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Brian John Huntley

Strategic Opportunism: What Works in Africa

Twelve Fundamentals for Conservation Success

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Twelve Fundamentals for Conservation Success

United Nations
Educational, Scientific and
Cultural Organization

UNESCO Chair on Life on Land
University of Porto
Porto, Portugal

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Brian John Huntley
CIBIO
University of Porto
Vairão, Portugal

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Preface

The reviews and narratives presented here were triggered by discussions during a retreat for writers, poets and artists at Oak Spring Garden Foundation, Virginia, USA, in the northern autumn of 2019. Our visit coincided with the shock report that since 1970, North America had lost 2.9 billion birds, 30% of its total population (Rosenberg et al. 2019 *Science* 366:120–124). During an introductory session, the focus of one presentation struck a chord – the relatively new concept of environmental melancholia. Environmental melancholia is a condition resulting from environmentally induced stress and depression. The ailment is experienced consciously or subliminally by individuals or communities as a consequence of growing exposure to the loss of a 'sense of place'. It is associated with one's helplessness at the seemingly irreversible degradation of landscapes, the scope and scale of species extinctions and the prospect of the negative impacts of global climate change.

The malady is all too familiar to African conservationists, faced with the collapse of elephant, rhino and abalone populations and their habitats through the industrial scale of the illegal trade in wildlife products. The loss of hope among some conservation professionals is understandable, especially for those on the frontline of anti-poaching actions, or working within weak governments which fail to recognise and address environmental crises.

So how does one respond to the seemingly endless flow of bad news? A positive and pragmatic answer is to focus on successful models that have worked in often difficult situations, which despite enormous challenges, have resulted in sustained success over long periods of time. I therefore sought lessons learned from colleagues across southern Africa, conservationists with 'glass half-full' attitudes, rather than the defeatist 'glass half-empty' perspective that one is often tempted to adopt. I identified projects that fitted the criteria of ambitious but realistic goals and with proven long-term sustainability, and at different spatial scales, socio-political circumstances and institutional capacities. Their work forms the substance of these case studies and provides the evidence base of the conclusion reached: conservation success is possible in Africa.

Vairão, Portugal Brian John Huntley
brianjhuntley@gmail.com

Acknowledgements

The personal experiences reflected in this book cover over five decades of working in diverse institutions and countries. At all times I have enjoyed the remarkable friendship and stimulation of inspiring people – cattle herdsmen in the hills of Zululand, game rangers in wilds of Angola, academics at prestigious universities, visiting scientists and an ever-supportive family. As must be the case for every student, the writings of the great pioneers of exploration, evolution and ecology formed the foundations of my learning and presented models of passion and dedication – opening the landscapes of the mind.

I must thank our generous hosts at Oak Spring Garden Foundation, Peter and Elinor Crane, for the opportunity to test ideas with a remarkable mix of artists, writers, poets, gardeners and researchers, in the tranquillity and beauty of rural Virginia, USA. Interdisciplinary artist Regan Rosburg introduced me to the fascinating concept of environmental melancholia – *solastalgia* – and how the syndrome is manifesting in urban and rural communities.

At the Research Centre for Biodiversity and Genetic Resources (Association BIOPOLIS/CIBIO), Porto University, Portugal, my colleagues and friends Nuno Ferrand, Pedro Vaz Pinto, Pedro Beja and Martim Melo have offered feedback on the developing narratives, and CIBIO has provided the ongoing institutional support for my research and writing activities.

Fieldwork in Angola was stimulated by the enthusiasm and good humour of Fernando Costa, Vladimir Russo, João Traguedo and João Serôdio D'Almeida. Marc Stalmans, Ken Tinley, Paul Dutton and Vasco Galante kept me abreast of the Gorongosa Project; Domitilla Raimondo, James Harrison and Alan Lee provided updates on the citizen science projects; Christopher Willis, Gideon Smith, Eimear Nic Lughadha and David Cantrill added details on SABONET, the African Plants Initiative and the extension of activities beyond Africa. The indefatigable team of Marion Island scientists – Marthán Bester, John Cooper, Rudi van Aarde and Ben Dilley – shared their personal experiences in the cat and mouse eradication programmes and plans. In Zimbabwe and Namibia, Brian Child, David Cumming, Russell Taylor, Raoul du Toit, Vernon Booth, Margaret Jacobsohn, Brian Jones, Chris Brown, Maxi Louis and John Mendelsohn provided valuable insights and warm hospitality. In my early professional career, I was extremely fortunate to have mentors with the wisdom of Ian Garland, Ken Tinley, Graham Noble and Alan Rodgers. The ever-positive outlook and optimism of John Hanks, Guy Preston and Clem Sunter have kept me focused on solutions rather than on problems.

Throughout my 50-plus years of working across southern Africa, the unfailing encouragement, and critical editorial skills of my wife, Merle, have been the source of continued support and companionship in often challenging environments.

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About the Author

Brian J. Huntley is a conservation scientist with over 50 years of field research and management experience in many African countries. He has initiated and led to successful conclusion several major inter-disciplinary cooperative research and institutional development projects. Following retirement as CEO of the South African National Biodiversity Institute, he has undertaken reviews of conservation projects in several African countries for various international agencies. He has edited or authored twelve books on various aspects of ecology and biodiversity conservation. He is an invited researcher at the Research Centre in Biodiversity and Genetics Resources (CIBIO) at the University of Porto.

List of Acronyms

AETFAT	Association for the Taxonomic Study of the Flora of Tropical Africa
ALA	Atlas of Living Australasia
ANC	African National Congress
API	African Plants Initiative
BGCI	Botanic Gardens Conservation International
BotSoc	Botanical Society of South Africa
CA	Zimbabwean CAMPFIRE Association
CAMPFIRE	Communal Areas Management Programme for Indigenous Resources
CBD	Convention on Biological Diversity
CBNRM	Community-Based Natural Resource Management
CCA	Community Conservation Area
CGG	Community Game Guard
CITES	Convention on International Trade in Endangered Species of Wild Fauna and Flora
CREW	Custodians of Rare and Endangered Wildflowers
CIBIO	Centro de Investigação em Biodiversidade e Recursos Genéticos
CSIR	Council for Scientific and Industrial Research
CSP	Cooperative Scientific Programmes
DFID	Department for International Development (UK)
DNC	Department of Nature Conservation (Namibia)
EWT	Endangered Wildlife Trust
GEF	Global Environment Facility
GNP	Gorongosa National Park
GoZ	Government of Zimbabwe
GP	Gorongosa Project
GPI	Global Plants Initiative
GRP	Gorongosa Restoration Project
GSPC	Global Strategy for Plant Conservation
GTZ	German Agency for International Cooperation
IBP	International Biological Programme

ICSU	International Council of Scientific Unions
IFP	Inkatha Freedom Party
IRDNC	Integrated Rural Development and Nature Conservation
IUBS	International Union for Biological Sciences
IUCN	International Union for the Conservation of Nature and Natural Resources
LAPI	Latin American Plants Initiative
MET	Ministry of Environment and Tourism (Namibia)
MPA	Marine Protected Area
MSB	Millennium Seed Bank
NACSO	Namibian Association of CBNRM Support Organisations
NBI	National Botanical Institute
NESAPS	Network of Southern African Plant Scientists
NETCAB	USAID Regional Capacity Building Network for Southern Africa
NWT	Namibia Wildlife Trust
PAC	Pan Africanist Party
PRECIS	Pretoria (PRE) Computerised Information System
ProDoc	Project Document
RDB	Red Data Book
ROSA	IUCN Regional Office for Southern Africa
SABAP	Southern African Bird Atlas Project
SABONET	Southern African Botanical Diversity Network
SACP	South African Communist Party
SANAP	South African National Antarctic Programme
SANBI	South African National Biodiversity Institute
SASCAR	South African Scientific Committee on Antarctic Research
SASUSG	Southern African Sustainable Use Specialist Group
SCOPE	Scientific Committee on Problems of the Environment
SSC	Species Survival Commission
SVC	Save Valley Conservancy
SWAPO	South West African Peoples Organisation
UCT	University of Cape Town
UNDP	United Nations Development Programme
UNEP	United Nations Environment Programme
USAID	United States Agency for International Development
WCPA	World Commission on Protected Areas
WWF	World Wide Fund for Nature

Part I
Background

Chapter 1
Strategic Opportunism: A Pragmatic Approach to Conservation in Africa

You can form all the committees, all the societies, all the working groups, all the charities you like but you know that in the end, it is that one individual, that one individual that has passion, that one individual that has fire in the belly, that one individual that is determined that something should be done.

Sir David Attenborough: Extract from address at the Future for Nature Awards Ceremony, Arnhem, The Netherlands, 2009

In the three decades since the United Nations Convention on Environment and Development convened in Rio de Janeiro, 1992, many billions of dollars have been invested in time-bound projects aimed at solving conservation crises and addressing human wellbeing needs in Africa. Much has been achieved. Yet in many countries the threats to biodiversity and to human development have increased rather than declined. Despite this sobering background, reasons for hope can be found in a selection of highly successful projects that offer models for adoption. Conservation success is possible in Africa.

This book addresses a complex mix of questions that challenge the minds of young conservationists and environmental scientists working in Africa: "How does one succeed in designing, initiating, implementing and leading to successful conclusion conservation projects in countries with weak institutions, unpredictable socio-economic and political trajectories, and limited human and financial capacities?" In search of answers to these questions, this book synthesises the lessons learned from a diversity of projects, across ten countries, each of which has been sustained for two or more decades. Detailed narratives are presented on the key personalities that have conceived, conducted and concluded long-term projects – personal stories of vision, challenges, failure, frustration, passion and persistence ultimately leading to success.

The case studies vary widely in their geography and goals. In selecting models that illustrate fundamental lessons, the three massively funded mega-projects of the region – those of the Peace Parks Foundation, African Parks Foundation, and the Working for Water Project – have been omitted. They have been widely celebrated

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and are well known. Here I have chosen less familiar and more moderately funded projects. Each demonstrate pragmatic solutions to complex problems. The single-handed commitment to re-discover and save the last surviving populations of giant sable in the miombo woodlands of central Angola, through the capture, translocation and establishment of robust breeding herds of this magnificent antelope, contrasts with the robustly funded, three-decade-long programme with over one hundred participants that reversed the annual loss of 455,000 seabirds to predation by feral cats on a sub-Antarctic island. The foresight of Zimbabwean and Namibian ecologists in placing rural communities at the centre of conservation programmes, by giving value to wildlife populations and benefits to local people, transformed a land degradation problem into a socio-ecological solution. Across ten countries, building capacity in botanical collection, documentation and herbarium management expanded into a global project that placed the knowledge base of Africa's flora onto an electronic data system accessible to researchers and conservation planners in even the most remote corners of the continent. None of these projects enjoyed immediate results. Each required remarkable leadership skills that combined vision, a generosity of spirit, fortuitous timing and the exploitation of the unexpected. These characteristics encapsulate the theme of this book: strategic opportunism.

The projects include models from both rich and poor countries, from those with long histories of biodiversity research and wildlife conservation, to those with weaker institutions and difficult histories. Some accounts are comprehensive and based on scores of peer-reviewed publications. Others are more anecdotal and draw on the field experience of key players, on correspondence and on personal interviews.

Focusing on the drivers of project success, twelve guiding lessons emerge from approaches where leaders took the long view on conservation. These fundamentals for success reflect the tools used, knowingly or not, by practitioners. The projects have survived changes in political leadership, economic climate and institutional arrangements, illustrating how success can be achieved regardless of systems of governance, of a nation's wealth, or of cultural traditions.

