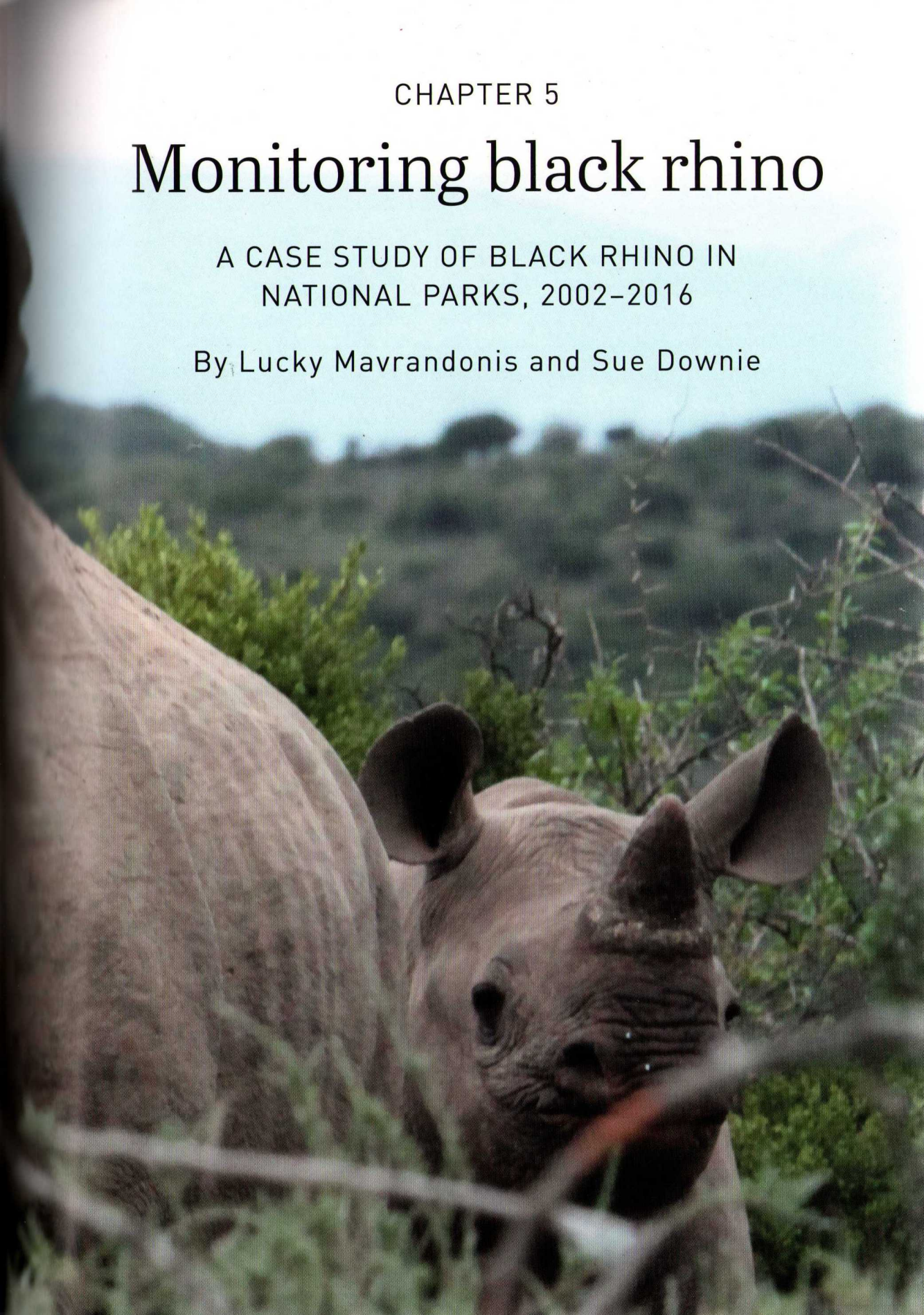
CHAPTER 5

Monitoring black rhino

A CASE STUDY OF BLACK RHINO IN NATIONAL PARKS, 2002–2016

By Lucky Mavrandonis and Sue Downie



It is now more than 20 years since Sue and Lucky began to work on the conservation of the black rhinoceros in South Africa ... These efforts have made large new areas of habitat available for the southwest arid zone subspecies of the black rhinoceros, **Diceros bicornis bicornis.** *On their watch a handful of these animals have grown into thriving populations ... The monitoring of reintroduced black rhinoceros populations by Sue and Lucky has produced an impressive body of biological information of great value to science and to practical conservation.*[1]

– Dr Anthony Hall-Martin, 18 February 2012

How the case study of monitoring began

Anthony Hall-Martin, a man of true vision, was far ahead of his time. His vision fuelled our passion and fund-raising abilities for our study on the black rhino subspecies (*Diceros bicornis bicornis*), and this resulted in generous sponsorships from the David Shepherd Wildlife Foundation (DSWF), Sasol, WildAid and others in order to expand two national parks, not only for the benefit of black rhino, but also more importantly to increase the habitat.

