

CONSERVATION

AND THE ENVIRONMENT IN NAMIBIA



ARE NAMIBIA'S
CARNIVORES AT RISK?

MINING AND THE
ENVIRONMENT

HUMAN-WILDLIFE
CONFLICT

GAINING INSIGHTS INTO
THE SECRET LIVES OF WILD ANIMALS

CONSERVATION

AND THE ENVIRONMENT IN NAMIBIA

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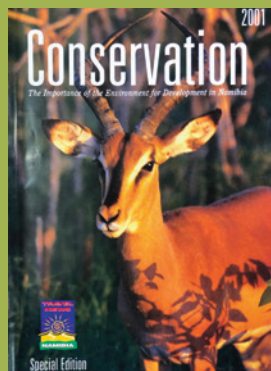
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FROM THE PUBLISHER

The first edition of *Conservation and the Environment in Namibia* coincided with the dawn of the new millennium. Now, almost two decades down the road, the magazine has an exciting new look and a shared purpose with the Namibian conservation fraternity which includes NGOs, government officials, researchers and scientists.

As one of the first members of the Namibian Chamber of Environment, Venture Media joins hands with other NCE members to tell the country's environmental and conservation success stories. Our collective aim is to ensure that topics and issues of national importance, good and bad, are addressed and discussed. As publishers we provide platforms to networks and communities reaching further than the magazine printed on paper twenty years ago ever could.

In the year 2000, after almost a decade of successfully publishing magazines to promote Namibia as a tourist destination, our team at Venture Publications realised that Namibian tourism businesses who are serious about the future of tourism should also take the protection of the environment seriously. As publishers of *Travel News Namibia* and *Namibia Holiday & Travel*, we took up the challenge to spread the message of conservation and the success stories to the general Namibian public.

Over the years we distributed *Conservation and the Environment in Namibia* with its wide variety of inspirational stories about the environment, environmental organisations, successful projects and the people behind the projects to thousands of readers. In Namibia we delivered the magazine to schools, government ministries and influencers in business, tourism and education. Over the years the electronic version of the magazine reached a growing audience on all continents.

We will continue to be the link between tourism and conservation stories and the man on the street – not only in Namibia, but through our tourism connections also to the source markets where a growing number of tourist are becoming aware of the importance of how tourism should contribute without harming either the social or natural structure of a country.

Namibia was always meant to be a high-yield, low-impact destination. We brand Namibia as “rugged, liberating, soulful and natural”. All of these emotive words describe our competitive advantage in the world of tourism. To stay true to the way in which we sell Namibia and to protect what we have we need to develop tourism carefully and strategically with the support, contribution and knowledge of people outside the tourism sector as well.

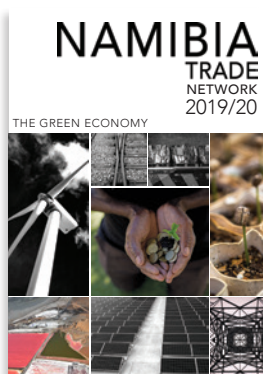
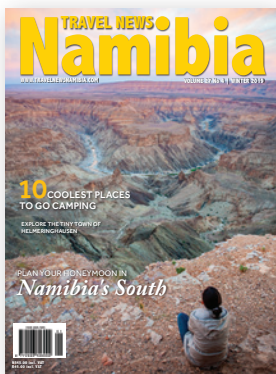
When we published the first edition of this magazine, the term over-tourism did not exist. It was hard to imagine that Namibia would ever have too many visitors. However, the conservation fraternity warned in the first edition: Ecotourism – A contradiction in terms. Most of the concerns raised in that article are still relevant today and some issues have become even more complicated.

All the more reason for a wider network from different walks of life to be engaged and committed and to be informed of the importance of the work being done to protect the environment.

Riëth van Schalkwyk

ABOUT VENTURE MEDIA

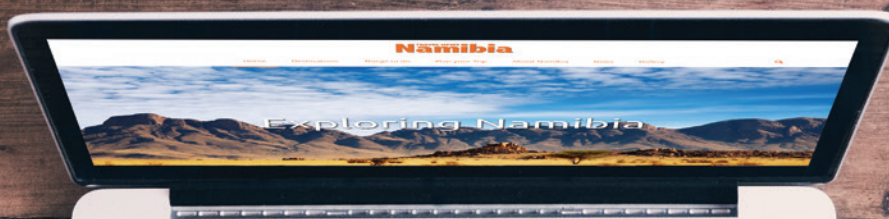
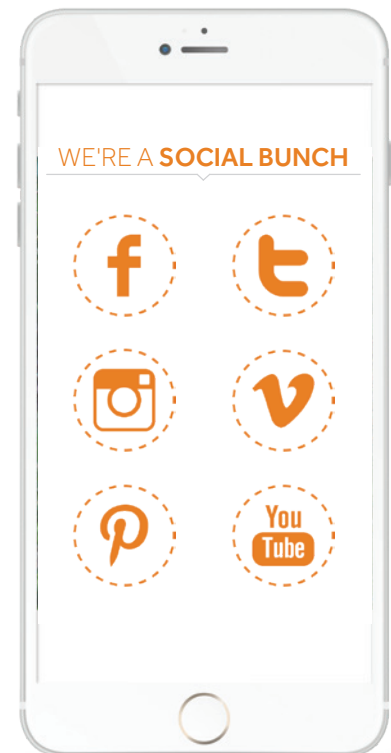
Venture Media is the pioneer of Namibia tourism promotion. We are the leader in spreading the tourism word around the world. We distribute accurate, credible, up to date and regular tourism-related information on paper, in social media, on the World Wide Web, and on mobile apps. We have reached hundreds of thousands of people over more than two decades. Be part of our community and let's do it together.



TRAVEL NEWS NAMIBIA is a high-quality glossy Namibia travel and lifestyle magazine tasked with promoting Namibia to the world. Travel News Namibia is published quarterly in English and annually in German.

The **NAMIBIA HOLIDAY & TRAVEL** is an annual tourism directory with over 200 pages of updated information on the country, regions, people, activities and wildlife.

The **NAMIBIA TRADE NETWORK** is an annual trade and industry portfolio and is the pillar of information dissemination to the private-sector and the promotion of foreign investment.





ABOUT NAMIBIAN CHAMBER OF ENVIRONMENT

The Namibian Chamber of Environment (NCE) is a membership-based and -driven umbrella organisation established as a voluntary association under Namibian Common Law to support and promote the interests of the environmental NGO sector and its work. The Members constitute the Council – the highest decision-making organ of the NCE. The Council elects Members to the Executive Committee at an AGM to oversee and give strategic direction to the work of the NCE Secretariat. The Secretariat (staff) of the NCE comprise a CEO, Director and Office Manager. Only the Office Manager is employed full-time. The NCE currently has 52 Full Members - Namibian registered NGOs whose main business, or a significant portion of whose business, comprises involvement in and promotion of environmental matters in Namibia; and 13 Associate Members – individuals running environmental programmes and non-Namibian NGOs likewise involved in local to national environmental matters in Namibia. A list of Members follows. For more information on each Member, their contact details and website link, please go to the NCE website at www.n-c-e.org/members.

THE NCE HAS FOUR ASPIRATIONAL OBJECTIVES AND FIVE OPERATIONAL OBJECTIVES AS FOLLOWS:

Aspirational Objectives

- Conserve the natural environment
- Protect indigenous biodiversity & endangered species
- Promote best environmental practices
- Support efforts to prevent & reduce environmental degradation & pollution

Operational Objectives

- Represent the environmental interests of Members
- Act as a consultative forum for Members
- Engage with policy- & lawmakers to improve environmental policy & its implementation
- Build environmental skills in young Namibians
- Support & advise Members on environmental matters & facilitate access to environmental information

The NCE espouses the following key values:

- To uphold the fundamental rights and freedoms entrenched in Namibia's Constitution and laws, including the principles of sustainable use, protection of biodiversity and inter-generational equity;
- To promote compliance with, uphold and share, environmental best practice, recognising that the Earth's resources are finite, and that human health and wellbeing are inextricably linked to environmental health.
- To recognise that environmental best practice is best promoted by implementing the following seven principles: sustainability, polluter pays, precautionary, equity, effectiveness & efficiency, human rights and participation;
- To develop skills, expertise and passion in young Namibians on environmental issues;
- To ensure political and ideological neutrality, be evidence-based and counter fake information; and
- To promote inclusiveness and to fiercely and fearlessly reject any form of discrimination.



TO EFFECTIVELY IMPLEMENT THESE OBJECTIVES AND VALUES, THE NCE HAS DEVELOPED EIGHT STRATEGIC PROGRAMME AREAS:

1. Support to Members

The NCE provides office facilities, boardroom, internet and safe parking for its out-of-town Members when in Windhoek; in partnership with Westair, a Cessna 182 for conservation purposes such as aerial surveys, radio-tracking and anti-poaching work; registration and research permit facilitation; and any other support requested by Members.

2. National facilitation

The NCE organises symposia and workshops on topical and priority issues (we report on three in this publication); strategic Best Practice Guides at sector level, the first on mining, the second (in preparation) on hunting; review of policy and legislation on and/or impacting Namibia's environment; and representing the sector and Members on national bodies.

3. Environmental information

The NCE hosts and supports the development of Namibia's Environmental Information Service (EIS at www.the-eis.com) in partnership with Paratus Telecom, a one-stop-shop for all environmental information on Namibia. The EIS comprises an e-library with over 15,600 reports, publications, maps, data sets, theses, etc., which are searchable and down-loadable. It provides an Atlasing platform for citizen science data collection that currently covers mammals, reptiles, amphibians, butterflies and invasive alien plants, sightings of these species are conveniently entered via a free cellphone App. The NCE has also established a free, open access scientific e-journal – Namibian Journal of Environment – now in its third year (www.nje.org.na). The NCE informs the public on topical environmental issues on its website (www.n-c-e.org) and Facebook page.

4. Environmental advocacy

The NCE addresses national threats to Namibia's environment and natural resources by first attempting to work constructively with the relevant government or other entity but, if necessary, through public exposure. The NCE has addressed the issue of Chinese incentivised poaching and illegal trade in specially protected wildlife, the over-fishing of pilchards in Namibian waters, illegal and unsustainable timber harvesting and export, and the need to reduce and eliminate single-use plastic from Namibia's environment. It has also initiated a highly successful Pangolin reward scheme in partnership with MET, some NCE Members and communities. The scheme rewards people for providing information on pangolin trafficking leading to arrests – more than 50 criminal cases were opened in the first year and over 100 people arrested.

5. Environmental policy research

When we talk about the "environment" we mean the interrelationship of ecological, social and economic aspects – essentially sustainable development. This is appropriate for a country with an economy reliant mainly on natural resource-based primary production where ecological and socio-economic issues are two sides of the same coin. However, this conceptual approach is rarely understood by people from western industrialised countries who think of environment as being just the green environment. To get around this problem, the NCE has established a socio-economic / livelihoods component that works seamlessly with the environmental component. The current focus of the new component is on the urban environment where about 50% of Namibians now live, projected to rise to 70% by 2030. The priority areas are access to affordable urban land for housing, appropriate sanitation, energy and research on the economics of poverty and how to escape this trap.

6. Young Namibian training and mentorship

Over the past two academic years the NCE in partnership with Woodtiger Fund has provided 35 bursaries in the broad environmental field (including subjects such as environmental economics, environmental law, environmental engineering) and 16 internships, mainly for NCE bursary-holders, that involves close mentoring by experienced environmental professionals. The aim is to build the capacity and confidence of young Namibians to become the environmental leaders of tomorrow.

7. Fund raising

Core funding for the NCE is currently provided by B2Gold. This means that all additional funding received is invested directly into environmental projects and programmes – there are no overhead costs. The NCE focusses on corporate support and avoids targeting funding sources that may compete with its Members. The corporate sector assists with fund raising by approaching their clients, partners and networks. Our main sponsors are shown on the back cover.

8. Grants making

Funds raised by the NCE are used strategically to support priority environmental projects and programmes in Namibia. Emphasis is placed on legacy initiatives that have tangible outcomes. These are often based on national policy and bring together government and NGO partners, communities and the private sector, and frequently lead to investments by larger bilateral or multilateral funding organisations. An on-line grant application process allows NCE Members to apply for funding. To date more than 20 grants have been awarded to projects and programmes, 80% of which are to NCE Members. Some of these projects are showcased in this magazine.

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FOREWORD

The Namibian Chamber of Environment (NCE) is a membership organisation representing the environmental NGO sector in Namibia. We are therefore delighted to present this edition of Conservation & Environment in Namibia as a showcase of our members' work and collaborative efforts facilitated by the NCE over the last few years.

This edition echoes the incredible biodiversity of Namibia – covering species ranging from the little known blind cave catfish to the charismatic big cats and elephants, and habitats ranging from the Namib Desert to the perennial Zambezi River. Conservation is a multi-faceted endeavour, as reflected by the wide range of topics from applied biological research and conservation through to environmental education and sustainable development.

Collaboration and communication is key to moving conservation forwards. Three articles in this edition cover symposia held to foster collaboration among conservation professionals for specific projects and provide a platform to learn from each other. These symposia covered research using satellite-tracking devices on animals, environmental best practice in the mining sector, and assessing the conservation status of carnivores in Namibia. The professionals involved in these symposia have since combined their knowledge and experience to work on an Environmental Best Practice Guideline for the mining sector and a Red Data Book for carnivores in Namibia.

There are a number of 'hot topics' debated by conservationists and the general public in Namibia. We shed some light on some of these by presenting our current knowledge and practice regarding the ongoing fight against wildlife crime, helping farmers live with elephants, dealing with widespread bush 'encroachment', and addressing the burgeoning growth of informal settlements in Namibia's towns. We also take a quick detour to the Angolan coast, which seems to be providing a haven for seabirds from Namibia in search of food as a result of overfishing of pilchards in Namibian waters. More 'hot topics' can be found on our website at www.n-c-e.org/resources/hot-topics.

Eight of our members contributed to this edition by providing updates on their work around the country. EduVentures and the Namib Desert Environmental Education Trust (NaDEET) detail their environmental education efforts by working with teachers and the Namibian government. The Leibniz Institute for Zoo and Wildlife Research (IZW) gives us a peak into their high-tech research on cheetahs, while the Cheetah Conservation Fund celebrates the 25th anniversary of their livestock guarding dog programme. Dr Robin Naidoo from WWF-Namibia talks about Africa's longest zebra migration between Namibia and Botswana, while Prof Morris Gosling provides the low-down on the Hartmann's Mountain Zebra Project. Clinton Hay working within the Namibia Nature Foundation describes his research on the blind cave catfish, and demonstrates how the Namibian community-based approach is conserving our inland fisheries. Finally, Marita van Rooyen of SunCycles Namibia shows us how their solar-powered bicycles are helping conservancy game guards patrol and monitor in the Zambezi Region.

This magazine, and the NCE facilitative work detailed herein, would not be possible without our sponsors – B2Gold Namibia deserves a special mention, as they have provided our core funding since inception. Venture Media (a member of the NCE) have done a fantastic job to ensure that Conservation & Environment is not only informative, but also visually attractive and highly readable. We hope you enjoy reading about these fascinating topics and species as much as we enjoyed putting this magazine together.

Yours in conservation,

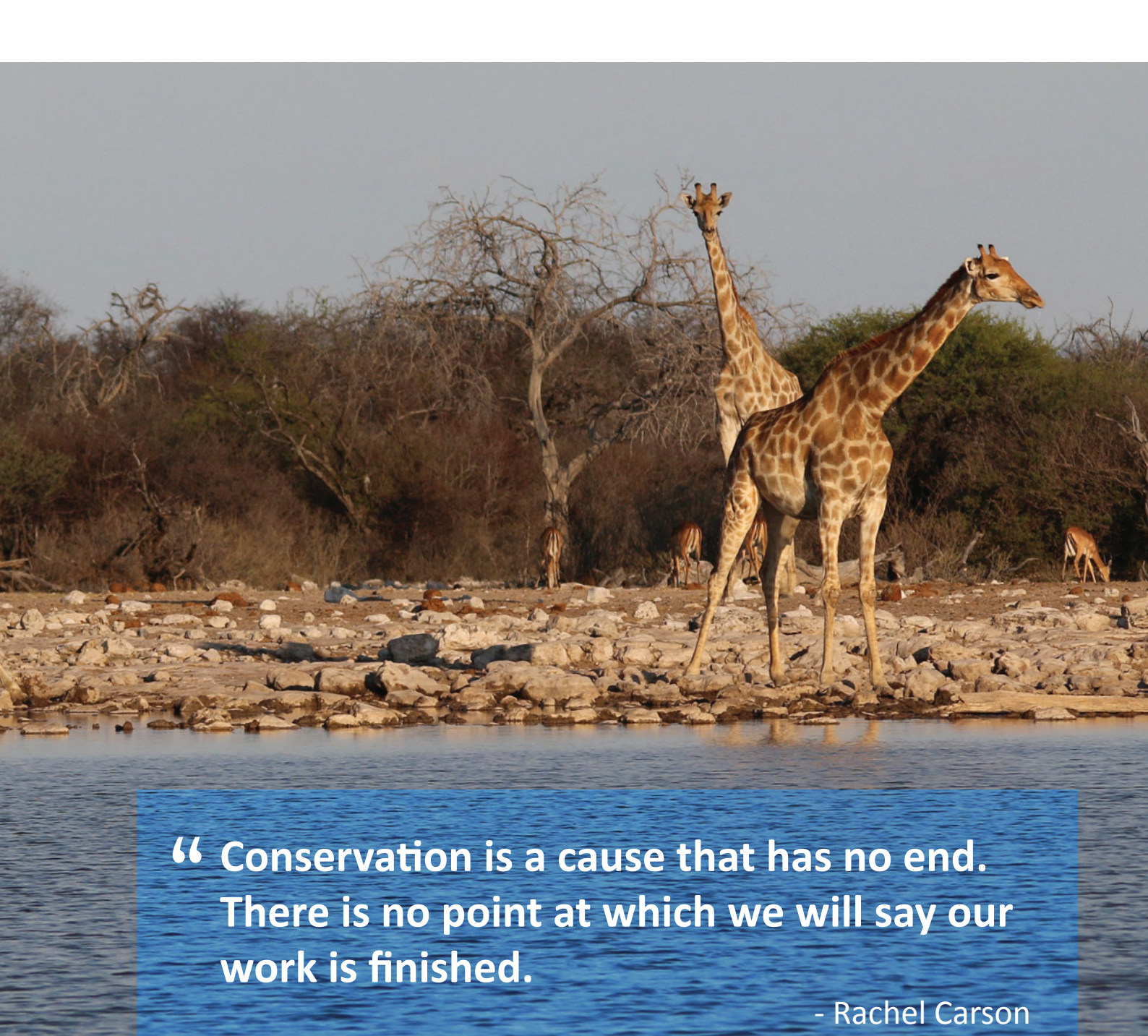
Chris Brown and Gail Potgieter

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“ Conservation is a cause that has no end.
There is no point at which we will say our
work is finished.

- Rachel Carson

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ARE NAMIBIA'S CARNIVORES AT RISK?

The New Red Data Book for Namibia





by Namibian Chamber of Environment

The world is facing an extinction crisis. According to the Living Planet Index, wildlife populations have declined by 60% in the last 40 years. Although species go extinct naturally, mankind's impact has accelerated the rate of extinction to up to 1,000 times faster than the estimated natural rate.



The African Wild Dog

The most endangered carnivore in Namibia is perceived to be incompatible with livestock farming and can be killed in large numbers due to its highly social behaviour.

Our world's plants and animals are of incalculable value as they provide ecosystem services that are essential to life on earth. Besides their direct worth, wildlife is valuable to us in many ways that cannot be expressed in dollars and cents – the majesty of an elephant in a savannah, the hard stare of a lion when you make eye contact, our sense of serenity and wellbeing in natural spaces. These are things that money cannot buy, but we could lose them if our conservation efforts fail.

The first step to addressing a problem is to understand its extent, severity and causes. Without this information it would be impossible to find effective solutions. To address this need, the International Union for Conservation of Nature (IUCN) established the Red List, which since 1964 has grown to become the largest and most comprehensive database of extinction risks to plants and animals.

By combining hard data with expert knowledge in a standardised and globally recognised format the IUCN Red List has become the go-to resource for conservationists and the general public. It is an especially useful guide for setting conservation priorities by identifying which species need the most urgent help, and what we can do to reduce the threats they face. You can search this database to find out more about plants or animals that interest you at www.iucnredlist.org.

When assessing a species, experts consider more than just the total number of animals left on earth. They take into account whether or not these numbers have declined in the last ten years, and if so, by how much; the extent and quality of the area they now occupy, and if that area is smaller or more fragmented than it used to be; current population estimates; and ultimately their probability of extinction in future. Once these factors have been taken into account, experts assign the species to one of the IUCN categories of threat – known as the species' status.

Besides species that are now extinct in the wild, or those we know too little about to assess, all others fall into one of the following categories (from worst to best status): Critically Endangered, Endangered, Vulnerable, Near Threatened, and Least Concern. Conservationists are most concerned about species falling in the first three of these categories, which face high to extremely high risks of extinction in the wild. Near Threatened species still warrant monitoring, as these species could decline into one of the worse categories in future if we fail to address the threats they face today.

The Red List is concerned with global extinction risks, but this is not always useful for governments and conservation organisations working in specific countries – species that are doing well globally may be declining within a country, or vice versa. If an increased national extinction risk is not identified and addressed, individual countries may lose these species before they are aware of the problem. Consequently, the IUCN has created a system for assessing extinction risks at national and regional scales. The information produced from collecting data and drawing on local expert knowledge is then published as a Red Data book. These books are available to the public and can assist national governments to set their conservation agendas. A good example is Namibia's Red Data Book for *Birds*, entitled *Birds to Watch in Namibia – Red, Rare and Endemic Species*, which can be sourced on Namibia's Environmental Information Service at www.the-eis.com/data/literature/Birds%20to%20watch%20in%20Namibia.pdf.

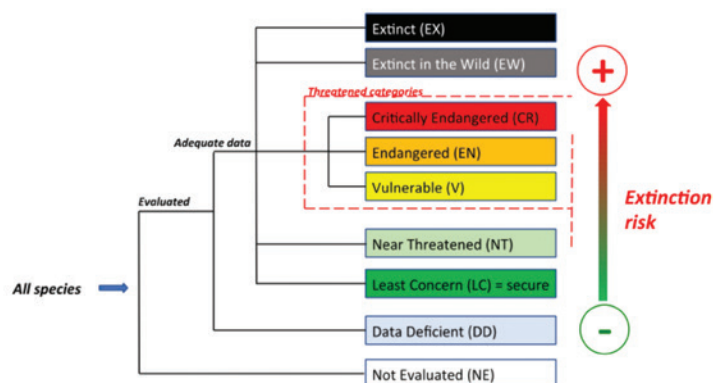
Namibia has not yet produced a Red Data book for any of its mammals, but the Namibian Chamber of Environment (NCE), together with the Large Carnivore Management Association of Namibia (LCMAN) and the Ministry of Environment and Tourism (MET), are looking to change this. On 8-10 November 2017, NCE facilitated a meeting sponsored by B2Gold Namibia at the Otjikoto Environmental Centre to look

at creating a Red Data book for Namibia's carnivores. The experts who attended the meeting are affiliated with LCMAN, NCE and MET, organisations that are ideally placed to undertake collaborative tasks such as this one.

