Being part of a dedicated team within SANParks Scientific Services was both a privilege and an inspiration, an experience that reaffirmed my passion for conservation, equipped me with skills essential to my career development, and opened doors to meaningful career opportunities.

Ntando Majola

Being part of the Groen Sebenza programme gave me the opportunity to grow both personally and professionally. I arrived curious, eager to learn and unsure of what to expect but I finished the programme confident, more skilled, and deeply inspired by the people and the places around me. What stood out most was the kindness of colleagues and the pride the community takes in their natural heritage. I am incredibly grateful to SANParks for the role they played in shaping me. Now, I return as a Junior Scientist Intern in SANParks Scientific Services, ready to face new exciting challenges with confidence.

Philasande Mambalu

Being part of the Groen Sebenza programme hosted by SANParks has been a great privilege. I have had the opportunity to explore different aspects of conservation such as terrestrial ecology, estuarine ecology, data analysis and report writing. I will forever be grateful for the opportunity to learn in a safe space with supportive and kind mentorship. The Groen Sebenza internship was a first step to an opportunity beyond my wildest imagination, being a junior scientist within an organisation with work culture that instils great work ethic and generally makes my weekday full of fun and learning.

Featuring Frontier technicians

Joshua Rogers

Employed as: Black Rhino Monitor, Addo Elephant National Park. **Employment date:** 01 June 2025

Favourite part of the job: My favourite aspect of the job undoubtedly lies in the rhino we work with and the fieldwork we undertake across the park. Tasks ranging from camera trapping to rhino capture operations within such a diverse range of habitats is both thrilling and deeply rewarding.

Most Interesting project worked on: Working with new age AI enabled Rouxcel collars and gateways.

Most memorable experience: Airlifting black rhino with a helicopter.

Why you love working for Scientific Services/SANParks: Working for Scientific Services has been a great privilege, offering me the opportunity to grow and learn alongside like-minded, passionate individuals who share my commitment to rhino conservation, thus creating a base for me to continue my passion for conservation.

Summary of my work: To effectively monitor the black rhino population of Addo Elephant National Park by utilising a variety of methods, such as camera trapping, aerial and vehicle patrols. Data processing plays a large role in the management of all the data captured. I assist in all the capture and veterinary interventions of rhino that take place within the park, the most common being rhino notching. I assist in the deployment of artificial intelligence collars and gateways throughout the park and am responsible for the maintenance of the gateways. I have a few additional administerial duties as well as being responsible for the upkeep of several assets. Last, but not least I hold a fixed-wing pilots license and pilot the park's Bathawk aircraft.

Ester van der Merwe

Employed as: Black Rhino Monitor, Addo Elephant National Park

Employment date: July 2022

Favourite part of the job: Working with black rhino.

Most Interesting project worked on: The current Black Rhino DNA Project

Most memorable experience: Getting to spend every day studying black rhino in a habitat with minimal disturbance.

Why you love working for Scientific Services/SANParks: I get to work with black rhino… they are my passion. I can't ask for a better job.

Summary of my work: I am responsible for ensuring accurate black rhino data is collected and stored. We ensure that our rhinos are monitored regularly and are in good health. I continuously work on improving our monitoring techniques and try to get as much information as possible on a species that very little is known about.

Heston McCabe

Employed as: Research Assistant, Frontier Region. **Employment date:** 1 November 2022

Favourite part of the job: So many different favourites to choose from, including the opportunity to meet and work with people from different backgrounds, specialities and interests in conservation; to having the opportunity to be out in nature in various landscapes, working with large game and contributing to tangible efforts towards conservation.

Most Interesting project worked on: Assisting Madison Lichak on her research project looking at the genetics of Addo Elephant National Park elephants.

Most memorable experience: Being chased by a black rhino in the field.

Why you love working for Scientific Services/SANParks: Since joining SANParks it has always been the department I have wanted to work in and join. The exposure and room for learning that one is exposed to in Scientific Services is such a pleasure. The opportunities and freedom which create this space for learning and having the opportunity to learn from passionate, experienced supervisors, colleagues and scientists is such a joy.

Summary of my work: As research assistant of the Frontier region, I am responsible for assisting the regional ecologist with the monitoring of all collared predators and megaherbivores in the Frontier Parks. I am also responsible for the monitoring and collation of climate data in the Frontier Parks.

In addition, I provide assistance with data collection and data capture for our internal scientists, as well as game guarding for external researchers. Other field work responsibilities include assisting in game capture operations and other wildlife management practices (for example: aerial census). Administrative duties include asset management, assistance with procurement of departmental assets and equipment, and various ad hoc duties.

Chanelize Swart

Employed as: Junior Black Rhino Monitor. **Employment date:** 1 May 2024

Favourite part of the job: Having the opportunity to work with some of the best and most dedicated rhino conservationists and to have the privilege to learn from them. It is so amazing to see the passion each person has for conservation. I have the privilege to be out and about in the field experiencing nature's beauty. I get excited when we have notching operations with black rhino; and each time we do these operations I struggle to hide my excitement, whether it's the first or the last animal of the capture operation.

Most Interesting project worked on: Working with black rhino in bomas and just learning so much about their behaviour and how they adapt to their surroundings. It was such an amazing experience being so close to such an amazing animal; they are so intelligent.

Most memorable experience: Airlifting black rhino.

Why you love working for Scientific Services/SANParks: I started working for SANParks as a field ranger and since I started, I have wanted to be part of the Scientific Services department. An opportunity opened and I am truly so blessed as it is more in line with my career path and goals. There is so much room to grow in our department and there are so many opportunities to work with other wildlife species as well and gain knowledge and practical experience working with them.

Summary of my work: The core function of my role is to monitor black rhino using various methods such as camera traps, vehicle patrols and aerial monitoring. In addition to monitoring, I assist with game capture operations of black rhino as well as assist with other wildlife operations. My administrative duties include processing data and assisting with collating the metapopulation database. I also assist with departmental assets and general administration of the department.

RESEARCH OUTPUT

SANParks' best scientific paper of the year 2024/25

Text by Stef Freitag-Ronaldson

We started an initiative in 2022 to institutionalise recognition of the best SANParks-led scientific paper for the year to acknowledge the value of producing and publishing rigorous research by our staff. In this, the fourth year, we requested two experienced and well-respected scientists, with insight into agency-based science such as ours, to assist in reviewing the first-authored scientific papers published by SANParks staff still in the employ of the organisation in this financial year. Based on these criteria, 12 papers qualified for consideration and evaluation this year. Reviewers assessed the papers based on (i) novelty of research, (ii) contribution to scientific knowledge base, (iii) practical value to SANParks, (iv) value to conservation more broadly. These criteria help consider both scientific value and rigour as well as practical and conservation relevance to SANParks and conservation.

The winning paper for 2024/25 is: Smit, I.P.J., Fernández, R.J., Menvielle, M.F., Roux, D.J., Singh, N., Mabuza, S., Mthombeni, B.M., Macgregor, N.A., Fritz, H., Gandiwa, E. and Foxcroft, L.C., & Cook, C.N. 2025. From parachuting to partnership: Fostering collaborative research in protected areas. Journal of Applied Ecology, 62(1), pp.28-40. https://doi.org/10.1111/1365-2664.14814

Reviewers' comments: A ground-breaking exploration of the potential for improving international research collaboration in protected areas. Recommended actions to stimulate collaborative research are particularly valuable. Whilst this paper takes a standard bibliometric approach, its novelty lies in how it frames and engages with the concept of "parachute science". I found this a "quietly subversive" paper, using a few strategic, but uncontroversial metrics to just slightly shift the conversation on parachute science. This is a small, but really important shift: from "global-North bad and extractive" to "here is how to capacitate international-collaboration in a meaningful and mutually-beneficial way". It is practical, simple and hopeful. Whilst a different study that engages more with perceptions and experiences would also be useful, this approach was the most appropriate in making a strong case for research collaborations and embedded scientists. Indeed, at a time when protected area agencies are crunched for money worldwide, this is an important paper with wider relevance (it spans three countries and contexts). I also really appreciated the excellent "practical recommendation section". This paper also aligns strongly with SANParks Vision 2040 priorities of inclusive conservation, co-governance, and thought leadership in protected area science. Its timing is particularly apt: as agencies face funding pressures and increasing demands for accountability, the paper offers a constructive and realistic pathway to strengthen research partnerships and maximise the value of collaborations. Although rooted in the Kruger case study (in the SA case), its lessons are transferable across SANParks and to other conservation agencies globally (particularly given the two other cases), positioning SANParks as a leader in shaping the conversation on equitable and effective science in protected areas.

The two runners-up papers are: Ferreira, S.M., Goodman, P., Balfour, D., Vigne, L., Knight, M. and Mosweu, K., 2024. Conservation impacts and the future of the black rhinoceros (Diceros bicornis). African Journal of Wildlife Research, 54(1), pp.81-91. Smit, I.P.J., Maze, K. and van Wilgen, B.W., 2024. Land cover change in and around South African protected areas. Biological Conservation, 300, p.110844.

Congratulations SANParks colleagues - Izak Smit with co-authors Dirk Roux, Nikisha Singh, Samantha Mabuza, Mbali Mthombeni and Llewellyn Foxcroft. Sincere appreciation is extended to the two reviewers for investing time and energy to engage with and evaluate all the papers critically. Sharing their thoughtful and insightful comments aims to both recognise good work, and contribute to our own engagement and learning from and with these papers.

Research Publications: A Year in Review

Text by Izak Smit, Dirk Roux, Kiara Druyan, Malwandla Matelakengisa & Judith Botha

143 peer-reviewed papers
54 papers had SANParks staff as lead or co-authors
41 SANParks staff contributed to publications

Peer-reviewed journal articles continue to be one of the cornerstones of scientific progress. The peer review process ensures quality and credibility, while the global accessibility and archiving of published work allow new research to build incrementally on existing knowledge and for ideas and new knowledge to spread far and wide. Papers do not only keep scientists up to date with the latest research and thinking in their field, but also helps them discover and connect with others working in similar fields.

Over the past year, SANParks scientists, together with external collaborators, have had another productive publishing year, contributing to a total of 143 peer-reviewed papers, of which 54 had SANParks staff as lead or co-authors. Specifically, 16 papers were led by SANParks scientists, with an additional 38 papers listing SANParks colleagues as co-authors. In total, 41 SANParks staff contributed to publications, including 12 different SANParks colleagues who took the lead on at least one paper.

In the year under review, five colleagues contributed to five or more papers, either as lead or co-authors (Sam Ferreira (7), Peter Buss (7), Llewellyn Foxcroft (6), Alison Kock (5) and Izak Smit (5)). However, more important than individual achievements, is the collective effort, which reflects the continued importance of South African National Parks serving as active "outdoor laboratories" that enable high-quality research in our national parks. It's also encouraging to see a broad cross-section of SANParks staff members contributing as authors, including scientists, biotechnicians, interns, veterinarians, park management (such as section rangers), and park planners.