Our dedication to black rhinos was inspired in 1991 by a very special rhino, Shibula. At Anthony's request, funds raised were used to return Shibula to southern Africa from Lisbon Zoo in Portugal. After two years in a concrete enclosure, Shibula was back in Africa. By May 2012, she had given birth to eight calves – an all-too-rare, good news, conservation story.

After sporadically visiting Shibula from 1991 to 2001, and seeing her first two calves very close up, our lives changed forever. Our passion and dedication to black rhinos goes way beyond a short-term, self-serving, research project.

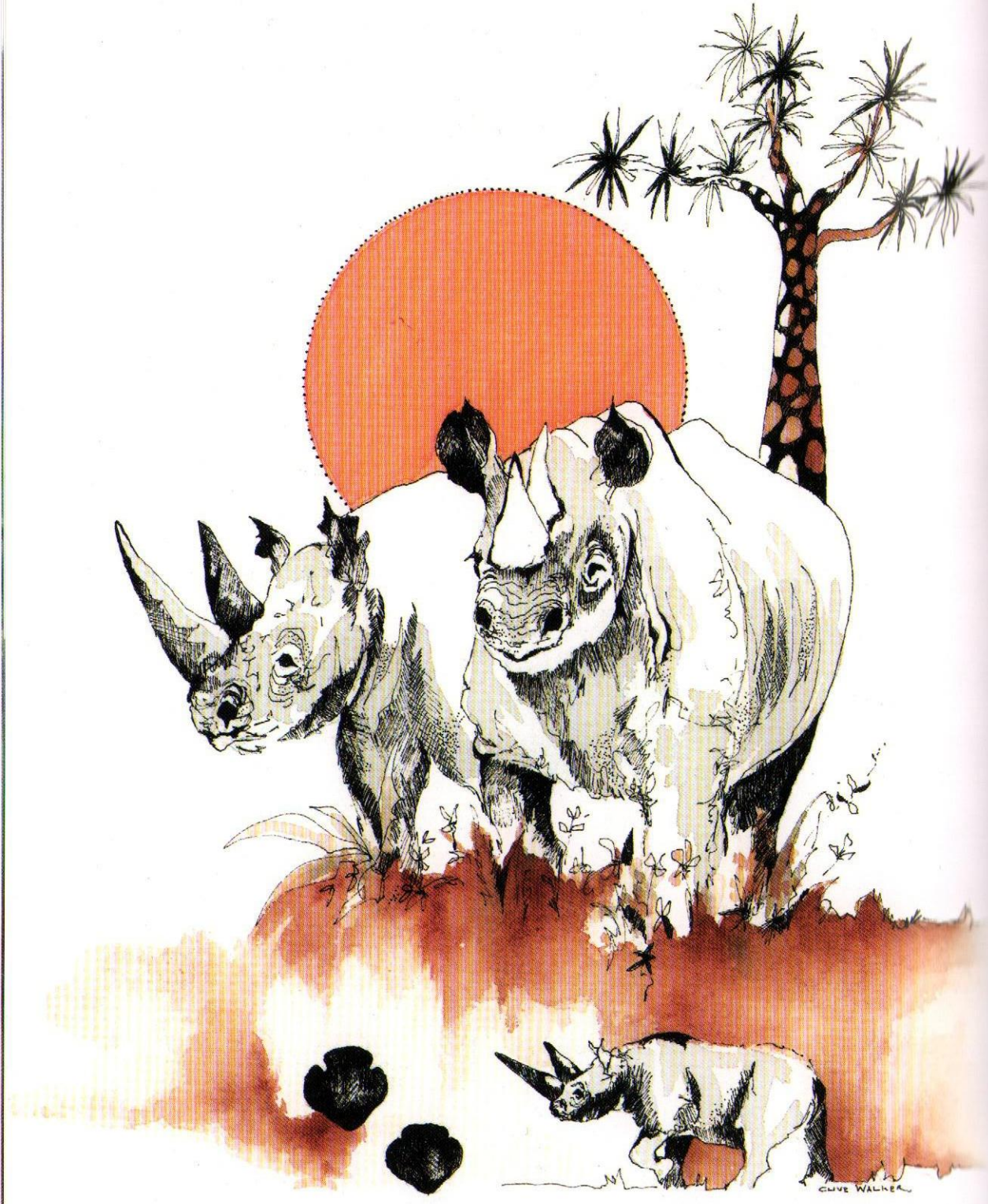
In January 2002 we applied to DSWF to fund a year of monitoring the black rhino. Incredibly, they covered the major portion for 10 years at a cost of R3.46 million (£266 000). The project study areas were four smaller national parks, and for security reasons, we prefer to use letters of the Greek alphabet to refer to them: Alpha, Beta, Gamma and Delta. The total study area was 1 825 km^2.