The case studies all have one characteristic in common – the central role of a champion or of champions driving an idea to success. In sharp contrast to stories of success in the business sector, none of these champions received any financial reward from their innovations and energy. In reality, many suffered years of physical and financial difficulty, in isolation – often with their life partners and families – and often without recognition other than that of their peers. Success resulted from inspiration, passion, innovation, opportunity and determination: Sir David Attenborough's 'fire in the belly'.

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Attenborough D (2009) Keynote speech. Future for Nature Awards, Arnhem

Chapter 2
Seizing the Moment While Imagining the Future

In the extensive international literature on project design and management, a multitude of models have been proposed through which to achieve successful outcomes. Six studies are pertinent to the present review. John Kotter (1996) provides an eight-step process for change, widely applied by the business community and adapted by Brian Child (2019) to community-based conservation projects. Richard Cowling et al. (2002) identify three interdependent components for consideration in structuring biodiversity mainstreaming projects - prerequisites, stimuli and mechanisms. Andrew Balmford (2012) synthesises conservation projects in terrestrial and marine environments and describes ten characteristics fundamental to success. Robert Pringle (2017) proposes eight pillars to be followed in the upgrading and expansion of protected areas. Peter Crane (2022) spelled out the message used in the title to this chapter: 'Seizing the moment while imagining the future' which underpins the concept and practice of strategic opportunism.

The above authors' elegantly simple frameworks, based on case studies from across the globe, identify key elements for success in business management, biodiversity mainstreaming, species and ecosystem conservation, protected area rehabilitation and the development of botanical gardens. Despite the differences of sector activity and the spatial scale of objectives, the driving elements identified have great consistency. Their lessons can be widely applied. Unsurprisingly, despite the efforts of international development agencies over the past half-century, there is no universally adopted formula for success in conservation projects that suggests that 'one size fits all'. Each situation has its individual idiosyncracies, temporal and geographic scales, socio-political and institutional strengths and weaknesses, and financial opportunities and challenges. Here it is proposed that the approach of strategic opportunism is most appropriate to the real-world challenges faced by conservationists in Africa. African solutions to African problems.

So, what is 'strategic opportunism'?

Over the past 50 years, as a researcher, administrator and project participant at various levels in all southern African countries, I have followed an approach that I have somewhat flippantly called 'strategic opportunism'. At the outset, I must

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emphasise that it is not a formalised model such as the 'Theory of Change' process used by many international and non-governmental agencies for project planning. In my personal experience, strategic opportunism emerged while working within fragile socio-ecological landscapes and adapting to uncertainty and change.

The concept and practice of strategic opportunism is not included in academic curricula, nor taught at post-graduate schools of wildlife management. But it requires nothing more than a clear vision, ideally shared by one's colleagues and project partners, within a flexible strategy through which to achieve realistic goals. The unpredictable opportunities that arise with the passage of time are key ingredients for success. While attending to frequent minor crises, one must never lose sight of the long-term vision. It contrasts with the rigid project frameworks demanded by many development agencies, which leave no space for chance or surprise. In reality, opportunities – big or small, arising from serendipity or simple good luck – must be recognised and exploited. In short, it amounts to transforming problems into solutions. Strategic opportunism is most concisely defined in Peter Crane's "seizing the moment while imagining the future". More formally, the concept is defined as "the ability to remain focused on long-term objectives while staying flexible enough to solve day-to-day problems and recognise new opportunities" (Iselberg 1987).

Even more than in politics, conservation is the art of the possible. It is a slow and iterative process. Strategic opportunism follows the West African expression: "softly, softly, catchy monkey". In simple terms, strategic opportunism is a mix of vision + strategy + opportunity + timing = success. It is not a rigidly linear process. The first requirement – a clear and shared vision – is fundamental. The strategy itself might be quite flexible – comprising many tiers of actions that include the ways and means of achieving goals – not tightly structured and time-bound plans.

The case studies that provide the evidence base for this set of hypothetical fundamentals demonstrate the key elements of strategic opportunism. Starting with a shared vision – imagining the future – the process advances through the matching of global ideas to feasible local actions, and through growing networks of collaboration. Mutual trust between partners are essential ingredients. Along the route, young talents must be nurtured. Mistakes will be made, but must be tolerated. Moving from small interventions to grander, bolder actions, a critical mass of committed, passionate partners 'get things done on the ground'. The latter point is most important. Unless measurable impact is achieved 'on the ground', no elegant theories, elaborate policies, acts of parliament or voluminous conference conclusions will guarantee success.

Getting things done on the ground will very often result from unexpected opportunities. Serendipity happens. One must be ready to act in response to chance events – seizing the moment. Each of the case studies illustrates how an unplanned event accelerated progress or changed the trajectory of a project. The surprising detection of hybridisation between giant sable and roan antelope catalysed efforts to capture and translocate genetically pure sable to form a breeding population. A chance meeting between a potential donor and the country's president triggered the Gorongosa Restoration Project. Connecting the dots between a simple digital scanning technology and the need to document hundreds of thousands of herbarium specimens led rapidly to the African Plants Initiative.

Moving from quick wins to broader successes requires the flexibility of the strategic opportunism approach. By giving participants in citizen science projects regular feedback through newsletters and press releases, local but significant findings were celebrated. The early volunteers of the bird atlasing and wildflower conservation projects could never have anticipated the vast impact of their projects, but they imagined a future of an easily accessible database that would guide conservation action.

In contrast to the practice of rigid project structures, not each step of project implementation needs to follow a seemingly logical sequence. Eradicating feral cats on Marion Island built on decades of fundamental research on seabird and cat population biology. The project advanced through trial and error, frequently revising approaches. It was a process of successive approximation – each step getting closer to the goal, through what can best be described as ‘learning by doing’. The years of negotiation required to access funding for the SABONET project saw progress in spasms rather than in predictable flows. Projects, like thinking, move both fast and slow.

Finally, an additional ingredient is needed for strategic opportunism to succeed. In all ‘communities of practice’ – loose networks of collaboration – keystone individuals are essential. Each of the successful projects reviewed had such personalities. These included political leaders with a commitment to the environment and its conservation, respected leaders of rural communities, academics with inspiring ideas and energetic students, private sector investors looking for socially meaningful projects, or amateurs and volunteers forming networks of citizen scientists. These keystone individuals, like the keystone species of ecosystems, served the role of project champions, catalysing symbiotic relationships among all participants. It is these extended families – multi-talented and cooperative ‘invisible colleges’ – that bring solutions to complex problems in Africa.

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Part ll
Strategic Opportunism in Action: Models of Success

Chapter 3
Angolan Giant Sable: Rediscovery, Rescue and Recovery

Just before my trip home at the time [1912], some Angola Boers had managed to get their wagons across the swamps, and had shot a number of the herd for their skins and meat. This was a new treasure trove for them, as they had by then shot out most of the accessible game in Angola … This threatened the complete extinction of the finest antelope in Africa, bearing the most magnificent horns of all.

Thomas Varian (1953) *Some African Milestones*

3.1 The Rise and Fall of a Narrow Endemic

At the dawn of the new millennium, the national icon of Angola was believed to be extinct. The giant sable antelope (*Hippotragus niger variani*) is a distinctive and geographically isolated sub-species of the widely distributed sable antelope. British railway engineer, Thomas Varian, while surveying a route for the Benguela Railway, discovered the subspecies in the miombo woodlands of central Angola (Fig. 3.1). Having witnessed the ravages of Boer biltong hunters, Varian feared for the future this 'finest antelope in Africa'. He immediately raised the alarm and mobilised the support and legislative intervention of the Portuguese High Commissioner for Angola, General Norton do Matos. Quick action saved the giant sable from the Boer biltong hunters of the 1920s. But half a century later, after decades of relative security, it was a civil war and its aftermath that spelt the giant sable's imminent doom (Walker 2002; Huntley 2017).

In 1971, the giant sable population was estimated to be between 2000 and 2500 animals. The vast majority of these sable occupied the 828,000 ha Luando Strict Nature Reserve, with about 150 in Cangandala National Park, of 63,000 ha, just to the north, across the Luando river (Huntley 1974). The global population was confined to an area of less than 10,000 km^2, with their closest relatives at least 500 km distant in the far corner of the Cuando Cubango (Fig. 3.2). The herds in Luando had been studied by American biologist Richard Estes in 1969/1970 (Estes and Estes

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Fig. 3.1 A giant sable herd in the miombo woodlands of Luando Strict Nature Reserve, 1972

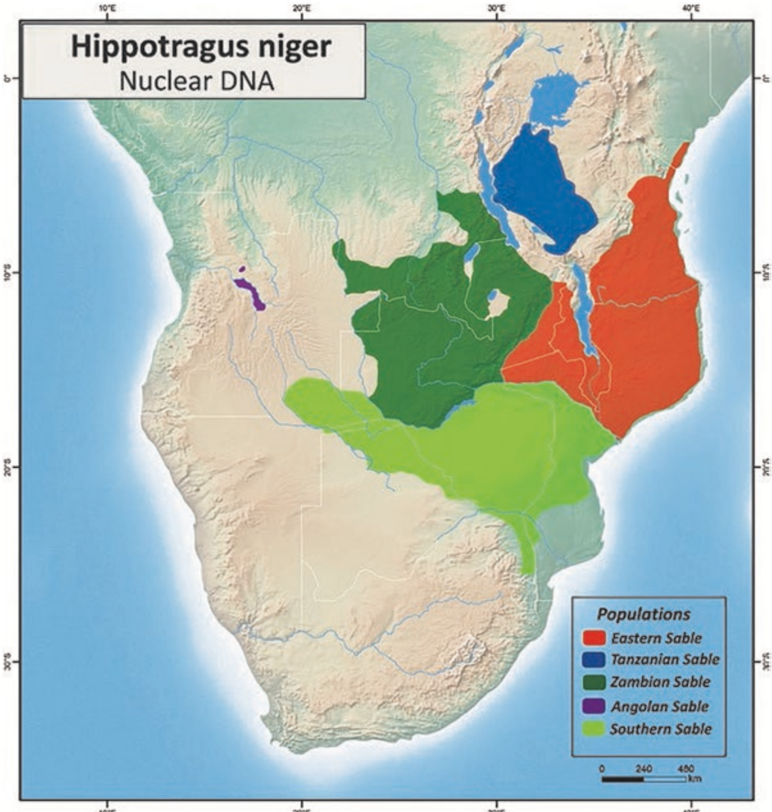

Fig. 3.2 Sable antelope populations (and sub-species) as determined through nuclear DNA analysis. The population of the giant sable of Angola is striking in its isolation. (From Vaz Pinto (2019))

1974). Through the diligent shepherding of the study herds by park warden José Alves, the animals had become so habituated to vehicles that in 1971 one had to hoot at the resting herds to be able to drive though their territory (Huntley 1973, 2017). Little surprise then, that when civil war broke out in the mid-1970s, the giant sable provided easy prey to hunters (Huntley 1975). Dick Estes and park warden João Amaro had photographed a herd in Cangandala during a brief visit in 1982 (Estes 1983), but since that date no sighting of giant sable had been reported. By the end of the twentieth century it was feared that they were already extinct.

International concern for the fate of the giant sable gained traction, especially with the publication of news reports of their possible demise. One book placed the giant sable on the conservation centre stage. The history of the discovery of the giant sable by Varian (1909) and the subsequent pursuit of trophies of the magnificent antelope by some of the world's leading museums and aristocrat hunters, was related in fascinating and compelling detail by John Frederick Walker in his book *A Certain Curve of Horn*. Walker (2002) describes eight frustrating and unsuccessful visits to Angola in search of the sable. He finally saw his first specimen in 2009 - exactly a century after Varian's 1909 report on the giant sable. Walker had joined the capture and translocation project led by an Angolan biologist, Pedro Vaz Pinto. It was the passion, tenacity and commitment of this one person – Pedro Vaz Pinto – that reversed the almost inevitably sad fate of the giant sable, in one of the great modern conservation successes of southern Africa.