Research published on national parks and/or by SANParks staff covered a wide geographic footprint. Papers were published from nearly all parks (see Appendix X), with 16 studies spanning multiple terrestrial parks. These multi-park studies offer valuable insights at larger spatial scales, which are not always apparent in studies conducted in a single park. Although terrestrial research dominated the publication output, it was encouraging that 20 papers focused on marine, estuarine or coastal study sites within or around the SANParks managed MPAs and estuaries. Eight of these papers included multiple marine sites along the South African coast, including a range of islands, estuaries and Marine Protected Areas (see Appendix X), reflecting an appreciation of studying these "open" systems over larger and interconnected scales.

Clarivate journal impact factors provide an indication of how frequently articles in a given journal are cited on average over a two-year period. Higher impact factors are generally associated with journals of high scientific standing that are widely read and cited, and therefore considered influential within their fields.

High-Profile Publications

SANParks co-authors were involved with three studies in prestigious journals with impact factors above 20. In Science (impact factor: 45.8), Dedman et al., with Alison Kock of SANParks as co-author, highlighted the many ecological roles of sharks, including as predators, competitors, facilitators, nutrient transporters, and prey. The paper warned that human pressures have altered these roles in ways that affect ecosystem functioning and carbon storage, stressing the need to rebuild shark populations and integrate their roles into broader management frameworks.

Another Science paper, Langhammer et al. (2024), with Wendy Foden of SANParks as co-author,

presented a global meta-analysis of 186 studies covering 665 conservation interventions. The analysis found that in two-thirds of cases, conservation efforts either improved biodiversity directly or slowed its decline. This provides compelling evidence that conservation works, but must be scaled up to meet global biodiversity targets.

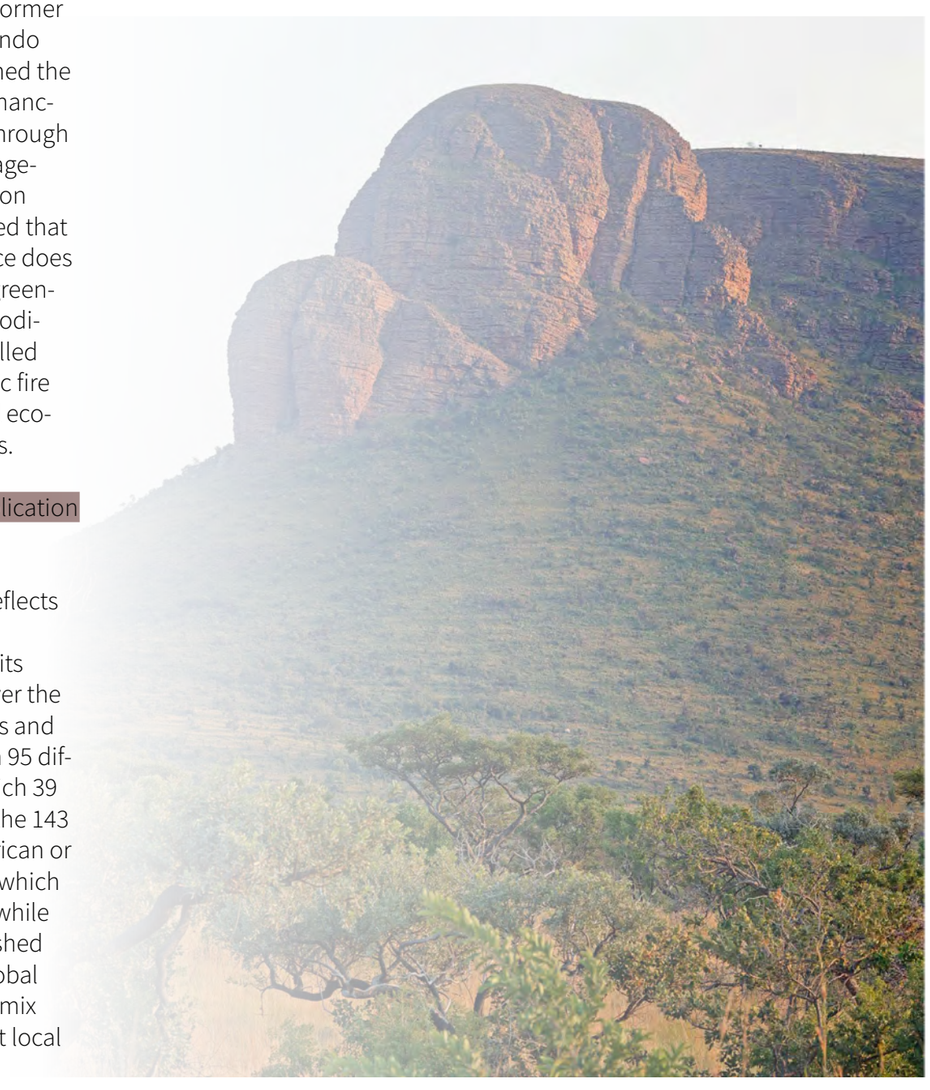
A paper published in Nature Sustainability (impact factor 27.1), led by Tony Knowles, included four SANParks-affiliated co-authors (Tercia Strydom, Navashni Govender, Izak Smit, and former SANParks Executive Luthando Dziba). The study questioned the idea proposed earlier of financing African conservation through early dry-season fire management and associated carbon credit markets. It concluded that current ecological evidence does not consistently support greenhouse gas mitigation or biodiversity gains. Instead, it called for flexible, context-specific fire regimes aligned with local ecological and social priorities.

Breadth and Reach of Publication Outlets

The diversity of journals reflects the breadth of disciplines covered by SANParks and its research collaborators. Over the year, SANParks researchers and collaborators published in 95 different journal titles (of which 39 by SANParks authors). Of the 143 papers, 37 appeared in African or South African journals (of which 13 by SANParks authors), while the remainder were published in journals with a more global readership. This is a good mix ensuring relevance both at local and global scales.

The most frequent outlet was the SANParks published journal Koedoe, which featured 18 papers by or in collaboration with SANParks authors (five with SANParks authorship). The second most used journal was Biological Conservation with five papers, with five more journals having three papers each (African Journal of Ecology, Diversity, Ecology and Evolution, Journal of Applied Ecology, Scientific Reports, South African Geographical Journal and South African Journal of Botany).

The 2024/2025 research outputs once again showcase the depth and diversity of scientific collaboration across SANParks' living laboratories. From ecology and conservation to heritage, tourism, marine, and social-ecological studies, the breadth of work spans many of our national parks and marine protected areas. Publications can fill knowledge gaps, build on past knowledge, deepen our understanding, and leaves a lasting legacy for future generations of researchers and conservation practitioners in SANParks and beyond.



TERRESTRIAL RELATED PUBLICATIONS

Addo Elephant National Park

Helm, C., Van Tonder, M., Carr, A., Cawthra, H., De Vynck , J. and Gräbe , P.J., 2024. Pleistocene fossil elephant tracks in the Addo Elephant National Park, South Africa. Pachyderm, 65, pp.160-167.
Mgqatsa , N., Jama, K., Landman, M. and Kerley, G.I., 2024. Understanding resource use of an invasive species: Diet of the common warthog in Eastern Cape succulent thicket. Journal of Arid Environments, 222, p.105155.
Visagie, M., Davis, R.S., Venter, J.A. and Honiball , T.L., 2024. Using spatial capture - recapture models to estimate spotted hyaena (***Crocuta crocuta***) population density and assess the influence of sex - specific covariates on space use and detection probability. Conservation Science and Practice, 6(9), p.e 13214.
Woodford, D.J., South, J., Mofu, L. and Pegg, J., 2024. River hydrology mediates fish invasions in Addo Elephant National Park, South Africa. Koedoe, 66(1), p.1806.

Agulhas National Park

Prins, A., Dyani, S.S., Vreulink, J.M., Maldonado, L.A. and Le Roes-Hill, M., 2024. Actinobacteria diversity associated with marine sediments and a wetland system, Agulhas-South Africa. Annals of Microbiology, 74(1), p.18.

Camdeboo National Park

Liu, L., Mou, C. and Xu, F., 2024. Improved wildlife recognition through fusing camera trap images and temporal metadata. Diversity, 16(3), p.139.

Garden Route National Park

Bernard, A., Guerbois, C., **Moolman, L., de Morney, M.A.**, Venter, J.A. and Fritz, H., 2024. Combining local ecological knowledge with camera traps to assess the link between African mammal life - history traits and their occurrence in anthropogenic landscapes. Journal of Applied Ecology, 61(10), pp.2470-2482.
Kraaij, T., **Baard, J.** and Schutte-Vlok, A., 2025. Plant response to the fire regime (1970–2023) in a fynbos World Heritage Site: Ecological indicators for fire management. Ecological Indicators, 170, p.113001.
Midgley, J.J., Cramer, M.D. and **Durrheim, G.**, 2024. Thirty years of stasis in the dynamics of the Knysna Afro - montane forest, South Africa. Austral Ecology, 49(9), p.e 13594.
Múnera -Roldán, C., Colloff, M.J., Pittock, J. and van Kerkhoff, L., 2024. Aligning adaptation and sustainability agendas: lessons from protected areas. Mitigation and Adaptation Strategies for Global Change, 29(7), p.64.

Golden Gate National Park

Bates, M., 2024. CHAMAELEONIDAE: ***Bradypodion dracomontanum*** Raw, 1976 Drakensberg Dwarf Chameleon. African Herp News, (84).
Daemane, M.E., Adelabu, S. and Ramoelo, A., 2024. Assessing species richness, diversity and assemblage of forest patches within a grassland matrix in the Afrotemperate ecosystems. Phytocoenologia , 52(1).
Mapuru, M.J., Xulu, S., Gebreslasie, M. and **Daemane, E.M.,** 2024. Exploring environmental factors that influence the distribution of poplar trees. African Journal of Ecology, 62(3), p.e 13310.
Mashiane, K., Ramoelo, A. and Adelabu, S., 2024. Prediction of species richness and diversity in sub - alpine grasslands using satellite remote sensing and random forest machine - learning algorithm. Applied Vegetation Science, 27(2), p.e 12778.
Mofokeng, O.D., Adelabu, S.A., Durowoju, O.S. and Adagbasa, E.A., 2024. Grass curing-driven fire danger index in a protected mountainous grassland using fused MODIS and Sentinel-2. International Journal of

Remote Sensing, 45(16), pp.5359-5384.
van Aardt, A.C., de Jager, J.L. and van Tol, J.J., 2024. Firebreaks and their effect on vegetation composition and diversity in grasslands of Golden Gate Highlands National Park, South Africa. Diversity, 16(7), p.373.

Karoo National Park

Bezuidenhout, H., Morgenthal, T., Kraaij, T. and Brown, L.R., 2024. Mapping plant communities of the Karoo National Park, South Africa, using Sentinel-2 and topo-morphological data. South African Journal of Botany, 173, pp.295-311.