During the conference the carnivore experts presented their current knowledge on everything from lions to mongooses. Large carnivores, like the big cats, hyenas, and African wild dogs, are generally better-studied and understood than small carnivores, but they are under much greater threat due to human pressures. During the conference the experts gave preliminary Namibian statuses to all of the carnivores, which will be revised once all available data have been collated and analysed for each species. These preliminary statuses indicate that African wild dogs, cheetah, and spotted hyena have greater extinction risks in Namibia than they have globally (see Table 1).

One of the reasons for the large carnivore status differences between Namibia and the rest of Africa is that their range and population densities are naturally limited by Namibia's dry climate. For example, spotted hyenas are more common in high rainfall areas and are not as well adapted to desert life as brown hyenas. Namibia's spotted hyenas therefore occur at relatively low densities, which increases their risk of extinction when compared to other spotted hyena populations.

African wild dogs are also confined to the wetter parts of the country (the northeast), but they are more susceptible to being killed by farmers than hyenas. The dogs are more visible as they hunt in packs and can be active during daylight hours, while their use of communal dens makes them vulnerable to farmer retaliation. Wild dogs are perceived to be incompatible with livestock farming, which means that if farmers find their dens, they can eliminate a whole pack in short order. Changing the perceptions and subsequent tolerance of farmers for wild dogs is thus a conservation priority.



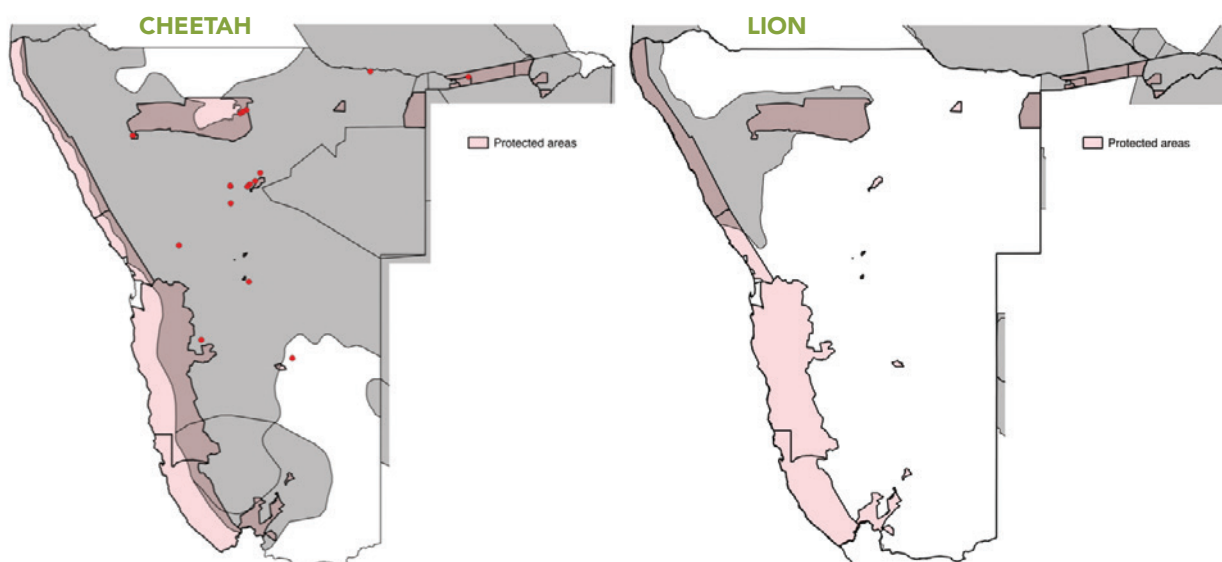
The IUCN categories of threat

Global status	Common name	Namibian status
Endangered	African Wild Dog	Critically Endangered
Vulnerable	Cheetah	Endangered
Vulnerable	Lion	Vulnerable
Vulnerable	Leopard	Vulnerable
Vulnerable	Black-footed Cat	Vulnerable
Least Concern	Spotted Hyena	Vulnerable
Near Threatened	Brown Hyena	Near Threatened
Near Threatened	African Clawless Otter	Near Threatened
Near Threatened	Spotted-necked Otter	Near Threatened

Table 1. The Global and preliminary Namibian statuses for carnivores. Species not listed here are classified as Least Concern globally and in Namibia.



Cheetahs are also under threat in Namibia, largely due to their conflict with livestock and game farmers. Despite Namibia hosting the largest population of cheetahs in the world, the vast majority of these cats occur on farmland that has no official protection status. There have been two recent calls to up-list the cheetah to Endangered globally, which will match the status given for Namibia. Currently cheetahs and livestock farmers coexist to some extent in Namibia, particularly in areas with healthy wild prey populations. Game farmers tend to be less tolerant of cheetahs, as these cats are efficient predators of their preferred prey species – e.g. springbok, blesbok and the young of larger, often high-value antelope.

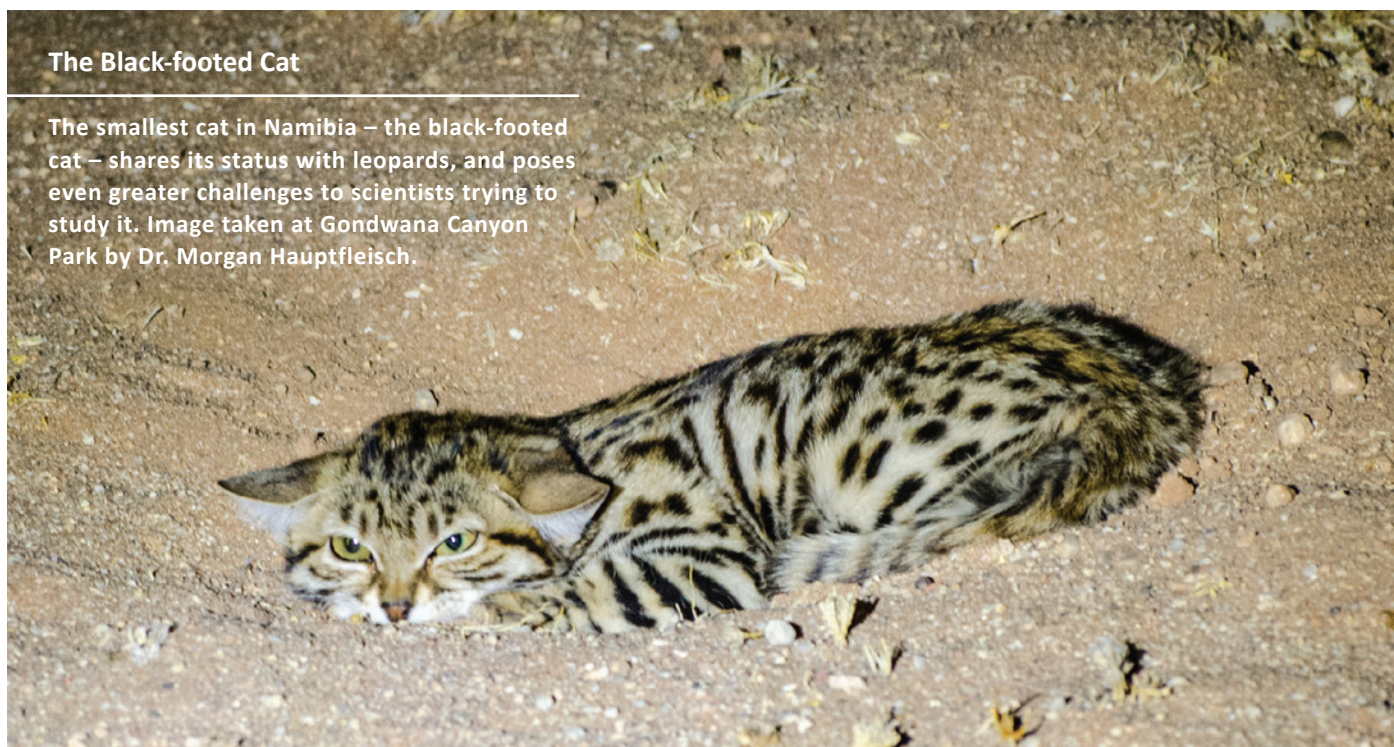


The cheetah range (left, shaded grey) compared to the lion range (right, shaded grey). The pink areas indicate where cheetahs and lions occur outside protected areas.

In stark contrast to cheetahs, Namibia's lions are almost entirely reliant on protected areas like Etosha, and they are rarely tolerated by farmers. The main exception to this rule is the population in the far northwest, where lions occur at naturally low densities due to the harsh desert environment. Farmers in these regions come into conflict with the lions, but several concerted conservation efforts from government, non-governmental organisations and local conservancies have contributed to keeping this unique population alive.

The Black-footed Cat

The smallest cat in Namibia – the black-footed cat – shares its status with leopards, and poses even greater challenges to scientists trying to study it. Image taken at Gondwana Canyon Park by Dr. Morgan Hauptfleisch.





Annabelle Venter

Leopards are more broadly distributed within Namibia than either cheetahs or lions, but their Vulnerable status indicates that they remain a conservation concern, perhaps more so at the global level than in Namibia. The smallest cat in Namibia – the black-footed cat – shares its status with leopards, and poses even greater challenges to scientists trying to study it. Leopards are difficult to count due to their secretive, nocturnal nature, and black-footed cats are even worse. Both cats are secretive and nocturnal, but whereas leopards can be counted using heat and motion-sensitive camera traps, black-footed cats are rarely caught on camera.

In the process of writing the Red Data book carnivore experts in Namibia will access as many sources of reliable information as possible. Carnivore researchers conduct intensive surveys using camera traps and other methods, but these efforts are usually limited to specific study areas and time periods. Furthermore, small carnivore species (e.g. mongoose species, honey badgers and weasels) are rarely surveyed so intensively. While intensive studies provide the cornerstone of our data collection efforts, more data over a larger area of Namibia and over longer time periods are required to improve the accuracy of the extinction risk assessments.

The good news is that anyone who lives in or visits Namibia can contribute by becoming a 'citizen scientist' and collecting data for scientific purposes. Today you can do this very easily by getting the free *Atlasing in Namibia* Application developed for smartphones. This app contributes to the Namibian Environmental Information System (www.the-eis.com), an online database that hosts a mind-boggling amount of information about the country.

After downloading the *Atlasing* app you can report any sightings of carnivores and a range of other animals and plants in a matter of seconds. The app uses your smartphone's built-in GPS unit to provide an accurate location for your sighting, and you can even submit photos if you are unsure of the species' identification. If you are not online when you record the sighting, the app will save your records and upload them when you choose to do so. Once you have entered and uploaded your sightings, you can visit www.the-eis.com/atlas to find your own and others' contributions to the database on a map of Namibia.

The global extinction crisis is real. Nonetheless you can help dedicated wildlife researchers collect accurate information on species that are under threat. This knowledge is power, which will be used to guide our conservation actions and prevent further human-caused extinctions. Get the *Atlasing* app, and become part of the solution.

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- Cats rarely caught on camera: www.onlinelibrary.wiley.com/doi/10.1111/aje.12564?fbclid=IwAR2QGKyQM38QZak0wcBleJuqUq-nDw2sFrga7cJ8ZtVjfhmUHVfTtDpP0KU
- *Atlasing* App: www.the-eis.com/atlas/?q=atlasing-in-Namibia-app

HOW NAMIBIA IS OUTSMARTING CRIMINALS INVOLVED IN THE ILLEGAL WILDLIFE TRADE

by Gail C. Potgieter



Serious crimes are being committed in Namibia – crimes against our precious wildlife, our natural heritage and, ultimately, our people. The criminal syndicates behind poaching are highly organised, professional and very clever. They are growing rich by stealing Namibia’s natural heritage, using poor Namibians to do their dirty work for them in return for less than 10% of the product’s market value. Those poaching on the ground thus bear all the risks associated with illegal activities, yet see precious little of the profit.

It is time to turn the tables on the illegal wildlife trade syndicates, and Namibia is doing just that. To combat this type of organised crime we need to be even more organised, professional and smarter than these shadowy syndicates. Doing this requires collaboration, funding and an unwavering commitment to stop poaching and trafficking, which is a different goal to just catching poachers. Whereas catching poachers is part of the job, in reality they are viewed as entirely expendable by their criminal bosses and can be easily replaced with others willing to do the same dirty work. Stopping poaching and trafficking, however, requires a smart, strategic approach that goes beyond the poachers on the ground and uses ‘weapons’ that are far more effective than guns.

Namibia’s first weapon is collaboration both within the country and with those who tackle illegal wildlife trade in neighbouring countries. Operation Blue Rhino in Namibia is a joint initiative between the Protected Resources Division of the Namibian Police Force (NAMPOL) and the Intelligence Investigation Unit (IIU) of the Ministry of Environment and Tourism (MET). This team includes police officers who were selected from different divisions and regions, and MET officers from the IIU and the regional offices. Blue Rhino also works with the Namibian Defence Force, with Save the Rhino Trust and their colleagues in Botswana and Zambia.

Using their collaborative network and funding from a few key donors who understand their operational needs, Blue Rhino has achieved enormous success in just the first six months. From July to December 2018 they arrested 88 suspects, opened 37 new dockets in the courts and confiscated 30 wildlife parts including three rhino horns, eight elephant tusks and 12 pangolin skins. Five live pangolins were also confiscated and released back into the wild. The extent of their success is not fully revealed by these impressive statistics, however, as they have disrupted illegal wildlife trade and started to dismantle a number of criminal syndicates. This sends a severe warning to other syndicates that still operate in the country. In some cases they have even managed to arrest poachers before rhinos or elephants were killed; this is a direct result of the significant investment Blue Rhino have made in intelligence gathering and analysis.

There are a number of poaching incidents for which no one was ever arrested or charged. With this new collaborative effort and focus, these former weaknesses are being addressed by employing another weapon in Namibia’s armoury – effective investigation through the strategic deployment of resources. Effective investigation is based on collecting and analysing hard evidence which can be used to build solid prosecutorial cases against suspects.

Arresting poaching suspects is only the start of a long legal process that includes building a case, presenting dockets to prosecutors, going through bail application hearings, prosecution and finally sentencing those found guilty. In the past, prosecutors and magistrates were not fully informed of the seriousness of wildlife crime, which allowed people to get bail and disappear, or to receive lenient fines and sentences. The MET has responded by developing a handbook for valuating and prosecuting crimes in Namibia, which is intended for investigators and prosecutors who are now working closely together on wildlife crime dockets, based on a shared sense of purpose and vision.





In 2017 Namibia primed another weapon in its armoury by increasing the legal penalties for illegal wildlife trafficking. Today, anyone caught with rhino horn, elephant ivory, pangolin scales or other controlled wildlife parts can be fined up to N\$15 million or imprisoned for up to 15 years, or both. Those caught trying to buy or sell these parts, both locally and for export, can be fined up to N\$25 million, be imprisoned for up to 25 years, or both.

State prosecutors will vigorously oppose bail for foreign nationals arrested for wildlife crime, and those found guilty will be deported once they have paid their fines or served their prison sentences. The state also opposes bail for Namibian suspects who are flight risks, may interfere with investigations or are likely to offend again. These maximum sentences are aimed at the high level criminals who ultimately drive the poaching activities. Such criminals are far more difficult to catch than the low-level poacher or product transporter, and once they are caught we need to ensure that the sentence truly reflects the seriousness of their crimes.

Besides enacting these tough new laws, prosecutors, magistrates, and judges are now more aware of how these crimes may be linked to other serious crime (e.g. drug and human trafficking). The on-going awareness workshops with legal professionals will ensure that suspects are charged using as many different pieces of legislation as possible, and will thus feel the full force of Namibian law. The result of this work was demonstrated by recent statements made by Magistrate Clara Mwilima when she sentenced a Namibian citizen caught in possession of ivory – after handing down a N\$ 50,000 fine (or five years in prison), she stressed the seriousness of wildlife crime as a threat to protected species, ecosystems and the economy. The convicted person's vehicle was also declared forfeited to the state.

Beyond these new strides in the right direction, the Namibian investigative and anti-poaching teams recognise the need to reach out to neighbouring countries. As a thin strip of Namibian land between Botswana and Zambia, the Zambezi Region is especially vulnerable to trafficking wildlife products, because poachers who have killed an elephant in one country can quickly hop across the border with their

ivory into the next country. Consequently, our teams are working closely with their Zambian and Botswana colleagues to ensure that poachers trying to use the Zambezi as a corridor are stopped in their tracks.

The Zambezi Region is part of the Kavango-Zambezi Transfrontier Conservation Area (KAZA), which provides a platform for information exchange among the governments and other organisations in Namibia, Angola, Botswana, Zambia and Zimbabwe. KAZA has the largest remaining population of elephants in Africa, so stopping ivory poaching in this region is of global significance. In February 2019 Namibia hosted a workshop funded by USAID for judges, magistrates and senior prosecutors from all five KAZA countries to spread the message about the importance of successful prosecutions and tough sentences for wildlife crime. MET and NAMPOL featured strongly in this workshop, as they demonstrated their search and seizure procedures for the attendees.

The final weapon that Namibia is employing to combat wildlife crime is all too often overlooked. Yet this particular weapon has enormous potential: it can be the game changer that finally sends the crime syndicates packing. That weapon is the average Namibian citizen. This is the 'man on the street', or the equivalent in our rural areas – those living on farms or in villages. A criminal can hide from police or anti-poaching units in uniforms, as they are easily identifiable. What will really give him sleepless nights, however, is when ordinary Namibians he encounters, and even those he does not see or notice, represent the eyes and ears of the law.

The Namibian strategy is based on the simple recognition that Namibia's natural resources ultimately belong to Namibian citizens. By recognising this right through the conservancy system, the government has included its citizens as joint managers and owners of wildlife. This means that when a foreigner comes to Namibia to kill rhinos, elephants or pangolins he is not just stealing from the government, but from the people of Namibia. As Namibians living on communal or freehold land benefit from wildlife, they make this logical connection and are motivated to blow the whistle on poachers.

Namibia is making great progress in combating wildlife crime using its full array of strategic weapons, but the war is far from over. Our investigative procedures and legal system must align even further to counteract the changing strategies of poaching and trafficking syndicates who are quick to respond to Namibia's adaptive law enforcement approaches. There is every reason to have confidence in Namibia's commitment and integrated strategy to fight and prosecute wildlife crime. Finally, every Namibian citizen needs to become fully aware of the severity of wildlife crime, so that we use our incredible collective power to help the authorities crack down on those who would dare to steal from us.

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Magistrate Clara Mwilima during her recent sentencing: [https://www.namibian.com.na/75995/read/Man-fined-N\\$50-000-for-possession-of-elephant-tusks](https://www.namibian.com.na/75995/read/Man-fined-N$50-000-for-possession-of-elephant-tusks)

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RHINO POACHERS CAUGHT DUE TO TIP-OFF FROM //HUAB CONSERVANCY MEMBER

The //Huab Conservancy in the Kunene Region is home to some of Namibia's free-ranging black rhino, but until recently the conservancy has struggled to generate income from its wildlife. Due to its largely inaccessible location off the main tourism route in southern Kunene, //Huab's members have reaped few benefits from their wildlife in the past. This changed when Ultimate Safaris established a lodge in the conservancy in 2016 and developed a unique rhino tracking tourism product that employs conservancy rhino rangers to monitor the rhinos and allows guests to view them unobtrusively. Ultimate Safaris is thus demonstrating the tangible value of rhinos to local people.

During June 2017 a member of the //Huab Conservancy noticed some suspicious activity on the road north of Khorixas while herding livestock. Knowing that these people might be on the way to kill one of the black rhinos, he alerted the local authorities. This tip-off led to the rapid deployment of police and MET rangers to the area, where they found the suspects and arrested them. They were armed and clearly prepared for poaching activities. The driver who dropped them off in the area, and was to collect them later, was lured back to the area, resulting in the arrest of the driver and the impoundment of the vehicle. This was enough evidence to open a court case against them. Criminal syndicates will find it increasingly difficult to operate in areas where the local people understand the value of their wildlife and know what to do when they spot suspicious activities.

<http://www.ultimatesafaris.na/about/journeys-under-canvas>



A SUCCESSFUL REWARD SCHEME CLAMPS DOWN ON PANGOLIN TRAFFICKING

Bringing Namibian citizens on board to fight wildlife crime involves increasing their awareness of the problem and providing suitable incentives for them to act. While the crimes against rhinos and elephants are well known, and their value to the country has been well publicised, the pangolin has historically received less attention than it deserves. Pangolins are the

most trafficked animal in the world, and this illegal international trade started affecting Namibia in early 2017 as cases of pangolin trafficking increased to unprecedented levels.

To counter this new threat, the Ministry of Environment and Tourism joined the Namibian Chamber of Environment and other partners to set up a reward scheme to incentivise Namibians to report pangolin trafficking. Cash rewards are offered for information leading to the arrest of poachers, and the reward amount is increased if the informant is willing to testify in court. Since its inception in late 2017 up to January 2019 this scheme has led to 75 criminal cases being opened, 139 arrests, and the rescue and rehabilitation of 45 live pangolins. This shows what can be achieved when we invite ordinary citizens to participate in the war against wildlife crime.

<http://www.n-c-e.org/sites/default/files/2019-02/Pangolin%20saving%20scheme%20paying%20off%20-%20Environment%20-%20Namibian%20Sun.pdf>



INLAND FISHERIES RESERVES

A COMMUNITY-BASED APPROACH TO PROTECT NAMIBIA'S FRESHWATER FISH

by Clinton Hay

University of Namibia/Namibia Nature Foundation

The inland fish resources of the Zambezi, Chobe, Kwando and Kavango rivers in Namibia have supported human riverine communities for centuries. Although gillnets were documented as early as 1893 in the Zambezi Region, local fisherfolk used mainly traditional fishing gear and methods until recently. Traditional fishing gear naturally limits fishing effort as it takes time to make the fishing equipment (e.g. fishing baskets), which also needs to be repaired and replaced regularly. Furthermore, traditional fishing gear is not as effective as gillnets. Historically, fisheries were managed to secure access to particular fishing areas for specific social groups, rather than to protect fish stocks. Traditional authorities occasionally closed fishing sites and sometimes entire seasons as part of their traditional management systems. Fish stocks were not considered threatened, as there were few people living in the area and they used mainly traditional fishing gear and fished to feed their families or barter for other goods.

This situation has changed drastically, especially during the last 10 to 15 years. The change has been driven by a combination of growing human populations along the rivers and the commercial exploitation of two major ephemeral lakes – Ngami (Botswana) and Liamebezi (Namibia) – which filled up in this period. Ephemeral lakes



Fish are processed with ice for export to neighbouring countries. Fishing has become a commercial activity that threatens fish stocks.

are dry for long periods of time and only fill with water under specific conditions. When they contain water, fish numbers increase, which provides a new source of protein for people in these areas. Expanding human populations along the rivers in Namibia and Botswana and in neighbouring countries (e.g. Zambia) have led to an enormous increase in the demand for fish, yet the available fish stocks in the rivers have remained the same. Natural ecosystems have limited productivity irrespective of human demand.

With the flooding of Lake Liambezi in the Zambezi Region, a commercial fishery developed, pushing up fish prices with exports to the Democratic Republic of the Congo and Zambia. Even after the lake dried up, fish prices remained high. The balance between supply and demand has been disturbed and the situation is unlikely to change in future. As fish stocks have declined, fisherfolk have resorted to more ingenious and effective fishing methods to catch more fish to meet their daily needs. Unfortunately, many of these new methods are illegal and the fishing pressure now exerted is unsustainable. This was further exacerbated when people started to see fish in these rivers as a commercial opportunity; fisherfolk from outside these regions arrived in droves with the sole purpose of making a profit. We are currently wiping out fish stocks in the vast oceans – just imagine how easy it is to destroy fish stocks in our river systems. Fish used to support the livelihoods of local communities in the Zambezi Region. Now, however, this has changed to support the lifestyle of a few, many of whom are not even from this region. This leaves the local poor in the Zambezi with even fewer livelihood options.