The necessity for accurately monitoring black rhino populations is not debateable – it is essential for such a valuable endangered species, especially during the current poaching crisis. Monitoring involves locating, identifying and observing rhinos by using a combination of methods and techniques, including telemetry, tracking spoor and searching from vantage points with a spotting scope to identify individuals by means of unique ear-notches.

With regular dedicated and focused monitoring, we have data on each and every black rhino in the four populations. We started with a handful of individuals and were caring for 14-fold the original number at the end (specific numbers withheld as a security precaution). We collected data over 14 years in the field, which was accurate, reliable and consistent, and provided meaningful information for analysis. We personally collected all field data.

OPPOSITE: Shibula's first morning back in southern Africa, August 1991. Photo: Lucky Mavrandonis.

PREVIOUS SPREAD: Sasha with her male calf Vukile who is 10 months old. 18 April 2012. Photo: Lucky Mavrandonis.


CLIVE WALKER

Our goals were:

- to positively identify at least 75% of rhinos on each trip (we achieved 77.7%);
- very importantly, to ensure we remained undetected by rhinos in 80% of sightings (achieved 82.5%);
- to attempt to see 100% of all rhinos each year (achieved 97%);
- to assess the body-condition of all rhinos identified;
- to record all details of each sighting immediately;
- to be in the veld at our planned position at least 30 minutes before sunrise until at least 30 minutes after sunset; and
- to always respect the rhinos and ensure their safety – if the wind changed, we would abandon the sighting.

Successful monitoring was a huge learning curve. We were totally ignorant, and not much was expected of us – only to find spoor and dung. We sought help from passionate rhino people such as Blythe Loutit in Namibia (we were shown how they tracked desert rhino) and Clive Walker in the Waterberg, together with David Bradfield and his rangers.

STATISTICS (2002–2012)

Number of field trips	150
Trip days including travel	1 406
Days in the field	1 150
Black rhinos in sight (in hours)	1 416
% population identified per trip	77.7%
% sightings with rhinos undisturbed	82.5%
Total number of digital photographs	89 968
Video footage (in hours)	105
Tracked on foot in km (last 5½ years)	1 243
Average per trip on foot in km (last 5½ years)	27.8
Maximum km on foot in one trip	73
Km travelled in study areas (last 5½ years)	35 586
Total km, including travel (last 5½ years)	149 933
Estimated km in 14 years	374 000
Black rhino sightings (5½ years)	620

STATISTICS (2002–2012)

Maximum hours with rhinos in sight on a trip	24.5
Average working day (in hours)	13
% sightings with more than one group (a group denotes one single rhino or a cow with calf)	26.5%

We made every effort to be unobtrusive. As a result we observed natural black rhino behaviour, interactions and a few matings. However, we had several unexpected, adrenalin-producing close encounters, but never hurt or were injured by any of the animals – rhinos, buffalo or lions. And we never carried a gun.

Our major technique was to find rhinos from high-vantage points, identify them with the scope, and then assess how to get closer without being detected. We could often get to within 50 metres, and then stayed as long as possible observing and photographing. Our 'scientific' objectives evolved:

- to assess the population performance;
- to facilitate the development of appropriate management strategies; and
- to assess the dispersal into new habitats after relocation.

Faru and Petra (two-and-a-half-month-old female calf), 15 May 2009. Photo: Lucky Mavrandonis.

Khora and Nomvula (a 10-day-old female calf), 19 February 2005. We waited five hours to identify the mother, as it was her first calf and she was the first tiny wild calf we found. Photo: Lucky Mavrandonis.

We also funded and assisted in the implementation of park-specific security plans.