Kruger National Park

Antonites, A., 2024. Overview of the Early Iron Age in the Letaba region of the Kruger National Park. Koedoe, 66(2), p.1805.
Bengis, R., 2024. One Health in the African Wilds–a Veterinary Tale. IJID One Health, p.100047.
Bhogapurapu, N., Siqueira, P., Armston, J., Urbazaev, M., Wessels, K. and Duncanson, L., 2024, July. Canopy height estimation using C-and L-Band Insar coherence over savannas and dry Forests. In IGARSS 2024-2024 IEEE International Geoscience and Remote Sensing Symposium (pp. 2290-2293). IEEE.
Biro, A., Wong, M.Y., Zhou, Y., Batterman, S.A. and Staver, A.C., 2024. Nitrogen and phosphorus availability alters tree - grass competition intensity in savannas. Journal of Ecology, 112(5), pp.1026-1038.
Bucciarelli, J.R., Pimm, S.L., Huang, R.M., Chase, M.J., Leggett, K., Bastos, A.D. and van Aarde, R.J., 2024. Local elephant movements, turning angles, and water access across a rainfall gradient in Southern Africa. Biological Conservation, 296, p.110669.
Buss, P., Miller, M., Fuller, A., Haw, A., Thulson, E., Olea-Popelka, F. and Meyer, L., 2024. Effects of Butorphanol on Respiration in White Rhinoceros (***Ceratotherium simum***) Immobilized with Etorphine-Azaperone. The Journal of Wildlife Diseases, 60(2), pp.388-400.
Cossu, C.A., Garofolo, G., Janowicz, A., De Massis, F., Wentzel, J., Ledwaba, M.B., Sabeta , C., De Klerk, L.M., Godfroid, J., Vergnaud, G. and van Heerden, H., 2025. Phylogenomics of Brucella abortus isolated from African Buffalo in Kruger National Park: New Perspectives on Wildlife-Cattle Disease Dynamics. Veterinary Microbiology, p.110493.
Čuda, J., Pyšková, K., Hejd , M., **Foxcroft, L.C.**, MacFadyen, S., Storch, D., Tropek, R., Zambatis, G. and Pyšek, P., 2024. Habitat modifies the relationship between grass and herbivore species richness in a South African savanna. Ecology and Evolution, 14(4), p.e 11167.
Davies, A.B., Levick, S.R., van Rensburg, B.J., Robertson, M.P. and Parr, C.L., 2024. Context - dependent directional effects of termite mounds on soil nutrients, vegetation communities, and mammalian foraging. Ecosphere, 15(9), p.e 4978.
Davis, R.S., Overton, E.K., Prugnolle, F., Rougeron, V., Sievert, O. and Venter, J.A., 2024. Baboons (Papio spp.) as a potentially underreported source of food loss and kleptoparasitism of cheetah (***Acinonyx jubatus***) kills. Food Webs, 38, p.e 00331.
de Klerk-Lorist, L.M., Miller, M.A., Mitchell, E.P., Lorist, R., Van Dyk, D.S., Mathebula, N., Goosen, L., Dwyer-Leonard, R., Ghielmetti, G., Streicher, E.M. and Kerr, T.J., 2024. Case report: Discovery of tuberculosis caused by ***Mycobacterium bovis*** in free-ranging vervet monkeys in the Greater Kruger Conservation Area. Frontiers in Veterinary Science, 11, p.1460115.
dos Santos, M., 2024. Climate Change, Air Pollution, and Human Health in the Kruger to Canyons Biosphere Region, South Africa, and Amazonas, Brazil: A Narrative Review. Atmosphere, 15(5), p.562.
Dwyer, R., Witte, C., **Buss, P.**, Warren, R., Miller, M. and Goosen, W., 2024. Antemortem detection of Mycobacterium bovis in nasal swabs from African rhinoceros. Scientific Reports, 14(1), p.357.
Eikelboom, J.A. and Prins, H.H., 2024. Poaching pressure on African rhinos is still at an all-time high. Science Advances, 10(25), p.eadl 1482.
Ferreira, S., Crowhurst, E., Greaver, C. and **Simms, C.**, 2024. Sample-Based Estimates of Elephants in Kruger National Park, South Africa. African Journal of Wildlife Research, 54(1).
Ferreira, S.M., Crowhurst, E.T., Greaver, C. and **Simms, C.** , 2024. Resizing Kruger National Park: Trends in numbers of rhinoceroses within priority zones. Koedoe, 66(1), pp.1-9.
Forbes, R.E., Everatt, K.T., Spong, G. and Kerley, G.I., 2024. Diet responses of two apex carnivores (lions and leopards) to wild prey depletion and livestock availability. Biological Conservation, 292, p.110542.
Gandaho, S.M., Sogbohossou, E.A. and Thompson, L.J., 2024. NIMO: A graphical user interface - based R package for species distribution modelling. Ecological Solutions and Evidence, 5(3), p.e 12385.
Gaona, F.P., Delabye, S., Potocký, P., Govorov, V., Čuda, J., **Foxcroft, L.C.,** Garlacz, R., Hejda, M., MacFadyen, S., Pyrcz, T. and Pyšková , K., 2025. Climate - driven vegetation characteristics shape phytophagous and carnivorous insect diversity in South African savannahs. Journal of Biogeography, 52(4), p.e 15076.
Hart, A.G., Tripp, E. and Goodenough, A.E., 2024. From tweets to tings: Dissimilarity in recorded species community between social media platforms and implications for resource-limited conservation. Community Ecology, pp.1-9.
Hermann, U.P., Nemaorani, T.M., Naudé-Potgieter, R.A. and de Klerk, C.D., 2025. Key Determinants of Visitor Satisfaction and Post-Visit Intentions at a Museum in the Kruger National Park, South Africa. Journal of Park and Recreation Administration.
Huyser, M.M. and van der Merwe, P., 2025. Evaluating COVID-19 health and safety measures for tourist satisfaction at Kruger National Park. Acta Commercii, 25(1), p.15.
Huyser, M.M., van der Merwe, P. and Ali, A., 2025. Contingency Strategies to Foster Resilience in National Parks During Crisis Events such as COVID-19. Tourism Planning & Development, pp.1-22.
Jørgensen, A.V., Stears, K. and Schmitt, M.H., 2024. In the Mix: Patterns of Warthog Herding Behaviour in Single - and Mixed - Species Herds. African Journal of Ecology, 62(4), p.e 13349.
Keates, C., Wasserman, R.J., Conradie, W., Dondofema , F., Munyai, L., **Riddell, E.** and Dalu, T., 2024. Frogs of the Makuleke Contractual Park, northern Kruger National Park. Koedoe, 66(1), pp.1-9.
Knight, J. and Evans, M., 2024. Flood dynamics on the upper Letaba River, South Africa, deduced from luminescence dating. South African Geographical Journal, 106(4), pp.423-445.
Knight, J., Evans, M. and Mugwabana, T., 2024. Sediment source areas and the role of floods in sediment mixing on the Letaba River, South Africa. South African Geographical Journal, 106(4), pp.368-398.
Kuseni, M. and Hermann, U.P., 2025. Visitor Participation in Deviant Leisure Practices in a South African National Park. Tourism and Hospitality, 6(2), p.53.
Le Roux, R., Colmonero -Costeira, I., Deikumah, J.P., Thompson, L.J., Russo, I.R.M., Jansen van Vuuren, B. and Willows-Munro, S., 2024. High conservation importance of range-edge populations of Hooded Vultures (***Necrosyrtes monachus***). Scientific Reports, 14(1), p.18040.
Lekota, K.E., Hassim, A., Ledwaba, M.B., Glover, B.A., Dekker, E.H., van Schalkwyk, L.O., Rossouw, J., Beyer, W., Vergnaud, G. and Van Heerden, H., 2024. Bacillus anthracis in South Africa, 1975–2013: are some lineages vanishing?. BMC genomics, 25(1), p.742.
Magome, T.G., Ochai, S.O., Hassim, A., Bezuidenhout, C.C., van Heerden, H. and Lekota, K.E., 2024. A genome-based investigation of the Priestia species isolated from anthrax endemic regions in Kruger National Park. Infection, Genetics and Evolution, 123, p.105649.
Malongweni, S.O. and van Tol, J., 2024. Effects of herbivory, fire, and vegetation type on soil compaction and aggregate stability in a semi-arid savanna. Environment, Development and Sustainability, pp.1-14.
Maphanga, T., Dube, T., Shoko, C., Sibanda, M. and Gxokwe , S., 2025. Using multisource remotely sensed data and cloud computing approaches to map non-native species in the semi-arid savannah rangelands of Mpumalanga, South Africa. South African Geographical Journal, 107(1), pp.88-111.
Maphanga, T., Shoko, C., Sibanda, M., Thamaga , K.H. and Dube, T., 2024. Understanding the spatio -temporal distribution of bush encroachment in savannah rangelands, South Africa. Geocarto International, 39(1), p.2366515.
Martin, L.C., O'Hare, M.A., Ghielmetti, G., Twesigomwe, D., Kerr, T.J., Gumbo, R., **Buss, P.E.,** Kitchin, N., Hemmings, S.M., Miller, M.A. and Goosen, W.J., 2024. Short-read full-length 16S rRNA amplicon sequencing for characterisation of the respiratory bacteriome of captive and free-ranging African elephants (***Loxodonta africana***). Scientific Reports, 14(1), p.14768.
Matshusa, K. and Leonard, L., 2024. Inventory of geoheritage sites in the Kruger National Park, South Africa. Discover Geoscience, 2(1), p.99.
Metzinger, A., Meyer, L.C., **Buss, P.,** Hooijberg , E.H., Huber, N., Viljoen, F.P., Leiberich, M. and Pohlin, F.,