Following years of research and in-depth discussions with local communities, the Namibia Nature Foundation in collaboration with the Ministry of Fisheries and Marine Resources, launched an initiative to allow local communities to once more manage their fish resources sustainably. The Inland Fisheries Legislation of Namibia allows for the proclamation of Fisheries Reserves. A Fisheries Reserve is a part of a river (or ocean) that is proclaimed to conserve fish stocks by setting and enforcing strict fishing rules. This concept is well known for protecting the marine environment, but less so for freshwater ecosystems. Research shows that if you close an area for fishing it produces more and larger fish, which may swim into the surrounding fishing areas. This means that a Fisheries Reserve could improve the quality of fish caught in other parts of the river.

The Namibian policy on freshwater fish states that the fish stocks are to be used by local people for subsistence purposes. They should not be commercialised, as these stocks cannot sustain commercial fishing. With initial funding from the World Wildlife Fund and later the European Union, NNF and the Ministry initiated a fisheries programme by consulting with local communities about managing their fish stocks with their own rules. Although establishing Fisheries Reserves is considered a “new approach”, local communities immediately grasped the concept, as it is similar to their traditional management practices.

Following these consultations, two Fisheries Reserves were gazetted in the Sikunga and Impalila conservancies in the Zambezi Region. No fishing is allowed in these areas, except for recreational catch-and-release by fishing tourists who pay a levy to the conservancies that manage these areas. Local communities do not see their Fisheries



Community fish guard patrolling the Impalila Conservancy Fisheries Reserve.



Community members monitoring fish catches by local fishermen.

Reserves as a means of earning money, but rather as a way to conserve their fish resources for present and future generations. Community members are trained as community fish guards, who are equipped to patrol these areas and ensure that everyone adheres to the rules. Other community members are trained to monitor the local fish catches; their data will be used to evaluate the effectiveness of the Fisheries Reserves in improving local fish stocks.

Current feedback from communities and the private sector is positive, which is confirmed by the two conservancies identifying more areas as Fisheries Reserves; these are now at various stages of being proclaimed. Furthermore, other conservancies in the region have made requests to establish their own Fisheries Reserves. Empowering communities to manage their own resources with assistance from government is probably the only way to protect the fish stocks. Communities have the will and ability to do this, but they need support from the private and the public sector to facilitate the process. NNF and the Ministry of Fisheries and Marine Resources remain committed to providing the support requested by people in the Zambezi Region to secure their fisheries for future generations.

SUNCYCLES NAMIBIA



How localised e-mobility solutions are changing
the face of conservation.

by Marita van Rooyen

Martin Mushabati is the leader of a group of conservancy game guards based at Salambala Conservancy, a 930 km² community conservation area located at the southernmost tip of the Zambezi Region. As one of 20 men who work in teams of five, in shifts of one week per month, he is proud of his profession, “because watching over nature helps me get to know the animals and their behaviour.”

For Martin and many others in his position, duty starts at 6 a.m. as rangers prepare to patrol and protect the wilderness. His team covers a distance of 30 kilometres per day, a task done by bicycle, through thick sand and dense mopane woodland – an exhausting journey that can take up to three hours of continuous pedalling.

The introduction of electric bicycles (e-bikes) to the conservancy in 2017, an initiative by Namibian social enterprise SunCycles, provided a more effective alternative to former patrolling methods and changed the way in which Salambala’s rangers go about their daily duties. “With the help of my e-bike it is much easier to attend to the scene of a crime, or catch poachers in the act”, Martin explains. “It helps me not to get tired when on patrol, and to not feel pain in my thighs when I’m riding for longer periods at a time.”

As caretakers of the very first e-bikes for game guards, Martin and his men are global e-mobility pioneers in their own right. The e-bikes are designed and built by SunCycles and developed to cater to Namibia’s rugged off-road terrain. With puncture-proof tyres, a sturdy frame, low-maintenance parts and powered 100% by solar energy, e-bikes provide a sustainable answer to mobility and electricity challenges faced by communities in off-grid, rural areas. Rangers are now able to travel up to double their previous daily range, with much less exhaustion and strain on their bodies. Along with supplying the e-bikes, this local initiative set up a solar recharge station at the team’s base camp in the midst of a dense forest. The solar station is an eco-friendly way to recharge the e-bike batteries, and it also supplies the camp with charging capacity for lights, mobile phones and two-way radios. These additions ensure that rangers can stay in constant contact with their seniors, while also enjoying some of the basic necessities of life in the depths of the forest.



Game guard Edward Mwafuluka from Salambala Conservancy uses a SunCycles e-bike to carry out his patrols.



The game guards own these new e-bikes, and maintain them using their training from SunCycles.

While maintenance is often one of the biggest obstacles to sustainability, Salambala has proven that when guards are given ownership of their wheels, they will also take care of them. The game guards were given adequate training in maintaining electric components and are supplied with basic spare parts by a bicycle shop at Ngoma.

This project is supported by the FNB Foundation in collaboration with the Bicycling Empowerment Network of Namibia. The team at Salambala now has six e-bikes at their disposal. This success story has shown that electric mobility provides a sustainable, fast, silent and cost-effective alternative for protecting the natural environment. Since SunCycles' e-bikes were first introduced to patrol protected areas, the Wuparo Conservancy has benefitted from a donation by German travel company Lernidee, while Ultimate Safaris' Conservation Travel Foundation supported rhino rangers in the //Huab Conservancy with e-bikes to carry out their duties.

Apart from supporting conservation initiatives, SunCycles' e-bikes have also proven to be game changers in the local tourism industry. Joining the global movement towards holistic environmental management and alternative nature-based activities, Namibian accommodation establishments and tour operators are now switching from fuel-powered vehicles to these locally designed electric bicycles. This environmentally friendly form of transport is ideal for enjoying Namibia's unspoiled natural environment. Quad bikes and cars are known to cause damage to the natural environment – besides the noise, harmful emissions and high accident rates, their tracks ruin the sensitive landscapes and consequently the tourism value of these areas. E-bikes have great environmental advantages: they create less surface pressure, are quiet and emission-free. An e-bike also provides a special nature experience, as it can be used to explore existing animal tracks and does not disturb the wildlife.



The SunCycles team handing over e-bikes and solar-charging facilities at the Salambala Conservancy headquarters.



In rural areas such as Outapi and Katima Mulilo, SunCycles' e-bikes have been successfully used as private commuters' transport, communal taxis and to pull ambulance and recycling trailers. Additionally, e-bikes make cycling more accessible to different riders and fitness levels, including children, senior citizens and persons with disabilities, and they require no special training or any licenses.

The next goal for SunCycles is to introduce an affordable e-bike rental programme for commuters, students and visitors to Windhoek, thus supporting the city's non-motorised transport initiative and providing a greener alternative to existing public transport.

With interest and dedication from local municipalities, communities, conservancies and tourism enterprises, and supported by private companies and individuals, SunCycles' e-mobility alternatives provide a truly local solution to protect and preserve our natural environment for generations to come.

For more information about SunCycles' initiatives and projects throughout Namibia, visit www.ebikes4africa.org

THE YEAR OF THE CCF LIVESTOCK GUARDING DOG



Bobby Bradley

Spots was a CCF Livestock Guarding Dog that lived at the Centre, served as LGD ambassador and worked on our Model Farm for many years. Spots was so reliable he could fill in for other dogs when needed, adapting easily to new herds and farmlands. Sadly, Spots passed away in 2018, but he died where he was happiest, in the field with his goats and Armas – his Namibian family.

by Dr Laurie Marker

Founder and Executive Director, Cheetah Conservation Fund

In 1994 the Cheetah Conservation Fund (CCF) began an experiment on its Model Farm, placing four large dogs with goats and sheep to protect the livestock from carnivores. Twenty-five years later, CCF Livestock Guarding Dogs are considered the Namibian farmer's best tool for reducing livestock losses to predation.

In 1994 I embarked on an experiment to determine if livestock guarding dogs, the same kind used in Turkey for more than 5,000 years, could be effective in reducing predation losses for small stock farmers in Namibia. With their imposing presence, fierce bark and loyal, protective nature, livestock guarding dogs provide a buffer between goats and sheep and wildlife sharing farmland habitat. They deter most would-be predators with their bark alone, alleviating pressure on farmers to trap or shoot predators on sight. In Namibia these dogs are credited with saving the lives of hundreds of cheetah and many, many other predator species.

This year our Cheetah Conservation Fund Livestock Guarding Dog (CCF LGD) programme reaches its milestone 25th anniversary. Over the past two-and-a-half decades our organization has bred more than 650 puppies and trained and placed them with Namibian small stock farmers at little or no cost to them. Due to their growing international reputation for being the best protectors of goats and sheep, there is a one to two year wait for those who wish to get a puppy through our programme.

CCFs' Livestock Guarding Dog Programme utilizes the Kangal Shepherd Dog, which now includes the Anatolian Shepherd. They are two rare Turkish breeds. I chose these dogs because Turkey has a similar hot and dry climate, the dogs have short coats and they are independent thinkers that do not rely on humans for doing their job.

Our livestock guarding dogs are highly regarded throughout southern Africa for being effective. In Namibia, farmers with CCF dogs report a drop in predation losses ranging between 70 to 100 percent. For communal subsistence farmers the loss of even one animal can be devastating, and guarding dogs therefore provide a valuable service.

In the 1970s and 1980s farmers were removing 700-800 cheetahs a year from the Namibian landscape. They regarded them as pests that have a severe negative impact on livestock farming and the game animal industry. I wrote about this in a research paper, Conservation Strategies for the long-term survival of the Cheetah, published by the Zoological Society of London in 1996. In the article, I highlighted the need to engage with local farmers to save the species: "The survival of the Namibian Cheetah is in the hands of approximately 1,000 farmers and their willingness to integrate Cheetah conservation efforts into farm management."



Puppies are weighed and measured at CCF's Model Farm in Otjiwarongo, Namibia.

CCF LGDs are intelligent and loyal. Usually their loud bark is enough to deter a predator seeking an easy meal.



‘The Livestock Guarding Dog Whisperer,’ Armas Shaanika, and Aleya, a Livestock Guarding Dog he raised and trained on CCF’s Model Farm. Photo: Jenna Brager

This was true then, and it is still true today. I would like to thank all Namibian small stock farmers who have agreed to work with CCF and our Livestock Guarding Dogs over the past 25 years, especially the pioneers who were there from the beginning helping us develop the programme. Without them we would not have reached this milestone. Success was achieved through many years of research and development, including scores of interactions. While at first dubious, Namibian farmers embraced the concept and the programme evolved rapidly. Today, Livestock Guarding Dogs are in great demand in many parts of Africa. CCF has helped launch livestock guarding dog programmes with sister conservation organisations in South Africa (Cheetah Outreach) and in Tanzania (Ruaha Carnivore Project). We are currently assessing how our dogs might be adapted to reduce human-carnivore conflict in Kenya.

Without the CCF staff who work with the dogs the programme would not have become what it is today either. Paige Seitz has been with us for five years as our Livestock Guarding Dog Programme Manager in Namibia. She juggles caring for pregnant mothers and multiple litters with assisting farmers seeking puppy placements. Toivo Tyapa joined us in 2011 as Small Stock Manager. His interactions with our dogs and CCF’s small stock dairy herd inform our Future Farmers of Africa (FFA) training and improve our dogs’ performance. Gebhardt ‘Gebbs’ Nikanor has been with CCF since 2001, working with our dogs as our Education and Outreach Officer. Gebbs places the dogs on the farms and remains in contact with farmers to check on each dog regularly.

There is one other staff member that deserves credit and gratitude, because without him our Livestock Guarding Dog

LITTLE KNOWN CCF LGD FACT:

The legacy of the dogs in Namibia was secured by Sam Nujoma, Namibia’s Founding President and CCF’s first International Patron. Two of the very first dogs from the CCF LGD program protected the President’s own goat herds.



A three-week-old puppy at CCF.

programme would not be anything like it is today. Most people know very little about him but he, too, has been with CCF a very long time. When we met in 1996 he was a farm worker at Boskop, a farm located 8 km from our CCF Centre. When I discovered that he had his own flock of sheep I gave him one of our first CCF Livestock Guarding Dog puppies to raise. He joined our staff as a herder in 2001 and began working with our dogs.

Flash forward eighteen years. Armas Shaanika is now CCF's chief goat herder, and he is the best herder in the world! Armas has since raised almost all our puppies. He knows our dogs and goats inside and out. We think of him as our 'Livestock Guarding Dog Whisperer.' Although he speaks Oshiwambo only, and I do not, we have developed a very close friendship because we're conversant in the language of Dogs and Goats.

Armas works with our puppies before we home them. He also works with adult dogs that need to be rehomed, either setting them right or keeping them at Boskop for more training with his own small stock. CCF's herd is made up of Boer goats, Damara sheep and Saanen dairy goats, a total of just over 300 animals. They are with our puppies day and night.



CCF LGDs are raised in the goat pens of CCF's Model Farm, so that they bond with the species they will protect. Photo: Andrew Harrington



Armas and Spots with CCF's goats. Photo: Bobby Bradley



Silver with her new goat herd.



Armas Shaanika delivers Silver to her new home, the farm of Cedric Shilango in Grootfontein.

"Since I was privileged to receive a CCF Livestock Guarding Dog our livestock's safety has improved very, very much. Our area has many small livestock predators. Compared to what we used to have, our losses have reduced drastically. Sometimes I would find that a rooikat (caracal) had killed seven sheep in a row without eating one, but this is history since Blackey joined our farming family. The new dog we received last year, Suzy, is learning fast, too. Many thanks to the Cheetah Conservation Fund for their valuable contribution to farmers in Namibia."

- Edmund Swartz, Received *Blackey* in 2014 and *Suzy* in 2018

"The presence of my Livestock Guarding Dog is definitely an advantage. The number of animals I have lost to predators has significantly decreased. Jackals can only be heard in a distance. The bond between the goats and sheep with the dog is a plus point. Because of my Captain I am a happy farmer."

- Chistian Haikali, Received *Captain* in 2016

As part of LGD training Armas takes turns bringing the dogs out to the bush with our goat herds during the day. He evaluates young dogs on field work and he assesses whether rehomed dogs are ready to go back to work. Armas' current favourite dog is an Anatolian shepherd named Silver (like our anniversary), because she is energetic, alert and listens to his commands.

Without Armas we would not have realised the full potential of our experiment. Thanks to him CCF Livestock Guarding Dogs are the Namibian farmer's best employee and CCF's most vital 'paws on the ground' partner in cheetah conservation.

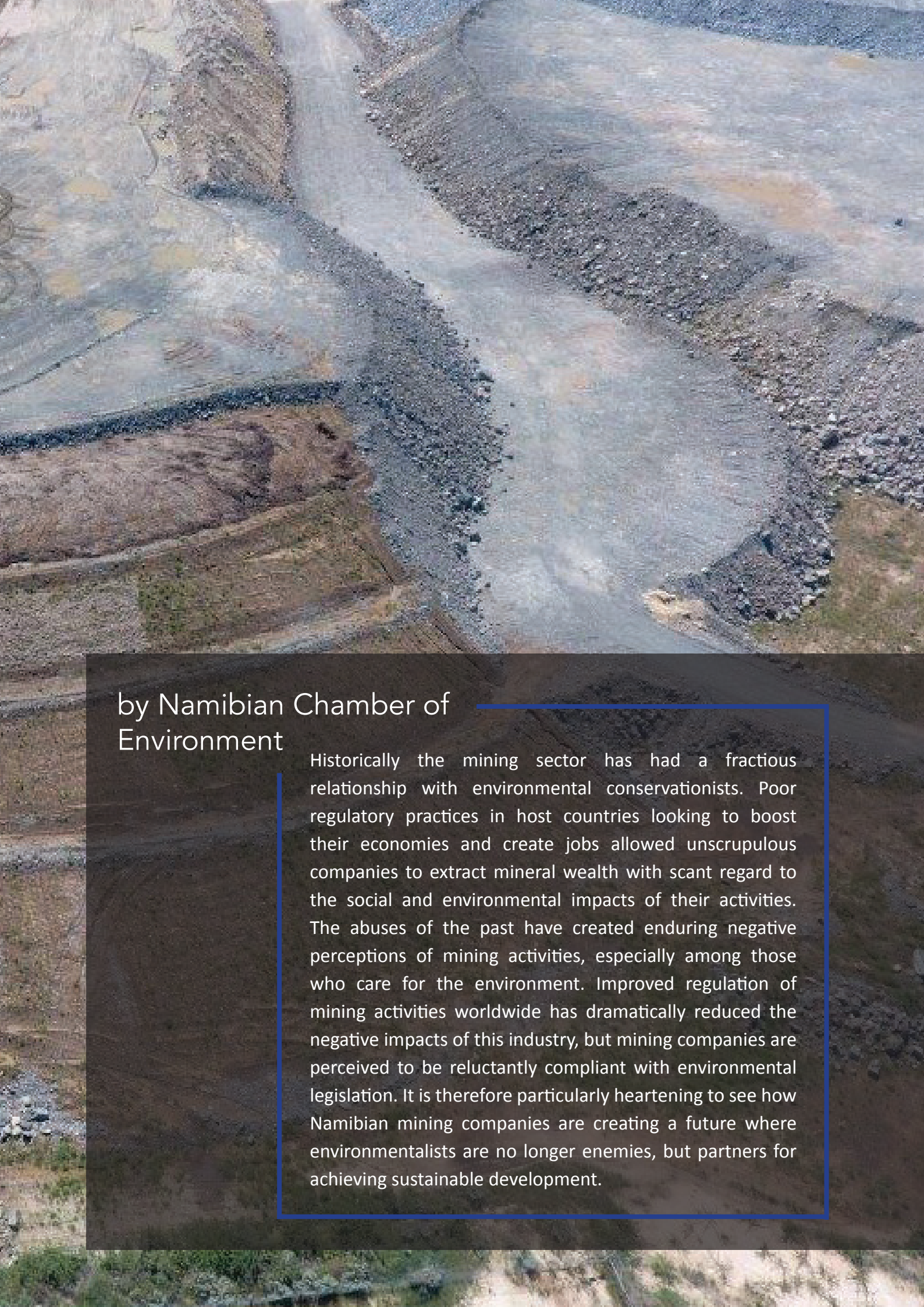
Bark out loud for CCF Livestock Guarding Dogs in 2019!

An aerial photograph of a mining site. In the upper left, a large open-pit mine is visible with a dirt road winding through it. To the right, a steep, terraced slope has been rehabilitated with green grass and small seedlings. The foreground shows a mix of brown earth and green vegetation.

MINING AND THE ENVIRONMENT

A Unique Namibian Partnership for Sustainable Development

The B2Gold Run of Mine pad is being rehabilitated while the mine is still operational. The slope shown here is being stabilised using grass and seedlings to prevent soil erosion and encourage natural vegetation regrowth.
Photo: B2Gold.



by Namibian Chamber of Environment

Historically the mining sector has had a fractious relationship with environmental conservationists. Poor regulatory practices in host countries looking to boost their economies and create jobs allowed unscrupulous companies to extract mineral wealth with scant regard to the social and environmental impacts of their activities. The abuses of the past have created enduring negative perceptions of mining activities, especially among those who care for the environment. Improved regulation of mining activities worldwide has dramatically reduced the negative impacts of this industry, but mining companies are perceived to be reluctantly compliant with environmental legislation. It is therefore particularly heartening to see how Namibian mining companies are creating a future where environmentalists are no longer enemies, but partners for achieving sustainable development.



An environmental scientist measures the growth of *Welwitschia mirabilis* leaves near the Swakop Uranium Husab mine.

Historically the mining sector has had a fractious relationship with environmental conservationists. Poor regulatory practices in host countries looking to boost their economies and create jobs allowed unscrupulous companies to extract mineral wealth with scant regard to the social and environmental impacts of their activities. The abuses of the past have created enduring negative perceptions of mining activities, especially among those who care for the environment. Improved regulation of mining activities worldwide has dramatically reduced the negative impacts of this industry, but mining companies are perceived to be reluctantly compliant with environmental legislation. It is therefore particularly heartening to see how Namibian mining companies are creating a future where environmentalists are no longer enemies, but partners for achieving sustainable development.

Sustainable development, as defined by the United Nations, recognises that strong economies depend on equitable societies and a healthy environment. At a minimum, efforts to strengthen the national economy through industries such as mining should not jeopardise the environment or perpetuate social inequalities. The Namibian Chamber of Mines, however, wants to go further than complying with these minimum requirements and its vision is to "...be widely respected as a safe, environmentally responsible, globally competitive and meaningful contributor to the long-term prosperity of Namibia." Establishing a strategic partnership with the Namibian Chamber of Environment (NCE) demonstrates its commitment to this vision.

This unique partnership between the mining and environmental sectors was initiated in June 2017, when the two chambers co-organised and facilitated the first-ever workshop for those working in the environment departments of mining companies in Namibia. This workshop, which comprised 15 presentations from 14 companies and two presentations from related industries (hazardous waste management and environmental compliance), allowed environmental practitioners in the mining sector to share information and learn about the successes and challenges encountered in their respective departments.

The workshop provided the ideal platform to develop the National Environmental Strategy and Action Plan, which was unanimously adopted by the Council of the Chamber of Mines in September 2017. This strategy provides clear guidance for actions to be taken for the period 2017-2020. They fall under eight focal areas identified by the workshop participants. To drive these actions the Chamber of Mines established a sub-committee dedicated specifically to environmental issues, which includes the director of NCE, Dr. Chris Brown, as well as a representative of the Ministry of Environment and Tourism (MET) and a representative of the Ministry of Mines and Energy (MME).

Closer communication with MET and MME will allow the mining industry to provide inputs on improving environmental management standards and procedures in Namibia. Workshop participants highlighted the lack of a national facility to handle hazardous waste from the mining industry as a key challenge. This has been recognised by both government and the private sector, which is working towards establishing such a facility in future. The mining industry will work through the new environmental sub-committee to ensure that those establishing the waste management facility are aware of the full scope of hazardous waste materials produced by mines in Namibia.

As minerals are a non-renewable resource, all mines have a finite lifespan. From an environmental viewpoint, mines that have extracted all the profitable minerals should not remain as a visible scar on the landscape that negatively affects plant and animal life near the mined area. Consequently, procedures to rehabilitate mining sites, preferably concurrent with mining, are critical to limiting long-term environmental impacts. Several workshop participants showcased impressive efforts to rehabilitate areas in their mines that are no longer operational, and everyone agreed that rehabilitation concurrent with mining and after mine closure must be included in the operational budgets of all current mining operations. Mine closure was therefore one of the key focal areas of the approved Environmental Strategy and Action Plan.

One of the tangible outputs achieved by this new partnership between mining and the environmental sector is the newly published Best Practice Guide for Environmental Management in the Mining Sector. Produced by the Environmental Compliance Consultancy, an independent company working under the guidance of the NCE, the Environmental Committee of the Chamber of Mines, MET and MME, this guide sets the standard and provides practical how-to examples for environmental practitioners to follow. The Best Practice Guide comprises four main sections: exploration and feasibility; development and construction; mining and processing; and rehabilitation and closure.