3.2 Pursuit and Re-discovery

Much has changed for the better in Angola since the 1990s and early 2000s of Walker's failed pursuits. For the privileged few who today can visit Cangandala and observe the healthy breeding herds grazing quietly in the park's peaceful miombo woodlands, it is difficult to imagine the challenges that Vaz Pinto faced when he decided, in early 2003, to focus his energy on re-discovering the giant sable. Vaz Pinto made repeated visits to Cangandala, first for lengthy surveys on foot across the park with local rangers, covering hundreds of kilometres through the tall miombo woodlands and grasslands Figs. 3.3 and 3.4).

Lest one think that Vaz Pinto's visits to Cangandala were quick rides out from the laboratory into the field, one needs to know that each visit involved a 10-hour drive along some of the worst, and most dangerous, roads in Angola. In the 1970s, the drive from Luanda to Malange would take me a pleasant 6 hours. But for the first decade after the year 2000, the Chinese were rebuilding and once again rebuilding the Malange road, the second busiest highway in Angola. Chinese civil engineers are not the best, and had obviously never encountered the notoriously mobile swelling and shrinking *terras negras de Catete* – the black cotton soils along the first 100 km of the route. The *terras negras* beat the lot of them. The road from Malange to Cangandala village, was worse. The once smooth tar macadam, had fallen apart,

Fig. 3.3 The preferred habitat of giant sable – a mosaic of woodlands and open grasslands: Cangandala National Park. (Photo: Pedro Vaz Pinto)

Fig. 3.4 Open miombo woodland with a dense grass ground cover in Cangandala National Park. (Photo: Pedro Vaz Pinto)

shredding the tyres of any over-hasty driver. So Pedro's repeated visits to Cangandala were never a stroll in the park.

Failure to locate the sable visually persuaded Vaz Pinto to set up camera traps. Selecting a few salt licks – the old termitaria that form nutrient pools in the otherwise poor soils of the *miombo* – he set up three cameras. A month later, in pouring rain and struggling across the flooded rivers near Bola Cachasse, he returned to check the cameras. True to the perverse nature of working in the Angolan bush, only one had functioned. Ants had made nests in the transmitter of one camera, the other had a malfunctioning receiver. When he developed the films, all he found in the images were a few duiker and warthog. He then set up five cameras, and was back again 2 weeks later. This time the problems included termites – so he blocked the tiny holes in the equipment with chewing gum. On the next visit, he found that the camera beam was at too low an angle – so he adjusted the fitting. By the next visit grass and shrubs had grown up in front of the camera – so he chopped the lot down. When he sent the film off to Portugal the results presented four duiker, 13 bushbuck. One had to admire his tenacity. On 14 December 2004 he wrote that one of his trap camera's infrared receivers had malfunctioned, recording 1900 events; another had battery problems. His e-mail read: "This is a game of patience. This activity has been physically and psychologically very demanding and it is frustrating not seeing the animals in so many visits and so many hours spent in the bush tracking them, but every time, finding fresh spoor and dung gives me the extra energy to keep going!"

Even low-level flights in a micro-light plane - including a crash which, in the words of a fellow biologist, left him 'shaken, not stirred'– failed to yield a single sighting. Turning to molecular approaches, Vaz Pinto collected dung and hair samples snagged on bushes for genetic analysis. This initially gave unconvincing results. Two years of continuous but fruitless efforts, and then success.

In February 2005 Vaz Pinto's camera traps revealed a group of female giant sable at a salt lick. Over the next 18 months, he made a further 15 visits to Cangandala, and through hundreds of camera trap photographs he built up an identity profile for 23 individuals. But he had still not seen a single sable with the naked eye. Nor were any male sable to be seen in the camera trap photos. Strangely, some of the female and young sable in the photos had what Vaz Pinto considered a 'funny' appearance. It was suggested by one of Vaz Pinto's volunteers that these animals could perhaps be hybrids. In January 2006 he succeeded in tracking down the herd on foot, and could photograph the group. These were the first sable that he had been able to see live, unaided by trap cameras. But to his great alarm, he noted that although no adult male sable accompanied the herd, a single roan antelope bull had joined the herd. Here Vaz Pinto had the evidence needed to explain the 'funny' members of the herd. These were unmistakably hybrids – 'robles' – the progeny of a lone roan bull and the giant sable cows, bereft of the services of a giant sable bull. The shocking truth was that the giant sable population in Cangandala was facing extinction, not only from poaching, but also from hybridisation (Vaz Pinto 2007; Vaz Pinto et al. 2016). Immediate action was needed.

3.3 Capture and Relocation

With donor support, a 400-hectare quarantine area was fenced off. After protracted negotiations with government agencies, donors and an ever-growing team of volunteers, Vaz Pinto was in position to mount an operation to capture pure giant sable females and to place them in an area isolated from the roan antelope bull. At the same time, a giant sable male in Luando would be captured and translocated to the Cangandala group of pure females. By August 2009 the plans were in place. With the help of the Angolan Air Force, and veteran game capture expert Piet Morkel and helicopter pilot Barney O'Hara, the project began. The nine surviving 'pure' females within Cangandala and a mature male from Luando were captured and translocated to the quarantine area. (Fig. 3.5). Ten other sable were fitted with collars and VHF transmitters. In 2011 two satellite transmitters were fitted to two sable released in Luando. In July 2022, 15 satellite collars were fitted to 10 sable cows and 5 sable bulls, providing an invaluable data set on sable movements, their social behaviour, and to track any incidents of poaching.

In the decade since the first capture success, the quarantine camp has been expanded to over 4300 ha and the captive breeding population has grown to over 100 animals. Despite ongoing poaching, regular satellite monitoring and ground patrols have brought a measure of protection to the Luando population, now estimated at over 200 animals. The combination of intense but arduous field work by one observer over nearly two decades (Vaz Pinto 2018), backed by molecular

Fig. 3.5 Pedro Vaz Pinto with the first giant sable immobilised in Luando Strict Nature Reserve for translocation to Cangandala National Park, August 2012. (Photo: Harold Roberts)

studies on the genetic diversity of sable antelope over their full range across Africa (Vaz Pinto et al. 2015), has added considerably to our understanding of the ecology, behaviour and evolution of this magnificent antelope.

While it might still be too early to celebrate total success in the rescue of giant sable from near extinction, the calamitous decline in the population has not only been halted, but has been effectively reversed. After decades of disinterested rule by the José Eduardo dos Santos regime, the giant sable is now enjoying active government support. Since 2017, the new President of the Republic, João Manuel Gonçalves Lourenço has transformed not only the country's future, but also that of the national icon. The president has appointed a high-level commission to ensure continued support for the project, and a new Minister of Environment is lending support for the provision of facilities and training for the ranger staff at Cangandala. Luando remains without basic facilities and receives only limited government support, but reserve management plans are being developed.

What is not obvious, however, is the fragility of the entire rescue programme. It has been held together by a single passionate volunteer, with uncertain funding, government interference in his initial activities, the continued use of wire-noose and AK rifle poaching of the vulnerable herds at isolated waterholes, and erratic payment of salaries and servicing of facilities for the small corps of rangers. On the positive side, Pedro Vaz Pinto has enjoyed excellent support from the Angolan Air Force, from successive provincial governors, from the local community and from dozens of committed volunteers. By training and inspiring a small team of 'sable shepherds' from the first days of the project, Vaz Pinto has attracted the trust and loyalty of the local community, gaining their support as the eyes, ears and actors in the conservation campaign.

3.4 Lessons Learned

The success of the project can be attributed to multiple factors:

- The existence of international concern regarding the fate of an iconic species.
- The presence of a young, energetic, resilient, charismatic and totally committed conservation biologist who independently and without any secure institutional base, took on the challenge to save the giant sable.
- A highly responsive, adaptive, and opportunistic project management model that allowed rapid maneuverability under complex and ever-changing situations.
- A sustained two-decade long focus for two decades on the key objective of saving the giant sable from extinction.
- The development of a wide base of volunteer and donor support within Angola which shared a long-term vision.
- The availability of highly skilled and experienced technical support from within the region (Botswana, South Africa, Namibia, Zimbabwe) for the capture and safe translocation of many dozens of animals without a single loss of life.

- The foresight on the part of the project leader to gain the trust and active participation of the local human population that shares the giant sable's habitat and restricted geographic range.

The Giant Sable Project demonstrates the concept of strategic opportunism. In its simplicity, focus and the tenacity and adaptability of its leader, it is a model of what can work in Africa.

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Chapter 4
Marion Island: Birds, Cats, Mice and Men

It appears to me that nothing can be more improving to a young naturalist than a journey in distant countries … the effect ought to be to teach him good-humoured patience, freedom from selfishness, the habit of acting for himself, and of making the best of every occurrence.

Charles Darwin (1839): *The Voyage of the Beagle*

4.1 Introduction – Africa's Sub-Antarctic Wilderness

Africa is no longer the Dark Continent – no longer unknown, unexplored and inaccessible. Few places in Africa lie more than a few miles from a road, or a few hour's drive from a village or even an airport. Internet access is increasingly ubiquitous. But there remains an African territory that is still seriously remote, wild and untamed: these are the Prince Edward Islands.

The Prince Edward Islands lie some 2300 km southeast of the southern tip of Africa. Discovered and forgotten in the mid-seventeenth century, re-discovered in the eighteenth century, plundered of their seal populations in the nineteenth century, and annexed by South Africa in the middle of the twentieth century, the islands remain little known beyond their rocky shores in the midst of the cold, wet, and gale-swept 'Roaring Forties' of the Southern Ocean.

The two islands, Marion and Prince Edward, form part of the circumpolar islands of the sub-Antarctic (Fig. 4.1). Despite their inhospitable climate, treacherous bogs, and volcanic and glaciated landscapes, the islands are home to hundreds of thousands of breeding seabirds – penguins, albatrosses, petrels and prions – and tens of thousands of breeding fur seals and elephant seals (Ryan and Bester 2008). Marion, the larger island, of 29,000 ha, rises to 1231 m; Prince Edward, of 4500 ha, to 672 m. With an estimated age of 450,000 years, the islands emerge as volcanic peaks from the ocean depths. Landscapes and vegetation include barren or fern covered lava fields, windswept communities of cushion plants, waterlogged mires and bogs, cliff lined coasts and snow-covered mountain peaks (Figs. 4.2, 4.3, 4.4, and 4.5).