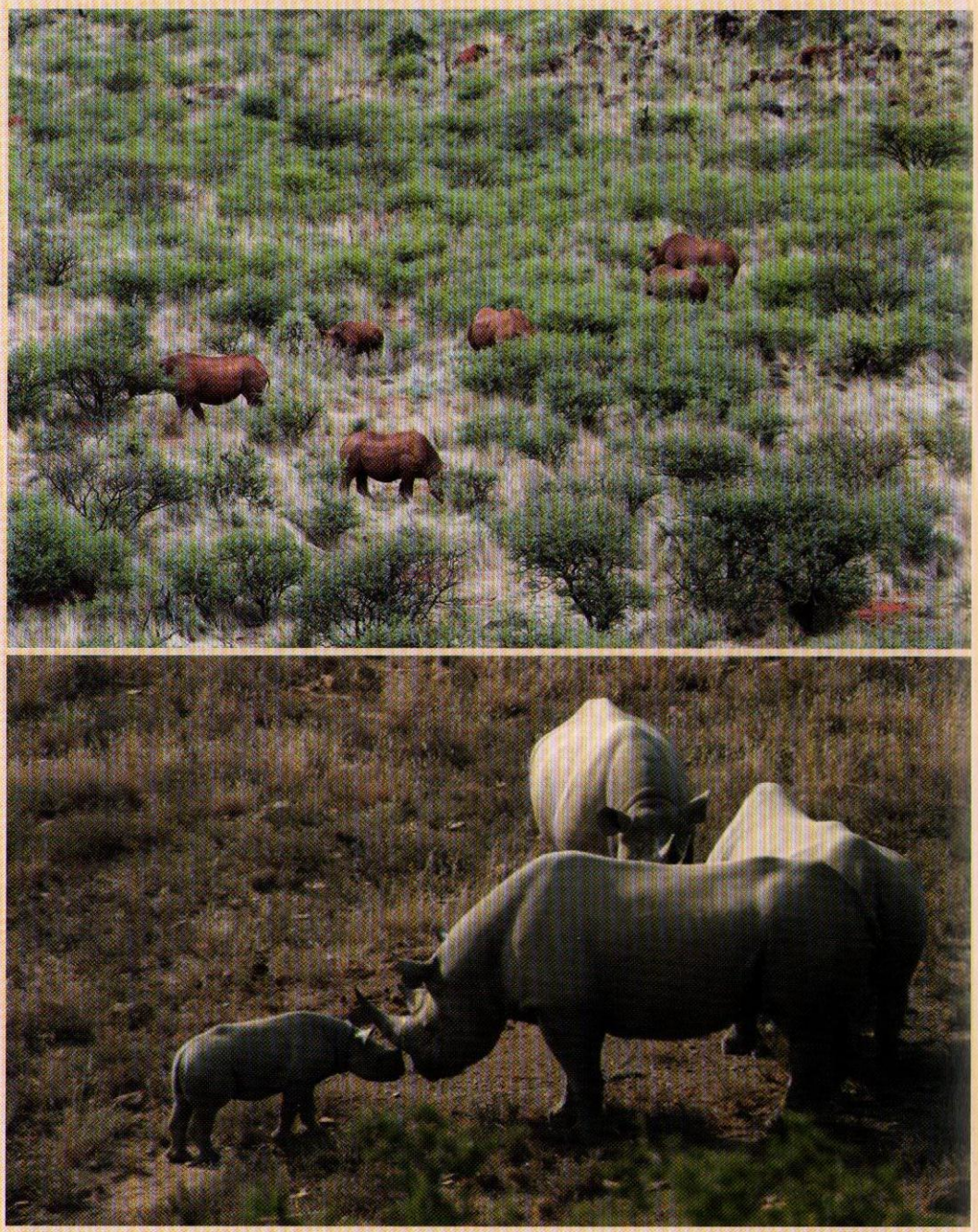
Patience and passion for knowledge of this magnificent ancient herbivore made every day an adventure filled with excitement.

From vantage points with the wind in our favour, we have observed rhinos greeting, calves playing, groups of five, six, up to 11 rhino socialising, bulls sparring, cows chasing off calves to give birth again, a cow and bull mating nine times, a cow and bull mating with a calf browsing calmly close by, a three-month-old calf greeting her father – these are just a few of the many interactions observed in these actively social rhinos. Observations have been as close as 25 metres without the rhinos being aware of our presence.

We often worked separately to double the coverage. This increased the danger significantly as it meant hiking alone with the ever-present possibility of bumping into rhinos, buffaloes or lions – which did happen!

With the wind in our favour we have walked 30 to 40 metres behind rhinos – a very intense privilege. At times of unexpected close contact in thick bush, once they had assessed the threat, they turned and ran away.

High-quality equipment is essential: binoculars, 20–60x spotting scope, range finder, camera, 100–400 lens, video, maps, GPS, transmitters, camera traps and up-to-date ear-notch charts for positive identification. Regular use of the telemetry paid dividends in being able to triangulate and pinpoint a position.



TOP: Six black rhino browsing together, 10 February 2010. They browsed and interacted for three and a half hours. Photo: Lucky Mavrandonis.

BOTTOM: Ombika (father) and Vuya (a three-month-old female calf), 29 May 2009. Ombika and the other bull, Alfred, had been sparring within 50 metres of Dundi and her first calf Vuya, when she walked out to greet the bulls. Little Vuya also greeted her father with proper rhino etiquette. Photo: Lucky Mavrandonis.

On every trip we added to the population information and developed family trees with historic data from Anthony and Dr Guy Castley. Soon we could accurately forecast births and query unexpected assumptions by field rangers. The precise data allowed for informed analysis, followed by recommendations to national parks, regarding over-population, adverse sex ratios and slowing population growth. Some recommendations were implemented and sadly some suggestions were ignored. Being independent was a major factor in ensuring accurate information, as we were never in a position of having to produce results for monthly reports.

Within a week after every trip, a detailed report with photographs was sent to the section ranger and park manager as well as other interested people.

In summary, we completed 150 trips in 14 years, roughly 11 per year, each lasting 10 to 12 days. We also did a number of intensive monitoring trips of up to 42 consecutive days. We observed rhinos for 1 416 hours!

After following Sukulu's transmitter signal, we found her in a dry riverbed. Photo: Lucky Mavrandonis.