Another exciting opportunity identified during the workshop is to develop a Responsible Mining Awards system, similar to the Eco Awards for the tourism industry. As an independent organisation, Eco Awards will work with auditors in the mining sector to develop an assessment procedure and a set of standards so that mining companies can measure their success against industry standards and their own progress over time. The system will produce a rating for each company and thereby increase transparency in the mining industry, as all ratings will be made public and companies that achieve high standards will be recognised at an awards ceremony.

The efforts described here position the mining industry as a leader among commercial industries in terms of their willing engagement with the environmental sector to reduce their negative impacts on the environment. Limiting impacts, however, is just one aspect of this new dawn for mining and the environment as the industry seeks to increase the benefits it provides to Namibia's people and biodiversity. Currently, several mines collaborate with local researchers to study the plants and animals in mining areas, and many have active programmes for engaging with neighbouring communities. These are all laudable efforts. However, they occur on local scales and are therefore limited to the people and environments directly adjacent to mining operations.



An environmental scientist at Dundee Precious Metals near Tsumeb takes a water sample from a stream near the mine. These activities are part of the mines' commitments to monitoring environmental impacts.



The solar plant at Trekkopje produces 5 Mega watts of energy to supply the mine.



Natural beauty surrounding the Husab Mine.

SUSTAINABLE DEVELOPMENT PROJECTS WHICH APPLY TO THE OFFSETS SCHEME MUST MEET THESE TWELVE CRITERIA:

1. Non-mining area?
2. Promotes sustainable development?
3. Supports national development priorities?
4. Priority for local community?
5. Has support of local, regional and/or national government?
6. Clear benefits to the poor?
7. Investment has clearly defined output / product?
8. Initiative has clear and credible budget?
9. Implementation process is clear & credible?
10. Project is potentially catalytic in terms of expansion & co-funding?
11. Project has no perceived environmental, social or economic risks?
12. Is there a contribution from beneficiaries?

The new Strategy and Action Plan takes the mining sector's contribution further and expands its strategic impact by implementing a national offset scheme whereby the mining industry can contribute to sustainable development projects throughout Namibia. Besides maintaining their local contributions to society and the environment, the mining companies have committed to contributing to a central offsets fund jointly managed by the Chamber of Mines and the Namibian Chamber of Environment.

Offsets schemes in other countries focus on biodiversity conservation, mainly by buying and protecting land of high biodiversity value to make up for land lost to mining. In Namibia, 17% of the land is formally protected by the state, and over 26% is managed through the communal and freehold conservancy system. In contrast, mining operations directly affect less than 1% of Namibian land. The offsets scheme for Namibia is therefore designed to address more pressing socio-economic needs in the country than land acquisition for conservation, namely sustainable development.

The new offsets scheme will focus on supporting projects in non-mining regions of Namibia, which previously have seen little benefit from the mining industry. In rural areas the scheme will focus on communal conservancies, as they are integral to the sustainable development plans for Namibia. The committee also recognises the needs of urban areas, which continue to struggle with rapid urbanisation and the resulting social and environmental challenges. The environmental committee reviews all potential projects using a standard list of criteria (see below), and provides recommendations for funds to be disbursed from the offsets account. In 2018, the first year of the scheme, N\$1,360,000 was granted by the mining sector to fund two sustainable development projects. This was seen as a start-up year to test and fine-tune the approach and allow everyone to become comfortable with the process.

The first project was based in the Mashi Conservancy (Zambezi Region), which requested N\$860,000 from the offsets scheme to help fund an electrification project to connect 900 households to the national electricity grid. The conservancy contributed N\$450,000 from its own funds to the project, thus indicating its importance to their members. The benefits of electricity are social as well as environmental – children can do their homework after dark and adults can extend their working hours; furthermore, reducing dependence on firewood will reduce deforestation rates and health problems associated with smoke inhalation. This project was successfully completed in early 2019, benefitting approximately 5,400 people.

The second project focused on assisting the urban poor on the outskirts of Oshakati (Oshana Region). Due to the rapid rate of urbanisation, provision of land and housing from municipalities lags far behind demand, thus causing urban immigrants to build shacks on unserviced land, which grow to become informal settlements. These settlements lack access to drinking water, sewerage systems, roads and electricity. This situation creates social and environmental problems, as people living there become stuck in poverty, and the environment surrounding the settlement is degraded. There is no incentive for people to improve their homes because they do not own the land and could be removed from it at any time.

The offsets scheme contributed N\$500,000 to create a land delivery fund managed by the Namibian Chamber of Environment and Development Workshop, a Namibian non-profit organisation that works with the local municipality to provide minimally-serviced plots (erven) at minimal cost to the urban poor. The plots are planned, surveyed, mapped and pegged, and core services such as roads and communal water points are provided by an engineering firm. Since this development is done at no profit, the 300 m² plots are very affordable at about N\$10,000 per plot (low-cost houses cost N\$ 250,000 or

more). Because the new development is well planned, services can easily be upgraded in the future.

Income from plot sales go into a revolving fund, which will be used to develop more plots on an on-going basis. Thus far, beneficiaries have been selected in a joint initiative between the Oshakati Town Council and Development Workshop Namibia, to ensure that the plots go to low income families. People who buy these affordable plots are given title deeds, which motivates them to invest in their new homes as stable capital assets. Building on the work done in Oshakati, the project has already expanded to Okahao, Karibib and Tsandi at the request of their respective local authorities, and other towns are keen to be added to the list.

Only a few decades ago no one would have believed that miners and environmental conservationists could sit around the same table, let alone work together to reach common goals. Yet this unique Namibian partnership between the Chamber of Mines and the Namibian Chamber of Environment has produced tangible results during its first two years of operation. Working closely with Government, this alliance has only just started to realise the benefits that can be delivered to all stakeholders, especially for the people and the environment of Namibia.

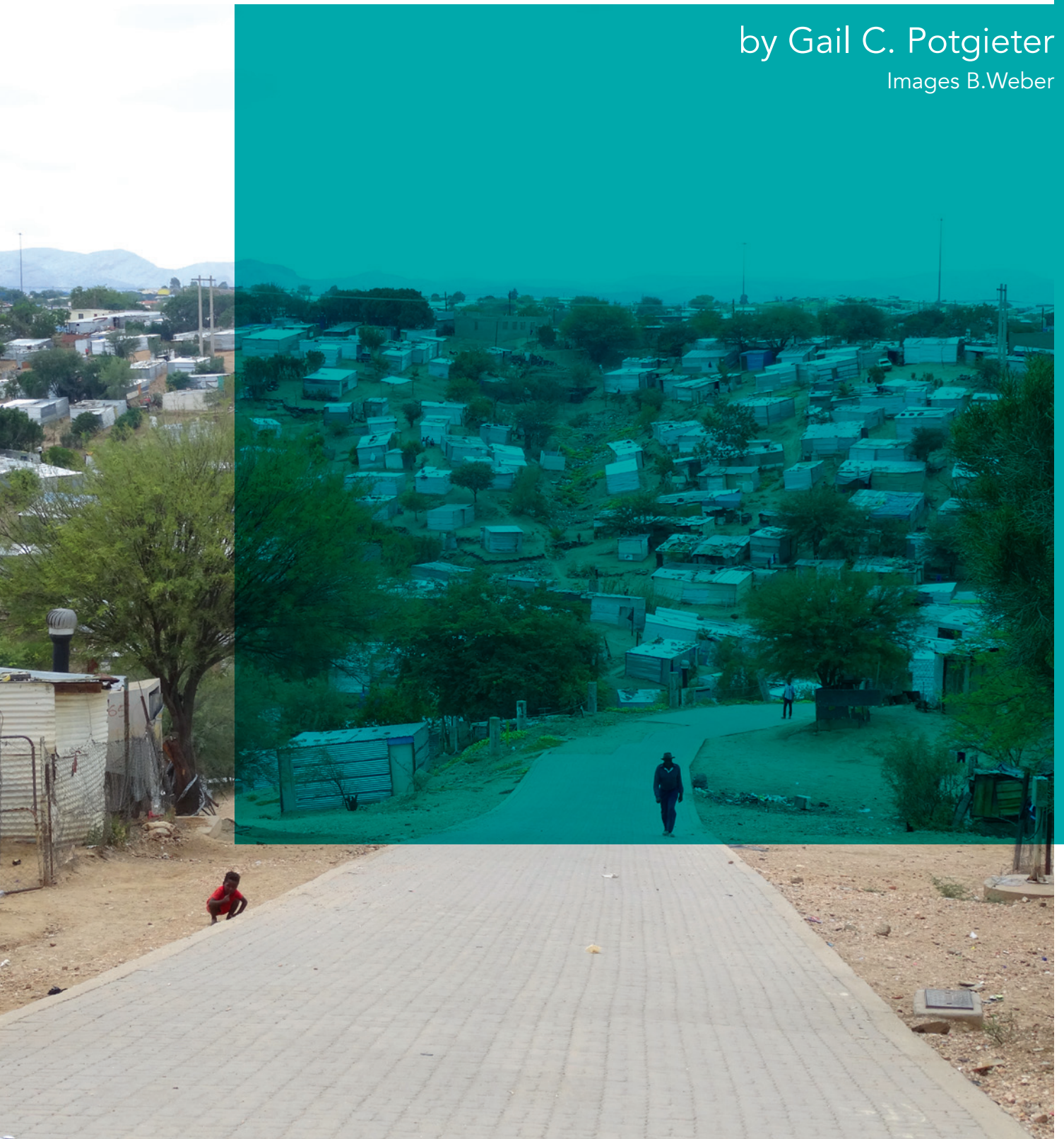


The electrification project at Mashi Conservancy helped connect 900 households to the national electricity grid.



CAN URBANISATION HELP NAMIBIA ADAPT TO CLIMATE CHANGE?

by Gail C. Potgieter
Images B.Weber



These worrying trends underline that people coming from the rural areas battle to find land and/or affordable housing, and often have to settle for putting up shacks on pieces of land to which they have no rights, and which are not serviced with clean water, sewerage systems or other waste disposal facilities. As more shacks are built, the area becomes an informal settlement, with residents living in increasingly unhygienic conditions as pollution increases. Many informal settlements are entirely unplanned, and they can grow to a point where providing basic services becomes impossible. With few roads between shacks, municipalities are unable to lay water pipes, sewerage lines or electricity cables to service the households in these informal settlements.

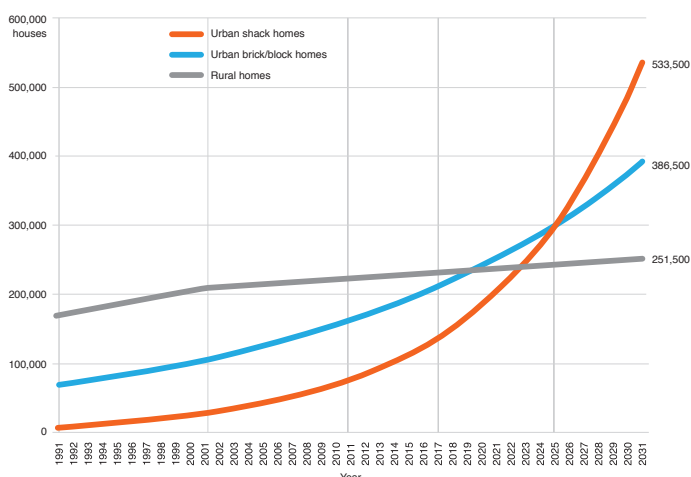


The Freedom Square settlement in Gobabis was upgraded to improve access routes; top is the area in 2013, bottom is the same area in 2016. The municipality and partners used a participatory approach to ensure that residents were satisfied with the process and the results.

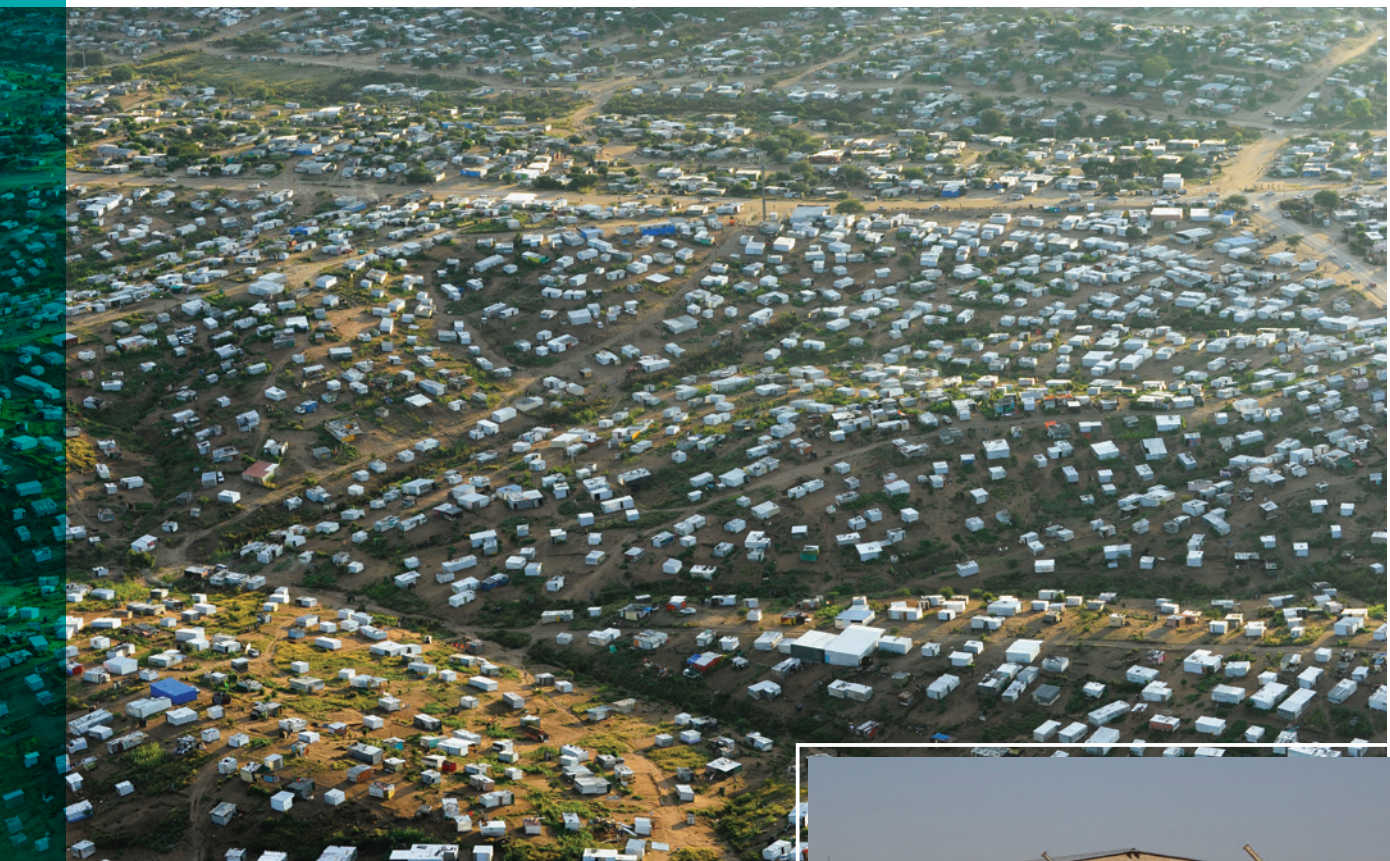
The bright city lights attract people from rural areas in countries all over the world. Urbanisation is a result of a growing economy that makes cities the hubs of enterprise and new opportunities. Educated young people are especially drawn to cities and towns in pursuit of jobs or the opportunity of starting their own businesses. In contrast, staying in rural areas, on farms or in small villages, is increasingly seen as a dead-end by the new generation. Life on the farm is not for everyone. Furthermore, farming with crops or livestock is already difficult given Namibia's dry climate and relatively infertile soils, and disturbing climate change predictions indicate that it will become drier still.

Urbanisation presents an opportunity to alleviate the pressure on farmlands and provide a way for the country to adapt to climate change. As the country becomes steadily drier, droughts will become more frequent and severe; land that is marginal for farming today will become even less productive, to the point where farming with crops or livestock becomes impossible. If people stay in rural areas their livelihood options will decline further, whereas if they move into urban areas they could explore other employment sectors like manufacturing or the service industry. As a country, switching from reliance on agriculture towards manufacturing or services could buffer Namibia's economy against climate change.

To realise the opportunities of urbanisation, however, Namibia must overcome several key social and environmental challenges. The first of these is keeping pollution under control in these ever-growing cities, as the demand for land and housing has outstripped supply. Research published in the Namibian Journal of Environment reveals that during 1991-2011, the number of brick or block houses in urban areas doubled, whilst the number of shacks increased seven-fold. If current rates continue, there will be more shacks than any other form of housing in Namibia by 2025.



Given current trends, the number of urban shacks is expected to exceed all other forms of housing by 2025.



People who have rights to the land they live on are likely to upgrade their homes from shacks to more permanent structures over time.

We therefore need to find ways to accommodate people moving into the urban areas: ways that limit pollution and improve their quality of life. Beat Weber, a scientist working with Development Workshop Namibia, has some recommendations for addressing this challenge. “The quickest way to accommodate people migrating into urban areas is to provide land, rather than housing”, he points out. “If we can plan and survey new settlements before people arrive, then people can start building their new homes on formally marked plots immediately, whilst municipalities work on providing services over time”.

Importantly, people arriving in a planned settlement will buy and own their plots. This means that they can invest in their new homes as rightful owners, rather than living in informal, illegal settlements where they have uncertain rights as squatters. Although they may initially only be able to afford cheap building materials such as corrugated iron, these new homeowners can improve their homes by replacing their shacks with more permanent brick or block structures over time. Owning a house changes the way you view it – as an asset that you can invest in, rather than just a place to stay.

Another benefit of urbanisation is the reduced pressure on our rural natural resources – particularly soil nutrients, woodlands, water and grazing. As people move away from rural areas and make their living in urban areas they no longer need to live off the land and continually clear forests and woodland for new fields.

John Mendelsohn of the Research and Information Services of Namibia (RAISON) points out yet another major benefit. “Urbanisation is the best way to reduce poverty in Namibia; indeed, it is the only way to make any significant dent on poverty which is so prevalent in rural areas”, he says. “This is because most people in communal areas are unable to earn an income from farming, mainly because of the poor soils, aridity and limited access to markets. All Namibians need to earn incomes, and the best opportunities come from urban jobs, enterprises and services.”

As Namibia gets drier, productive farmland will become increasingly scarce. That’s the bad news. The good news is that urbanisation could be part of the solution. By implementing visionary policies to encourage more people to migrate to urban areas, thus reducing reliance on rainfall and grazing, Namibia can achieve sustainable development in the face of climate change. Moreover, urbanisation will reduce poverty, offer the majority of Namibians the opportunity of a decent living, and reduce pressure on Namibia’s natural resources. Says John Mendelsohn, “Urbanisation is the win-win-win solution for Namibia to adapt to climate change, improve livelihoods and conserve our natural resources!”

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THE EIS

Namibia's Environmental Information Service

There are few countries in the world that have better access to environmental information all in one place than Namibia. Indeed, in this regard we are the envy of many countries, including so-called developed or industrialised nations. And it all happens through Namibia's environmental one-stop-shop, the EIS – www.the-eis.com.

About 15 years ago, four friends and colleagues – environmental scientists, programmers and IT specialists – decided to set up an electronic, web-based environmental information system and service for Namibia. With the support of the IT, Internet and web provider company Paratus, the EIS was born. Over the years, as small amounts of funding were secured to invest in the system, the EIS slowly grew in size and significance. It started with an electronic, online library. Today, this is Namibia's largest, most comprehensive and accessible library of environmental material – and it is free to anyone in the world who has access to the Internet. A key objective of the EIS was to democratise access to environmental information. Whether you are a student, researcher, conservation manager, policymaker, learner or an interested member of the public, you can access the eLibrary from Windhoek, Warmbad, Katima Mulilo or anywhere in the world, including on your smartphone. Another feature of the eLibrary is that, in addition to published articles, it contains a large amount of “grey” literature: important reports, policy documents, legislation, data sets, theses, presentations and other material that is not otherwise readily accessible.

The eLibrary has a user-friendly search interface. If you are interested, for example, in Climate Change, you simply enter those words in the search box and a list of all relevant reports and publications will be produced. You can then click on the articles that interest you and read them online or download them for free. If a listed article is not on the EIS, it will direct you via a link to the journal that published the article.

The EIS also has an easy upload function so that you can submit your publications and reports into the system. They will be checked (to screen out inappropriate material such as advertising), keyworded and loaded. This is one of the most effective ways of getting your work widely read and known, as the eLibrary is used by researchers, students, NGO and government staff, the private sector and more, both within Namibia and internationally.

The second component added to the EIS was a “citizen science” public-participation atlas program to record and monitor Namibia's biodiversity (see screenshot of the atlas homepage). You can enter plant and animal sightings via the website (www.the-eis.com/atlas) or the Atlas in Namibia App (available on PlayStore for Android devices and the website for iOS devices). It currently has sections for recording mammals, reptiles, amphibians, butterflies and invasive alien plants. By bringing Namibia's biodiversity data together, we can enhance their value and usefulness. Comparisons become possible across space and time, between and across species. To this end, several substantial datasets have been incorporated into the Atlas in Namibia system, including from museums, regional game counts, aerial surveys and camera traps. Information from the system is freely available and has been

The screenshot shows the 'Atlas in Namibia' website. At the top, there's a header with the logo and navigation links: Home, News, About us, Submit your records, View results, Resources & links, and a search bar. Below the header is a grid of six animal images with captions: 'Atlas of mammals', 'Atlas of alien plants', 'Atlas of carnivores', 'Atlas of amphibians', 'Atlas of reptiles', and 'Bird Information System'. Each image has a link to 'find out more'. Below the grid is a section titled 'Download the Atlas app' with a description and a link to the app. To the right is a section titled 'Latest records added' with a table of records. Below the table is a section titled 'Latest records map' with a map of Namibia showing the locations of the records. At the bottom, there's a footer with the text 'Go to the EIS' and 'Contact the atlas in Namibia team'.

Species	Date	Recorder
Canis lupus (Grey Wolf)	21/05/2019	Walter's Natter
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Canis lupus (Grey Wolf)	11/10/2019	Walter's Natter
Canis lupus (Grey Wolf)	12/10/2019	Walter's Natter
Canis lupus (Grey Wolf)	13/10/2019	Walter's Natter
Canis lupus (Grey Wolf)	14/10/2019	Walter's Natter
Canis lupus (Grey Wolf)	15/10/2019	Walter's Natter
Canis lupus (Grey Wolf)	16/10/2019	Walter's Natter
Canis lupus (Grey Wolf)	17/10/2019	Walter's Natter
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Canis lupus (Grey Wolf)	01/11/2019	Walter's Natter
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Canis lupus (Grey Wolf)	04/11/2019	Walter's Natter
Canis lupus (Grey Wolf)	05/11/2019	Walter's Natter
Canis lupus (Grey Wolf)	06/11/2019	Walter's Natter
Canis lupus (Grey Wolf)	07/11/2019	Walter's Natter
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used for many purposes including the upcoming Red Data book on Namibian carnivores.

Other components of the EIS include a photo library of landscapes in Namibia to monitor changes over time (www.the-eis.com/photo-library), a birds and powerlines interactive tool (www.the-eis.com/tool.php) and the Cuvelai-Etosha river basin interactive tool (www.the-eis.com/cuvelai_atlas.php).