B. J. Huntley, *Strategic Opportunism: What Works in Africa*, SpringerBriefs in Environmental Science, https://doi.org/10.1007/978-3-031-24880-1_4

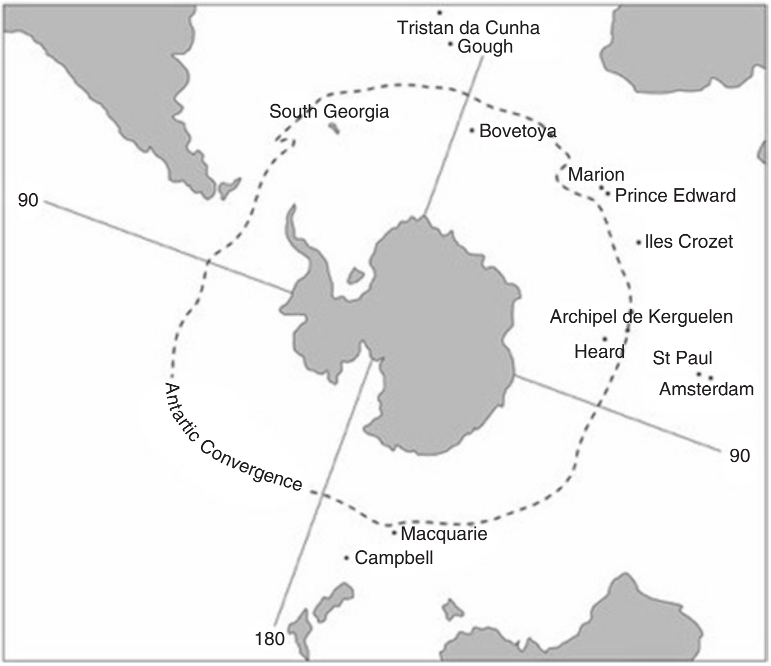

Fig. 4.1 Marion and Prince Edward Islands lie approximately 2300 km southeast of the southern tip of Africa, slightly north of the Antarctic Convergence

Fig. 4.2 Exploring Marion Island in 1965 – the frequently snow-covered central peaks

Fig. 4.3 The fern and shrub-covered basalt lavas of the west coast plain

Fig. 4.4 Black basalt lava flows provide shelter for feral cats

Fig. 4.5 Boulder beaches occupied by breeding colonies of penguins and elephant seals. (Photo: Christiaan Brink)

The islands provide a fascinating story of species-poor, simplified ecological systems at work, and the impact of invasive species on the ecosystem's fragile structure and functioning. They also provide a stage for remarkable actors who have devoted their professional careers to understanding the dynamics of sea-land-plant-animal and human interactions in what, for most researchers, are extremely hostile environments. What makes the islands unique for researchers in the African context is their remoteness, and the challenges that students have to face when physical contact, supplies, medical support, or in earlier years, even communication was a once-in-a-year opportunity.

At the time of annexation in 1947/48, the islands were truly *terrae incognitae*. Only one botanist had previously collected plants on Marion, on a hurried one-day visit during the voyages of the British *Challenger* expedition in 1873 (Moseley 1874). Shortly after annexation, Robert (Bob) Rand spent six summer months (1951/52) on Marion, undertaking a valuable baseline survey of birds and seals (Rand 1954). Like all visitors who followed him, Rand experienced the difficulties of working on the island: "No boat was available on the island; all excursions were made on foot. Food and gear for periods of four to seven days away from the base were carried in a rucksack, including heavy equipment. The varying nature of the ground and the unpleasant climate made movement from place to place very fatiguing, and detracted from the enjoyment and success of biological work. Rain, in particular, was a trying factor …".

As plant ecologist on the first 'Biological-Geological Expedition to the Prince Edward Islands 1965-66' (Van Zinderen Bakker Sr. et al. 1971), I spent 15 months on the islands surveying the flora and vegetation (Huntley 1971, 2016). I could not anticipate the changes that were to follow. In the 1960s, the islands had a mean annual temperature of 5.5 °C, mean annual rainfall of 2726 mm, falling on 311 days per year, and with gale-force winds recorded on 107 days per year.

The climate has ameliorated over the past five decades, with annual precipitation down to.

1778 mm in the 2010s, and temperature means increasing by 1.2 °C, between 1949 and 2016 (Le Le Roux 2008, Le Roux and McGeoch 2008, Hedding and Greve 2018) with a consequent shrinking of much of the icefields of the high plateau (Meiklejohn 2011) and progressive drying of mires and bogs. Climate change has also resulted in multiple ecological changes such as increased house mouse abundance and in turn their impacts on the islands' ecological structure and functioning (Chown and Smith 1993; Smith et al. 2002; Le Roux and McGeoch 2008; McClelland et al. 2018). The history, geology, biology, ecology and conservation of the islands is comprehensively covered in the synthesis volume edited by Chown and Froneman (2008), which draws on the considerable body of publications – over 1000 papers in peer-reviewed journals – of research conducted on the islands since the 1960s.

4.2 An Emerging Invasion Crisis

In common with most island ecosystems (Elton 1958; Mooney and Cleland 2001) but especially those of the remote oceanic islands of the sub-Antarctic, Marion and Prince Edward are highly vulnerable to invasive alien species – the greatest threat to the biodiversity of the sub-Antarctic islands (Frenot et al. 2005; Greve et al. 2017). The first human visitors to the islands were sealers, first recorded in 1802 (Cooper 2008). These early teams of intrepid men unintentionally introduced house mouse *Mus musculus* and several alien plants to the islands, probably from 1818 (Watkins and Cooper 1986). In 1948 five domestic cats *Felis catus* were introduced to Marion Island to try to control the mouse population at the small meteorological station that had been established on the recently annexed island. By 1952, offspring of the original cats had, according to Rand (1954): "gone feral and were preying on the smaller petrels or mice that are widespread over the coastal plain". This is when the trouble really began.

By the time of my survey of the island, in 1965/66, the depredations of the cats on the smaller seabirds and the nightly foraging activities of mice were regularly observed. In hindsight, the 1965/66 Expedition should have raised the alarm regarding the crisis that would develop from cats and mice on the islands, especially given the warning call on the impacts of invasive biota raised a few years earlier by the seminal work of Charles Elton (1958). In their comprehensive review of the feral cat eradication project on Marion Island, Bester et al. (2002) noted that in October

1965, the expedition leader, Van Zinderen Bakker, informed the South African Scientific Committee on Antarctic Research (SASCAR) that: "The feral cat population was not large enough to threaten bird populations, and that the cats were indeed contributing to the control of mice in the meteorological station." I suspect that Van Zinderen Bakker, a humanist and sensitive animal-lover, felt some compassion for the friendly cats that then lived around the meteorological station.

A decade later, research confirmed that the cats were exerting a negative impact on the bird populations (Anderson and Condy 1974). More dramatically, what focused attention on the ecological crisis on Marion Island was a report by Van Aarde (1975), that an estimated 455,000 birds were being killed annually by the population of feral cats. SASCAR was convinced that a cat eradication programme should be initiated.

What followed was the most ambitious, largest, longest and most expensive cat eradication programme yet undertaken on an island ecosystem. It still remains the most successful operations of its kind (Preston et al. 2019). As a model of the integration of elegant basic research, targeted monitoring and pragmatic conservation action by literally hundreds of contributors, it stands out as a conservation project that brings credit to South Africa. Yet, as noted at the end of this chapter, work on invasive alien mammals on the Prince Edward Islands has not yet concluded.

4.3 A Science-Driven Approach to Eliminating an Aggressive Invasive Species

Following the Van Zinderen Bakker expedition of 1965/66, nearly a decade passed before research resumed on the islands. Three institutions took the lead – the Percy FitzPatrick Institute of African Ornithology at the University of Cape Town, the Mammal Research Institute at the University of Pretoria and the Botany Department at the University of the Free State. The programme was multi-disciplinary, focusing initially on adding fine detail to the broad outlines of the biota reported by the 1965/66 expedition (Van Zinderen Bakker Sr. et al. 1971). By the end of the 1970s, detailed accounts were completed on the vegetation, cats, mice, ground-nesting birds, marine mammals and nutrient cycling in terrestrial ecosystems (see papers in Chown and Froneman 2008). Enough scientific evidence regarding the impact of cats on the burrow-nesting seabirds had been assembled to mobilise the cat-eradication project. Like similar science-driven projects, short funding cycles resulted in a rather unpredictable and frequently interrupted programme of work. But the commitment and persistence of the research leadership, and generous support of the main governmental funding source ensured ultimate success.

As with most large cooperative projects, there were many key players and champions. The stalwarts of the Marion Island research programme over many years include Rudi van Aarde and Marthán Bester (mammalogists), Valdon Smith and Niek Gremmen (botanists), John Cooper and Peter Ryan (ornithologists) and Steven

Chown (entomologist) – plus a talented cast of over one hundred co-workers. Unsurprisingly, in contrast to the vast detail on the natural sciences included in the 1000-plus papers published on the islands' biophysical history, biological diversity and ecological structure and functioning, only a handful of papers cover the human sciences, and even fewer study the social history of the island's transient community of researchers, meteorologists and support teams. Fortunately, this near vacuum has been ameliorated by a fascinating collection of memories of the mammalogists, ornithologists, botanists, entomologists and cat-hunters involved in four decades of the cat eradication programme and of seal studies on the islands (De Bruyn and Oosthuizen 2017). The anecdotes – full of nostalgia of the blood, sweat and tears of working under physically and mentally demanding conditions, and of failures and triumphs have a primary focus – the remarkable leadership and charisma of the person who drove the project to success, Marthán Bester (Fig. 4.6). Here I will draw heavily on Bester et al.'s (2002) summary of the cat eradication programme.

Bester and his co-authors describe the seven phases of the feral-cat eradication programme, sometimes overlapping in chronology, and which extended over 25 years from conception to successful conclusion. Their paper provides an excellent model for such projects, even though the authors cautioned that there were many factors in the exercise that were peculiar to Marion Island, and that the programme: "… may therefore not be repeatable in the same way on other islands." The phases follow a logical succession of a science-based collection of evidence for the development of policy and practice – a pragmatic exercise of 'learning by doing'.

The *first phase* studied the ecology of the feral-cat population. Cat distribution, density, habitat selection, feeding and reproductive behaviour were studied between 1974 and 1976. The thorough research of Rudi van Aarde, published in a series of papers (Van Aarde 1978, 1979, 1980, 1983, 1984; Van Aarde et al. 1996), provided

Fig. 4.6 Marthán Bester with a tame member of the feral cat population. (Photo: Grant Craig)

a firm baseline on the biology and demography of the cat population. His estimates put the 1975 population at 2139 individuals, increasing by 26% per annum, and annually consuming an estimated 455,000 burrowing petrels. A decade later, Schramm (1986) estimated that Marion had suffered a 25-fold decrease in burrowing petrel population densities as compared to those of cat-free Prince Edward Island, 19 km to the northeast of Marion.

Having established the magnitude of the problem, a diversity of solutions was considered by the advisory group established by SASCAR. Biological control was recommended, and here the extended experience of the Veterinary Research Institute at Onderstepoort, Pretoria, provided leadership. The *second phase* researched the feasibility of using feline panleucopaenia virus (a highly contagious parvovirus that causes cat distemper) as a biological control. Serological testing of a small sample group of Marion cats proved the efficacy of the approach (Howell 1976, 1984). However, despite the potency of the virus, it was still considered necessary to have an integrated control programme using a variety of techniques, of which the virus would be a primary component.

Basic research advanced into applied research in the *third phase*, from March 1977, when the cat population was estimated at 3405 individuals. This phase saw the release of 96 cats inoculated with the virus, at 93 sites around the island, using helicopter support. Evaluation followed introduction. *Phase four*, from November 1976 to May 1978 assessed the impact of the virus. It was found that there was an estimated 53% reduction in the cat population after 18 months (Erasmus 1979). It was suspected that the cats could develop resistance to the virus, indicating the need for a multifaceted approach. Phase four explored a variety of other controls. Cage traps and gin traps, plus different baits and lures and a range of poisons were tested. Hunting with shot guns by day and by night was evaluated, as was hunting with dogs – three Jack Russell terriers, a German shepherd and a Labrador.

All these experimental approaches proved too costly or inefficient or held potential environmental risks. Despair started to set in. Bester et al. (2002) recorded that by February 1978 some doubt was expressed that the cats could ever be eradicated. Undaunted, three years after the virus release, SASCAR wisely recommended that further control, monitoring and research were needed.