Relocations and rehabilitations

In the mid-1980s, because all the south-western subspecies in South Africa had been killed, national parks started new populations by translocating a small number from Namibia. In 1989 South Africa had less than 20 black rhino of this subspecies. Our project alone has helped quadruple that number.

Both relocations and rehabilitations were used to manage the population in the study period. Although we monitored four separate small populations, the rhinos were all the same subspecies, therefore they were managed as one meta-population. Rhinos were relocated as required to improve their breeding success. We observed many introductions and relocations and recorded the results. After a few years we carefully analysed the population dynamics in the four areas and the results were clear. We submitted a report with suggestions and recommendations to national parks.

POPULATION CONSTRAINTS & RECOMMENDATIONS

Area	Problems	Interventions
Alpha	None	None
Beta	Carrying capacity exceeded; too many females	Remove sub-adult females
Gamma	Carrying capacity exceeded; too many male calves	Remove sub-adult males to another reserve
Delta	Too few rhinos; too few breeding females	Introduce sub-adult females from Beta

Relocations have inherent risks and should not be undertaken lightly. However, with the goal of improving the meta-population's growth rate and genetic pool, the relocations were approved and took place in May 2012 and May 2013.

Because there are so few black rhino of this subspecies, our project also proved the usefulness of rehabilitation and introduction into a wild population. As mentioned earlier, Shibula was returned to Africa after two years in a zoo, and had become very tame. It was Anthony's idea to return her to the wild in South Africa, as she was the only black rhino of her subspecies in Europe with very little chance of breeding. It was very well thought out, and it was a long, slow and ultimately very successful process.

Shibula became a celebrity with her journey covered by the TV programme *50/50*. The SA Air Force flew her on a C130 from Cape Town and the army transported her crate to the boma. Her 13-day return to Africa involved 8 560 km by sea, 820 km by air and 127 km by road. After several months in the boma, being weaned off the zoo diet, acclimatising to the local natural browse, and safely meeting the resident rhino, it was time to fend for herself.

When the gate of her boma was opened before sunrise on a clear summer morning, she took her time slowly assessing what was happening. A few of us were sitting on top of her transport crate. Before she walked off into the veld, she came

Shibula and Dundi in 1995. Shibula, still accustomed to humans, brought her calf up close to meet us. Photo: Lucky Mavrandonis.

TOP: Thandi and Mia with Sue Downie, 23 November 2008. Photo: Lucky Mavrandonis.

BOTTOM: Thandi and Mia 'swimming', 27 November 2008. Photo: Sue Downie.

back, lifted her head to smell Anthony's hand – as if to thank him for her freedom, an unexpected empathy between pachyderm and human.

The results were phenomenal – by May 2012 Shibula had given birth to eight calves witb a ninth due at year end. Two of her daughters had five calves between them. Rehabilitation into the wild had resulted in 14 more black rhinos in 18 years.

In another rehabilitation, Thandi arrived unexpectedly. Her mother Sasha had given birth in a holding boma after relocation from Namibia. Baby Thandi was separated during the night and was found cold and alone at first light. Concerned that Sasha may reject Thandi, she was airlifted by helicopter to a rehabilitation centre.

We visited Thandi every month to photograph and monitor her progress – a unique opportunity to study this rare and endangered mammal at such close quarters. When she was nine months old, we assisted in her move back to her birthplace as she had chronic diarrhoea and needed to ingest natural browse. When she was two, she was moved into a fenced enclosure of 400 hectares to begin breaking the human contact. She was then joined by a very young, wild-born female called Mia and they formed a close bond. When Thandi was 5½ years old, she and Mia were relocated to a very large arid park, and we monitored their introduction intensively until we were sure they could find water and adapt to the new browse, as well as meet the resident rhinos.

After brief stays in a boma, then a fenced release camp, the gate was opened late one afternoon. This was a critical time for them as two years earlier a young female had died after a veld-to-veld introduction. Thandi had only known a concrete reservoir from which to drink water and Mia was only three years old.

On the third morning they were on top of a high hill with a very steep slope. It was getting hot on the treeless koppie and not a cloud in the sky. We established that they had not found any water since the previous morning. They must have been thirsty, and did not know where to find any and could not find their way down – a very stressful situation.

The field rangers knew an easier way down. We had 20-litre containers of water and two troughs. We believed that intervention to assist the rhinos was essential. After all what was the point of all the effort by so many people if we left them to die like the other young rhino? It was 38°C at midday and they had no shade or water. We carried 60 litres of water and the troughs up the hill. Both drank thirstily and then Thandi followed us, as did Mia, squeaking constantly, as they walked down with Sue ... incredible trust and communication. It rained soon after that and we found them 'swimming' in an old farm dam.

Both rhino have adapted, and had one calf each by May 2012. Another successful rehabilitation, and a good boost to the rhino numbers.