The latest addition to the EIS is a scientific journal, *Namibia's Journal of Environment* (www.nje.org.na), now in its third year, which publishes peer-reviewed scientific articles as well as editor-reviewed articles that facilitate quick publication of field notes and related observations.

As Namibia's one-stop-shop for the environment, the EIS provides:

- 1) an easy-to-use platform for submitting environmental information;
- 2) a facility where this important information is curated and managed;
- 3) a place where scientists and others can submit papers and observations for publication;
- 4) a place to search for all your environmental information needs.

After 15 years of development and growth, we are pleased



BEATING BACK THE BUSH

Recent Insights into improving Namibian
Rangeland Productivity and Biodiversity

by Gail C. Potgieter

If you have ever driven from Windhoek to Tsumeb or Grootfontein, via Okahandja and Otjiwarongo, you will have noticed that much of the landscape around you is dominated by bush. Visitors to Namibia driving this route will be struck by how few people and buildings they encounter. The seemingly endless tracts of farmland give the impression of wilderness. What you may not realise is that the dense bush all around you represents one of the greatest agricultural and ecological challenges facing Namibia today.

A bush, as opposed to a tree, is defined as a woody plant that rarely grows taller than 10 feet, and usually has multiple stems rather than one long trunk. The thorny bush species like Black Thorn and Sickle Bush grow so densely in places that it would be difficult to walk through some of the farms you encounter on the journey north, although non-thorny species like Mopane and Cluster-Leaf Terminalia dominate the landscape around Outjo and Gobabis, respectively. The bushes mentioned here are indigenous to Namibia, which begs the question – why is this issue, known as bush encroachment or thickening, considered a problem?

The problem is not so much the presence of these bushes, but their density. Most of the northern half of Namibia (except the desert in the far west) is classified as a savannah ecosystem. Healthy savannahs are characterised by a balance between grass and bush, with the proportions of each depending on local ecological conditions. Although not easily apparent to human observers, the grasses and woody plants in a savannah are in constant competition with each other. Solid grass cover provides fuel to feed an occasional fierce fire that kills young

bushes, whereas the widespread roots of bushes and trees dry out the surrounding soil, making it difficult for grass to grow.

Whether the grass or the trees ‘win’ this competition changes over time and space, and depends on a bewildering array of factors, including: rainfall, soil nutrients, fire, grazing and browsing by herbivores, and even the amount of carbon dioxide in the atmosphere.



Discussing the bush problem in a dense thicket of Black Thorn.



The landscape near Otjiwarongo is dominated by bush.

R. Thomson



P. Cunningham

Kudu are browsers that do well in the bushy savannahs of Namibia.



P. Cunningham

A bush clearing operation in Namibia. The bush seen lying on the ground will be turned into charcoal and sold.

It is therefore no surprise that scientists continue the debate about which of these factors are the main causes of the increasing dominance of bushes over grasses in Namibia and similar ecosystems elsewhere. There is even debate about how open or bushy Namibian savannahs were before colonial commercial farming systems were first established. The state of the savannah before any form of livestock farming took place (e.g. by Herero and Nama people) is entirely unknown to modern day scientists.

Commercial farmers historically replaced wild herbivores, which ate both grass and leaves, with large numbers of cattle and sheep that rely almost entirely on grass. Besides differences in diet, wild herbivores used to move over large tracts of land in response to highly patchy rainfall patterns in Namibia, but this migration was disrupted by fencing commercial farms. The result is that domestic and wild herbivores stay on the same farmlands year round, thus putting continuous pressure on the plants they eat. Furthermore, early commercial farmers viewed fire as destructive and would therefore prevent it as far as possible, not realising that grass is rejuvenated by occasional natural fires at the start of the rainy season, usually caused by lightning striking dry grass. On a broader scale, humans have altered nutrient, water and carbon cycles through their agricultural and industrial practices. One of the results of these environmental impacts is that the competition between grass and bush has tipped the balance heavily in favour of the bush.

Densely bushed farms are economically as well as ecologically less productive than they were historically. Farmers can keep fewer cattle

and sheep on land where little grass grows within dense bush thickets, resulting in low economic returns for large tracts of land. Ecologically, a healthy mix of grass and bush provides habitats for a larger variety of animal and plant species than is provided by a system dominated by one or the other. Reducing bush encroachment in Namibia is therefore important for both the economy and the environment.

The first volume of the Namibian Journal of Environment (NJE), published in 2017, contained three scientific articles concerning bush encroachment, emphasizing the importance of this topic to environmental scientists in Namibia. I will take this opportunity to touch on some aspects of their contributions to our knowledge about bush encroachment and potential solutions for Namibia.

Dave Joubert and colleagues pointed out in their article that Black Thorn grows so slowly in their study area (a farm near Windhoek) that the bush thickets seen there today were already present over 50 years ago. This is supported by Peter Cunningham's 2014 review of notes by early European explorers in Namibia who indicate that they frequently encountered dense bush thickets in the period 1856-1925. These scientists contend that declining farm productivity since the 1950s cannot be attributed solely to bush encroachment, and that Namibia's savannah has always consisted of some bushy areas.

Ibo Zimmermann and colleagues view increasing bush density as a symptom of farmers continually removing nutrients from the soil, because livestock sold for meat consumes these nutrients by eating plants. In a natural ecosystem the animals living on the land will return the nutrients to the soil through decomposition after their death. Bush encroachment is the result of reduced soil fertility, but clearing the bush from farmlands may exacerbate this problem.

While bush is usually turned into charcoal on farms in Namibia, the Cheetah Conservation Fund (CCF) uses it to produce a fuel briquette known as Bushblok. Zimmermann et al.'s study on the CCF bush clearing operation revealed that soil fertility was lowest in locations that had been totally cleared of bush, intermediate in areas where some bush was cleared, and highest in thickets that were not cleared. Ibo Zimmermann cautions that removing bush from farms without replacing mineral nutrients may not be the ideal solution, as this counteracts nature's attempt to restore soil fertility through bush growth.

In contrast, Peter Cunningham and Frank Detering view bush as an opportunity for diversifying farm income by making charcoal and other products. Their study shows that the slow-growing Black Thorn takes 21-26 years to reach the ideal size to be harvested for charcoal, and

that it can be sustainably harvested over time. Rather than managing farmlands solely for grazing livestock, Peter Cunningham suggests that farmers include the bush on their farm as a resource for diversifying their income. He also points out that leaves and twigs are not used for charcoal, but left on the land to decompose and release their minerals back into the soil.

Still within the 2017 volume of NJE, we find an intriguing opinion piece by Peter Andrews and colleagues about improving rangeland management practices to halt the decline in productivity on Namibian farmlands. They refer to lessons learnt from experiments on Australian rangelands to suggest new approaches for Namibian farmers. Among their recommendations is to clear bush in long strips along the natural contours of the land (rather than blocks), and then place the dead bush along these strips. This would imitate the self-reinforcing natural pattern of banded vegetation, which can still be seen in some parts of Namibia. When it rains, the decomposing bush, and grasses encouraged to grow underneath them, will reduce the rate of runoff (thus reducing soil erosion) and slowly release nutrients back into the soil. While this option may be more ecologically sound than harvesting and selling the bush, it means that farmers would not be able to recoup the costs of harvesting in the short-term. Improving soil fertility and moisture retention should, however, produce long-term economic gains by increasing farm productivity.

"Large scale bush clearing poses a significant desertification threat to Namibia's rangeland, which I have noted while driving north of Windhoek," cautions Ibo Zimmermann, "Whirlwinds are often evident blowing over the occasional large cleared block of land, yet die out at the edge when meeting the neighbouring bush encroached land; the rising hot air from cleared land often causes rain clouds to dissipate." Peter Cunningham notes, "Clearing bush in large blocks, or even long strips, does not imitate nature. I recommend that farmers thin the bush in a mosaic pattern, rather than clearing it". He further suggests, "Farmers should adapt their farming methods to Namibia's natural bushy savannah, and investigate farming with livestock that browse and graze – like goats, damara sheep, and Nguni cattle."



Bags of charcoal are loaded onto trucks to be taken to market. This is one way for farmers to diversify their income on densely bushed farms.

Fully cleared land (left) was found to be less fertile than the partially cleared land (right), and both sites were less fertile than land that had not been cleared.



G. Potgieter

Scientists estimate that between 17-41 million hectares of farmland in Namibia is affected by bush encroachment. The extent of the estimated area affected reveals disagreements about what defines an area as “encroached”. With this article we have caught a glimpse of the complexity of this issue, and some of the scientific debate about its severity, causes and potential solutions. Consequently, a concerted effort from scientists, farmers and policymakers is required to find and implement affordable, practical solutions to improve the productivity and ecological integrity of Namibian farmlands.

I am grateful to Ibo Zimmermann and Peter Cunningham for their helpful comments and insights. This article is dedicated to Dave Joubert, a scientist who contributed to rangeland research in Namibia. He sadly passed away in 2018.

The NJE articles referenced here are all open access and can be found at <https://www.nje.org.na/index.php/nje/issue/view/1>.

Andrews, P, H Pringle, and I Zimmermann. 2017. “Could Critical Australian Insights Illuminate Rangeland Management in Namibia?” *Namibian Journal of Environment* 1 B: 1–6.

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Zimmermann, I, M Nghikembua, D Shipingana, T Aron, D Groves, and L Marker. 2017. “The Influence of Two Levels of Debushing in Namibia’s Thornbush Savanna on Overall Soil Fertility, Measured through Bioassays.” *Namibian Journal of Environment* 1 A: 52–59.

The article referring to historical explorers of Namibia:

Cunningham, PL. 2014. “Bush Thickening in Namibia – A Historical Perspective.” *Namibia Scientific Society* 62: 164-185.

If you would like to know more about this topic, visit <http://www.the-eis.com>, and search for “bush encroachment”.



The bush is turned into charcoal by burning it slowly in metal drums.



IT'S TIME TO GROW

MAINSTREAMING EDUCATION FOR SUSTAINABLE DEVELOPMENT IN NAMIBIA

by Viktoria Endjala
NaDEET Centre Manager

Education for Sustainable Development is about enabling all people to constructively and creatively address present and future global challenges and thereby create more sustainable and resilient societies. This approach is not limited by age; children and adults alike can participate, and it should be mainstreamed in all levels of learning and teaching. Education for Sustainable Development has been emphasised at the international level through the adoption of the Sustainable Development Goals by world leaders at a United Nations Summit held in New York in 2015. Specifically, Quality Education (Goal 4) aims to ensure that *“all learners acquire the knowledge and skills needed to promote sustainable development, including, among others, through education for sustainable development and sustainable lifestyles”*. Furthermore, this is a cross-cutting theme in the Namibian national curriculum.

The Namib Desert Environmental Education Trust (NaDEET) offers Education for Sustainable Development through several projects managed from its centres on the NamibRand Nature Reserve and in Swakopmund. NaDEET's environmental literacy project is aimed at promoting and encouraging environmental learning at different levels in education. This is done through the production of a variety of environmental learning materials. One of the booklets – *It's Time to Grow* – is written for young children just entering school. Developed in 2013, this booklet was originally meant to be used as a child's environmental learning pack at home. In practice, however, it was primarily used in a school setting. We consequently received feedback

that the booklet was too small for use in the classroom, as teachers reported that they *“could not use it with many children”*. Another issue for many teachers was that it was written only in English.

A Quality Education Platform hosted jointly by the University of Namibia and UNESCO focusing on Education for Sustainable Development and mother tongue instruction in schools inspired NaDEET's Director to translate and reconceptualise our *It's Time to Grow* booklets. The new project also aimed to integrate various components of NaDEET's work to improve the overall impact. As part of our new approach we trained lower primary school teachers in Education for Sustainable Development concepts and invited them to translate the booklet series into their own mother tongues. This doubled our impact by increasing teacher ownership over the environmental literacy material.

Sixty teachers nationwide participated in one of three of our training workshops in 2017, during which time they translated the booklets into Oshindonga, Otjiherero and Khoekhoegowab. *It's Time to Grow* comprises four booklets. They cover themes of *Water, Sun, Animals & Plants and Recycling* to ensure that teachers and learners incorporate



these themes in teaching and learning, thus enabling learners to practice sustainability at a young age.

Combining translation of the booklets with the workshops helped build capacity among lower primary teachers to teach their learners the Environmental Studies curriculum in their respective languages. Overall it was an empowering experience, as participants not only learnt about how to practice sustainability, but also broadened their vocabulary for teaching about sustainability in their own languages. During translation it became clear that a concept such as recycling is not used in everyday conversation in many local languages. Therefore it was important that the teachers not only translated but also learnt in depth what these concepts mean.

After the first phase of the project teachers were able to:

1. incorporate stories from their own cultures in the booklet
2. produce a teacher's A4 'big book' and convert the children's copies into an A5 format
3. create 4 'Memory' card games directly linked to the booklets

With new funding from Brot für die Welt and additional support from the Ministry of Education, we expanded the project in 2019 by another two local languages, Rukwangali and Silozi, as well as English. Two multi-day workshops were hosted during this second phase with 40 pre-primary and lower primary teachers, advisors and lecturers, who were introduced to the practical application of sustainability at the NaDEET Centre. Topics included waste management, water saving methods and sustainable energy. After the workshop a participant exclaimed: *"I never knew a chance like this would reach me, where I would use my language to teach children about the environment"*.

Through this project we aim to change the way people think and empower them to work towards a sustainable future. *It's Time to Grow* helps reach this goal using mother tongues. It allows children to combine learning about numbers, shapes and colours in the lower primary curriculum with environmental topics. Learners acquire knowledge and develop skills in recycling and water saving, the importance of energy as well as personal growth through storytelling, games and puzzles. Furthermore, this material uses local examples and artwork that learners can relate to while being made aware of important aspects of sustainable development.

The first phase was sponsored by the Namibian National Commission to UNESCO through the UNESCO Participation Programme, which published and distributed 50 learning packs per language (a total of 150 packs) throughout the country. In the second phase the same number of packs will be distributed (50 per language). However, this time not only to schools, but the English versions will be given to institutions of higher learning where they will be used for training



pre-service teachers. Each pack consists of 50 booklets per topic for children, which means that 2,500 children will benefit in each language group. There are over 18,000 Rukwangali learners and 8,000 Silozi learners in Grades 1-3 alone. Although these printed packs will not be enough for each learner, soft copies will be available for teachers to print out for their classes. A representative from the National Institute for Educational Development who took part in one of our workshops appreciated this project, saying: *"There are not enough children's resources in Silozi"*.

NaDEET is committed to supporting the national school curriculum and the Namibian government's education efforts. All of the school programmes we offer are therefore developed in line with the national school curriculum.

MORE ABOUT NADEET

The Namib Desert Environmental Education Trust (NaDEET) offers Education for Sustainable Development programmes to primary and secondary school children, educators, youth and community groups. NaDEET is a small but vibrant non-governmental non-profit organisation whose mission is to protect the natural resources of Namibia by educating its citizens to practice a sustainable lifestyle. For over 15 years NaDEET has offered unique hands-on experiential learning opportunities through educational programmes presented at the NaDEET Centre on the NamibRand Nature Reserve. Four main themes are covered: biodiversity, water, energy and waste. Although our main operations are based in the Hardap Region, participants come from all over Namibia. To date, over 14,000 Namibians have taken part in over 400 of our educational programmes. In 2018 NaDEET was awarded the UNESCO-Japan Prize on Education for Sustainable Development. This international prize is awarded annually to only three outstanding projects and programmes worldwide.



EDULINK

TEACHING NAMIBIA'S FAR-FLUNG TEACHERS

by Holger Vollbrecht and Nathan Vyklicky

EduVentures Trust

Classrooms are key to teaching Namibia's nearly one million school-age children about conservation – yet Namibian teachers receive little training on environmental education. This new programme equips teachers with all-Namibian lessons to create a generation of environmental heroes, in every region of our vast country.

Early morning, Etosha National Park. You can smell the cool, humid tang of night in the savannah still hanging on the air. The twittering of red-eyed bulbuls wakes a group of francolins, who add their chatter to the breaking day. Vilho Absalom, a Ministry of Environment and Tourism warden at the Namutoni Environmental Education Centre, is already hard at work. He is setting up an outdoor workshop, which he usually leads as part of a three-day course for schoolchildren visiting the park. Today, though, is a little different. Instead of children, fellow environmental educators arrived the previous night, travelling from government institutions and non-profit organisations in every corner of the country. These specialist educators hail from places that represent all the landscapes of Namibia: Namib Desert, Waterberg, Kavango and Zambezi, Succulent Karoo and the Atlantic Coast. They are here to work on a new kind of nature education for the nation.

Not all classrooms are five-star affairs

These specialists were invited by Corris Kaapehi and Maria Johannes of EduVentures, the National Museum of Namibia's education

programme. Together, they form a new network which is collaborating to give Namibian teachers a new level of support nationwide. Corris describes what life can be like for the teachers they are trying to help: "In a remote school located in a village with only 150 people, their classroom is under a tree – you cannot even teach some of the practical stuff in the textbooks. For example, the books call for a microscope, but rural teachers have no access to this kind of equipment. So your classroom, after a while, becomes boring."

Environmental education in Namibia: The story so far

To be sure, excellent conservation curricula do exist. Following Namibia's independence, the Desert Research Foundation of Namibia created Enviroteach, focussing on outdoor activities for teachers. The Enviroteach Toolbox was recognised for its outstanding quality by the International Union for Conservation of Nature in their "Education and Sustainability: Responding to the Global Challenge" report. The challenge is getting these tools into the remote teachers' hands, and making sure they have sufficient training to use them once they



With guidance from the Ministry of Environment and Tourism warden, Vilho Absalom, educators gain hands-on experiences that help to sharpen their Education for Sustainable Development skills.

do. Environmental education remains profoundly neglected in rural Namibian schools.

More recently, Namibians have been innovating to reach young people in new ways. In 2018 the Namib Desert Environmental Education Trust (NaDEET) won one of three international UNESCO-Japan Prizes for Education on Sustainable Development, for teaching immersive, hands-on sustainable living at their education centre in the NamibRand Nature Reserve. In another initiative the Think Namibia campaign hosts an online platform for young environmental activists and entrepreneurs. Since 2014, EduVentures has operated the Ombombo (“Butterfly”) mobile classroom, a modified truck which travels to schools across the country, where it opens up into a fully equipped smart classroom that allows us to offer a five-day, mixed-method conservation programme with Internet, “bush cinema” and lab equipment.

EduLink, connecting rural Namibian teachers

The EduVentures mobile classroom project struck an even deeper chord than expected. As one of the teachers said: “We want the same kind of education. Since I came here as a teacher, I have never really had an opportunity to revive my knowledge. I am isolated from all the other teachers – I am located here in the middle of nowhere.” Corris at EduVentures responded to this and similar requests: “Why don’t we set up a programme that targets the teachers? They spend the most time with the learners at school, and have the biggest influence.”

The new EduLink project was thus born in 2018, with support from Solidaritätsdienst International (SODI) Berlin. Specialists from nine Environmental Education Centres across Namibia were strategically selected to serve all 14 regions of the country. They now form a network to tailor conservation curricula for their regions and share them with hundreds of teachers from various towns and villages. These centres were already teaching learners on field trips: Why not teach teachers as well, to take lessons and skills back to their classes? The network brainstormed the most pressing issues facing Namibia, and EduVentures helped develop teaching aids that reflected these. Not only does this strengthen bonds and learning among Namibia’s distant Environmental Education Centres, it connects rural teachers to the best the system has to offer.

Through EduLink, teachers can arrive at a participating centre and experience – many for the first time – cutting-edge methods such

as role-playing and arts-based education, smart boards and creative outdoor learning sessions using everyday materials. By playing themselves, the teachers learn how to use play with their learners; they return home with new ideas and practical ways to implement these ideas. Corris illustrates the process with one activity that the network developed: “In our ‘bucket game’ the teacher gets the learners to take buckets and collect different ecosystem components.” He further explains, “The teachers take many informative booklets and handouts back with them, which they can refer to when they are back at their schools.” Even more importantly, they are now linked to a group of teachers who have a common vision for educating young Namibians about their environment.



Teachers and conservancy members learn from Corris Kaapehi from EduVentures in the Ombombo mobile classroom during a 3-day pilot training session held in the George Mukoya and Muduva Nyangana Conservancies.



These teachers are learning from fine artist and educator, Hangula Werner, about arts-based environmental education that combines art and the environment in lessons that are interactive and fun. The workshop was hosted at the Okatjikona Centre in Waterberg National Park.

GAINING INSIGHTS INTO THE SECRET LIVES OF WILD ANIMALS





by Namibian Chamber of Environment

If you have had the privilege of spending plenty of time watching wildlife in Africa's wilderness areas, it is likely that you have spotted an animal wearing a collar. In the context of a safari in the wilderness the presence of a clunky leather collar around the neck of a majestic lion or elephant may seem out of place and even jarring, as it reminds us that man's impact on the environment extends right into the lives of individual animals. This may leave you wondering: why are collars necessary? What benefit do the animals get from humans catching and collaring them? What information do scientists get from these devices, and how is it used?

The basic reason for attaching a tracking device to an animal (not all devices are collars) is to find out where animals go and what they do across the landscape. These devices either send their location directly to the researchers' computers via satellites, or store this information until they are retrieved and the data points are downloaded. Although one could try to find out where animals go by following them day and night, come rain or shine, such an effort would require enormous amounts of time to gather enough information to be useful for answering scientific questions. Furthermore, the presence of a person or vehicle may interfere with the animal's normal behaviour, for example, by disturbing hunting or mating. Some animals, like bats, fish and birds, would be impossible to follow so closely anyway. Attaching a device that can tell us where the animal goes 24/7 without our constant presence is therefore considered a less intrusive and more practical approach to wildlife research.

But why do we need to know where an animal goes and what it does all the time? Is it not good enough just to know that they are out there living their lives? In an ideal world, the only reason for tracking animals would be for purely scientific purposes, to find out more about their behaviour and ecology. In reality, animals are under threat, and tracking them has become essential to conservation efforts. In Namibia, the Ministry of Environment and Tourism (MET) recognises the value of data gained through wildlife tracking, but also acknowledges that more needs to be done to use this information for conservation management.

With this in mind, the Namibian Chamber of Environment organised a wildlife tracking symposium in November 2016, with support from B2Gold and in partnership with MET and the Namibia University of Science and Technology (NUST). The Deputy Director of Research and Monitoring in MET, Kenneth /Uiseb, emphasised the importance of wildlife tracking as a conservation tool, especially as man-made environmental threats – from destroying local habitats to changing

the global climate – continue to force animals to change their behaviour and movement patterns, often leading to conflict with people. He welcomed the 38 delegates to the symposium – many of whom have used tracking devices for a diverse array of species, from puff adders to elephants, to answer a variety of research questions. This overview of the symposium will give you a glimpse of the kinds of data that researchers gather with tracking devices, and how this information can ultimately be used for the benefit of the animals being tracked.

REDUCING HUMAN-WILDLIFE CONFLICT

One of the clearest links between tracking animals and conserving them is the potential for reducing human-wildlife conflict. Representatives from N/a'an ku sê, Africat, the Cheetah Conservation Fund (CCF) and the Leibniz Institute for Zoo and Wildlife Research (IZW) showed how collaring leopards, lions and cheetahs could help reduce conflict incidents and change farmers' attitudes towards these predators.