The *fifth phase*, from April 1981 to May 1983, intensified studies on the impacts of the virus on cat demographics and ecology, their effect on bird populations, and the utility of hunting as a secondary control measure. These detailed studies gave results that confirmed the promise of an integrated approach. The cat population had been decreasing by 26% a year, and by 1982 it was down to 615 individuals or 18% of the 1977 population. But the news was not uniformly positive. By 1983 the cats were found to be developing immunity to the disease (Van Rensburg et al. 1987) and parallel studies concluded that the bird populations were still threatened (Fugler et al. 1987; Newton and Fugler 1989).

With a much-reduced cat population, hunting became a feasible (but very costly) option (Van Rensburg and Bester 1988). *Phase six*, between August 1986 and May 1989, focused on hunting by night using 12-gauge shot guns and battery-operated spotlights (Fig. 4.7). Eight teams of two men killed 458, 206 and 145 cats in the

Fig. 4.7 Teams of hunters used spotlights to locate and shotguns to kill 809 cats during three hunting seasons. (Photo: Kevin Language)

three winter hunting seasons. But the decline in hunting success indicated that hunting alone would not be sufficient. An independent review of the programme was commissioned. The reviewers recommended continued hunting in winter, and that dogs and baits be tested once more, and that controlled gin trapping and poisoning be used. It became obvious that complex problems such as invasive species control need multiple approaches to their solution.

Having already spent many millions of dollars on the programme, the funding source (Ministry of the Environment) needed a compelling motivation to invest more millions. Fortunately, the strong and courageous departmental and institutional leadership was convinced by the quality of the science, the seriousness of the developing conservation crisis, and by the commitment of the researchers, hunters and support teams. Funding was approved for the final, and most expensive, *seventh phase* which commenced in April 1989 and ended in March 1993.

Increased intensities of trapping, hunting and poisoning led to the last cat being trapped in July 1991. Other than a few skeletal remains, no further signs of live cats were found despite even higher intensities of hunting and trapping effort over the following 22 months. During the core control period, from 1986 to 1993, no fewer than 76 hunters were engaged, a total of 14,357 hours of hunting was invested, 3155 cat sightings were made and 768 cats shot. In total, 197 cats were trapped, using 3227 traps and 30,000 poisoned day-old chicken baits. The total count of cats killed (excluding those that died, undetected, from panleucopaenia or poisoning), was 1080 (Bester et al. 2002).

By 2000, with no cats having been seen nor their signs detected in over nine years, it was concluded that cats had been successfully eradicated from Marion Island (Bester et al. 2000). This was unquestionably the largest successful cat eradication programme yet undertaken at the scale of Marion Island's 29,000 ha of unforgiving volcanic mountains in the sub-Antarctic. Nearly three decades passed before another extensive cat eradication project was successfully concluded – on tropical Dirk Hartog Island, of 63,000 ha – just off the West Australian coast (Algar et al. 2019).

4.4 Lessons Learned

Bester et al. (2002) suggested that, with the benefit of hindsight, greater efficacy could have been achieved by a quicker, more intense initial reduction, followed by a large and persistent effort. However, the Marion programme required considerable, lengthy and repeated consultation due to the risks and sensitivities of such a novel project. The media regularly published articles and letters on the project, positive and negative, reasoned and emotional. Further, the inevitable lags associated with mobilising the very considerable finances required for such a large programme on a remote and inhospitable island resulted in its extended timespan. Bester et al. (2002) humbly concluded that: "Few would understand what it takes to be a successful hunter on Marion Island, and particularly what was required to prove the absence of cats over the last 22 months of the programme."

In their assessment of the programme, Bester et al. (2002) noted three critical drivers of success, of which they considered the first the most important:

- The susceptibility of the Marion cat population to the feline panleucopaenia virus;
- The lack of tall stands of vegetation, which would have rendered the hunting campaign impossible due to decreased sighting rates and hunting success; and
- The recolonisation of preferred habitats, cleared of cats, from neighbouring suboptimal habitats, which served continually to concentrate surviving cats in smaller areas.

Other factors contributing to the success of the programme noted by Bester et al. (2002) were:

- The initial study of cat biology and distribution provided detailed knowledge of the cat population;
- The absence of other terrestrial predators which would have interfered with the trapping and poisoning campaigns;
- The inclusion of experienced personnel from previous teams in each new team to continue the programme; and
- The resolve of the funding bodies to provide the necessary support.

What Bester et al. (2002) did not mention, but which were equally important factors included:

- The early recognition by young researchers of the gravity of the impact of the feral cats on the bird population and the urgency to mobilise population control actions;
- The importance of the scientific and technical capacity of South African institutions, in particular the Veterinary Faculty of the University of Pretoria at Onderstepoort, and the Mammal Research Institute, University of Pretoria;
- The high quality of the basic biological studies undertaken by young researchers spending long periods, usually without direct mentorship, on the island;
- The availability of young, resilient, adventurous and extremely dedicated cat hunters, willing to work under extremely difficult weather conditions in hazardous terrain, usually in the pitch darkness of freezingly cold winter nights;
- The strong leadership and intellectual maturity of the projects' young field supervisors; and
- Finally, and most importantly, as repeatedly emphasised in the 464-page tribute volume to Marthán Bester (De Bruyn and Oosthuizen 2017), one fact is abundantly evident: the inspiring leadership of the man. Through the multiple challenges of logistics, personalities, inclement weather, hazardous terrain and financial uncertainties, Bester was able to provide calm, decisive and firm leadership of the 76 cat hunters, dozens of researchers and the inevitable demands of government administrators, advisory committee members and the interested public.

4.5 Postscript: When the Cat's Away, the Mice Can Prey

Eradication of the cat population has not removed the problem of alien predators from Marion Island. As early as 1990s the impact of cat eradication on the house mouse population, and the knock-on effect of higher mouse populations on their invertebrate prey, was discussed by Van Aarde et al. (1996). The island's mice, weighing in at a mere 20 grams, are now proving to be mortal predators on the bird populations, from the smallest burrowing petrels to large fledglings of wandering albatrosses, of up to 7 kilograms.

The task of proving that there are no cats left on the island was a considerable challenge. It took several years of concerted effort by teams of cat hunters spending tedious and often dangerous nights searching the coastal cliffs, soggy mires, rocky plateaus, broken lava flows and desolate mountains of the island. Having concluded that the cats had been successfully eradicated, assessing the recovery of the burrow-nesting seabird populations was the next priority. In 2013, 22 years after the last cat was killed on Marion Island, Ben Dilley re-surveyed the same study sites where petrel burrows had been counted by Michael Schramm in 1979. Schramm revisited Marion with Dilley to ensure replicability of the surveys. In the northeast sector of

Marion Island, 741 quadrats of 10 × 10 m were searched for burrows, following Schramm's design. Based on the known dynamics of burrow-nesting seabird populations on neighbouring Prince Edward Island, free of introduced predators, Dilley et al. (2016a) expected a three- to five-fold increase in Marion petrel burrow densities following cat eradication. However, within the 1041 ha study site, the number of burrows of eight petrel species showed only a 56% increase between 1979 and 2013 – from a 1979 estimate of 156,000 to a 2013 estimate of 243,000 burrows. Dilley et al. (2016a, 2018) concluded that the slow recovery rate of burrows was due to predation of petrel eggs and chicks by the increasing mice population.

It was not long before mice started attacking larger birds. Dilley et al. (2016b) recorded a seemingly sudden eruption of mice attacks on grey-headed, sooty and wandering albatrosses (Fig. 4.8). Following a first record of attacks on wandering albatross chicks in 2003, one-third of sooty albatross fledglings were found 'scalped' at a remote colony on the island's southwest coast in 2009 (Jones and Ryan 2010). An unprecedented increase in the frequency of mouse attacks on grey-headed, sooty and wandering albatross chicks was recorded in 2015 (Dilley et al. 2016b). Filming at night with motion-activated infra-red cameras provided confirmation that the mice attacked the heads of chicks, debilitating the birds, which in some cases were then attacked by giant petrels. The records showed that 11% of 2201 grey-headed and 9% of 1045 sooty albatross chicks were attacked by mice in the autumn of 2015. Most of the chicks died. Even the large chicks of wandering albatross have not escaped the predations of mice. Between 2003 and 2018, 32 wandering albatross chicks have been noted with mice-inflicted wounds, of which 72% died (Dilley et al. 2016b). In 2016, mice attacks on large chicks of three albatross species continued at similar levels to those seen in 2015. In 2017 and 2018 fewer albatross

Fig. 4.8 Two grey-headed albatross chicks with typical 'scalping' wounds due to predation by mice, Marion Island, 2015. (Photo: Ben Dilley)

chicks were attacked, but in 2019 attacks were again frequent and widespread, but the reasons for these annual fluctuations are not clear – what has become clear is the sudden increase of this mouse behavior was not a one-off event in 2015.

Even more alarming were the records, in 2017, of mouse wounds on breeding adult giant petrel on Marion Island and adult Tristan albatross and Atlantic yellow-nosed albatrosses on Gough Island (Jones et al. 2019). The adult birds were not killed by the mouse attacks, but the presence of many chick carcasses in the vicinity pointed to the probable cause. As Jones et al. (2019) observe, mortalities of breeding adults would have far greater impacts on the breeding populations than loss of eggs or chicks. Dilley et al. (2016b) concluded that although mice were not an important food source for cats, feral cats might have influenced mouse demography before the cats were eradicated. As Chown and Smith (1993) and Le Roux and McGeoch (2008) have suggested, a warming climate, together with cat removal, might have resulted in increased mouse densities. These reached up to 237 mice per ha (McClelland 2013). With the approach of winter, and with decreasing invertebrate food populations recorded over the past 40 years, mice might be switching their prey. Rayner et al. (2007) attributed this prey switch process to the 'mesopredator release' effect, whereby mesopredators (mice) increase after the eradication of top predators (cats). Marion Island's bird populations are again threatened by an invasive mammal (McClelland et al. 2018).

The concern regarding mice is not new. As early as 1995, a workshop of Marion Island biologists considered that the eradication of mice from Marion Island would be beneficial for the restoration of the island's ecosystem functioning (Chown and Cooper 1995). The workshop made specific recommendations on research activities needed to precede an eradication programme, including mouse population dynamics and feeding behaviour, and the differentiation between the effects of climate changes and mouse predation on the island biota. A decade and a half later, in a detailed unpublished review, Angel and Cooper (2011) concluded that most of the research proposed by the 1995 workshop had been undertaken, "justifying and providing the information necessary for a feasibility study for the eradication of the species on the island." There have been a series of studies on Marion's house mouse population, at irregular intervals from the late 1970s through to the present (Gleeson 1981; Matthewson et al. 1994; Ferreira et al. 2006; McClelland 2013; McClelland et al. 2018). Much has been learned about the interactions of mice with their physical and biological environments. The annual peak populations of mice have been increasing in response to ameliorating climatic conditions, in turn suppressing native invertebrate biomass (McClelland et al. 2018).

In order to accelerate action, John Cooper, one of the pioneer researchers on the islands' bird populations, encouraged funding from BirdLife South Africa, in partnership with the South African National Antarctic Programme (SANAP) to commission a feasibility study: "to assess whether eradication of the mice is feasible, and to review the constraints and risks to be resolved or mitigated before making such an attempt." The field study was undertaken in April 2015 and the results presented to SANAP later that year. The report (Parkes 2016) concluded that the eradication of mice from Marion Island is definitely possible, mice eradication having been successfully achieved on 62 islands, including sub-Antarctic Macquarie Island, which at 12875 ha is half the area of Marion. The tried and tested approach recommended would use up to four large helicopters to disperse cereal-based pellet baits containing the second-generation anticoagulant toxin brodifacoum. The exercise would need to be completed within a few days and repeated within 10 days. As Parkes (2016) noted: “Eradication is the permanent removal of all individuals from a defined area, Marion Island in this case. It is an all or nothing management goal – one cannot almost eradicate a pest”.