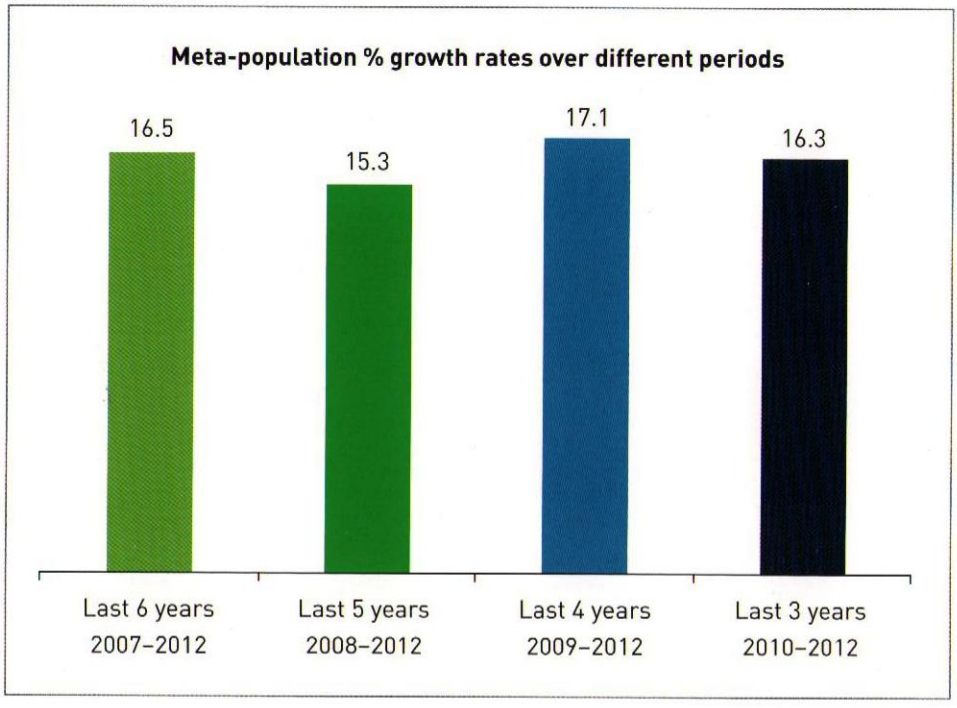
Astounding results

Thandi, heavily pregnant, 19 September 2010. Photo: Lucky Mavrandonis.

Regular unobtrusive monitoring over 14 years gave us spectacularly accurate results in this case study, because in over 80% of observations, rhinos were not aware of us watching them. We were able to accurately record the details of every calf: the date of birth, who the father was and establish its sex quite soon – all the essential information to create family trees.

In our published paper,[2] the growth rate for the four populations was calculated as +13.4% per year, which is much higher than the estimated average of 5% in the literature for black rhinos. This growth of 13.4% is even more impressive as it included many negative influences, from different introduction dates in each park, to very small founder populations, as well as introduction of sexually immature rhinos. Also included was one incident of a newly introduced bull causing the death of six rhinos, including three females in 2005 and 2006. This single incident resulted in the death of 31.6% of this park's population.

A better gauge of real growth is the last six years (2007–2012), which eliminated most negative influences. An incredible growth of 16.5% per year, which was consistent whether calculating for the last five, four or three years. This underscores the potential of a safe and undisturbed population.



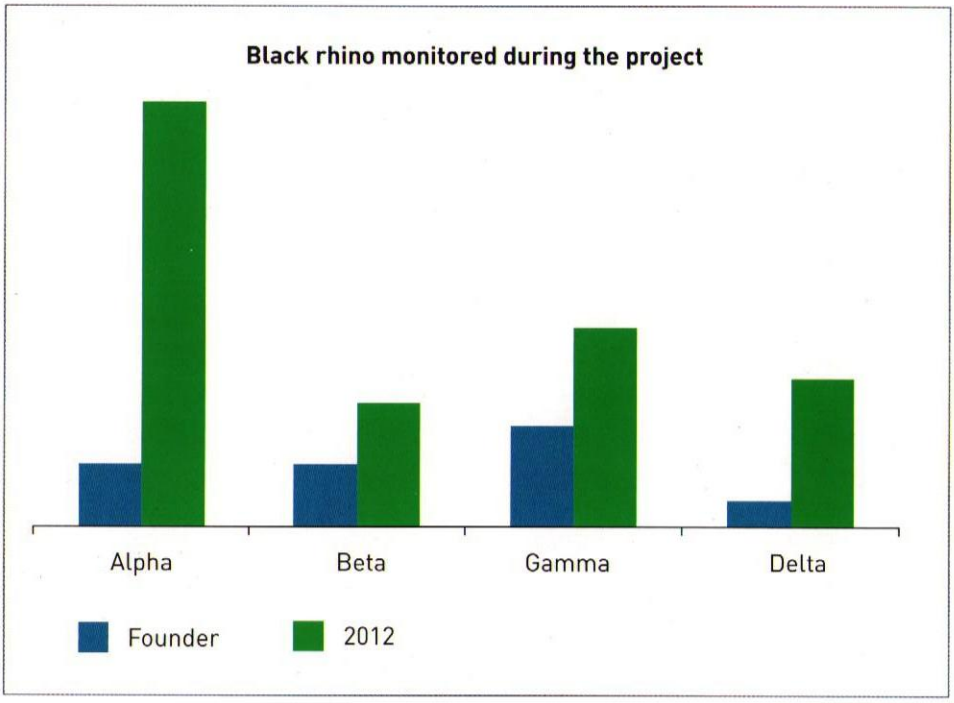
There are several factors that contributed to this successful breeding population, especially when starting with only a few rhino. Obviously good habitat is one of the factors that is essential in keeping their body condition good.