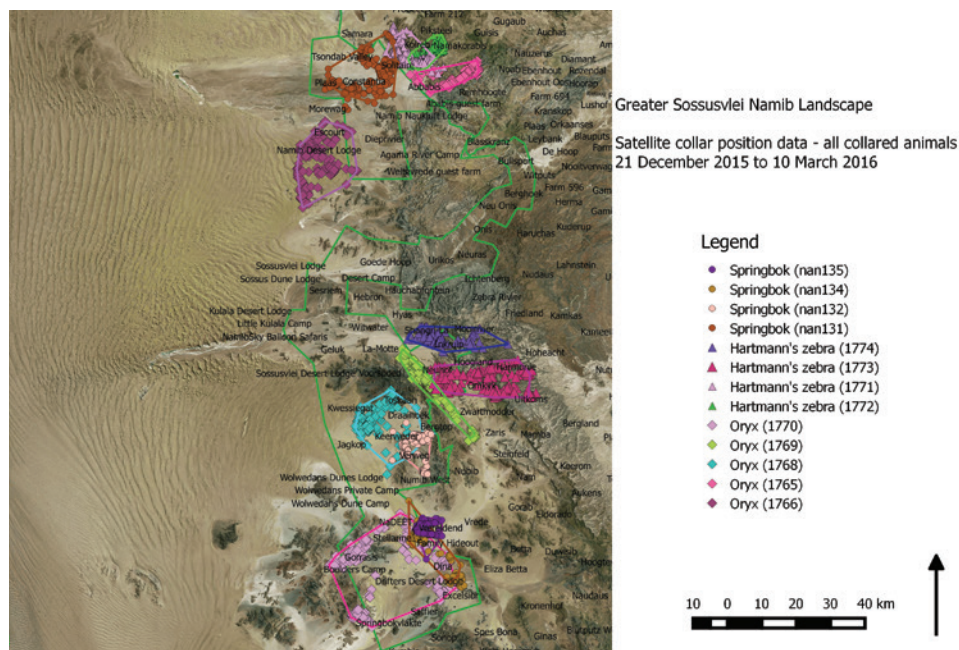
Using GPS collars that show lion movement in near real-time, the team at Africat warns communal farmers living on the western boundary of Etosha when the collared lions are in their area. Specially trained 'lion guardians' are alerted to the presence of lions, and they ensure that cattle are herded and put into predator-proof kraals each night until the threat has subsided. Meanwhile, N/a'an ku sê, CCF and IZW have collared leopards and cheetahs on commercial farms, revealing that many cats which were previously viewed as 'problem animals' were actually not responsible for livestock losses. Sharing tracking information with farmers who live with these carnivores thus has an important role to play for ensuring the long-term survival of these species outside protected areas.

In cases where leopards and cheetahs have to be removed from farms due to conflict, tracking collars can help determine whether relocations



Lions in northwestern Namibia are free-ranging and therefore encounter people and their livestock, which may lead to conflict. Lions are collared in this region to reduce their conflict with local farmers and for research purposes.

Using tracking devices, scientists can study the movements of many different animals from several different species at once, as illustrated in this map showing springbok, Hartmann's mountain zebra, and gemsbok movements on the edge of the Namib Desert. Credit: Dr Morgan Hauptfleisch, NUST. Project managed and funded by MET and the Greater Sossusvlei Namib Landscape.



to new areas are successful. In particular we need to know if the animal settles in the new area or tries to return, and whether or not it starts killing livestock again after being relocated. N/a'an ku sê reported that 67% of the leopards and 57% of the cheetahs they relocated survived for at least a year afterwards. Similarly, CCF reported a 68% success rate for the cheetahs they returned to the wild after being kept in captivity for some time. According to the IZW, the likelihood of whether a male cheetah stays in the new area or returns to where it was caught might depend on whether he was holding a territory or not. A territorial male is more likely to return, whereas one without a territory might stay in the new area. Nonetheless, both organisations recognise the importance of keeping cheetahs and leopards in their original home ranges on farmlands in Namibia, which can only be done by working alongside farmers as conservation partners.

Presentations from the Kwando Carnivore Project, the University of Namibia (UNAM) and the University of KwaZulu Natal (UKZN) confirmed that knowledge about animal movements contributes indirectly to addressing human-wildlife conflict. The UKZN study reveals how killing lions on farms on the southern boundary of Etosha could influence the lion populations inside the park. Although the Etosha lion population is healthy and big enough to survive despite conflict, the UNAM/MET study in the Zambezi Region shows that the lion population in Mudumu National Park is severely threatened by the same problem. Similarly, spotted hyenas require a much larger area than is available within the small national parks in eastern Zambezi, according to tracking data collected by the Kwando Carnivore Project. Together, these studies underline a pressing need for protected areas to engage proactively with neighbouring communities to reduce human-lion conflict.

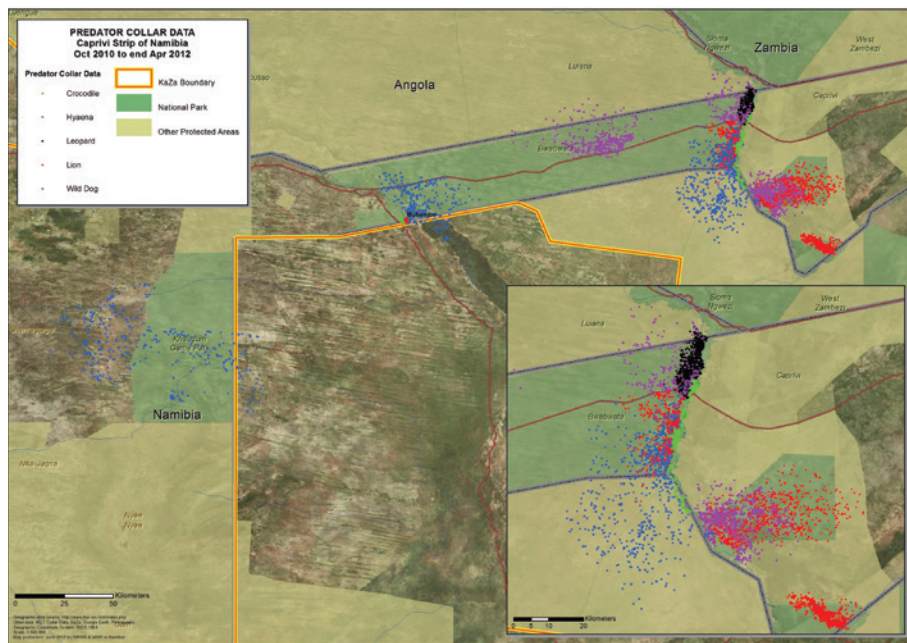
Besides carnivores, elephants and snakes were highlighted as species affected by human-wildlife conflict. N/a'an ku sê has partnered with NUST to study puff adders that are relocated away from their research and visitors centre. The data show that the relocation of puff adders has a high success rate, and that the snakes do not usually return to where they were caught. On a very different scale N/a'an ku sê has partnered with MET to track elephants in conflict areas in northern Namibia as part of an early warning system to help prevent conflicts with farmers.

UNDERSTANDING TRANSBOUNDARY ANIMAL MOVEMENTS

The Kavango-Zambezi Transfrontier Conservation Area (KAZA) has turned several researchers' attention to tracking animals that cross the borders of the countries involved in the KAZA initiative, i.e. Namibia, Angola, Botswana, Zambia and Zimbabwe. MET researchers have found that buffaloes, elephants, crocodiles and other large carnivores all move through the Zambezi Region of Namibia en route to or from the other KAZA countries. A UNAM and MET study of African wild dogs further confirmed the key importance of the Zambezi Region. Several dog packs were collared in the Zambezi, which revealed that their home ranges reach into Botswana, Zambia and Angola. Additionally, the UNAM and MET studies indicated that animals from Khaudum National Park and neighbouring conservancies in the Kavango East Region move far into north-western Botswana.

The Zambezi Region is thus a critical corridor within KAZA, which hosts globally important populations of lions, elephants and wild dogs, to name but a few. The chief value of these tracking studies is to find out which areas in KAZA function as key corridors for different species. In all five countries the areas demarcated in KAZA include fully protected national parks, multiple use areas like communal conservancies and farmlands with no conservation status. When overlaid with the boundaries of protected areas and conservancies, animal movement data can indicate which non-protected areas in KAZA need to be earmarked for future conservation action.

The most amazing international journeys recorded through tracking devices thus far come from bird studies. Although we know that some birds migrate seasonally across continents and even oceans, researchers from Raptors Botswana did not expect their Lappet-faced Vultures to take several round trips of over 1,000 km to Namibia. The vultures collared during this project breed in Botswana and were thought to stay relatively close to their breeding sites. Yet tracking information reveals that they fly from the Central Kalahari Game Reserve in Botswana to the //Karas region in southern Namibia and back again, for entirely unknown reasons. The delegate from VulPro in South Africa presented similarly astonishing flying achievements by a Cape Vulture and a White-backed Vulture that were released at the VulPro centre in Gauteng, yet flew through Botswana and into Namibia.



The Zambezi and Kavango regions are part of the KAZA Transfrontier Conservation Area (top left). The coloured dots represent different species tracked by MET researchers: blue = African wild dog; black = leopard; pink = spotted hyena; red = lion; green = crocodile. These data show that all of the studied species cross international borders in the KAZA area. Credit: Piet Beytell, MET.



The Cape Vulture also visited southern Angola, Zambia, Zimbabwe and Mozambique on its epic southern African journey. The Rare and Endangered Species Trust (REST) from Namibia highlighted the current vulture crisis with their presentation at the symposium. The pressing conservation concerns and impressive long-distance journeys underlined the need for collaboration among vulture conservationists throughout southern Africa.

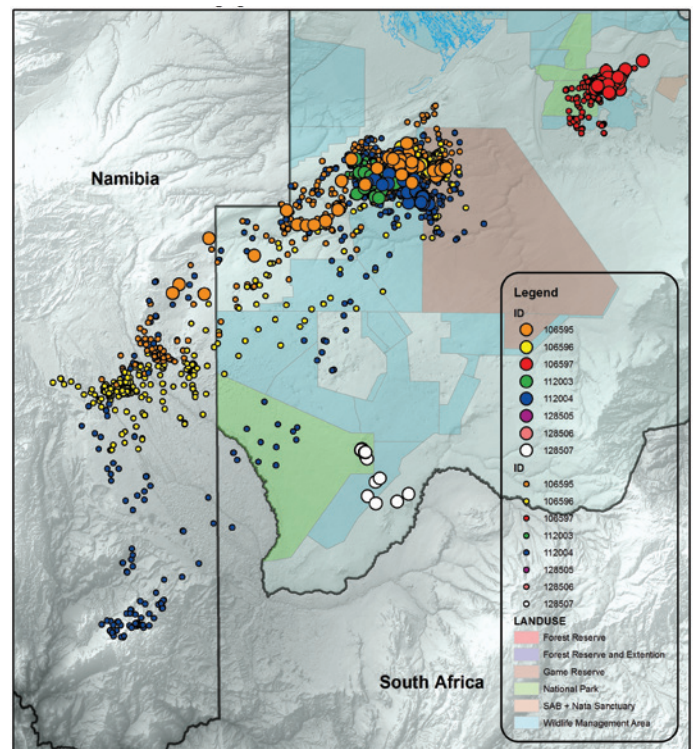
USING ANIMAL MOVEMENTS TO INFORM CONSERVATION MANAGEMENT

All animals need to find enough food to survive and reproduce to pass their genes on to the next generation. Consequently, studies that focus on where animals go to find food and when and where they give birth are vital to understanding how we can conserve them.

MET's researchers in the Kavango and Zambezi regions have used tracking devices to find out when and where animals have their young, with particular focus on species of conservation concern like African wild dog, roan antelope, black rhino and lion. The Brown Hyena Research Project is doing similar work near Lüderitz, where they use tracking data to find hyena dens. They then set up camera traps at the den sites to unobtrusively study behaviour and record cub development. One of the key aims of the project is to ensure that the mining activities near Lüderitz do not negatively affect the hyenas, and the researchers work closely with the mining sector to achieve this goal.

Studies in and around Etosha by MET, Africat and other researchers show that elephants, lions and blue cranes leave the boundaries of the park in search of food or mates. In the case of elephants and lions, young males are the most likely to move away from their herd or pride to find a new group and thus have opportunities to mate. If they leave the park on their journeys they are likely to encounter people, which may lead to conflict.

In contrast, Blue Cranes do not conflict with people, yet are critically endangered in Namibia. The national Blue Crane population has declined from over 100 in the 1970s, to only 23 counted in 2016. The Crane Working Group of Namibia tracked some of these birds, showing that they leave Etosha to visit a lake in the Oshana region to the north



Movements of Lappet-faced Vultures (top right) recorded by tracking devices. Different colours represent different individuals; the size of each dot represents the length of stay in each location (bigger dots = longer time spent). Credit: Rebecca Garbett, Raptors Botswana.

of the park during the dry season. Understanding what resources cranes need and why they leave the park will help manage this highly threatened population.

The need to find new food sources causes several herbivore species to migrate long distances each season to maintain their body condition. An eye-opening study by an international research team, including MET researchers, revealed the longest zebra migration in Africa, extending from the southern edge of eastern Zambezi in Namibia

The map displays the Zebra Collar Data for the period from September 2012 to October 2015. It covers a region spanning Botswana, Namibia, and South Africa. Key geographical features include the Okavango Delta, the Zambezi River, and several national parks and reserves such as Botswana National Park, Chobe National Park, and Moremi Game Reserve. The map uses various symbols and colors to represent different types of data and boundaries. A legend in the bottom left corner provides a key for these symbols.

Legend:

- City
- Primary/Secondary Road
- Rivers
- Veterinary Fences
- National boundary
- Communal Conservancy
- Aerial Wetland Survey
- Zebra sightings during Zambezi game counts

Zebra Collar ID

• SAT1486	• SAT500
• SAT1487	• SAT501
• SAT1488	• SAT502
• SAT1489	• SAT503
• SAT1490	• SAT504
• SAT1491	• SAT505
	• SAT506
	• SAT507

ZEBRA COLLAR DATA
Collar History Map
Sep 2012 to October 2015

Zebra migrate to and from Nxai Pan in Botswana

The migration of zebra between the Zambezi Region in Namibia and Nxai Pan in Botswana is the longest migration of its kind. Different colours represent different individual zebras. Credit: Piet Bevtell, MET

A full-page photograph of a hyena standing in a dry, sandy, and rocky landscape. The hyena is facing the camera, with its dark brown and tan mottled fur clearly visible. The background consists of rolling, arid hills under a clear sky. The overall tone is warm and naturalistic.

Tracking collars help brown hyena researchers find dens, which can then be monitored unobtrusively with camera traps.

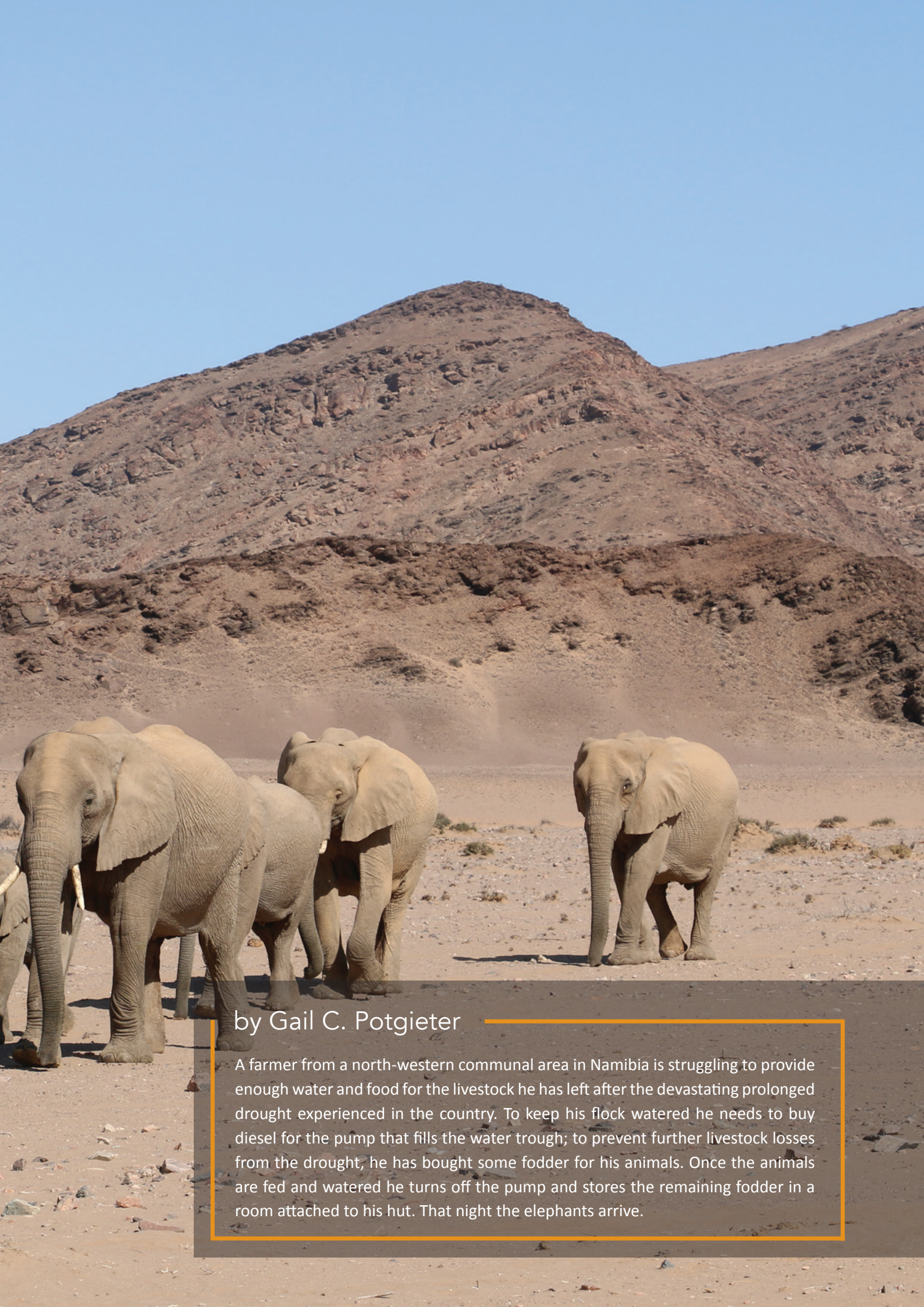
A group of penguins on a sandy beach. In the foreground, two fluffy brown chicks are standing close together. The chick on the left has a small black tag on its back. Behind them, several adult penguins with black and white plumage are visible, some sitting and some standing. The background shows more penguins and some green vegetation on the right side.

The data-logging device attached to the back of an African penguin is used to reveal where these birds go to fish off the coast of Namibia. These devices are removed from the penguin after 2-3 days, and the data are downloaded onto a computer.

WHAT DO YOU DO WHEN THE ELEPHANTS ARRIVE?

Keep Calm and Work Together!





by Gail C. Potgieter

A farmer from a north-western communal area in Namibia is struggling to provide enough water and food for the livestock he has left after the devastating prolonged drought experienced in the country. To keep his flock watered he needs to buy diesel for the pump that fills the water trough; to prevent further livestock losses from the drought, he has bought some fodder for his animals. Once the animals are fed and watered he turns off the pump and stores the remaining fodder in a room attached to his hut. That night the elephants arrive.



“There are huge costs involved in moving elephants, which need to be darted and transported one at a time. These relocations also pose a risk to the elephants, especially if you are trying to move a breeding herd with young ones.”

MET

Elephant being darted from a helicopter in Sorri-Sorris Conservancy.

These elephants, as stressed by the drought as the farmer, are desperate for water and always on the lookout for food. They arrive at the livestock trough to find that it is empty – the little ones cannot go much further without water, so the matriarch takes matters into her own trunk. She smells the water in the pipes that feed the trough and pulls one of these pipes right out of the ground, effortlessly. Fresh, clean water gushes out of the broken pipe, and the herd gathers around to drink to their hearts’ content. Later that evening, one of the herd smells something delicious emanating from a nearby hut – lucerne! He approaches the hut and finds it to be a makeshift structure of iron sheets and hardened earth – it is a simple matter for him to break down one of the walls and access bales of nutritious lucerne.

The farmer comes out of his hut the next day, having not slept a wink the entire night. He was angry when he first heard the pipes break, but that soon changed to terror when his house shook as the elephants broke the wall down. His wife and children were with him in the hut – the children nearly cried out, but they couldn’t risk drawing the elephant’s attention. Just the other day, an elephant killed their neighbour who was walking home at night. They were terrified.

Further to the north of this area, on a fenced commercial farm, another farmer is facing a different problem caused by the same great, grey beasts. An entire section of farm fence has been flattened: a sure sign that a breeding herd passed through here recently. Baby elephants cannot walk over fences, so the adults flatten large sections to let the babies through. As the farmer surveys the damage, he realises that this story is not over yet. These elephants will break out of this camp again soon, using a different route and destroying yet more fences. Besides the cost of repairing the fence, this farmer is deeply concerned about the animals he may lose before he can make sufficient repairs. He tries to calculate the financial cost of this incursion, but stops when it makes his head hurt.

The plight of these farmers has not gone unnoticed. Both the communal and the commercial farmers have lodged complaints with the Ministry of Environment and Tourism. The commercial farmers wrote letters to the local newspaper to publicise their problems, whilst

the communal farmers complained vocally to the Ministry’s regional officers. Their requests were nonetheless the same: please take these elephants away.

This situation puts the Ministry in a very difficult position, as Kenneth /Uiseb, the Deputy Director of Wildlife, Monitoring and Research, explained to me in an interview. “The elephants that are causing these problems are from the west – the dry riverbeds in unfenced communal areas”, he points out. “If we took them to Etosha, they would just break out to return to the desert; if we took them west, they would just walk back again.” There are huge costs involved in moving elephants, which need to be darted and transported one at a time. These relocations also pose a risk to the elephants, especially if you are trying to move a breeding herd with young ones. So what should farmers do when elephants come knocking?

“The Ministry has adopted an integrated approach to dealing with human-elephant conflict”, /Uiseb explains. “Our overall aim is to reduce the costs of living with elephants to tolerable levels.” A key part of this approach is to find out where the elephants are going, and relay that information to the farmers in time for them to prevent major incidents.

MET has been able to raise sufficient funds to collar 11 elephants from the Kamanjab commercial farming area in the north, right through to the Omatjete communal areas in the south. The Kamanjab Farmers Association, Horst Weimann (a local farmer and businessman), the German development agency GIZ and Namibian Breweries Limited (via the N/a’an ku sê Foundation) all contributed funds to MET’s collaring efforts. Elephant Human-Relations Aid, a field-based elephant conservation group, also assisted by tracking elephant groups that were earmarked for collaring by MET.

Knowing where the elephants are has helped the commercial farmers in the Kamanjab farming area substantially, and this project has greatly increased their tolerance despite the continuing fence breakages. MET is currently setting up a system to inform the southern communal farmers about the elephant’s whereabouts through their regional offices and the local radio stations. To address the fodder issue, MET has built an

elephant-proof storeroom in the area. It is hoped that farmers will take steps to protect themselves and their livestock fodder when they are alerted to the presence of elephants via the radio.

The community in the south needs more than just information, however, as they cannot afford to pump enough water for elephants and their livestock, nor can they keep fixing broken pipes and reservoirs. To address this need, MET is working to replace the diesel pumps with solar pumps, build protective walls around the water installations, and build alternative elephant watering points some distance away from human settlements. Furthermore, they are looking to increase tourism in this area by building a lodge and working with local tour operators to create a safari route. By improving benefits and reducing the costs of living with elephants, MET hopes to help this community to coexist with these giants.