2024. Dehorning Does Not Alter the Stress Response in Southern White Rhinoceroses (*Ceratotherium simum simum*) during Transport: A Preliminary Investigation. The Journal of Wildlife Diseases, 60(2), pp.490-495.
Mills, A.J., van Mazijk, R., Allen, J.L. and **Strydom, T.,** 2024. Soil geochemistry and constraint of tree seedlings immediately after germination on Macrotermes termite mounds in the Kruger National Park, South Africa. Ecology and Evolution, 14(5), p.e 11348.
Mtetwa, T.K., Snelling, E.P., **Buss, P.E.**, Donaldson, A.C., Roug, A. and Meyer, L.C., 2024. Reliability, clinical performance and trending ability of a pulse oximeter and pulse co-oximeter, in monitoring blood oxygenation, at two measurement sites, in immobilised white rhinoceros (*Ceratotherium simum*). BMC Veterinary Research, 20(1), p.319.
Mukwevho, L., Dalu, T., Ndlovu, M. and Chidawanyika, F., 2025. Consequences of fire and grazing to conservation of arthropod functional diversity in a protected Afrotropical savanna. Biological Conservation, 301, p.110885.
Munyai, L.F., Mugwedi, L., Wasserman, R.J., Dondofema, F., **Riddell, E.,** Keates, C. and Dalu, T., 2024. Water and sediment chemistry drivers of chlorophyll-a dynamics within a Ramsar declared floodplain pan wetland system. Environmental Science and Pollution Research, 31(19), pp.28549-28563.
Ndlovu, M., Wardjomto, M.B., Pori, T. and Nangammbi, T.C., 2024. Diversity and Host Specificity of Avian Haemosporidians in an Afrotropical Conservation Region. Animals, 14(19), p.2906.
Nemakanga, R., Harilal, V. and Tichaawa, T.M., 2024. Tourists awareness and understanding of game drive protocols post COVID-19 in South Africa. Geo Journal of Tourism and Geosites, 57, pp.1877-1884.
Ochai, S.O., Hassim, A., Dekker, E.H., Magome, T., Lekota, K.E., Makgabo, S.M., de Klerk-Loris, L.M., van Schalkwyk, L.O., Kamath, P.L., Turner, W.C. and van Heerden, H., 2024. Comparing microbiological and molecular diagnostic tools for the surveillance of anthrax. PLOS Neglected Tropical Diseases, 18(11), p.e 0012122.
Ochai, S.O., Snyman, L., Dolfi, A.C., Ramoelo, A., Reilly, B.K., **Botha, J.M.**, Dekker, E.H., van Schalkwyk, O.L., Kamath, P.L., Archer, E. and Turner, W.C., 2024. Roles of host and environment in shift of primary anthrax host species in Kruger National Park. Plos one,19(12), p.e 0314103.
Pyšek, P., Čuda, J., **Foxcroft, L.C.**, Pyšková, K. and Hejda, M., 2024. Even the losers: five-year distribution dynamics of alien plant species in South African savanna. NeoBiota, 96, pp.279-297.
Raphela Tlou, D., 2024. Was It About COVID-19 Vaccine Acceptance or Societal Culture and Livelihoods? A Case of The Kruger National Park Employees, South Africa. Journal of Ecohumanism, 3(8), pp.3448-3457.
Rautenbach, Y., Parsons, S.D., Loots, A.K., Goddard, A., Meyer, L.C., Buss, P.E. and Hooijberg, E.H., 2024. Genetic characterization of diagnostic epitopes of cardiac troponin I in African rhinoceros. Journal of Veterinary Diagnostic Investigation, p.1040.
Riccardi, T., **Wigley, B.J.**, Kleyn, L., **Coetsee, C.**, MacFadyen, S., Attorre, F. and Malatesta, L., 2024. First woody cover vegetation map of Kruger National Park in 1939–1944: Evidence from historical black and white aerial photography. Ecological Informatics, 81, p.102590.
Roberts, G., Wooster, M.J. and **Strydom, T.**, 2025. Assessment and validation of Meteosat SEVIRI fire radiative power (FRP) retrievals over Kruger National Park. International Journal of Applied Earth Observation and Geoinformation, 136, p.104375.
Romero, A., O'Neill, B.J., Rauch, K. and Roscoe, A., 2024. How African Ungulates Respond to Tourist Vehicles in Kruger National Park. African Journal of Ecology, 62(4), p.e13335., 2024. How African Ungulates Respond to Tourist Vehicles in Kruger National Park. African Journal of Ecology, 62(4), p.e 13335.
Schellnack-Kelly, I., 2024. Accessing collective memory: the role of oral history in building an inclusive archives reflecting a people's archives. Collection and Curation, 43(1), pp.24-29.
Schellnack-Kelly, I.S., 2024. Information sharing on social media pages related to wildlife conservation in a South African national game reserve. Global Knowledge, Memory and Communication, 73(1/2), pp.84-99.
Shikwambana, P., **Foxcroft, L.C.**, Taylor, J.C. and Bouwman, H., 2024. Microplastic Concentrations in Sediments and Waters Do Not Decrease in Two Rivers Flowing Through the Kruger National Park, South Africa. Water, Air, & Soil Pollution, 235(10), p.675.
Singh, J., Donaldson, J.E., Archibald, S., Parr, C.L., Voysey, M.D. and Davies, A.B., 2024. Small - scale fires interact with herbivore feedbacks to create persistent grazing lawn environments. Journal of Applied Ecology, 61(7), pp.1531-1545.
Sithole, B., Giddy, J.K. and Nsukwini, S., 2024. Safari Tourism in the Post-COVID-19 Environment: The Case of Small Businesses in Mpumalanga. African Journal of Hospitality, Tourism and Leisure, 13(4), pp.889-896.
Smit, I.P.J., Fernández, R.J., Menvielle, M.F., **Roux, D.J., Singh, N., Mabuza, S., Mthombeni, B.M.**, Macgregor, N.A., Fritz, H., Gandiwa, E., **Foxcroft, L.C.** and Cook, C., 2025. From parachuting to partnership: Fostering collaborative research in protected areas. Journal of Applied Ecology, 62(1), pp.28-40.
Strydom, L.H., Conradie, S.R., **Smit, I.P.J.**, Greve, M., Boucher, P.B., Davies, A.B. and McKechnie, A.E., 2024. Mapping tree canopy thermal refugia for birds using biophysical models and LiDAR. International Journal of Biometeorology, pp.1-14. https://doi.
Strydom, T., Smit, I.P.J. and van Tol, J.J., 2024. Short and long-term fire effects on soil C and N in an African savanna. Geoderma Regional, 37, p.e 00802.
van Vollenhoven, A.C., 2024. A historical archaeological investigation of Sardelli's shop, Sabiepoort, Kruger National Park. Koedoe, 66(2), p.1792.
van Wilgen, B.W., 2025. Fire ecology and management in South Africa: A history of research achievements and future challenges. South African Journal of Botany, 177, pp.699-712.
Wang, Z., Singh, J. and Davies, A.B., 2025. Consistent patterns of LiDAR-derived measures of savanna vegetation complexity between wet and dry seasons. Ecological Indicators, 170, p.113061.
Wessels, J.A. and Douglas, A., 2024. Exploring the use of visitor surveys as a tool for supporting EIA follow-up in protected areas: a case study of a conference centre in an iconic national park. Impact Assessment and Project Appraisal, 42(3), pp.229-239.
Yildiz, H., Heise, O., Gerhardt, B., Fritsch, G., Becker, R., Ochs, A., Sicks, F., **Buss, P.,** de Klerk - Lorist, L.M., Hildebrandt, T. and Brecht, M., 2024. Macrovibrissae and microvibrissae inversion and lateralization in elephants. Annals of the New York Academy of Sciences, 1538(1), pp.85-97.
Zdunek, P., de Wit, T., Jeow, A.T.K., Harold, G. and Seah, B., 2024. Predation of an Adult Nile Monitor (*Varanus niloticus* Linnaeus, 1758) by a Nile Crocodile (*Crocodylus niloticus* Laurenti, 1768) in South Africa with Other Records of Interactions Between Monitor Lizards and Crocodilians. Biawak , 16(1), pp.20-23.

Mapungubwe National Park

Antonites, A.R., 2024. Animal diversity and procurement strategies at Schroda, Limpopo Valley, South Africa. Koedoe, 66(2), p.1790.
Forssman, T., 2024. Unmasking the forgotten foragers of the Mapungubwe landscape. Koedoe, 66(2), p.1787.
Mlilo, T. and Bandama, F., 2025. A Pandora's Box: Indigenous Voices in Heritage Management Within the Mapungubwe and Makgabeng Cultural Landscapes in South Africa. Journal of Heritage Management, p.24559296241313095.
Nxumalo, B.S., Sulas, F. and Pikirayi, I., 2024. Geochemical characterisation of archaeological sites in Mapungubwe National Park, South Africa. Koedoe, 66(2), p.1793.
Pentz, J.A., Sherwood, N.L. and Forssman, T., 2024. Preliminary analysis of forager stone technology at Little Muck Shelter: Pre-to contact levels. Koedoe, 66(2), p.1789.
Sherwood, N.L. and Forssman, T., 2024. Social implications of archaeology at Little Muck Shelter during the contact period: 150–1300 CE. Koedoe, 66(2), p.1788.

Marakele National Park

Tsele, P. and Ramoelo, A., 2024. Hybrid retrieval of grass biophysical variables based-on radiative transfer, active learning and regression methods using Sentinel-2 data in Marakele National Park. Geocarto International, 39(1), p.2387087.

Mokala National Park

Maruping-Mzileni, N.T., Bezuidenhout, H., Ferreira, S., Ramoelo, A., **Mapuru, M., Munyai, L.** and **Erusan,**

R., 2024. Implications of Ecological Drivers on Roan Antelope Populations in Mokala National Park, South Africa. Diversity, 16(6), p.355.

Richtersveld National Park

Klak, C., van Wyk, P.C., Hanáček, P. and Bruyns, P.V., 2025. Two new species of Ruschieae from north-western South Africa and south-western Namibia. South African Journal of Botany, 177, pp.392-396.
Konje, M.M., 2025. Use of Remote Sensing (MODIS) Data and Rainfall to Estimate Forage Production in Arid Rangeland. Iconic Research and Engineering IRE Journals, 8(9), pp.187-193.
van Wyk, P., **Bezuidenhout, H.** and Jürgens, N., 2024. A checklist of indigenous flora in the Richtersveld National Park confirms high plant diversity in the arid north-western tip of South Africa. Koedoe, 66(1), pp.1-10.

Table Mountain National Park

Haddad, C.R. and Dippenaar-Schoeman, A.S., 2024. Checklist of the spiders (Arachnida, Araneae) of The Table Mountain National Park, South Africa. Koedoe, 66(1), p.1797.
Nattrass, N., Wittenberg, B.S., Woodgate, Z. and O'Riain, M.J., 2024. Honey badgers in and around Table Mountain National Park, Cape Town. Koedoe, 66(1), pp.1-8.

Tankwa Karoo National Park

Munting, K., 2024. Cultural landscapes and the vernacular: A case study of the Tankwa Karoo. Koedoe, 66(2), p.1801.

Multipark

Britnell, J.A., Kerley, G.I.H., Antwis, R. and Shultz, S., 2024. A grazer's niche edge is associated with increasing diet diversity and poor population performance. Ecology Letters, 27(1), p.e 14357. (**Bontebok, Camdeboo, Mountain Zebra**)
de Jager, D., Möller, M., Hoal, E., van Helden, P., Glanzmann, B., Harper, C. and Bloomer, P., 2025. A highly divergent mitochondrial genome in extant Cape buffalo from Addo Elephant National Park, South Africa. Ecology and Evolution, 15(1), p.e 70640. (**Addo Elephant, Kruger, Mokala**)
Epps, C.W., Crowhurst, R.S., Spaan, R., Weldy, M. and Tavalire, H.F., 2024. Influence of climate and landscape on genetic differentiation of aardvarks (***Orycteropus afer***). Diversity and Distributions, 30(3), p.e 13792. (**Agulhas, Augrabies Falls, Camdeboo, Karoo, Kgalagadi, Namaqau, Tankwa Karoo**)
Helm, C.W., Carr, A.S., Cawthra, H.C., De Vynck, J.C., Lockley, M.G., Dixon, M.G., Rust, R., Stear, W., Thesen, G.H., Van Berkel, F. and Venter, J.A., 2024. Pleistocene ichnological geoheritage in national parks on the Cape coast. Koedoe, 66(2), p.1786. (Addo Elephant, Garden Route, West Coast)
Huang, R.M., Maré, C., Guldemond, R.A., Pimm, S.L. and van Aarde, R.J., 2024. Protecting and connecting landscapes stabilizes populations of the Endangered savannah elephant. Science Advances, 10(1), p.eadk 2896. (Kruger, Mapungubwe)
Luyt, J., Faith, J.T. and Sealy, J., 2024. Large herbivore δ18O as a proxy for aridity in the South African winter and year-round rainfall zone. Quaternary Research, 122, pp.92-105. (**Addo Elephant, Augrabies Falls, Bontebok, Garden Route, Karoo, Kgalagadi, West Coast**)
Maoela, M.A., Nhamo, G., Chapungu, L. and Madikizela, A., 2025. Tourists' perceptions of climate change awareness, impact, and response mechanisms in South African national parks. Development Southern Africa, 42(1), pp.153-175. (**All parks except Groenkloof and Meerkat**)
Mashula, N., Chapungu, L. and Nhamo, G., 2025. Extreme heat trends and impacts in Savanna national parks of South Africa. Environmental Development, p.101216. (**Kruger, Mapungubwe**)
Nhamo, G., Mashula, N. and Mutanda, G.W., 2025. Managers' perspectives on weather extremes prevalence in South African national parks. International Journal of Geoheritage and Parks. (**Addo Elephant,**