As the population increased, there were six reproductive indicators[3] that we measured. The four project areas together were rated good to excellent in five of these, and only one indicator was rated as moderate to good.

We recorded 65 births, including Shibula's first two calves. We calculated an accurate gestation for one female of between 15.3 and 15.58 months. We observed three matings – one from a distance of 102 metres when the bull mounted the cow nine times in four hours. During another mating, a 19-month-old calf browsed close to the couple and was never threatened or chased away.

Over the 10-year-period, the mortality rate was 2.6%, which is lower than the accepted level of 3–4%. However, natural deaths only accounted for 18%, while human-induced deaths were responsible for 82% (poor management decisions, human disturbance and relocations).

Dhora (female) and Kaba (male), 10 April 2008. Photo: Lucky Mavrandonis.



If we include the years 2013–2016 in only one park, the mortality increased due to a poor management decision. National parks, after doing a 'risk analysis', introduced the same bull responsible for the six deaths in 2005/2006. We opposed this decision because of his aggressive history, and the availability of other unrelated males. This time three rhinos died in 2013 and 2014. The logical assumption was that the same bull was responsible.

Our project started in 2002 with only a handful of rhinos in one park, and in May 2012 the total population in all four parks had increased 14-fold. We know the numbers are small, growth can be over-simplified and deceptive in small populations, but the study is on a subspecies where the numbers are inherently very small. In 2012 our project accounted for 56% of national parks or a third of South Africa's total population of this subspecies of black rhino, therefore the numbers are significant. Even if we include Namibia's population, the world has less than 2500 of this subspecies.

Our results are real, based on visual observations and positive identification of known individuals. No manipulated scientific models or assumptions were needed.

There are some myths about black rhino that we disproved in the populations we studied. Scientists call black rhinos 'solitary' because they do not live in herds. It may be that in arid areas food is not abundant and they are found browsing far apart. But we observed up to 11 rhinos socialising for several hours at a time. They have a 'greeting' ritual and know each individual in their population. In 26.5% of our observations we observed more than one group together, i.e. a group denoted as a single rhino or a cow with calf.

Bulls did not attack calves when mating with the mother. Competition between bulls is not necessary for successful breeding – a better breeding rate is achieved if the bull concentrates on courting the females and making 'babies', rather than fighting with other bulls.

Black rhinos' eyesight is not as poor as 'they say'. Rhinos have fair, if narrow, binocular vision, and they often turn their head from side to side to get a better view. They do, however, have excellent motion detection, which, together with superb hearing and smell, allows them to pinpoint an intruder (human or other) incredibly quickly. Snorting elicits movement!

We have never found black rhinos to be aggressive, even though we have on many occasions unexpectedly 'bumped' into them. They are inquisitive and want to assess the threat, but usually in our experience they run or walk away. They are big, incredibly nimble and quick, so if a calf is scared or threatened, or an exit blocked, they would charge the threat, and it could be very dangerous.

Effective monitoring – an expensive and long-term undertaking

The black rhino is difficult to monitor due to its preferred habitat. They are mainly nocturnal, with the best sightings usually occuring early morning and late afternoon.

It cost national parks nothing for our black rhino monitoring project. Besides the fund-raising and donations, the project sponsored transmitters, helicopter flying time and security, among other things. National parks received all pertinent information verbally after every monitoring trip, as well as a written report within a week.

Only our direct costs were sponsored during our project, such as airfares, diesel, accommodation and equipment. We volunteered our services and time for 14 years. There were two direct sponsors: DSWF and ourselves personally, while national parks contributed 'in-kind'.

BREAKDOWN OF COSTS AND SPONSORSHIP

DSWF	R3 460 000	69%
Ourselves personally	R1 470 000	30%
National parks	R 73 000	1%
	R5 003 000	100%

National parks' contribution allowed us to stay in tourist accommodation at no charge, mainly in one park, if the camp was not fully booked. In another park we paid the full price, but could occasionally take advantage of a pensioner's discount!

The R5 million covered all monitoring costs for 14 years, including security from late 2010, plus a special donation of R185 000 for transport of rhinos from Namibia. Monitoring itself cost R3.04 million with security amounting to R1.7 million.