What is clear, from the available scientific evidence reviewed by Preston et al. (2019) is that: “Left uncontrolled, it is feared that 18 of the 28 species [of seabirds] breeding on Marion Island may be vulnerable to local extirpation should the mice not be eradicated.” The significance of this statement is that it is the consensus of its 31 co-authors, all with extended experience in conservation science, action and administration. The lead author, Guy Preston, as Deputy-Director General of the Department of Environment Affairs, Forestry and Fisheries, in the Ministry of Environment, spear-headed South Africa’s massive Working for Water project, which has invested more than US$1000 million in nation-wide invasive species control projects over the past 25 years, the largest conservation programme in Africa. The proposal carries the weight of sound science, decades of experience and strong government endorsement.

The concern for Marion’s bird populations is paralleled by a similar crisis on Gough Island, in the South Atlantic, where an international partnership was established to implement a mouse eradication project in 2020, led by the United Kingdom’s Royal Society for the Protection of Birds. Gough Island, of just 6500 ha, is one of the world’s most important seabird breeding islands, home to an estimated 12 million seabirds of 22 species. Predation by mice, with very heavy mortality rates, has been reported for several of its albatross, petrel and prion species (Dilley et al. 2015). The Gough Island mice eradication project has provided a testing ground for South African teams in preparation for a similar project on Marion Island in the southern autumn of 2025. The South African government has already budgeted the equivalent of US$2.2 million for the project, while BirdLife South Africa is mobilising donors and crowd-funding to provide further support for the project. However, the estimated total budget for the project is over US$20 million, a challenge that will require extraordinary fund-raising strategies.

It took over two decades of heroic efforts by more than 100 scientists and cat hunters to eradicate the cats of Marion Island. It would seem unrealistic to expect that the much more numerous, much better concealed, and much more resilient mice population could be eradicated within a few weeks of helicopter-borne aerial bombing with a shower of toxic bait. But as Nelson Mandela famously said: “It always seems impossible until it is done.”

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Chapter 5
Gorongosa National Park: Wilderness, War and Wildlife Recovery

It is one thing to draw a line around a beautiful natural area, declare it to be a national park, then add the amenities necessary to serve the public. It is entirely another thing, at a higher order of magnitude, to restore a damaged park to its original health and vibrancy.

Edward O. Wilson (2014) *A Window on Eternity. A Biologist's Walk through Gorongosa National Park*

5.1 This Once Was an Eden

To succeed, conservation programmes in Africa must take the long view. Sadly, much of conservation investment in Africa looks for quick-fixes and instant gratification. Donor funding cycles force short three- to five-year timeframes, and co-financing commitments from governments are usually shorter, if they ever materialise. The failure of short-term projects are legion. But Africa is full of surprises – even from one of the poorest countries on the continent, Mozambique.

Fifty-plus years ago – in the autumn of 1969 – my wife and I had the good fortune to spend a week of our honeymoon in Gorongosa National Park, Mozambique, as guests of my colleagues from university days, Ken and Lynne Tinley. Ken was completing a comprehensive survey on the ecology of the entire Gorongosa ecosystem, a classic study that has now – a half-century later – been published (Tinley 2021). During our visit, Ken was focusing his attention on the critical role that Mount Gorongosa plays as the source and driver of the region's ecosystem services – long before the concept became a key component of our understanding of environmental functioning and management. To demonstrate his ideas, we did a stiff one-day hike up the 1800 m mountain. We heard the calls, but did not see, several of the mountain's endemic bird species, and marvelled at the altitudinal zonation of vegetation as we ascended the steep, rain-catching mountain face. From the high peak we had a bird's view of the workings of the vast ecosystem – with Ken describing the intricate meshing of geomorphology, hydrology, habitats and fauna (Figs. 5.1, 5.2, and 5.3).

B. J. Huntley, *Strategic Opportunism: What Works in Africa*, SpringerBriefs in Environmental Science, https://doi.org/10.1007/978-3-031-24880-1_5

Fig. 5.1 Gorongosa National Park. View across the Urema Floodplain, with the Cheringoma Plateau in the far horizon. (Photo: Marc Stalmans)

Fig. 5.2 Gorongosa landscapes: Fever trees line the margin of the Urema Floodplain. (Photo: Marc Stalmans)

Fig. 5.3 Montane forests and grasslands clothe Mount Gorongosa. (Photo: Marc Stalmans)

What we saw from Mount Gorongosa during our May 1969 visit was a uniquely coherent and pristine suite of African ecosystems – rivers and lakes and floodplain grasslands and fringing fever-tree woodlands, dry thickets and forests, extensive acacia and mopane savannas and brachystegia woodlands, and on Mount Gorongosa itself, ancient grasslands interdigitating between Afromontane forests. The wildlife populations, of impala, zebra, wildebeest, sable, waterbuck, oribi, nyala, reedbuck, bushbuck, buffalo, hippo, warthogs, elephant and numerous predators had made Gorongosa a special destination for eco-tourists in the 1960s. What we did not foresee was the coming revolution, in Portugal and across its many colonies, that brought death and destruction to so many and so much. This was another chapter in the sad processes that characterised political transitions to independence across many African countries during the 1960s to 1990s. By the year 2000 the game population of Gorongosa had fallen to less than 15% of that which Tinley had recorded in the 1960s. For many, Gorongosa National Park (GNP) was added to Africa's lengthening list of failed protected areas.

5.2 Serendipity and Good Timing

Gorongosa's sad story of decline took a dramatic turn in the early 2000s. In 2004, Gregory Carr, an American intel entrepreneur, human-rights activist and philanthropist, visited Mozambique. His purpose was to discover whether there was a way in which he could help the country, one of the poorest in Africa. He eventually met with Joaquim Chissano, the then President of Mozambique, and learned of the latter's desire to rehabilitate Gorongosa and other national parks in an effort to attract tourists and thus help revitalise the country's economy. Greg Carr was immediately struck by the possibility of contributing to the dual goals of wildlife conservation and social development that a successful, long-term investment in Gorongosa offered. In 2008, in an innovative and efficient development of partnerships, the government of Mozambique entered into a 20-year agreement with the Gregory C. Carr Foundation for the science-based and people-oriented conservation management of the park – initially known as the Gorongosa Restoration Project (GRP). The agreement has since been extended for another 25 years. The project report for 2021 (Gorongosa Project 2021) describes the remarkable progress made in the decade since the first agreement was signed. The Gorongosa Restoration Project was never meant to be a quick-fix. From the start, it was a long-term commitment. It was a case of 'think big, start small'.

In 2014, after 45 years absence, I was fortunate to return to Gorongosa. The visit was both depressing and uplifting. The once abundant herds of buffalo, elephant, hippo, zebra, wildebeest and hartebeest had declined dramatically, although they were already in the process of recovery. The proud lions that had occupied some abandoned outpost buildings in the 1960s were gone. But the breath-taking beauty of the Urema floodplain, gigantic lemon-yellow fever trees and staggeringly large populations of waterbuck – now over 55,000 – were scenes demonstrating conservation success after an apocalyptic collapse. Reedbuck, oribi and bushbuck were even more numerous than in the 1960s, possibly reflecting the absence of predators such as leopard, hyena and hunting dog. By the 1990s these species had become locally extinct. Waterbuck numbers skewed the biomass distribution, and indicated the need for strengthening the predator diversity, in addition to reinforcing the herbivore populations. But that was 2014. Actions and results have accelerated over recent years (Fig. 5.4).

The Gorongosa Project (GP) – no longer called the Gorongosa Restoration Project – now has a holistic approach to the long-term socio-economic-ecological system. The Gorongosa Project's 30-year strategy spells out its ambitious vision: "A thriving, biodiversity-rich, Greater Gorongosa conservation landscape, which supports Sofala Province as an engine for resilient and sustainable development enabling nature experiences and wellbeing for its people, enriching all of Mozambique and the world." By 2019 the park and its adjoining conservation areas were being expanded as land-use agreements and transfers were negotiated, incremental steps towards the grand design of a park extending from Mount Gorongosa, across the Rift Valley and the Cheringoma Plateau to the Zambezi river floodplains of Marromeu and the sea – from the mountain to the mangroves – as originally proposed by Tinley (1977, 2021) in his benchmark ecological study.

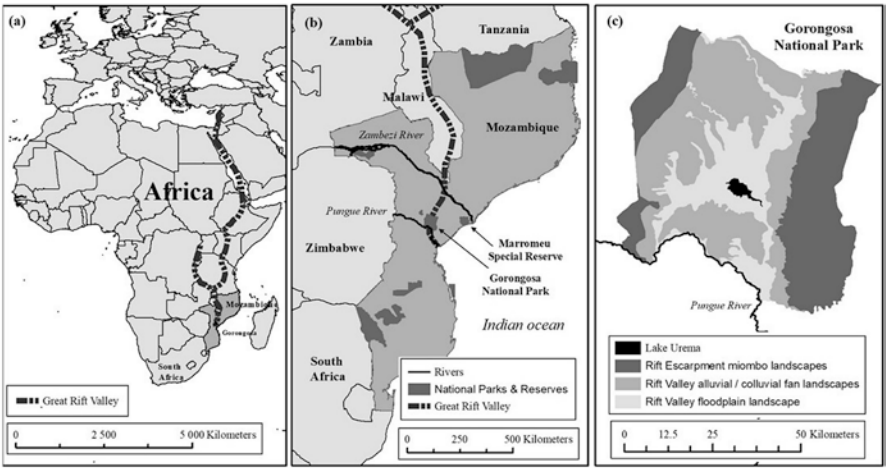

Fig. 5.4 Map of Gorongosa National Park, Mozambique, in relation to the Great Rift Valley, other protected areas and Gorongosa landscapes. (From Stalmans et al. (2019), PLoS/ONE Creative Commons)

5.3 Winds of Change: Cyclones and Peace

Much of the progress has been due to the dynamic leadership of a strong, competent and committed team of biodiversity professionals. But as with so many conservation projects in Africa, politics and people, not biologists, govern the future of wildlife. Two events during 2019 had major positive impacts on both the development process and public perceptions of the GP.

First, in March 2019 a singular event tested and demonstrated the human resource capacity and community commitment of the GP. A tropical cyclone, Idai, surged inland from the Indian Ocean and brought floods and destruction to much of central Mozambique and neighbouring Zimbabwe (Gorongosa Project 2021). GP team members acted as first responders, backed by the project's helicopters. Rescue missions delivered food and medical support by foot, canoe, vehicles and air. Over 500 tonnes of food was distributed to 80,000 people. Maize and bean seeds were provided to farmers throughout the park buffer zone to assist in crop recovery. The GP team led the rescue and rehabilitation responses for the people of the greater Gorongosa landscape. The very existence of the park, as a hydrological buffer and sink to much of the flood waters, proved its importance as an ecological service provider to the wider community.

Second, and even more significant for the long-term success of Gorongosa was the historic ceremony, held at the park headquarters, Chitengo, in August 2019 to celebrate the 'Cessation of Hostilities Accord' between the leaders of the Government of Mozambique and the opposition Renamo Party. The accord established Gorongosa as a 'Park for Peace'. Today, a new sense of the possible prevails, where once deep-rooted concern and anxiety had been a shadow over the project.