Agulhas, Augrabies Falls, Garden Route, Golden Gate Highlands, Kgalagadi, Kruger, Mapungubwe, Namaqua, Richtersveld, Table Mountain, Tankwa Karoo, West Coast)
Sauma-Sánchez, T., Alcorta, J., Tamayo-Leiva, J., Díez, B., Bezuidenhout, H., Cowan, D.A. and Ramond, J.B., 2024. Functional redundancy buffers the effect of poly-extreme environmental conditions on southern African dryland soil microbial communities. FEMS Microbiology Ecology, 100(12), p.fiae 157. (**Namaqua, Richtersveld**)
Slippers, B., Ramabulana, E. and Coetzee, M.P.A., 2024. Botryosphaeriaceae partially overlap on asymptomatic and symptomatic tissues of Anacardiaceae in agroecosystems and conservation areas in northern South Africa. Fungal Systematics and Evolution, 13(1), pp.131-142. (**Kruger, Mapungubwe**)
Smit, I.P.J., Maze, K. and van Wilgen, B.W. 2024. Land cover change in and around South African protected areas. Biological Conservation, 300, p.110844 (**All parks**)
van Wilgen, B.W., **Cole, N.S., Baard, J**., **Cheney, C.,** Engelbrecht, K., Stafford, L., Turner, A.A., **van Wilgen, N.J.** and Wannenburgh, A.M., 2025. Progress towards the control of invasive alien species in the Cape Floristic Region's protected areas. Biological Invasions, 27(1), p.8. (**Agulhas, Bontebok, Garden Route, Table Mountain, West Coast**)
Venter, A., Vorster, I., Nkosi, N.F., Sibeko-Matjila, K.P. and Bhoora, R.V., 2024. Molecular genotyping of Babesia caballi. Veterinary Parasitology, 329, p.110214. (**Augrabies Falls, Bontebok, Karoo, Kruger, Mokala, Mountain Zebra)**

Not park-specific

Ameca, E.I., Nie, Y., Wu, R., Mittermeier, R.A., **Foden, W.** and Wei, F., 2024. Identifying protected areas in biodiversity hotspots at risk from climate and human-induced compound events for conserving threatened species. Science of The Total Environment, 938, p.173192.
Balfour, D., Makoma, K. and **Ferreira, S.M.**, 2024. African Rhino Specialist Group Chair report/Rapport du Groupe de Spécialistes du Rhinocéros d'Afrique. Pachyderm, 65, pp.20-34.
Briske, D.D., Vetter, S., **Coetsee, C.** and Turner, M.D., 2024. Rangeland afforestation is not a natural climate solution. Frontiers in Ecology and the Environment. 22(5)e2727.
Clauss, M., Roller, M., Bertelsen, M.F., Rudolf von Rohr, C., Müller, D.W., Schiffmann, C., Kummrow , M., Encke, D., **Ferreira, S.**, Duvall, E.S. and Maré, C., 2025. Zoos must embrace animal death for education and conservation. Proceedings of the National Academy of Sciences, 122(1), p.e 2414565121.
Ferreira, S.M., Goodman, P., Balfour, D., Vigne, L., Knight, M. and Mosweu , K., 2024. Conservation impacts and the future of the black rhinoceros (***Diceros bicornis***). African Journal of Wildlife Research, 54(1), pp.81-91.
Knowles, T., Stevens, N., Amoako, E.E., Armani, M., Barbosa, C., Beale, C., Bond, W., Chidumayo, E., Courtney-Mustaphi, C., Dintwe, K.,Dobson, A. Donaldson, J., Dziba , L., **Govender, N.**, Hempson, G., Humphrey, G.J., Kimuyu, D., Laris, P., N'Dri, A.B., Parr, C.L., Probert, J., Ruecker, G., **Smit, I.P.J., Strydom, T.**, Syampungani ., S., and Archibald, S., 2025. Viability and desirability of financing conservation in Africa through fire management. Nature Sustainability, pp.1-8.
Kumschick, S., **Foxcroft, L.C.** and Wilson, J.R., 2025. Advancing the Risk Analysis for Alien Taxa (RAAT) framework. NeoBiota, 97, pp.319-324.
Langhammer, P.F., Bull, J.W., Bicknell, J.E., Oakley, J.L., Brown, M.H., Bruford, M.W., Butchart, S.H., Carr, J.A., Church, D., Cooney, R. and **Foden W.**, 2024. The positive impact of conservation action. Science, 384(6694), pp.453-458.
Mapuru, M., Xulu, S. and Gebreslasie, M., 2024. Modelling possible habitats for poplar invasion in South Africa. Koedoe, 66(1), p.1783.
Mukhari, D.L., Mofu, L., Lombard, A.T., Attwood, C.G., Witteveen, M., Smith, M.K.S., Cowley, P.D., Weyl, O.L.F. and Pegg, J., 2024. Life-history of invasive common carp, Cyprinus carpio , within a natural lake (Groenvlei), South Africa. African Journal of Aquatic Science, 49(3), pp.246-253.
Selier, J., Miller, S.M., Coverdale, B., **Ferreira, S.**, Kruger, J. and Parker, D.M., 2024. Wild lions in small, fenced reserves in South Africa conform to a meta-population. Ecological Solutions and Evidence, 5(3), p.e 12341.

Seymour, D.A. and **Spear, D.**, 2024. Maximising the value of visual data in South African National Parks. Koedoe, 66(1), p.1811.

Marine, Estuary and Coastal Related Publications

Ackland, S.J., Andersen, M.N., **Kock, A.,** van Blerk, D., **Ariefdien, R.**, Robinson, T.B ., 2025. First record of the marine alien bryozoan ***Amathia verticillata*** (delle Chiaje , 1822) in South Africa. BioInvasions Records 14(1): 183–196, https://doi.org/10.3391/bir.2025.14.1.1 (**Langebaan**)

Arendse, C.J., Hayes, J.S., Mokhatla, M.M., Britton, J., Kruger, N. and Brown, M., 2024. Shortening vehicle access permitting for mobility-impaired individuals to beaches in South Africa's National Parks. Ocean & Coastal Management, 255, p.107259. (**Garden Route Beaches**)

Beine, K., Connell, L.J. and Greenfield, R., 2024. Variations in the heart rate of Mediterranean mussels ***Mytilus galloprovincialis*** and brown mussels ***Perna perna*** under thermal stress on rocky shores of South Africa. African Journal of Aquatic Science, 49(2), pp.166-176. (**Garden Route, Namaqua, West Coast**)

Dedman, S., Moxley, J.H., Papastamatiou, Y.P., Braccini, M., Caselle, J.E., Chapman, D.D., Cinner, J.E., Dillon, E.M., Dulvy, N.K., Dunn, R.E., Espinoza, M., Harborne, A.R., Harvey, E.S., Heupel, M.R., Huveneers, C., Graham, N.A.J., Ketchum, J.T., Klinard, N.V., **Kock, A.A.,** Lowe, C.G., MacNeil, M.A., Madin, E.M.P., McCauley, D.J., Meekan, M.G., Meier, A.C., Simpfendorfer, C.A., Tinker, M.T., Winton, M., Wirsing, A.J. & Heithaus, M.R., 2024. Ecological roles and importance of sharks in the Anthropocene Ocean. Science, 385(6708), p.adl 2362. (**Not Park specific**)

Field, L.C., Wright, K., Sullivan-Stack, J., Harris, J.M., Kirkman, S.P., Fielding, P.J., Oosthuizen, A., Dlulisa, S., Laznya , A., Gonçalves, E.J. and Grorud-Colvert, K., 2025. Assessing South Africa's marine protected area quality and progress towards conservation goals: An application of The MPA Guide framework. Marine Policy, 173, p.106513. (**Malgas Island, Marcus Island, Jutten Island, Langebaan Lagoon, Sixteen-Mile Beach**)

James, N.C., Jacobs, A.G., Gayiza , M., Human, L.R.D., Steyn, P.P., Bernard, A.T. and Rishworth, G.M., 2024. Nursery provision of red-algal habitats in temperate Algoa Bay, South Africa. Marine Biology, 171(9), p.185. (**Algoa Bay, mostly Swartkops Estuary**)

Kalinski, J.C.J., Noundou , X.S., Petras, D., Matcher, G.F., Polyzois, A., Aron, A.T., Gentry, E.C., Bornman, T.G., Adams, J.B. and Dorrington, R.A., 2024. Urban and agricultural influences on the coastal dissolved organic matter pool in the Algoa Bay estuaries. Chemosphere, 355, p.141782. (**Algoa Bay Estuaries: Swartkops and Sundays River Estuaries**)

Klimley, A.P., Curtis, T.H., Johnston, E.M., **Kock, A.** and Stevens, G.M., 2024. A review of elasmobranch breaching behavior: why do sharks and rays propel themselves out of the water into the air?. Environmental Biology of Fishes, pp.1-41. (**Not park specific)**

Lawrence, C.M., 2024. Quantifying direct and indirect linkages between seagrasses, environment and associated macrofauna in a temperate lagoon. Marine Ecology, 45(2), p.e 12804. (Langebaan Estuary)

Madell, K.A., Scharler, U.M., Savage, C., Karlson, A.M. and Pillay, D., 2024. Arrested development and increased incidence of sandprawn embryonic aberrations along an intertidal human recreation gradient. Scientific Reports, 14(1), p.26836.

McInnes, A.M., Weideman, E.A., Carpenter-Kling, T., Barham, P., Christian, M., Day, K., Glencross, J.S., Hagen, C., **Kock, A., Lawrence, C.** and Ludynia, K., 2024. Commercial fishery no-take zones for African penguins minimize fisheries losses at the expense of conservation gains. ICES Journal of Marine Science, 81(8), pp.1632-1646. (**Various MPAs**)

McQuaid, C.D. and Buresch, M., 2024. Coastal topography and rates of mussel recruitment: a comparison of bay versus open-coast sites. African Journal of Marine Science, 46(2), pp.149-153. (**Algoa Bay**)

Nodo, P., Childs, A.R., Pattrick, P. and James, N.C., 2024. Spatial patterns and environmental drivers of demersal fish assemblages in the Swartkops and Sundays estuarine to marine seascapes, South Africa.