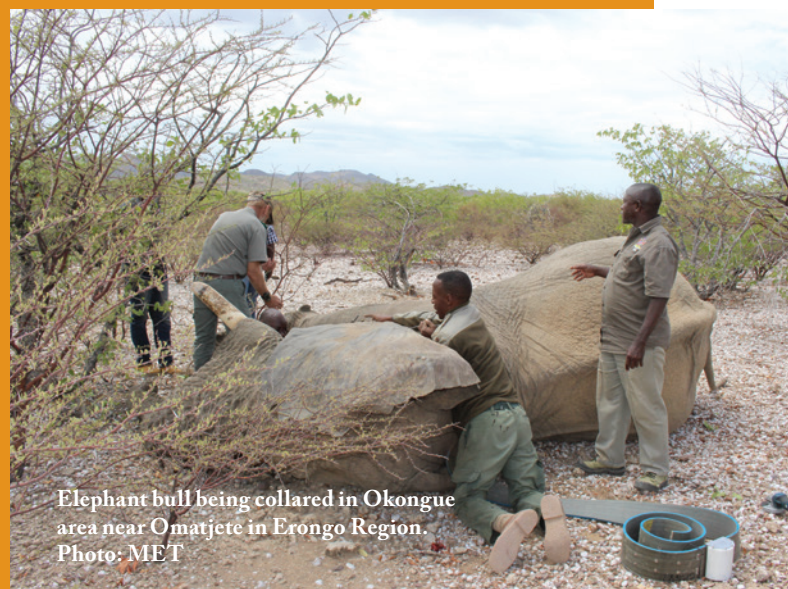
These interventions provide support to the country's well-known conservancy programme. The commercial farming area is located within the Loxodonta Africana freehold (commercial) conservancy, which is aptly named after the African elephant. In the south, communities have established the Ohungu and Otjimboyo communal conservancies, and another community that lives with elephants is considering establishing their own conservancy soon. These entities make it easier for tourism operators to establish working relationships with the communities and provide a means for developing new community projects.

"Besides trying to reduce conflict, we are also interested in understanding the elephants' movements from a research perspective", /Uiseb explains. "It seems that the drought is driving these elephants further east, and we want to know more about how these groups link with others that have remained in the west". They are especially interested in finding out how the bulls move through this landscape, and whether or not they provide genetic links between different breeding herds in the region. Kenneth / Uiseb gives me an example: "One of our collared bulls walked 50 kilometres from the Ugab River to the Huab River and now lives in the Fransfontein area between Khorixas and Kamanjab."

Besides shedding light on the ecology of these free-ranging elephants, the data will be used to make more informed policies and decisions. Climate change predictions indicated that Namibia's climate will get drier still, and droughts such as the one we are currently experiencing will get longer and more severe over time. It seems that the drought is the primary cause for elephants moving east, but it will be interesting to see how or if their range changes according to future rainfall patterns.

In the north-eastern parts of the country similar changes are taking place as elephants move away from the dry Kalahari towards commercial farmlands around Grootfontein. The future of free-ranging elephants in Namibia therefore lies in the hands of livestock farmers. MET's integrated approach holds some promise for increasing farmer tolerance for these charismatic animals. Living with elephants is difficult, but Namibian farmers are showing that it can be done.

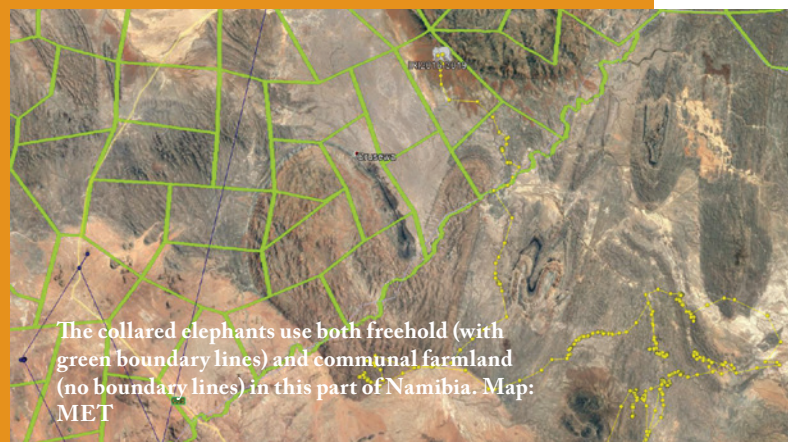
The reservoir in the photo was cracked in several places by elephants trying to get access to the water. The adults can drink out of the top of the reservoir, but babies cannot, so the adult females break it to give access to their young ones.



Elephant bull being collared in Okongue area near Omatjete in Erongo Region. Photo: MET



Movements of three collared elephants in separate groups (different colour dots are for different elephants) to the north and south of Khorixas in the Kunene Region. Map: MET.



The collared elephants use both freehold (with green boundary lines) and communal farmland (no boundary lines) in this part of Namibia. Map: MET



A RECORD-BREAKING JOURNEY

Migration of plains zebra from
Namibia to Botswana

by Robin Naidoo
World Wildlife Fund



Migrations are among the natural world's most spectacular phenomena. These jaw-dropping feats of endurance undertaken by huge numbers of animals inspire awe and amazement, as they conquer everything the environment throws at them. Among the most impressive migrations are those of large mammals, perhaps the most famous of all being the journey taken by wildebeest in the Serengeti. Commonly known as the longest of all terrestrial mammal migrations, this enduring annual occurrence is set against a backdrop of disappearing migrations around the world, as the large areas necessary for such movements continue to vanish in a growing sea of human development.

Researchers were therefore astonished to discover a migration of plains zebra beginning in the Salambala Conservancy in the Zambezi Region of Namibia. Local community members had reported for years that zebra appeared on the banks of the Chobe River during the dry season to share the land with grazing cattle, only to disappear again at the onset of the rains in December. Where these animals went remained a mystery until 2012, when researchers working independently on the Namibian and Botswana sides of the Chobe River collared a number of zebra with satellite tracking devices. They were astounded to discover that the collared animals moved quickly and directly from the Chobe River floodplains south to Nxai Pan National Park in Botswana. This is a journey of over 250 km, yet most of the collared zebra made it in only two weeks. The animals remained in the Nxai Pan area for several months before beginning the journey back to the Chobe River. The return journey northwards was longer and less direct than the southward trip, so we speculate that the zebra lingered around wet pans along the route north that had been dry during their December journey.

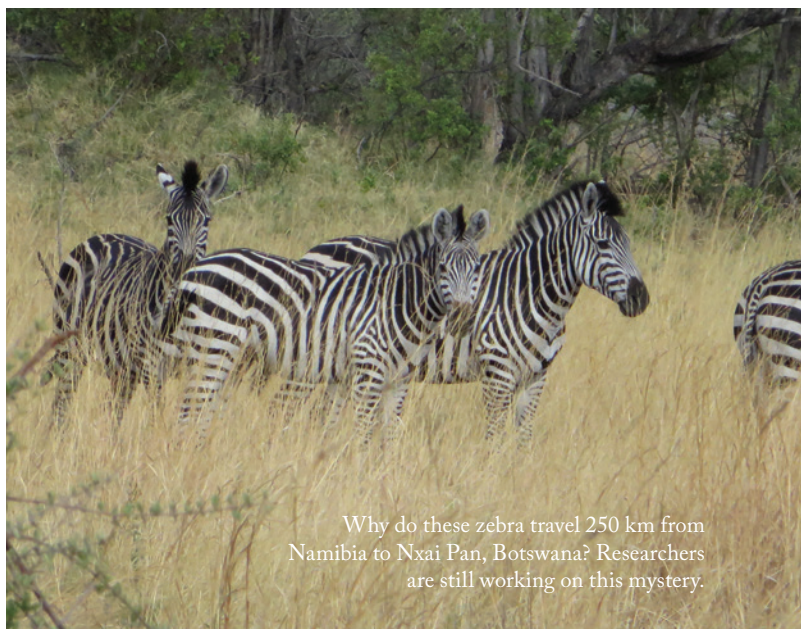
That a migration of large animals like zebra could exist under the radar in this day and age is truly remarkable. Furthermore, this migration appears to be among the longest of all terrestrial mammal migrations ever documented: the total round-trip distance of about 500 km is even longer than the Serengeti wildebeest migration. In an era where migrations of large mammals in southern Africa and around the globe are being extinguished, the discovery of a previously unknown migration reveals nature's capacity to persist even in the most difficult circumstances.

One reason why this migration remained uncovered until just recently is that the number of animals involved is relatively small. While researchers do not yet have a firm grip on the size of the migratory population, estimates from aerial censuses indicate we are probably talking about only 5,000 to 10,000 individuals, which is tiny compared with the approximately one million wildebeest that undertake the Serengeti migration.

Several other mysteries remain to be discovered regarding this migration of plains zebra. We are not yet clear on why these animals migrate all the way from Salambala to Nxai Pan, while bypassing closer, seemingly suitable alternate destinations, such as the Savuti area of northern Botswana. Are there environmental conditions we do not know about that make Nxai Pan a prize destination for zebra, despite the incredible hardships they must endure to get there from Namibia? Or is this migration perhaps a legacy of times past, when conditions were such that Nxai Pan was the only suitable destination for zebra from Namibia? If that is the case, perhaps the migratory route has been passed down from generation to generation of zebra. Even more intriguingly, is it somehow genetically coded in this lineage of animals?



Using satellite tracking collars, researchers from Namibia and Botswana discovered an astonishing new zebra migration route.



Why do these zebra travel 250 km from Namibia to Nxai Pan, Botswana? Researchers are still working on this mystery.

Irrespective of why this zebra migration occurs, there is no question that the Zambezi Region of Namibia and northern Botswana jointly host one of the natural world's most incredible migratory events. As such it is critically important that every effort is made to conserve this and other similar phenomena in this part of southern Africa. The transboundary nature of this migration complicates effective conservation actions. Fortunately, a five-country initiative called the Kavango-Zambezi Transfrontier Conservation Area (KAZA) provides the ideal agreement to facilitate conservation actions among Namibia, Botswana, Zambia, Zimbabwe and Angola. KAZA is an enormous area, about the size of France, which contains Africa's largest population of elephants, significant populations of threatened carnivores such as lions and wild dogs, and long-distance movements of buffalo and other zebra populations. Conservation actions under the KAZA umbrella are perhaps our best chance of conserving the zebra migration and much of our endangered wildlife, while ensuring a path towards sustainable development for the citizens of all five countries.

Cheetah fitted with GPS collar for scientific research.



WANT TO DO FIELDWORK IN THE 21ST CENTURY?

Pack your high-tech equipment to generate big data!

by Jörg Melzheimer and Dr. Bettina Wachter

Leibniz Institute for Zoo and Wildlife Research (IZW),
Berlin, Germany

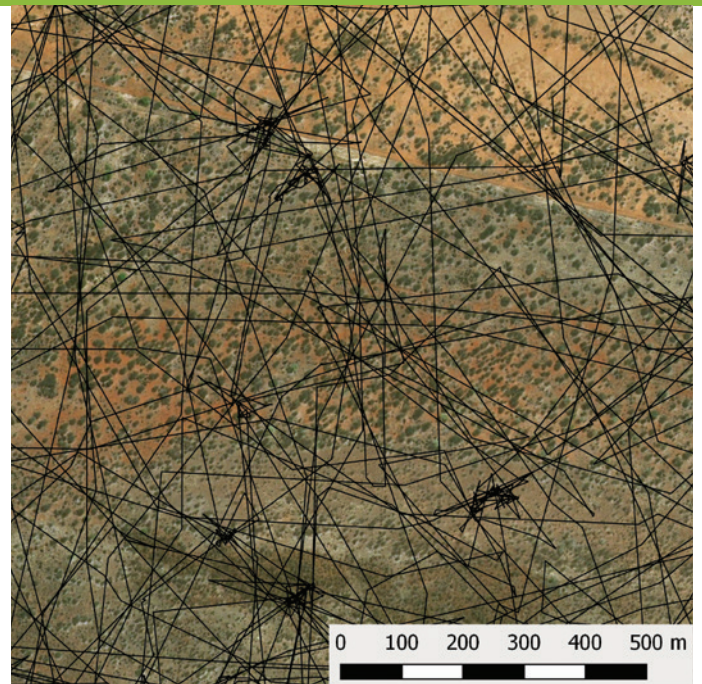
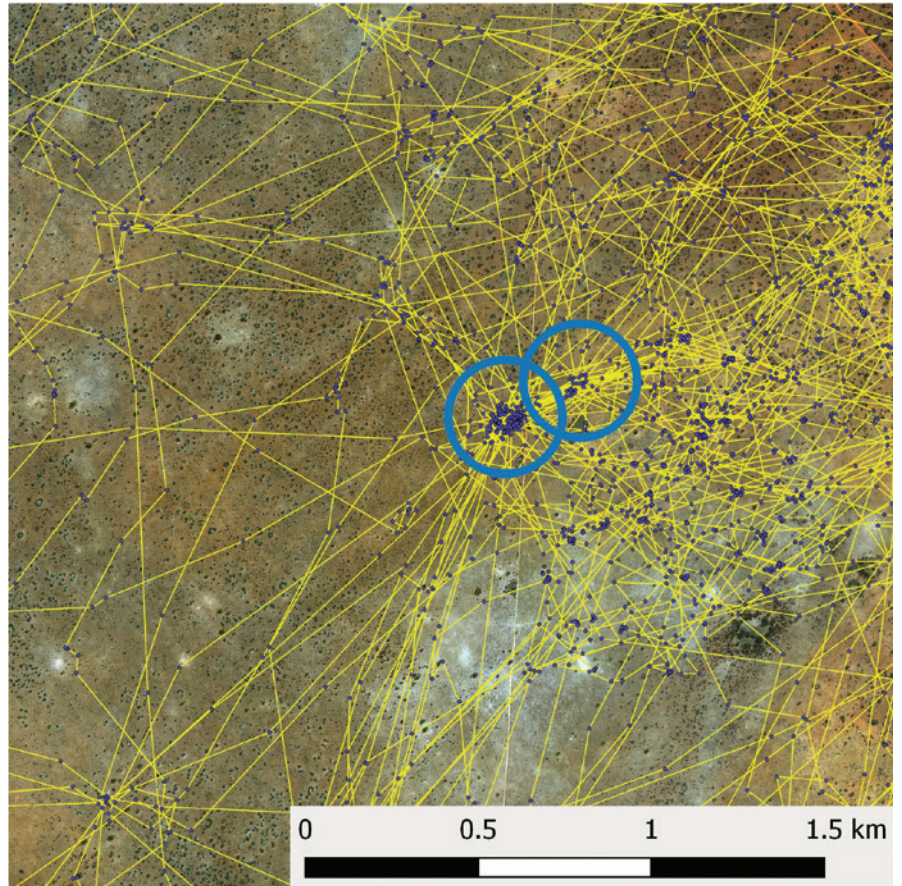
Satellite tracking technology is used in everything from smartphones to smart watches – gadgets that can tell you where you are, how fast you are moving and even what kind of activities you are busy with throughout the day. They collect this surprising amount of data from built-in miniature sensors. These devices are getting more powerful but nevertheless smaller, lighter and easier to use every year. This rapidly advancing technology is now available for ecologists who want to know more about the behaviour and movements of the wild animals they study.

Using technology similar to smartphones and smart watches, ecologists can now almost continuously monitor their study animals' geographic location, behaviour, activity and body temperature. At the same time the device collects information about the area the animal is moving in, including air temperature, atmospheric pressure and water salinity. This not only provides insights into ecology but also into the weather, climate, atmosphere, natural catastrophes (e.g. earthquakes and tsunamis) and outbreaks of diseases, all of which may change animal behaviour. This new technology with its myriad of different applications has heralded the start of a golden age for "bio-logging" – a term scientists have coined for logging large amounts of biological data.

Ecologists choose the smallest possible bio-logging devices (or bio-loggers) to ensure that their study animals are not hampered in any way by carrying them. The heaviest part is the battery that powers

various sensors, the GPS unit and the data uplink device. These components are becoming more efficient with every bio-logger generation; at the same time battery technology is progressing to deliver smaller batteries that produce more power. Consequently, battery size and the subsequent weight of the devices can be reduced, whilst also increasing the device's lifespan and data collecting capacity. GPS tracking collars today gather more than ten times the amount of data than similar-sized collars that were developed only 10 years ago. This means we can study smaller animals than before, and collect more data to answer a huge variety of new research questions that we could not have dreamed of answering previously.

The Leibniz Institute for Zoo and Wildlife Research (IZW) in Berlin, Germany, uses satellite telemetry on a variety of species in Namibia including cheetah, leopard, kudu and gemsbok. Our Cheetah Research



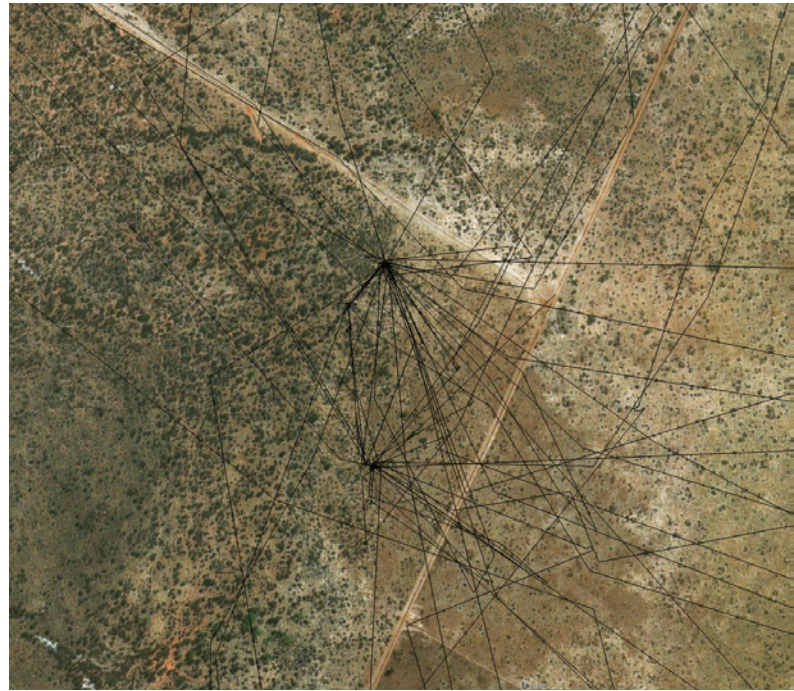
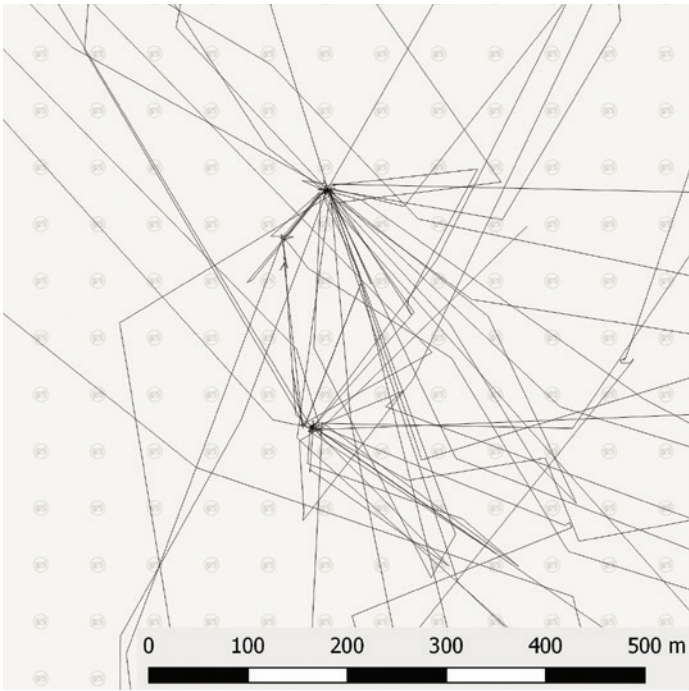
Project is now 18 years old, making it our longest running study in Namibia. Studying cheetahs is especially important due to their precarious conservation status.

Historically, cheetahs were widely distributed throughout Africa and Asia. During the last few decades their distribution has been reduced to only 9% of their previous range, and scientists estimate that only 7,100 cheetahs are left in the wild. Namibia and Botswana are the global strongholds for this species: Namibia hosts approximately 1,500 adult and juvenile cheetahs, which are part of a larger population of around 3,000 occurring across both countries. Nearly 77% of the current cheetah range lies outside of protected areas, where cheetahs potentially come into conflict with farmers. This conflict is therefore one of the most important issues to address in order to conserve cheetahs.

One of the most promising approaches to solve human-wildlife conflicts is by analysing the population dynamics and movement ecology of the study species to develop solutions based on scientific findings. Leibniz-IZW takes this evidence-based conservation approach – we have fitted almost 200 cheetahs in Namibia with GPS collars (Figure 1), thereby generating more than 4 million GPS locations. In addition the new technology in our GPS collars produced 43 million data points that tell us more about what the cheetahs do at the places they visit.

Top: GPS locations of a male kudu show regular visits to two waterholes (blue circles), resulting in a cluster of GPS locations. In addition the map indicates that kudu prefer bushy habitat to open grasslands.

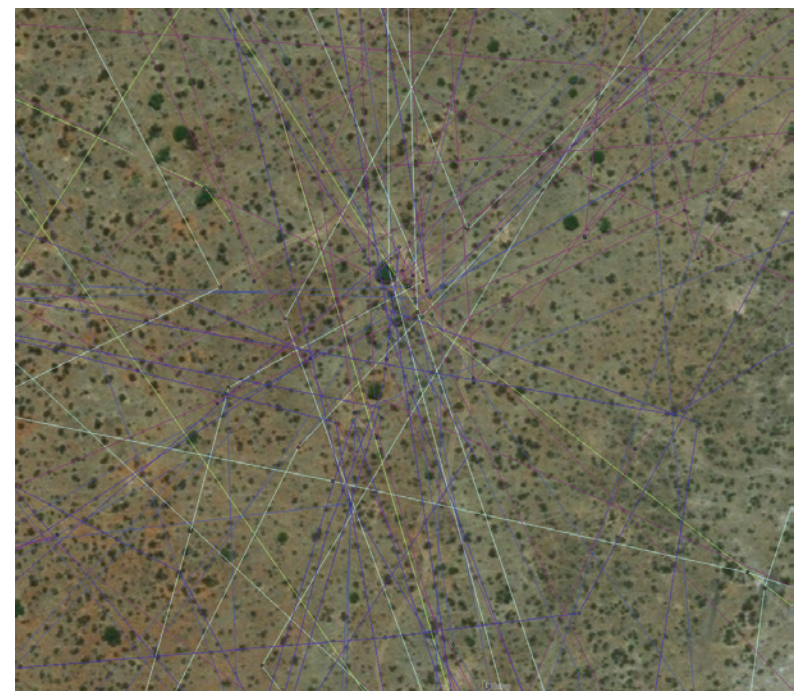
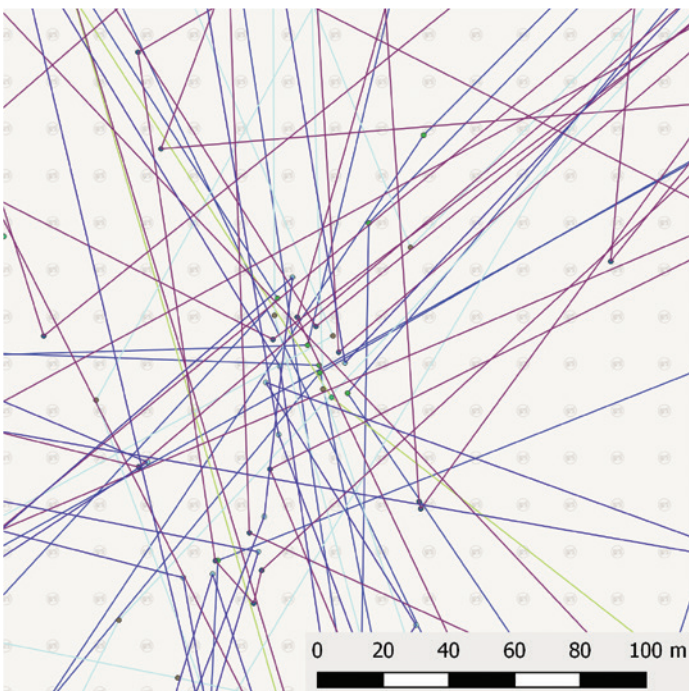
Above: Movements of a female leopard – each cluster represents the site of a kill. Leopards typically spend 3-5 days near their kill, resting in the vicinity and repeatedly feeding on the prey. Kill sites were visited to identify the prey species to study prey preferences of leopards in Namibia.