R5 million may sound a lot, but to protect all our project's highly endangered rhinos over 14 years, it is a valuable investment. In the last three years, we have been monitoring in one park only, at a cost of R7 475 per rhino per year. In the four areas during our monitoring, no rhinos were lost to poaching.

This 14-year study by external researchers with international and local funding has proven that the four sub-populations of this black rhino subspecies – given good habitat and limited human interference – can breed at a rate of 13% per year over 14 years, and will contribute significantly to the survival of the subspecies by exceeding South Africa's Biodiversity Management Plan targets and growth rate of 5%.

However, is there the will to make the effort required to make more land available, improve the levels of monitoring and do what is best for the rhinos?

Factors essential to continuing this success are:

- Careful and unobtrusive monitoring to ensure reproductive indicators remain positive. Relocations should be undertaken only when necessary.
- Black rhinos breed best when there is minimum tourist impact. Areas should be dedicated for breeding with limited tourist access, with one or two areas specifically for 'surplus' bulls where tourists can see black rhinos.
- Beta is an example of how high-tourist density and intrusive monitoring impacted negatively on the animals. One month after the abrupt termination of the project, a field ranger was severely injured by a cow that had been separated from her calf. The calf later died. Beta should not be a breeding area, but rather a camp for 'surplus' bulls that would satisfy tourists.
- Long-term investment and partnership with the private sector can play a pivotal role in developing rhino areas, as well as monitoring them to provide independent analysis of progress and performance.
- Our birth forecast indicates it is imperative to acquire new areas of suitable habitat for black rhino. This is the single most important component to ensure the future of the species.
- The study also validates the value of a long-term investment to rehabilitate rhinos. In this study, two rehabilitated females resulted in 18 additional rhinos.
- Formal ethology (behaviour) studies should be pursued to better understand black rhinos, but observations should be unobtrusive – which our study proved is possible.
- Above all, a dedicated senior rhino manager or coordinator is vital for the future of rhinos in national parks.
- Respect for dedicated external researchers working closely and sharing information with national parks is essential.

We do not believe that a parastatal has the staff or funds to dedicate to proper black rhino monitoring and security. Also, independent input is vital to keep information accurate and relevant. External researchers should be encouraged.

Researchers should have the passion to dedicate time and financial resources for a long-term study. They should be totally independent and always put the rhinos first. Meticulous fieldwork is essential for meaningful results and analysis. Computer

models/assumptions do not give accurate results.

Some disparage the field study of small populations, but sadly the reality is that there are very few black rhinos left – so it is all we have. Respect is also overdue locally for a conservation attitude to research. This was acknowledged by the 2013 symposium[4] in the session dealing with Population Dynamics and Conservation.

Simplistically, more passion means more knowledge, better management and improved growth.

Termination of the project

In May 2012 the project was terminated in three of four areas after 10 years of regular monthly monitoring – in fact our 25-year involvement went back to 1991.

The termination by the regional manager in charge of the three parks was abrupt. The dispute involved computer access codes for GPS satellite foot collars sponsored by ourselves. Transmitter frequencies were always given to the section ranger who was directly responsible for the rhinos, and he was also given the access codes. But with new GPS technology, there were huge security risks, and we were not prepared to compromise security ethics by letting anyone else have the codes. Namibian authorities were much stricter.

Senior directors and the chairman of the African Rhino Specialist Group (AfRSG) met with us in an attempt to reconcile the disparate views, but the regional manager refused to meet us. However, we were asked to continue in the remaining park and did so up to January 2016, when we received an email from an employee to the effect that it 'had come to their attention' that our 'research agreement' had come to an end and we were 'not permitted to conduct any further fieldwork in the park for the project'. In fact the research agreement was with Dr Anthony Hall-Martin, who had sadly died in May 2014.

We do understand that rules are rules, but are they so disinterested and short-sighted not to realise that this is not just a research project, and that we provided an essential service to park management on the black rhinos in their parks?

Our gratitude goes to Anthony Hall-Martin for his support and help, always given freely – his death was a huge loss to rhinos and to many of us personally. We are grateful to David and Melanie Shepherd who tirelessly raised funds for the project. Dr Hector Magome also gave us enthusiastic support and encouragement. The field rangers and the Bushman (San) we worked with in the veld showed great interest

in learning about our unobtrusive method of monitoring rhinos, and we found their work ethic amazing. The biggest compliment we were paid by the rangers was that we made them feel that they were important.

We have enormous respect for these magnificent animals, their majesty, competence and power. To see them run with their smooth, elegant, fluid and efficient style, reaching a top speed of over 40 km/h in a matter of 2.5 seconds, is one of the most awesome things to watch. Our years of walking with black rhinos has been an exceptional experience and a privilege.

FOLLOWING PAGE: Protect the elephant and you protect whole ecosystems. The African elephant is currently diminishing across much of Africa, whereas in southern Africa the opposite is the case. However, we need to guard against complacency. Photo: Wilderness Safaris/Dana Allen.