African Journal of Marine Science, 46(2), pp.125-141. (**Algoa Bay: Swartkops and Sundays River Estuaries**)

Pichegru, L., Makoala, M., Barham, B.J., Barham, P.J., Dalton, D., Ludynia, K., Freeman, M., Geldenhuys, D., Hagen, C., Harris, G., Kock, A., Lawrence, C., McGeorge, C., McInnes, A.M. Makhado, A.B., Malan, T., Masotla, M.J., **Milne, R.,** Muller, H., Purves, A., Sherley, R.B., Stander, N., de Villiers, P., Visagie, J., Wilke, C. and Waller, L.J., 2025. A decade of implementing the Biodiversity management plan for African penguins – successes, failures and lessons learnt, Journal for Nature Conservation doi: https://doi.org/10.1016/j.jnc.2025.126919 (**Malgas Island, Marcus Island, Jutten Island, Boulders Beach, St Croix Island, Bird Island**)

Pichegru, L., Sherley, R.B., Malan, T., Barham, B.J., Ludynia, K., Geldenhuys, D., Amos, K., Barham, P.J., Drost, E., Hahndiek, V. and Hufke, A., 2024. Decades of artificial nests towards African penguin conservation—Have they made a difference?. Ecological Solutions and Evidence, 5(4), p.e 12388. (Robben Island, St Croix, Bird Island, Boulders Beach)

Reusch, K., Connan, M., Ryan, P.G., Butler, M. and Pichegru , L., 2025. Spatio - temporal differences in the diet and trophic ecology of Kelp Gulls (***Larus dominicanus***) in South Africa. Ibis, 167(1), pp.124-144. (**Malgas Island, Jutten Island, Swartkops River**)

Ryan, P.G., Pichegru, L. and Connan, M., 2024. Tracing beach litter sources: Drink lids tell a different story from their bottles. Marine Pollution Bulletin, 201, p.116186. (**Addo Elephant, Namaqua, Table Mountain**)

Smith, M. K. S., Penry, G. S. and Mokhatla, M. M. 2024. To move or not? Tourists' perceptions and management considerations of a beached whale carcass in a South African national park and marine protected area. African Journal of Marine Science 46 (3): 22 (T**sitsikamma MPA**)

Waterworth, S.C., Solomons, G.M., Kalinski, J.C.J., Madonsela, L.S., Parker-Nance, S. and Dorrington, R.A., 2024. The unique and enigmatic spirochete symbiont of latrunculid sponges. mSphere , 9(12), pp.e 00845-24. (**Algoa Bay and Tsitsikamma MPA**)

Whitfield, A.K. and **Smith, M.K.S.**, 2024. Future of the IUCN Endangered white steenbras Lithognathus lithognathus (Sparidae)–a tale of two estuaries. African Journal of Marine Science, 46(3), pp.155-167. (**Knysna and Swartkops Estuary**)

Book Capters

Baade, J., Gessner, U., Hahndiek, E., Harmse, C., Hill, S., Hirner, A., **Maruping-Mzileni, N.,** Otte, I., Pathe, C., Renner, P. and Schellenberg, K., 2024. Observational support for regional policy implementation: land surface change under anthropogenic and climate pressure in SALDi study sites. In Sustainability of Southern African Ecosystems under Global Change: Science for Management and Policy Interventions (pp. 845-877). Cham: Sprinr International Publishing. (**Augrabies Falls**)

Chadyiwa, M., Kagura, J. and Stewart, A., 2024. Application of machine learning in the prediction of employee satisfaction with support provided in a national park. In Tourism and Hospitality for Sustainable Development: Volume Three: Implications for Customers and Employees of Tourism Businesses (pp. 107-119). Cham: Springer Nature Switzerland. (**Kruger**)

Hoffman, M.T. and Gillson, L., 2024. Conserving the Karoo: Traditional approaches, new developments, and future challenges. Contested Karoo, p.201. (**Karoo**)

Kirsten, K.L., Forbes, C.J., Finch, J.M. and Gillson, L., 2024. The application of paleoenvironmental research in supporting land management approaches and conservation in South Africa. In Sustainability of Southern African Ecosystems under Global Change: Science for Management and Policy Interventions (pp. 313-333). Cham: Springer International Publishing. (**Kruger**)

Conference Proceedings

Ramoelo, A. and Tsele, P., 2024, July. Estimating Nitrogen and Biomass Interactions as an Indicator of Forage Condition in Rangelands with Remote Sensing-Derived Variables. In IGARSS 2024-2024 IEEE International Geoscience and Remote Sensing Symposium (pp. 5316-5319). IEEE. (**Golden Gate Highlands**)
Tsele, P. and Ramoelo, A., 2024, July. Integrating Active Learning and Regression Methods for Estimation of Grass Lai Over a Mountainous Region using Sentinel-2 Satellite Data. In IGARSS 2024-2024 IEEE International Geoscience and Remote Sensing Symposium (pp. 10516-10519). IEEE. (**Golden Gate Highlands**)
Tsele, P., Ramoelo , A. and Qabaqaba , M., 2024. Evaluation of Sentinel-2 Spectral Reflectance and indices to estimate grass LAI and CCC in heterogenous grasslands. In Space and Geospatial Technologies for the Africa We Want: 13th International Conference of the African Association of Remote Sensing of the Environment (p. 363-372). Springer Nature. (**Marakele**)

Editorials, commentaries and letters to editors

Ndlovu, N., 2024. Celebrating cultural heritage within national parks. Koedoe, 66(2), p.1816.
Ferreira, S.M., 't Sas - Rolfes, M., Balfour, D., Barichievy , C., Chege, G., Dean, C., Doak, N., Dublin, H.T., du Toit, R., Ellis, S. and Emslie, R.H., 2024. Risky conclusions regarding shrinking rhino horns. People and Nature 6: 1015-1018. https://besjourn
Bowlby, H.D., Dicken, M.L., Towner, A.V., Rogers, T., Waries, S. and Kock, A., 2024. Ecological conclusions remain unchanged for white sharks in South Africa: A reply to Gennari et al. 2024. Ecological Indicators, 165, p.112160.

Jutten Island is a 46-hectare, rocky island located approximately 800 metres off the coast of Saldanha Bay. Part of the West Coast National Park and a Marine Protected Area (MPA), it is a critical breeding site for seabirds like African penguins and cormorants.

Dr. **Alan Whitfield** is a retired Chief Scientist with the South African Institute for Aquatic Biodiversity (SAIAB) and has a strong interest in the biology and ecology of fishes in estuaries, especially those in the southern Cape such as Knysna Estuary.

Dr. **Alison Kock** is a marine biologist at SANParks, leading marine research and biodiversity monitoring. She focuses on MPA effectiveness, African penguin conservation, and shark ecology, contributes to management planning and national scientific working groups, and is an Honorary Research Associate at the South African Institute for Aquatic Biodiversity.

Dr. **Anthony Swemmer** manages the Ndlovu node for SAEON (South African Environmental Observatory Network), with a specific interest in long term environmental research linked to issues such as global climate change, fuel wood harvesting, elephant impacts and eco-hydrology.

Mr. **April Lukhele** manages the permitting and compliance office for the Mpumalanga Tourism and Parks Agency, in Nelspruit, Mpumalanga. April has many years of experience of working with communities adjacent to the Kruger, and has a keen interest in effective management of human-wildlife conflict.

Ms. **Aseeqah Davids** is the Junior Marine Scientist at SANParks Scientific Services and is based at the Cape Research Centre. She holds an MSc in Biodiversity and Conservation Biology from UWC and supports ecological research and monitoring in MPAs under SANParks authority and is skilled in BRUV and data analysis and management.

Dr. **Benjamin Wigley** holds a research position with the University of Bayreuth and his current research focus is on the different strategies that savanna trees employ to deal with highly variable rainfall.

Prof. **Brian van Wilgen** is an Emeritus professor at the Centre for Invasion Biology at Stellenbosch University. He has conducted extensive research on fire ecology and management, including studies in the Table Mountain, Garden Route, Kruger and Addo Elephant National Parks.

Prof. **Carly Cook** is a conservation scientist at Monash University in Australia. Her interest lay in research at the intersection between science and practice, with an emphasis on developing decision support tools that help.

Ms. **Chanelize Swart** is a Junior Black Rhino Monitor in Addo Elephant National Park. Her passion for conservation drives her commitment to learning more about rhino monitoring and contributing to their long-term survival.

Dr. **Charlene Bissett** is a Regional Ecologist for the Frontier Parks based in Addo Elephant National Park works at the interface between science and management.

Mr. **Clement Arendse** is a Marine Biologist based at Rondevlei Scientific Services in the Garden Route National Park. His research interests include life history studies and management of recreational linefish species, intertidal rocky shore invertebrate and fish communities and estuarine ecology.

Dr. **Cloverley Lawrence** is a Marine Scientist with SANParks, working across the Garden Route and Addo Elephant National Parks. Her work focuses on monitoring marine biodiversity, managing research in MPAs, and supporting conservation of key species like African penguins, seagrasses, and estuarine birds.

Dr. **Corli Coetsee** is an ecosystem ecologist based in SANParks' Scientific Services savanna node and an editor of this report. She enjoys science, art, the ocean and spending time with her family.

Prof. **Craig Tambling** is an Associate Professor with the Department of Biotechnology and Biological Sciences at the University of Fort Hare. His research focuses on large mammal ecology and, in particular, how large predators influence the ecology and demography of co-occurring herbivores.

Mr. **David Pienaar** is very interested in protecting and preserving wildlife and their natural habitats. I like working inside an office and being outside in a natural environment . He cares deeply about enforcing laws in the conservation field to protect the ecosystem and also the assets of the organization.

Ms. **Deborah Winterton,** the Cape science liaison officer, has a passion for the outdoors, hiking and researching habitat use of medium and large mammals .

Mr. **Deen Shade** is a Junior Planner working in Park Planning and Development for South African National Parks. Deen works closely with the GEF 7 and GEF 8 teams to assist with GIS related tasks along with the SANParks Vision 2040 Mega Living Landscapes projects.

Mr. **Diba Rikhotso** is a biotechnician based in the Garden Route responsible for monitoring and research in Forest dynamics, Fynbos , Invasive plants and Veld Condition Assessment (VCA) in Frontier Parks.

Prof. **Dirk Roux** is based in SANParks' Garden Route & Frontier Research Node. He is interested in promoting the resilience of social-ecological systems through processes of co-learning and adaptive management/governance.

Dr. **Dumisani Khosa** is a Freshwater Ecologist at SANParks. My work focuses on making sure that the freshwater ecosystems are healthy to maintain their functions and to continue providing benefits to both people and wildlife.

Dr. **Edson Gandiwa** is a Director General at the Zimbabwe Parks and Wildlife Management Authority. His research interests include biodiversity conservation, community-based natural resource management, ecotourism, and communication science.

Ms. **Emma Wright** is a junior climate change scientist at the Cape Research Centre where she is responsible for supporting park-level adaptation planning across all parks. She is particularly interested in how scientific research can be used to inform the effective management of protected areas in a changing world..

Ms. **Erin Crowhurst** has been an intern in the large mammal division since March 2023, and is passionate about her job. She has co-authored two papers, conducted predator and elephant dung surveys, and assisted with aerial censuses.