Table 5.1 Estimates of wildlife species populations in Gorongosa National Park, 1972–2020. (Stalmans et al. 2019)

Species	1972 estimate (Tinley 1977)	2000 estimate	Losses 1972–2000 (%)	2020 Population	Recovery as % of original population	Recovery as % of Original numbers
Buffalo	14,000	<100	>99	>1200	8	>8
Elephant	2500	<250	>90	>800	32	>30
Hippo	3500	<100	>97	>750	21	>20
Waterbuck	3500	<300	>91	>52,000	1480	>100
Zebra	3500	<20	>99	<50	1	<2
Blue wildebeest	6500	<20	>99	>800	12	>10
Sable antelope	700	<100	>86	>600	85	>85
Lichtenstein hartebeest	800	<100	>88	>500	62	>60
Lion	>200	<30?	>85	>150	75	>75

Fueling the optimism of participants in the GP has been the remarkable recovery of wildlife populations. Stalmans et al. (2019) and Gaynor et al. (2020) describe the rise and fall and rise again of the mammal populations of the park, from the 1960's peak, to the abyss of 2000, to the new peaks of 2021. By 2002, all species had lost upwards of 85% of their 1960s numbers. But since the implementation of effective poacher controls and the re-introduction of small breeding nuclei of key species, the recovery has been remarkable – as summarised in Table 5.1.

The dramatic changes in predator-prey structures (Pansu et al. 2018) have provided a novel opportunity to examine the trophic cascade in the park (Atkins et al. 2019) and the impact on vegetation structure (Daskin et al. 2015; Herrero et al. 2017) and functioning (Becker et al. 2021; Correia et al. 2016; Guyton et al. 2020). The predator-prey imbalances of Gorongosa have been addressed by strengthening the lion population (Bouley et al. 2018), now close to 200 individuals, and the re-introduction of African wild dogs, now over 150 (Bouley et al. 2021). Re-introductions of leopard started in 2019, and a small clan of spotted hyena were released in 2022. In fact, the wildlife populations are recovering so significantly that the park has been able to commence game translocations from its own sable, waterbuck, oribi, warthog and reedbuck populations in the re-wilding of Zinave National Park and Maputo Special Reserve (Gorongosa Project 2021).

5.4 The Socio-Ecological-Science System

Since 2005, the project has mobilised the investment of more than US$120 million in partnership with multiple donors. Project staff has increased from less than 100 to over 1000, 98% of whom are Mozambican with the majority of them coming from the surrounding Buffer Zone. Health, education and agricultural development activities are touching the lives of 200,000 people in the Buffer Zone around the Park (Easter et al. 2019). It has built four schools, provides bursaries for 37 girls to attend high school, and runs Nature Clubs in 50 primary schools involving over 2000 girls. The GP supports 88 community health workers, 129 traditional birth attendants and 159 'model moms' in the districts adjoining the Park (Gorongosa Project 2021).

Increased emphasis is now being given to community-based natural resource management, drawing on the experience of the Namibian Association of CBNRM Support Organisations (NACSO). The GP is taking advantage of the Mozambican Conservation Law of 2017 that provides for the establishment of Community Conservation Areas (CCA) as part of the formal protected area system. CCAs provide communities with the rights to manage resources themselves and the opportunities to benefit from sustainable use of these resources. Maxi Louis and Brian Jones from NACSO have been supporting the work of the GP in assisting local communities to establish CCAs or 'conservancies' as the GP is also calling them. An important characteristic of the GP has been its readiness to embrace the advice and experience of colleagues across southern Africa. In 2021, the first three Community Conservation Areas were formally established in the Sustainable Development Zones adjoining the Park (Gorongosa Project 2021).

The GP agricultural livelihoods programme focuses on two objectives – inclusive value chains, and farming for biodiversity. This is best illustrated by the Mount Gorongosa Coffee project. On sites where montane forest had been damaged by past slash-and-burn practices, indigenous trees are being planted to provide shelter and shade for coffee. Where previous slash and burn practices had led to eroded gullies, the planting of indigenous woodland and forest tree species is building a closed canopy which secures the soils and provides shade for the coffee trees. The bird, small mammal and other fauna of wooded communities are returning to the previously barren hillslopes. The activity has accelerated since the Peace Accord, with 200 ha now planted. A record 600,000 coffee trees were planted in 2021. Over 400 farmers are involved, providing a sustainable cash income. Gorongosa Coffee is the first coffee ever exported from Mozambique, with six tonnes of the first crop of over 100 tonnes of green coffee being exported to the United States in 2021. Beyond the coffee programme, GP agricultural extension services reach 10,000 farmers, with specific support for cashew and honey producers.

The science programme is now one of the most dynamic and best equipped in southern Africa, thanks to partnerships with over 30 institutions in the USA, Europe and southern Africa. The establishment of the E.O. Wilson Research Laboratory at the park headquarters, Chitengo, brings with it the prestige of one of Gorongosa's most illustrious champions. It also provides opportunities for Mozambican researchers to enhance their careers through mentorship projects and scholarships. The research programme includes studies on plant, vertebrate and invertebrate biodiversity. The All-taxa Biodiversity Inventory now exceeds 7500 species (Stalmans and Naskrecki 2019). New species, especially endemics, are being discovered and described (Branch et al. 2017; Janssens et al. 2018). Young professionals study in fields that range from the molecular systematics of ants and amphibia, to elephant ecology (Branco et al. 2019b; Gaynor et al. 2018), the genetics of primates (Martinez et al. 2019) and the exploration of the palaeontological treasures of newly discovered Miocene fossil beds (Habermann et al. 2019). Studies on human-wildlife conflict and mitigation strategies are being undertaken (Branco et al. 2019a, b). In July 2019 the E.O. Wilson Research Laboratory hosted a Wenner-Gren Foundation conference on primatology – the first ever to be convened in Africa. The science programme supports a two-year MSc course in conservation biology. The first two cohorts, each with 12 Mozambican students, graduated in 2020 and 2022. A third cohort will graduate in 2024. A new generation of Mozambican biologists is growing through applied field research in their country's most iconic landscapes.

5.5 Enter the Nay-Sayers

The Gorongosa Project has done much to build constituencies and the Gorongosa brand (Stalmans et al. 2018). But like many ambitious conservation projects in Africa, the early days of the Gorongosa Restoration Project were not free of criticism.

One short-term visiting researcher (Schuetze 2015) described emerging narratives – 'fortress narratives' – about the tensions between park-based actors and mountain residents. Based on visits to the area in 2006, 2008 and 2011, Schuetze's study was undertaken during a period of intense conflict between the two political factions that had been at war since 1973 – Frelimo and Renamo. Schuetze suggested that the GP invented a deforestation 'crisis' to support their proposal to have the mountain added to the park to protect the forests and the mountain's rich biodiversity. The assumption by Schuetze that the forests had not decreased in size, nor had such imagined decrease resulted from slash-and-burn cultivation, has not been supported by an objective analysis of high-resolution satellite imagery that showed very significant forest losses, with 45% of the forest having been lost between 1977 and 2021 (Stalmans and Victor 2022). These authors presciently describe the ongoing process of slash & burn deforestation as 'death by a thousand cuts'. The fragmentation of mature forests into patches is compounded by the drying out of the forest margins, increasing their vulnerability to regular fires.

The volatility of local communities was evident when I visited the GP reforestation project above the Murombodzi waterfall on the upper-slopes of Mount Gorongosa in late 2014. While admiring the robust growth of thousands of young indigenous forest saplings in the well-tended nursery, we were confronted by three armed Renamo soldiers, who asked us to leave. I assumed that they objected to the presence of GP rangers (who they might have considered to be aligned with their enemy, Frelimo), within the area of influence of Renamo. We later learned that the reason for their objection to our presence had no political overtones, but was simply due to the dismissal of one of their members from the reforestation project. The aggrieved party had been involved in the murder of a local villager, had absconded, was subsequently dismissed, and was fearful of arrest. Such tensions within local communities can easily lead to polarised views on and mis-interpretations of rural development projects such as the GP.

The dual-narrative line of argument was expanded in an entertaining and elegantly written but generally cynical book authored by American journalist Stephanie Hanes (2017). Hanes, like Schuetze, takes a short-term view, and a somewhat selective choice of evidence in her critique of the Gorongosa Project. Failure by the GP to take into account and solve the socio-economic problems of the people of central Mozambique within the early years of the original GP is seen as failure of the project as a whole. That centuries-old tensions between tribal groups could not be resolved in the first decade of the GP, and that health, education, communication and agricultural development were not the first priority of a privately sponsored initiative, was characterised as a neo-colonial exercise. In Hanes' view, once again, Westerners had failed in their attempt to try to help Africa. Greg Carr and the GP team, with fixed mindsets, were considered deaf to the perceptions and stories of the local communities. What Hanes ignored were the multiple challenges of conservation initiatives across Africa, where weak governance, collapsed institutions, corruption, industrial-scale poaching and poverty are endemic. A quick-fix solution to all of Africa's problems is what many short-term visitors to the continent so earnestly desire. They cynically chose to ignore success stories, such as the GP undoubtedly represents, in favour of seeking failure, large or small.

With the power of hindsight, perhaps the processes of community engagement in the formative years of the GP did not always follow what are now seen as best practises for community engagement. Community relations and partnership development require flexibility, respect, trust, participation, integration, relevance and empowerment (Lichtenfeld et al. 2019). These clear principles are easy to summarise in textbooks, but challenging to implement on the ground. The key elements require years, even decades, to consolidate.

5.6 Gorongosa as a 'Human Development Engine'

That the evolving Gorongosa Project has moved beyond the initial challenges is demonstrated in a statement by Greg Carr (2019):

"By reframing Gorongosa National Park as a 'human development engine,' we are supporting and enhancing national health services, agricultural programs, and education for local people, trying to lift them out of poverty and create more support for the park in a positive feedback loop—with a special focus on providing more opportunities for women and keeping girls in school."

As today's visitors to Gorongosa can attest, actions speak louder than words. What has been achieved since my 2014 visit would astonish any experienced observer of conservation action in Africa. Gorongosa is providing a powerful stimulus for the local economy, in an area plagued by poverty, poor infrastructure, malaria and low agricultural productivity. The Gorongosa Project, as a model of government/private sector collaboration, demonstrates what can be achieved in a relatively short time in Africa. The Mozambique government had the foresight to understand the advantages of partnering in good faith with a private philanthropist. Mutual trust and a common vision built a network of local communities and foreign expertise to rapidly rehabilitate a fractured ecosystem.

With an annual budget of US$16 million, of which 56% comes from foundations, philanthropy and donations, and 44% from cooperation partners (Gorongosa Project 2021), the GP still has a way to go before becoming financially self-sustaining. However, financial independence is a dream that no large protected area in Africa has yet attained. What is more important is that the financial model adopted by the GP is vibrant, innovative and adaptive. Its performance over the decade since the far-sighted partnership agreement was signed between the government of Mozambique and the Greg Carr Foundation is a model for any African protected area to follow.

5.7 Lessons Learned

In his succinct review of the drivers of success in two very different protected areas – Costa Rica's Área de Conservación Guanacaste and Mozambique's Parque Nacional da Gorongosa, Princeton University ecologist Robert Pringle (2017) highlights eight pillars of upgrading and expanding protected areas. With specific reference to Gorongosa, Pringle's messages can be summarised as follows:

- *Protect remaining refuges, and harness nature's resilience*: GNP provides the core area for the regional programme of biodiversity rehabilitation;
- *Upsize and inter-connect*: the GP has negotiated the proclamation of the uplands of Mount Gorongosa as an extension of GNP, and has been commissioned to manage a large hunting concession area and to establish a wildlife corridor between the concession area and GNP;
- *Be long-term and local*: the GP set a minimum of a 20-year framework for its public-private partnership, which has already been extended. Its work programme focuses on local communities as the primary stakeholders of the strategy;
- *Pay the opportunity costs*: the substantial investments by the GP in education, health care and agricultural extension are key drivers of socio-economic development in the region;
- *Develop creative financial strategies*: the initial investment of a private philanthropist – Greg Carr – has been increased multiple times through co-financing and in-kind support from over 20 corporations, NGOs, academic institutions and governments;
- *Know thy biodiversity*: founded on the early surveys of Ken Tinley (1977, 2021) – and rapidly expanded by the GP through the activities of the E.O. Wilson Research Laboratory, the knowledge base of GNP is one of the best for any protected area in Africa;

- *Be adaptable*: the courage of the government of Mozambique to initiate a public-private partnership with the Greg Carr Foundation, and the willingness of both partners to adopt a 'learning by doing' approach, required a large measure of adaptability as new challenges and opportunities arose; and
- *Involve young people*: the broad base of the GP's involvement with local communities, park staff, academics, students and researchers has capitalised on the energies and passion of youth.