Movements of a female cheetah showing two distinct clusters. Each cluster represents the location of a lair. The female used the northern lair for the first 3 weeks after giving birth before taking her cubs to a new lair, probably to minimize predation risk and parasite infections.

We address a wide portfolio of research questions with these data such as i) determine space requirements and habitat use, ii) detect interactions among cheetahs and between cheetahs and other carnivores, e.g. leopards, iii) detect lairs with cubs to determine cub survival and reproductive success of females, iv) compare movements of territorial with non-territorial males, v) monitor marking behaviour of males and females, vi) investigate feeding ecology, vii) identify day-night

and seasonal rhythms, viii) monitor human-wildlife conflicts, ix) fine-tune study design of density surveys using camera traps and x) increase success in capturing individuals for collecting biological samples. We usually set the GPS collars to record locations every 15 minutes, which they can do continuously for about two years before the battery runs flat. For most of our research questions and hypotheses this provides an ideal compromise between data resolution and collar



Movements of a territorial male cheetah (blue) and three non-territorial males (green, purple, light green), all visiting the same marking location. The territorial male visits the marking location much more frequently than the other males.



Cubs in the lair.

longevity. Since cheetahs move at an average speed of 2-3 km per hour we miss almost nothing between two consecutive points. Working with 43 million bits of information can be daunting, and we would not have been able to analyse all of this with the computer technology of the past. Fortunately there is a plethora of new tools and approaches to analyse this information, including artificial intelligence and deep learning algorithms. These advanced computer statistical models allow us to deal with our extremely high-resolution data and understand what it means in terms of cheetah behaviour and ecology.

Clusters of GPS locations are one of the most striking patterns revealed by these analyses. Such clusters indicate when an animal spends many consecutive hours or days in one location, when a specific animal is re-visiting the same location or when different animals are visiting and re-visiting the same location. Re-visitations can occur on different time scales depending on the biological determinants that trigger it. These clusters can indicate a lair of a female that recently gave birth, the death of an animal, territorial marking and/or communication at marking sites, visits to waterholes to drink, or feeding on a prey animal over several days (Figure 2). Information from these clusters thus provides scientific insights into and measurements of fascinating animal behaviour and ecological processes.

We also use these clusters to streamline our other fieldwork. For instance, clusters that indicate marking locations can be used to

better design studies on cheetah abundance or density using motion-sensitive camera traps. GPS clusters from collared territorial males tell us that these locations may be marking sites that may also be used by non-territorial males and females. We are therefore more likely to take photos of cheetahs when we place camera traps at well-used marking sites instead of other locations; more photos enable us to make better cheetah population estimates.

GPS clusters from collared females can be used to locate their lairs, thus allowing us to study cheetah reproduction. Visiting a lair when the mother is present, or just as she returns, can disrupt her natural behaviour and cause her to move her cubs unnecessarily. Consequently, we use the GPS collar data to monitor the mother's movements for at least several days before we visit her lair. Only when we know that the mother has left the lair and is likely to stay away for a while, we proceed to visit the cubs (Figure 3) quickly to count them and determine their sex, and to collect non-invasive samples such as fur or faeces for genetic analysis.

The 21st century has heralded a new and exciting era for biological research. IZW is making the most of this new technology to increase our understanding of cheetah biology and behaviour. By arming ourselves with more detailed knowledge of this species we will develop evidence-based conservation actions that ensure its long-term survival.

SWIMMING BLIND

Why Namibia's Critically Endangered blind cave catfish needs more research attention

by Clinton Hay

Catfish swimming near the surface. Our study reveals that the blind cave catfish prefer ledges in the cave that are less than 15 metres deep. If water levels drop below these ledges, this species may not be able to survive.

Clarias cavernicola or blind cave catfish, as it is called in English, is known only from one cave near Otavi in Namibia, where it lives in total darkness. It is classified as Critically Endangered by the International Union for Conservation of Nature (IUCN), the global authority on the status of nature and its species. The total population of catfish in the cave is probably less than 200 individuals, which is the minimum genetically viable population size required for any species to survive over a longer period of time. This makes the blind cave catfish one of the rarest freshwater fish species in the world.

This little catfish species, which grows only up to 17 cm long, has lost its eyes. Additionally, it lacks the pigmentation that produces the normal dark skin colour of other catfish species, and is thus a beautiful golden-pink. In a dark cave, eyes and skin pigmentation are not necessary for survival, so it is likely that not producing these characteristics is part of the catfish's survival strategy. Conserving energy is especially important for survival when food is scarce. It seems that this rare catfish feeds mainly on invertebrates or insects falling into the cave. Another possible item on the catfish's menu is an isopod (a shrimp-like organism) that is also endemic to this cave and lacks colour and eyes. Our research team further speculates that the catfish uses guano from the bats in the cave to supplement its meagre invertebrate diet.

The cave catfish seems to be closely related to the snakehead catfish found in the Kunene, Kavango and Zambezi rivers. Since catfish species in these rivers need a flood to stimulate breeding, we assume that the cave catfish needs similar conditions to breed. During Namibia's summertime thunderstorms, water rushes into the cave and may stimulate breeding. We found that females carry about 50 transparent, sticky eggs with a greenish yolk. On a recent research dive we found smaller individuals of around 5 cm in length, indicating successful breeding within the last couple of years although very little is known about the growth rates of this species.

The water in the cave is currently very clear, but if that were to change it might negatively affect reproduction, as the sticky eggs will

A member of our research dive team counts the catfish swimming on the ledge in the cave.



R. Engels

An adult and a young blind cave catfish. We still have much to learn about reproduction, growth rates and feeding strategies of this species.



R. Engels

be smothered by particles suspended in the water, thus limiting the oxygen supply to the eggs. The newly hatched larvae of this catfish are very small, meaning their food source must be even smaller. The larvae of other catfish species feed on large zooplankton, but we do not yet know what the cave catfish larvae feed on; this is one of our future research questions.

A team from Dantica Diving did a recent research dive in the cave, with kind permission from the owner of the property where the cave is located. Given their rarity and vulnerability, studying this fish species calls for the utmost care to avoid disturbance and harm to individuals. On a previous dive, one of our team went down to a depth of around 90 metres and still did not find the bottom of the cave. Despite the great depth of the cave, the catfish were only found at a maximum depth of 15 metres. It seems they prefer to live near the surface on ledges where food is readily available. Consequently, the catfish is very vulnerable to lowering the water table, as much of their food source accumulates in an area that may no longer be accessible to them if the water level drops.

What will the future bring for this unique and rare fish species? Current threats to its survival include: direct negative impacts on the cave and its water, future climate change resulting in less rainfall and subsequent lowering of the water table, a decline in their food source and illegal harvesting for the aquarium trade. The survival of the blind cave catfish depends on the integrity of the entire ecosystem. Anything that negatively affects the ecosystem around the cave may eventually affect the catfish. It is therefore very important to protect the ecosystem around the cave, although factors such as climate change require international conservation efforts.

On a positive note, there seem to be more openings to the cave that we have not yet been able to explore. It is therefore possible that there are more catfish near these openings, but this has not yet been confirmed. The Namibia Nature Foundation is supporting this research project with funding from the Namibian Chamber of Environment and the Norwegian Institute for Nature Research. We hope to better understand these incredible, unique fish and ensure that they continue to survive in this cave, their only habitat in the world.

Research team:

- Clinton Hay (University of Namibia/Namibia Nature Foundation)
- Francois Jacobs (Ministry of Fisheries and Marine Resources)
- Tor Naesje (Norwegian Institute for Nature Resource)
- Gerhard Jacobs (SLR Environmental Consulting)
- Reuben Engels (Dantica Diving)
- Chris Steenkamp (Dantica Diving)



USING STRIPE PATTERNS TO MONITOR HARTMANN'S MOUNTAIN ZEBRA IN NAMIBIA

by Prof L. M Gosling

School of Natural and Environmental
Sciences, Newcastle University, U.K. and
Namibia Nature Foundation, Windhoek

The Mountain Zebra Project aims to understand what causes changes in Hartmann's mountain zebra population size in order to provide information needed for their conservation. This sub-species is classified as Vulnerable under the IUCN Red List and is specially protected in Namibia (Gosling et al. 2019). Historical records show that they are vulnerable to extreme drought, particularly when fencing restricts their ability to find remaining patches of grazing.

In this project I use two zebra characteristics to monitor their populations: 1) each mountain zebra can be recognised using fingerprint-like variation in stripe patterns and 2) they need to visit waterholes to drink. Using motion-sensitive camera traps at waterholes, I have photographed and identified large numbers of zebra in some key populations. For example, over 3,000 individuals are now known in the mountainous part of the Namib-Naukluft National Park. When I identify animals under two years old, I estimate their year of birth and then follow their progress throughout the rest of their lives using networks of camera traps. Individuals that are not seen for several years are assumed dead. Births and deaths in the population are then related to factors in their environment such as rainfall and consequent grass growth, and zebra population density. Rainfall is the main predictor of zebra birth and death rates in Gondwana Canyon Park in southern Namibia – in good rainfall years, there are more births and fewer deaths, and vice versa in years of drought.

The study started in Gondwana Canyon Park in 2005 but, as I am interested in knowing how much rainfall or predation affects Hartmann's mountain zebra throughout Namibia, I have extended my study to sites that have more rain and more predator species than this protected area in the arid south. Two of these sites – Etosha National Park and the Hobatere Concession Area – have a full array of large predators. While in the Namib-Naukluft National Park and NamibRand Nature Reserve, only lions and African wild dogs are absent, Gondwana Canyon Park and Ai-Ais National Park host very few hyenas, and no lions or wild dogs, which makes it an ideal study site with little or no predation on zebra. Leopards and cheetahs are present in all six sites, but they probably have only a minor role as predators of mountain zebra. We do not yet know what role predation plays in limiting mountain zebra populations, so a comparison of these sites will contribute to our understanding of this crucial aspect of their biology.

While an understanding of key population processes, like birth and death rates, is ultimately most important for conservation management, landowners and managers also need to know how many animals are in their areas. Zebras are usually counted by driving specific roads at given times of the year, which is a standard method for counting herbivores. These road counts provide important information on population trends, but probably underestimate mountain zebra populations. It is difficult to count this species in its mountainous habitat, as zebra can be extremely wary of vehicles, especially in areas where they have been hunted. Even aerial surveys can underestimate mountain zebra populations, as they may seek shade by standing under rocky overhangs and thus escape detection from the air. Individual-based monitoring by the Mountain Zebra Project using camera traps potentially provides the information needed to supplement and correct these estimates.

My research supports the contention that Hartmann's mountain zebra rely on free movement over large areas for their long-term survival. While their population is currently quite healthy, we know that a large proportion of the national mountain zebra population died in the severe drought of the 1980s. The ultimate reason for this mass mortality was lack of food due to low rainfall, but fences erected around farms magnified the problem by restricting the zebras' movement. Mountain zebra depend on moving to patches of grass that grow after highly localised rainfall in their arid environment.

Under drought conditions the zebras' ability to move to patches of remaining vegetation is vital to their survival. This problem can be addressed by landscape scale conservation initiatives that encourage

fence removal. Initiatives that provide most grounds for optimism are the communal conservancies in the northwest of Namibia, and the NAM-PLACE scheme that aims to link up protected areas, conservancies and neighbouring lands. Using my networks of cameras I have frequently recorded individual zebras walking over 40 km in response to patchy rainfall in the Greater Sossusvlei-Namib (5,730 km²) and Greater Fish River Canyon (7,621 km²) landscapes. Hopefully the sheer size of these areas will help buffer the mountain zebra from drought, and thereby reduce the mass mortalities experienced in the past.



Hartmann's mountain zebra have unique stripe patterns that allow researchers to identify them individually.



Hartmann's mountain zebra survive in arid, mountainous areas like Gondwana Canyon Park by moving long distances in search of grazing.

Reference:

Gosling, L.M., Muntifering, J., Kolberg, H., Uiseb, H. & King, S.R.B. (2019). *Equus zebra ssp. hartmannae*. The IUCN Red List of Threatened Species 2019. In press.



ANGOLAN ISLAND PARADISE FOR CAPE CORMORANTS

by Gail C. Potgieter

Take a close look at the image to the left. Each black dot is a Cape Cormorant (shown on the below) as seen from a light aircraft. Can you count the cormorants? This aerial view of a colony of Cape Cormorants is a composite of several of the thousands of images taken during a 2017 survey of Ilha dos Tigres, an island off the coast of Angola. The purpose of this survey was to document all visible animals using this island, so every dot counts!





Using Photoshop and other software, John Mendelsohn found a way to estimate the number of cormorants in these photos without having to count each dot, thus saving time and his eyesight. The final survey result was an eye-popping 250,786 birds, of which 16,038 were found on nests. A survey in 2005 estimated only 2,630 nesting birds at this site, although unlike the 2017 survey, it did not cover the entire island.

Despite numbering in the hundred thousands, the Cape Cormorant is listed as Endangered by the IUCN. With breeding colonies occurring only on the coastlines of Namibia, South Africa and Angola, the global Cape Cormorant population plummeted during the mid-1900s. Over-fishing of sardines and anchovies is thought to have precipitated the loss of over half the Cape Cormorant populations in Namibia and South Africa. This was exacerbated by guano mining activities at their breeding sites, which caused major disturbances and therefore reduced their breeding rates.

Much less is known about the Cape Cormorant population in Angola, which had always been thought to be peripheral to the main populations in Namibia and South Africa. The six-fold increase in nesting Cape Cormorants on Ilha dos Tigres and the nearby mainland of southern Angola has enormous significance for this species. Although one may be tempted to add these numbers to the current global population estimate, thus doubling it, John Mendelsohn suggests a more cautious interpretation of his study: "It is possible that these cormorants moved north from breeding sites off the coast of Namibia, rather than being an entirely new population." To find out whether this is so, one would need to survey all the known breeding colonies in northern Namibia and southern Angola during the same breeding season.

Whether the cormorants moved or expanded north remains hard to know. But the major increase in cormorant numbers does suggest that

this northern part of the Benguela Current now supports large stocks of fish. Could this be indicative of a much bigger change in the marine environment off the south-western coast of Africa?

Fascinating research questions aside, the Cape Cormorant still needs active conservation to reverse the global population decline. One thing that has helped the birds is the construction of guano platforms on Namibia's coastline, which provide protected locations for breeding. Controlling disease outbreaks among the cormorant colonies will also save thousands of birds, as they are susceptible to avian cholera. However, the ultimate conservation action that will save not only Cape Cormorants but also many other fish-eating species is to ensure that fish stocks are allowed to recover from historical over-fishing. Enforcing sustainable fishing quotas in the coastal waters of Namibia, South Africa, and Angola are thus essential conservation interventions.

The researchers who found such surprising numbers of cormorants on *Ilha dos Tigres* saw thousands of other seabirds during their study and also counted over 15,000 Cape fur seals. "There are indications that the government of Angola wants to declare *Ilha dos Tigres* and the surrounding coastal waters a marine protected area," says John Mendelsohn. "Our study confirms the importance of this area for marine conservation, and we fully support plans to protect this area." This conservation initiative would ensure that the Cape Cormorants of *Ilha dos Tigres* can fish and breed in peace for years to come.

This article is based on a scientific paper by Mendelsohn JM & Haraes L (2018). Aerial census of Cape Cormorants and Cape Fur Seals at Baía dos Tigres, Angola. *Namibian Journal of Environment* 2A:1-6.
www.nje.org.na/index.php/nje/article/view/volume2-mendelsohn/20

NCE SUPPORTS

BURSARY HOLDERS 2019

The NCE Bursary and Internship programme provides support to carefully selected students in the broad fields of environment and sustainable development. In addition to the more conventional fields of conservation biology, biodiversity, wildlife, forestry, agriculture, water and fisheries, the programme also supports students in the fields of environmental engineering, environmental law, and social, financial, economic and business studies linked to natural resources, environment and sustainable development. In 2018 the NCE had 45 applications for bursaries, in 2019 that figure jumped to 108. In the past two years 35 students have been supported with bursaries and 16 with internships.

The **NAMIBIAN JOURNAL OF ENVIRONMENT** is a peer-reviewed, free, open access scientific journal published by the Environmental Information Service, Namibia, for the Ministry of Environment and Tourism, the Namibian Chamber of Environment and the Namibia University of Science and Technology. The NJE accepts papers containing information about any aspect of the environment in Namibia. This includes areas of ecology, agriculture, social sciences, economics, policy and law, water and energy, climate change, planning, land use, pollution, strategic and environmental assessment and related fields. It publishes primary research findings, syntheses and reviews, applied and theoretical research, field observations and the testing of hypotheses, new ideas and the exchange of opinions, and book reviews. The NJE publishes two categories of articles: Section A contains Peer-reviewed papers while Section B contains editor-reviewed Open articles such as field notes, book reviews and opinion pieces.

www.nje.org.na



CESSNA 182 AIRCRAFT DEDICATED TO CONSERVATION

A four-seater Cessna C182 aircraft, registration V5-IIM, is available to the Namibian Chamber of Environment (NCE) and its Members. The aircraft is dedicated to wildlife and environmental protection, conservation and related monitoring and research work of a non-commercial nature. The Cessna 182 has been used on several occasions, with much success. The use of the aircraft includes: Carnivore Conservation, Anti-Poaching operations in Etosha and North-West Namibia, Rhino Conservation and Wetlands surveys. A big thank you to Westair Aviation for their support to conservation through making the aircraft available to the NCE and all its members, and to Welwitschia Insurance Brokers for covering the insurance of the aircraft.



NAMIBIAN PARTNERSHIPS AGAINST WILDLIFE CRIME

is a broad collaboration between government agencies, NGOs, private sector, rural communities, international funding agencies and the public. Through this broad coalition of more than 30 organisations working constructively together, from local to international, Namibia has achieved notable success.

www.n-c-e.org/resource/conservation-partnerships-combat-wildlife-crime-namibia

FAST FACTS ON NAMIBIA

GENERAL



SURFACE AREA:

824,268 km²

CAPITAL: Windhoek

INDEPENDENCE:

21 March 1990

CURRENT PRESIDENT:

Hage Geingob

Multiparty parliament

Democratic constitution



Division of power between executive, legislature and judiciary

Secular state freedom of religion

90% Christian

Freedom of the press/media

ECONOMY

MAIN SECTORS:

Mining, fishing, tourism and agriculture

BIGGEST EMPLOYER:

Agriculture

FASTEST-GROWING SECTOR: Tourism

MINING: Diamonds, uranium, copper, lead, zinc, magnesium, cadmium, arsenic, pyrites, silver, gold, lithium minerals, dimension stones (granite, marble, blue sodalite) and many semi-precious stones

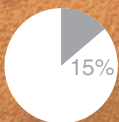
MONEY MATTERS

CURRENCY:

The Namibia Dollar (N\$) is fixed to and on par with the SA Rand. The South African Rand is also legal tender.

Foreign currency, international Visa, MasterCard, American Express and Diners Club credit cards are accepted.

TAX AND CUSTOMS



All goods and services are priced to include value-added tax of 15%. Visitors may reclaim VAT.

ENQUIRIES: Ministry of Finance
Tel (+264 61) 23 0773 in Windhoek

TRANSPORT

Public transport is **NOT** available to all tourist destinations in Namibia.

There are bus services from Windhoek to Swakopmund as well as Cape Town/Johannesburg/Vic Falls.



Namibia's main railway line runs from the South African border, connecting Windhoek to Swakopmund in the west and Tsumeb in the north.

There is an extensive network of international and regional flights from Windhoek and domestic charters to all destinations.

ENVIRONMENT

17%

NATURE RESERVES: of surface area

HIGHEST MOUNTAIN:

Brandberg

OTHER PROMINENT MOUNTAINS: Spitzkoppe, Moltkeblick, Gamsberg

PERENNIAL RIVERS: Orange, Kunene, Okavango, Zambezi and Kwando/Linyanti/Chobe

EPHEMERAL RIVERS: Numerous, including Fish, Kuiseb, Swakop and Ugab

FLORA

14

vegetation zones

200

ENDEMIC plant species

120

species of trees

100+

species of lichen

LIVING FOSSIL PLANT: *Welwitschia mirabilis*

FAUNA

BIG GAME:

Elephant, lion, rhino, buffalo, cheetah, leopard, giraffe

20

antelope species

240

mammal species (14 endemic)

250

reptile species

50

frog species

676

bird species

ENDEMIC BIRDS including Herero Chat, Rockrunner, Damara Tern, Monteiro's Hornbill and Dune Lark

DRINKING WATER

Most tap water is purified and safe to drink.

Visitors should exercise caution in rural areas.



TIME ZONES

GMT + 2 hours

ELECTRICITY

220 volts AC, 50hz, with outlets for round three-pin type plugs

INFRASTRUCTURE

ROADS:

5,450 km tarred

37,000 km gravel

HARBOURS:

Walvis Bay, Lüderitz

46

airstrips

MAIN AIRPORTS: Hosea Kutako International Airport, Eros Airport

RAIL NETWORK: 2,382 km narrow gauge

TELECOMMUNICATIONS:

6.2 telephone lines per 100 inhabitants

Direct-dialling facilities to 221 countries

MOBILE COMMUNICATION SYSTEM:

GSM agreements with 117 countries / 255 networks

INFRASTRUCTURE

1 medical doctor per 3,650 people

+4 privately run hospitals in Windhoek with intensive-care units
Medical practitioners (world standard)
24-hour medical emergency services

POPULATION 2.5 million
DENSITY: 2.2 per km²

400 000 inhabitants in Windhoek (15% of total)

OFFICIAL LANGUAGE: English

14 regions

13 ethnic cultures

16 languages and dialects

ADULT LITERACY RATE:

85%

POPULATION GROWTH RATE: 2.6%

EDUCATIONAL INSTITUTIONS:

over 1,700 schools, various vocational and tertiary institutions



FOREIGN REPRESENTATION

More than 50 countries have Namibian consular or embassy representation in Windhoek.



Promoting and supporting conservation of the natural environment.

A membership-based organisation established as a voluntary association to support and promote the interests of environmental NGOs and their work to protect Namibia's environment, biodiversity and landscapes. The NCE currently has 65 members and associate members, comprising environmental NGOs and individuals running nationally significant environmental projects and programmes.

www.n-c-e.org

Xenia Vanhoff-Erb

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