Ms. **Ester van der Merwe** is a passionate Black Rhino Monitoring Technician in Addo Elephant National Park. She has been actively monitoring wildlife populations for 18 years including monitoring large Black Rhino Populations for the past 11 years.

Mr. **Evans Mkansi** is the park manager of the Mountain Zebra National Park. Evans Mkansi is the Park manager for Mountain Zebra National Park. He brings over two decades of conservation experience, having begun his career with SANParks through in-service training at Kruger National Park in 2000 and rising through various roles, including Regional Ranger at Satara and Conservation Manager at Addo Elephant National Park.

Ms. **Fahiema Daniels** is the conservation planner for South African National Parks. She holds a Master of Science degree in Conservation Biology from the University of Cape Town and has over 18 years' experience in the biodiversity sector, working specifically as a biodiversity/ conservation planning specialist.

Dr. **Frans Radloff** is an Associate Professor with the Department of Conservation and Marine Science at the Cape Peninsula University of Technology. His research interests lie within community ecology and ecosystem functioning, with a particular interest in how mammals influence and shape ecosystems **by means of herbivory and predation.**

Dr. **Graham Durrheim** undertakes long-term indigenous forest monitoring and research programmes in the Garden Route.

Mr. **Hendrik Sithole** has been an invertebrate ecologist for SANParks since 2001 and he is mainly interested in studies that are empirically discovering the roles different invertebrates play in ecosystems.

Prof. **Hervé Fritz** is a Research Director at CNRS (France) and Adjunct Professor at Nelson Mandela University (NMU). He is the director of the International Research Laboratory REHABS, a joint entity between CNRS, University of Lyon 1 and NMU.

Mr. **Heston McCabe** is a esearch assistant in the Frontier Region Parks based at Addo Elephant National Park. He is a dedicated conservationist with a passion for protecting biodiversity and wildlife monitoring to ensure a sustainable future for conservation.

Mr. **Innocent Lindani Buthelezi** is currently the Security Manager for Babanago Game Reserve, in KZN, deployed by Security 4 U. Innocent is a former Environmental Monitor and Data collator/field assistant for the K2C at the time of his involvement in the study.

Dr. **Izak Smit** is a Senior Scientist with SANParks based in the Garden Route. He focuses on applied ecology and conservation science, with the aim of informing the thinking behind the management of protected areas in South Africa and beyond.

Prof. **Janine Adams** is a distinguished professor at the Nelson Mandela University and Deputy Director of the Institute for Coastal and Marine Research. She occupies the national Research Chair for Shallow Water Ecosystems. Ongoing research is investigating blue carbon ecosystems and responses to climate change.

Mr. **Januario Fernandes** works in the Conservation Management Department in the Kruger National Park, as the manager of the Wildlife Products Section. Januario effectively manages both the operational side of the Skukuza abattoir, meat storage and sales, wildlife economy activities and sustainable use, processing of wildlife offtakes as well as the ivory and rhino horn storage and stock.

Ms. **Jessica Hayes** is the Garden Route regional ecologist, providing support at the science -management interface. She has a particular interest in coastal, estuarine, and marine ecosystems.

Mr. **Johan Baard** is a scientist responsible for GIS and Vegetation Ecology in the in the GRNP. His main interests lie with invasive alien plant control planning and research, rehabilitation, plant collection, inventories, and developing and managing the park's Geographic Information System.

Mr. **Joshua Rogers** is a Biotechnician: Black Rhino Monitor based in Addo Elephant National Park. He is a passionate rhino conservationist and has worked extensively with rhino in Kwazulu-Natal, Limpopo, Mpumalanga, and the small country of Malawi.

Ms. **Judith Botha** works as a Senior Manager in the Science Support section based in Skukuza. She enjoys working with large datasets and is currently focusing on adding data and additional features to the SANParks Biodiversity Information Management System that was launched in 2024.

Mr. **Juzzy Mashele** served as supervisor in the Skukuza Abattoir, Kruger National Park for many years, before his untimely death on 25 March 2025. Juzzy was known for his conscientious work ethic at the abattoir, and his sincere, helpful and friendly manner among his peers. Juzzy is greatly missed in the park.

Ms. **Kgaugelo Morale** worked as a data collator and team leader of the Kruger to Canyons Biosphere Reserve Environmental Monitor Programme until her untimely death on 11 July 2015. Kgaugelo was a dedicated, respected and valuable asset to the K2C team.

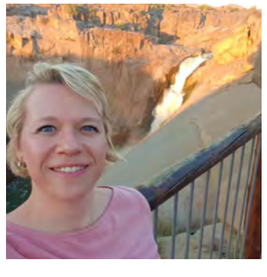
Ms. **Kiara Druyan** is a GIS intern for SANParks based in Skukuza, Kruger National Park from the WWF internship program for 2025/2026. Her interests lie in cartography and using spatial data to create clear, meaningful visualisations that support conservation and environmental decision-making.

Dr. **Kristal Maze** is the General Manager for Park Planning at SANParks, where she leads the growth of the national parks system through an integrated landscape approach. She has worked at the interface of biodiversity science, strategic planning, and development policy, and is passionate about unlocking biodiversity's potential as a catalyst for social and economic transformation.

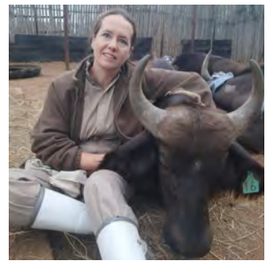
Ms. **Kutullo M. Buthelezi (Mina)** has worked with SANParks BSP and K2C for many years. Mina currently serves as the People and Culture Manager for CSA, with her strong leadership skills grounded in compassion, integrity, and a genuine passion for people and nature.

Mr. **Kyle Smith** is a Marine ecologist based at Rondevlei Scientific Services in the Garden Route. Conducting applied social-ecological research in the marine and estuarine environments with a particular focus on recreational and subsistence fisheries, estuarine fish communities, and the effectiveness of marine protected areas.

Dr. **Laurence Kruger** is the director of both Organization for Tropical Studies South Africa programmes and the Nsasani Trust. In partnership with SANParks, the Skukuza Science Leadership initiative (SSLI) was formed to provide training and research opportunities for southern African students and biodiversity practitioners.



Dr. **Liandi Slabbert** oversees tourism research at the South African National Parks, navigating between managerial and academic research to foster evidence-based decision-making. Her research interests cover nature-based tourism, visitor research, visitor management, strategic market development, human-nature interactions, and knowledge utilisation.



Dr. **Lin-Mari De Klerk Lorist** is a state veterinarian in Skukuza, Kruger National Park, falling under the Department of Agriculture (DOA). Lin monitors and does research on issues related to animal health and zoonotic diseases and also delivers a veterinary public health service at the abattoir.

Prof. **Llewellyn Foxcroft**, based in Kruger National Park, focuses on invasive alien species. His goal is to develop and connect ecological knowledge of alien species and impacts, to policy.

Dr. **Louise Swemmer** works from Hoedspruit, Limpopo coordinating social and economic research for Scientific Services' Savanna research node. Louise's main interests include effective benefit sharing, resource use, traditional medicine and human-wildlife conflict.

Ms. **Lucia Hlatshwayo** is a Social Economic Transformation Officer within the SET Department, Kruger National Park, coordinating community engagement from Phabeni Gate to Komatipoort/Crocodile Bridge. Lucia has a specific interest in Human Wildlife conflict and runs the operational side of the KNP compensation strategy.

Dr. **Lucienne Human** works for the South African Environmental Observation Network (SAEON) as a marine and coastal biogeochemist with an interest in estuarine ecology. He is affiliated to Nelson Mandela University and is an active research associate of the CMR.

Ms. **Madison Lichak** is a PhD student at Princeton University, where she combines fieldwork, molecular techniques, and bioinformatic analyses to study the impacts of hunting and other human activity on wild populations of animals. She also nurtures a passion for field safety and wilderness medicine, and she is a trained Wilderness First Responder.

Mr. **Malwandla Matelakengisa** is a data technician based at Scientific Services in Skukuza, working in the GIS lab. He specializes in cleaning, structuring, and validating large scientific datasets through the use formulas, lookup functions, and formatting techniques to ensure data accuracy and compatibility for online biodiversity platforms.

Dr. **María Fernanda Menvielle** brings over three decades of experience from Argentina's National Parks Administration. Focused on systematizing ecosystem management procedures, ensuring updated conceptual frameworks and effectively connecting scientific, technical, and operational aspects and people.

Dr. **Marie-Tinka Uys** (MT) championed the declaration of the Kruger to Canyons UNESCO Biosphere Region in 2001 and continues to play a critical role in the conservation and sustainable development interface in the landscape. MT is the executive coordinator and chief operating officer of the Kruger to Canyons Biosphere Region NPO.

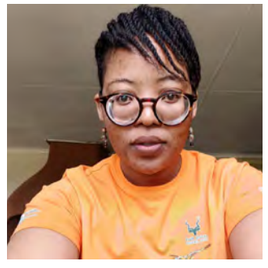
Prof. **Martin Villet** is a retired zoologist, now using that freedom to participate in surveys in South Africa and Angola. He curates the National Bristletail Collection in Cape Town.

Ms. **Mbali Mthombeni** is a skilled Environmental Monitor based in Kruger National Park, South Africa. She is passionate about research and on the ground conservation practices.

Ms. **Melanie de Morney** is a biotechnician at Garden Route Scientific Services. She plays a supportive role in the implementation of terrestrial fauna research and monitoring, with a particular focus on insects, as well as wildlife Species of Special Concern and outreach programs.

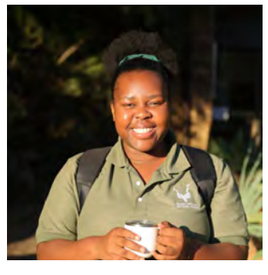
Ms. **Michael-Jade Meyer** was a part of the SANBI Groen Sebenza programme from 2023 to 2024 with SANParks Scientific Services and based in the Garden Route National Park. She is currently pursuing her honours degree in Natural Resource Management at Nelson Mandela University in George.

Mr. **Kyle Smith** is a Marine ecologist based at Rondevlei Scientific Services in the Garden Route. Conducting applied social-ecological research in the marine and estuarine environments with a particular focus on recreational and subsistence fisheries, estuarine fish communities, and the effectiveness of marine protected areas.



Ms. **Naledi Sebonesho** joined SANParks in 2023 July, serving as an Environmental Monitor in Kimberly scientific services. She assists with field data collection, capture, analysis and with the management of the herbarium. She is interested in contributing to a better understanding of how nature functions (plants, mammals, insects & birds).

Dr. **Ndukuyakhe Ndlovu** has a PhD from Newcastle University in the United Kingdom. He is currently the Manager for Archaeology at SANParks and before this, was a senior lecturer for archaeology at the University of Pretoria.



Dr. **Nelsiwe Mpapane** is a social-ecological systems researcher and practitioner based in the Garden Route and Frontier region. She is a PhD candidate working at the intersection of transdisciplinary research and policy engagements. Her doctoral research focuses on transformative change through inclusive pathways and practices for biodiversity conservation in South Africa.

Ms. **Nerina Kruger** is a science liaison and GIS officer based at Rondevlei, Garden Route node. Her main function is to oversee research project administration and supply logistical support to researchers working in the Garden Route, Marine and Frontier parks. Some other functions include GIS analysis of monitoring data and database management.

Mr. **Nicholas Cole**, Interface Manager with the Biodiversity Social Projects (BSP), has worked with SANParks since 2002. He has broad interest in ecology; however, his main focus is alien species and compliance with relevant legislation, from within SANParks through to international agreements.

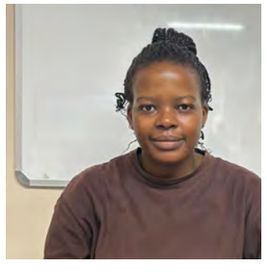
Dr. **Nicholas Macgregor** is a conservation biologist at Parks Australia. He has a wide range of research interests, from species ecology and ecosystem processes to monitoring design and management decisions.

Dr. **Nicola van Wilgen-Bredenkamp** has a broad interest in ecology, conservation, ecosystem management and data analysis. She is a global change scientist at the Cape Research Centre, where most of her research focuses on alien species and climate change.

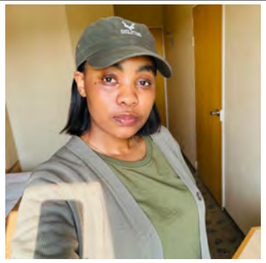
Ms. **Nikisha Singh** is Senior Biotechnician: Collections. Her duties predominantly focus on the curation and digitisation of the Reference Collection and management of the related biodiversity data in Skukuza.

As the General Manager of the Cape and Arid Research Units in South African National Parks, Dr. **Nkabeng Mzileni** facilitates strategic science-management support for national parks. This includes policy interpretation and contributions toward national conservation management strategies.

Ms. **Nkateko Silinda** is the former Curator of Mapungubwe National Park and World Heritage Site. Nkateko was responsible for the stewardship of archaeological collections from the Kingdom of Mapungubwe.She facilitated in hosting TheMuseumLab 2023 and 2024, a flagship international residency.



Ms. **Noxolo Njapha** is a Junior Marine and Estuarine Ecology Intern with SANParks Scientific Services, based at Rondevlei. She first joined SANParks in 2023 as a SANBI Groen Sebenza Intern. She participates in estuary ecology research, with a particular focus on estuarine fish communities, and recreational and subsistence fisheries and the effectiveness of marine protected areas.



Ms. **Ntando Majola** previously served as a Marine Ecology Intern under the Groen Sebenza Programme (2023-2024) and is currently a Junior Scientist Intern specialising in marine and estuarine ecology at Rondevlei Scientific Services in the GRNP. Her work includes assisting with intertidal rocky shore monitoring in MPAs, water quality monitoring and supporting estuarine ecological research.

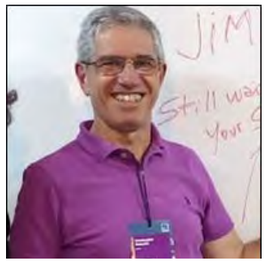
Mr. **Obert Mathebula** has dedicated 42 years to SANParks, starting as a general worker and advancing to a research assistant for the large mammal team. Throughout his career, he has contributed to numerous projects, showcasing his commitment and extensive experience in wildlife research and conservation efforts.

Mr. **Phillip Mhlava** began his SANParks career in 1998. He started with the Scienitific Services department in 2008 before joining the large mammal team in 2020, where he has made significant contributions. He seizes every opportunity to work in the field and often takes guests on game drives during his spare time, sharing his passion for wildlife.

Ms. **Purvance Shikwambana** is based at the University of Mpumalanga. She was based in the Scientific Service Laboratory for more than a decade. Her research interests include freshwater quality monitoring and the recent environmental challenge of riverine microplastic pollution.

Mr. **Raffaele Morisoli**, born in Switzerland 25 years ago but with his heart in Africa since childhood, studied biology at the University of Basel and later at the University of Neuchâtel, specializing in animal behaviour and conservation to fulfil his dream of studying Africa's large predators. He is now qualifying as a science teacher in the schools of his home country.

Mr. **Rion Lerm** is a community ecologist and technician at the SAEON Ndlovu Node. His passion for specifically birds started at a very young age during visits to the Kruger National Park with family, leading to a pursuit to better understand the patterns and processes that shape biotic communities.



Prof. **Roberto J. Fernández** is a professor of Ecology at Universidad of Buenos Aires, and a Conicet researcher in IFEVA-UBA (Argentina). An agronomist by training, is currently concerned with how science findings are (and are not) used in decision making in the context of polarised discourses.

Mr. **Robin Petersen** is a scientist in the Garden Route National Park, responsible for the Integrated Water Resources Management, aquatic ecosystems and groundwater research programmes.

Ms. **Roxanne Erusan** is a biotechnician for scientific services based in Kimberley. She has experience in various monitoring projects including mammals, plants, freshwater, ichthyology and macroinvertebrates.

Mr. **Rudi Swart** is a forest ecologist associated with NVT (Nature's Valley Trust, Forest Programme) and Nelson Mandela University, who has done research on southern Afrotemperate forests for over ten years. His research interests are focused on tree-insect interactions, especially insects that feed on fruits and seeds of our indigenous tree species.

Mr. **Rushdi Ariefdien** obtained his MSc in Marine Science and is currently working as a marine biotechnician at Cape Research Centre based in TMNP. His work is based around the marine space in three MPAs being TMNP MPA, RI MPA and NNP MPA. He has a love and passion for coastal research.

Mr. **Russell Dixon** is a former Video Analyst with SANParks Scientific Services and was employed under the JRS Fund. During his time with SANParks, he was responsible for analysing Baited Remote Underwater Video footage collected from Robben Island and West Coast National Park MPA's. His interests include estuarine and marine ecology, fish movement patterns, and conservation effectiveness.

Dr. **Ruth-Mary Fisher** is the Freshwater Scientist for the Cape Parks including Namaqua National Park. Her focus is on wetland mapping and river health monitoring. Current projects include wetland monitoring and WetHealth assessments. She recently completed a PhD with a focus on soil hydrophobicity in fynbos ecosystems.

Dr. **Sam Ferreira** works for SANParks as large mammal ecologist. He focuses on improving how large mammals in general contribute to the well-being of people.

Ms. **Samantha Mabuza** is a Science liaison officer for the Savanna Research Unit, based in Kruger National Park. She assists with the registration of research projects in the Savanna parks, research logistics and managing the Skukuza Research camp. Her interests are in Science Communication and engagement.

Dr. **Shane Campbell-Staton** is interested in how human history, culture, technology and politics influence life, biological stress and evolution of species around the world. He uses physiology, gene expression, genomics and experimentation to identify genes and traits that allow animals to rapidly adapt to new environmental pressures faced in a human-dominated world.

Ms. **Sharon Thompson** coordinates avian ecology research for the savanna node based in Phalaborwa. She has a keen interest in the role of protected areas sustaining bird populations and understanding birds as biological indicators in a rapidly changing environment.

Ms. **Sinothando Shibe** is a marine biologist working with the Cape Research Centre Marine Team. She has a background in benthic ecology and supports the SANParks–OFB partnership by delivering on some marine management plan actions and assisting with fieldwork and ecological data

Dr. **Stef Freitag-Ronaldson i**s General Manager of the Garden Route, Marine & Frontier Research Unit. She works at the interface of various forms of knowledge and understanding to inform decisions in the social-ecological systems complexity of protected areas management.

Dr. **Tercia Strydom** is a Science Manager: Systems Ecology in the Savanna Research Unit within Scientific Services. Her work focuses on fire, soils, hydrology and the interactions between these abiotic drivers.

Dr. **Terrence Bellingan** is a curator of Entomology and Arachnology at the Albany Museum Terrestrial Invertebrates Collection, Makhanda, South Africa.

Ms. **Thabang Sibiya** is a restoration ecologist based in the Garden Route National Park, South Africa. Her research primarily focuses on understanding vegetation and plant community dynamics, with a particular emphasis on ecological drivers, such as fire regimes, land degradation and invasive alien plant species.

Ms. **Thembisile Marshall** is a project Manager for SANParks BSP and has been since 2017. Thembi is responsible for the Working for Ecosystem programme, the main aim of which is to rehabilitate land degradation in communal rangeland.

Prof. **Tim Forssman** is an Associate Professor in Culture and Heritage Studies at the University of Mpumalanga, South Africa. He currently leads an inter-disciplinary, multi-scalar project on the Thulamela landscape examining the archaeological landscape and history of the Thulamela

Dr. **Tim Kuiper** is an African biodiversity scientist leading solutions-focused research on human–nature relations. He combines statistical modelling and stakeholder interviews to understand biodiversity loss drivers and evaluate solutions, prioritising practitioner and policymaker insights for real-world action.

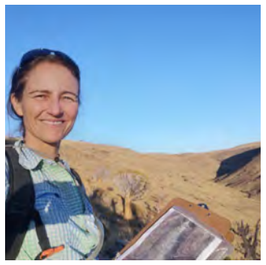
Mr. **Trevor Adams i**s a terrestrial biotechnician at the Cape Research Centre. He is responsible for the Species of Special Concern – Plants Monitoring programme. He is SASS5 accredited and provides a supportive role to the freshwater monitoring program.

Ms. **Tsholofelo Wechoemang** is an Environmental Monitor based at Kimberley Scientific Services. She has a keen interest in entomology and is actively involved in freshwater ecosystem monitoring. In her current role, she provides technical and field support to an invertebrate ecologist during SASS5 assessments, contributing to the evaluation of river health and water quality within protected areas.

Mr. **Victor Mokoena** is the Regional General Manager for the Garden Route Region at SANParks. He began his SANParks career in 2005 as Duty Manager at Golden Gate Highlands National Park and has held several leadership roles, including Front Office Manager, Tourism Manager, and Regional Manager of Tourism and Marketing. He has managed the Tsitsikamma section since 2019.

Dr. **Vincent Naude** is the Science Interface Manager at African Parks and an Extraordinary Lecturer at Stellenbosch University. He works to bridge the gap between pragmatic management needs and the cutting-edge advancement of scientific techniques and understanding across Africa.

Prof. **Wayne Twine** is an ecologist interested in the relationships between people and nature in rural socio-ecological systems. He is based at the Wits Rural Campus in Limpopo Province, where he leads a programme of research and student training focussed on environmental change, sustainable rural livelihoods, and community-based natural resource management.



Dr. **Wendy Foden** has a specific interest in translating science for practical conservation use, and in fostering conservation leadership. Her main research areas include climate change vulnerability assessment, adaptation planning, biodiversity indicators and monitoring, African conservation and systems ecology.

Mr. **Wonga Pama** is the Senior Section Ranger at Mountain Zebra National Park in Nxuba, Eastern Cape, where he leads conservation efforts to protect endangered species such as the Cape mountain zebra, cheetah, and black rhino. His role includes overseeing anti-poaching operations, ecological monitoring, and visitor safety.

Camel thorn creates islands of fertility and habitat to many types of biodiversity in the otherwise desert conditions of the Gemsbok Kalahari National Park.