What Robert Pringle did not highlight was the availability, within southern Africa, of an extensive network of wildlife conservation professionals and business models that could be adapted rapidly to Gorongosa's needs and opportunities. Fortunately, the Mozambican authorities took a leap of faith in accepting the support of their immediate neighbours, including countries with which they had been at war for decades. This example of regional collaboration in conservation research and action is one of the many 'peace dividends' coming out of the political transformation in the region since 1990. Greg Carr, knowingly or not, seized the political moment while imagining the future.

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Chapter 6
Overcoming the Taxonomic Impediment: SABONET and the African Plants Initiative

The taxonomic impediment consists of several problems: the incomplete knowledge of the largely unknown global biodiversity, the insufficient number of experts and their unbalanced distribution across the globe and the taxonomic infrastructures that are not meeting the demands yet.

Charles Coleman (2015) *Taxonomy in Times of the Taxonomic Impediment*

6.1 The Long Walk to the GEF

Sunday 11 February 1990 dawned brightly over southern Africa, nowhere more so than in Cape Town, as the sun's golden rays lit up the slopes of Table Mountain, the tourist icon of the Republic of South Africa. For some people, the mountain's silhouette portrayed a vision of another country, staring down as it did on Robben Island. The calm beauty of the scene belied a palpable tension in the morning air. It was the day on which Nelson Mandela would end his long walk to freedom (Mandela 1994). From the early hours of the morning, tens of thousands of ANC supporters, throngs of diplomats from across the globe, and a swarming mass of international media waited, apprehensively, almost in disbelief. This was the day on which Nelson Rolihlahla Mandela would be released from over 27 years of incarceration.

In Maputo, two thousand kilometres way, just beyond the north-eastern border of South Africa, a rather different group of Africans was developing a strategy for collaboration among plant scientists in a post-Apartheid southern Africa (Fig. 6.1). Thirty biologists from a dozen African countries had spent a week discussing research and coordination needs and opportunities to mobilise a new dawn for the plant sciences in the region. Southern Africa was soon to be freed from the tensions and isolation that had characterised relations between South Africa, its neighbours and the world since 1948, the year in which policies of segregation and disenfranchisement became law under the country's Nationalist Party government.

B. J. Huntley, *Strategic Opportunism: What Works in Africa*, SpringerBriefs in Environmental Science, https://doi.org/10.1007/978-3-031-24880-1_6

Fig. 6.1 Plant scientists from across southern Africa meet in Maputo, Mozambique, to formulate a collaborative programme for the post-Apartheid era. February 11, 1990

That Sunday morning, at the conclusion of the Maputo workshop's discussions, the participants walked down the potholed streets of the Mozambican capital to join a small gathering of excited people. As the hot day wore on, the crowd grew, singing resistance songs, dancing up clouds of dust, and waving tattered banners calling for the release of Nelson Mandela. We arrived in front of a rather run-down building which housed the African National Congress (ANC) headquarters in Mozambique. A local radio station broadcast the proceedings from Cape Town, relayed via loudspeakers for the benefit of the crowd. A mix of excitement and fear embraced the gathering. It was clear that some delays were being experienced in the release process. One nervous workshop delegate received a message from the Cape. There had been a right-wing attack on Mandela; rioting had broken out; Mandela had been re-arrested. Much noisy protest erupted in the crowd, but fortunately was soon calmed by what was to become the unforgettable, unmistakable, deep intonation and inspiring voice of Nelson Mandela as he addressed the wildly rejoicing crowds assembled in front of the Cape Town City Hall.

Sunday 11 February 1990 became a defining timeline in Africa's history. A less well documented narrative is that of the transformation in botanical and conservation actions that followed the heady days of the early 1990s. Here I describe two initiatives that could not have happened without political change in the region. The first, SABONET, led seamlessly into the second, the African Plants Initiative.

The Maputo meeting was a rather cathartic process for participants from South Africa, cut-off as they had been from free movement across the continent by political and academic isolation for several decades. Here, in Maputo, for the first time, we could work together with colleagues from many African states, states whose governments endorsed the United Nations declaration that Apartheid was a crime against humanity and had legislation to arrest any South African arriving in their country. The meeting was remarkably free from any rancor, and from the first day agreement was reached to establish a 'Network of Southern African Plant Scientists – NESAPS', specifically to promote information exchange, training opportunities, collaborative studies and to publish a regional journal. *Leadership* would rotate between countries, with the first two-year term based at the National Herbarium of Malawi. The context of the meeting included a view that much of post-colonial Africa had suffered from the paradox of a steady erosion of national collections (of plant and zoological specimens) simultaneous to the rise in international and national concern for biodiversity conservation. An African approach to the paradox was needed, and ambitious action plans were developed and approved by acclamation. We then walked down to the ANC celebrations.

Following the Maputo workshop, meetings were held in Zomba (Malawi) in April 1991 and in Bulawayo (Zimbabwe) in March 1993, but little progress was reported. It was widely assumed that the NESAPS initiative was dead. But events on the international horizon gave signals of hope. In June 1992 the United Nations Conference on the Environment and Development had been convened in Rio de Janeiro, Brazil, setting new global agendas for conservation. Two key outcomes were the Convention on Biological Diversity (CBD 2018) and the establishment of the Global Environment Facility (GEF). The first set clear policy directions for governments and the broader community to achieve biodiversity conservation goals, and the second provided a financing mechanism to support conservation action in developing countries.

In South Africa, the political mood since February 1990 had been swinging from elation to deep depression as negotiations between the government and representatives of the ANC, IFP, SACP, PAC and other liberation movements were undermined by violent interference from both right-wing and left-wing extremists. But the spirit of the Maputo meeting was kept alive. A further regional workshop was convened in September 1993 at Kirstenbosch National Botanical Garden, Cape Town, which brought together 140 botanists from 14 African countries. The Kirstenbosch workshop produced a regional synthesis on southern Africa's botanical diversity (Huntley 1994), plus a strategic plan to mobilise an ambitious vision of a training and capacity development network. The project would be called the Southern African Botanical Diversity Network (SABONET). All that was needed was a generous donor to fund the project. This is where the 'Long Walk to the GEF' began.

Armed with the proceedings of the Kirstenbosch workshop, communication with a wide range of potential donors commenced. Initial responses were not encouraging. As a logical but problematic policy in the new political landscape of South Africa, all foreign donors focused their support on the priorities of the former liberation movements, not on any activity led by a South African statutory institution – such as the then National Botanical Institute (NBI), hosts of the Kirstenbosch meeting.

Despite these challenges, the view of the leadership of NBI was clear – the opportunities created by the CBD and GEF were too good to miss. The timing seemed perfect, or nearly so, for SABONET. In October 1993 I wrote to an old friend, Chilean ecologist Eduardo Fuentes, who was then with the United Nations Development Programme (UNDP), based in New York. I sent him a draft of the Kirstenbosch proceedings, now in the format of a funding pre-proposal to the GEF. A reply soon arrived to remind me that South Africa was not yet recognised as a member of the United Nations, having been expelled on 30 September 1974, and as such could not qualify for UNDP support. Undaunted, we waited patiently for South Africa's first democratic elections, held in April 1994, followed by the inauguration of Nelson Mandela as its first democratically elected president on 11 May. South Africa was re-admitted to the UN General Assembly on 23 June 1994.

The path now seemed open for SABONET. In September 1994 another proposal was sent to UNDP, and this was approved by GEF/UNDP for 'initial development'. In March 1995 the revised 'Project Brief', having passed a technical review by UNDP, was held back from approval because South Africa had not yet ratified the CBD. Although South Africa had signed the CBD on 4 June 1993, it was not to become a member state to the Convention until 2 November 1995. The goal posts of the GEF seemed to keep moving.

By this time a new GEF contact person, John Hough, had been appointed at UNDP. Hough had years of experience in Africa, and was willing to play the long game. He guided us through the next steps, which required not only the complete revision of our initial rather naïve project outline, but also inclusion in the project document of signed statements, on official government letterheads, from each of the ten southern African countries that would participate in the project. This step proved to be one of the most complicated. Communications between African countries did not then enjoy the speed of the internet, and two countries, Angola and Mozambique, required all working documentation to be submitted in Portuguese. But we persisted, and by late 1995 the Project Document was dispatched to the UNDP offices in New York. I soon received a sympathetic but sobering reply from John Hough. The project proposal was excellent, but funding was not available until the second phase of GEF, that would only commence in 1997.

Unexpectedly, and fortuitously, an interim arrangement could be made. In September 1995, simultaneous to the news that GEF could not initiate funding until 1997, the International Union for the Conservation of Nature (IUCN) Regional Office for Southern Africa (ROSA) in Harare, Zimbabwe, had received funding from USAID for a Regional Capacity Building Network for Southern Africa (NETCAB). Through the support of Achim Steiner, then director of ROSA (and later Executive Director of UNEP and now Administrator of UNDP), SABONET was able to access seed funding to start its activities.

SABONET was now on a fast track. It held its first Steering Committee in Pretoria in March 1996, and in June 1996 the NBI appointed a highly competent Project Coordinator, Christopher Willis. With all arrangements in place, the project commenced training programmes, field trips and herbarium rehabilitation in its ten member countries – Angola, Botswana, eSwatini, Lesotho, Malawi, Mozambique, Namibia, South Africa, Zambia and Zimbabwe (Fig. 6.2).

Fig. 6.2 Participants from ten African herbaria at a field-based training course. (Photo: Christopher Willis)

With the project mobilised through NETCAB funding, negotiations with GEF continued. When we assumed that everything was in place, a further hurdle was presented – neither Angola nor Namibia had yet ratified the CBD. They could thus not receive GEF funds. A compromise could be arranged, given that IUCN ROSA could fund the activities in Angola and Namibia until these countries had ratified the convention. Further delays and multiple iterations of the Project Document (affectionately called the ProDoc in UNDP-speak) were exchanged between Cape Town and New York. In April 1996 the GEF Council approved SABONET, but the ProDoc needed the GEF CEO's signature – which was inexplicably delayed until September 1997. Eventually, after eight member countries had signed the approved document, the final ProDoc was signed by the UNDP Resident Representative in Pretoria on 20 January 1998. From 1 April 1998 the GEF funds became available. After a gruelling four and a half years of negotiation, the Long Walk to the GEF was over.

6.2 The SABONET Model: Learning by Doing

GEF funding totalled US$4.7 million, matched by similar funding from the ten participating countries. The project was approved to run for four years, but due to careful fund management (and the devaluation of African currencies against the dollar) it ran for nine years, 1996–2005. The justification for the GEF/UNDP investment was the project's direct contribution to achieving CBD objectives and articles, in particular:

- Article 12. Research and Training – The Contracting Parties shall … establish and maintain programmes for scientific and technical education and training in measures for the identification, conservation and sustainable use of biological diversity … and provide support for such education and training for the specific needs of developing countries …
- Article 17. Exchanges of information – Each Contracting Party shall … facilitate the exchange of information …
- Article 18. Technical and Scientific Cooperation – The Contracting Parties shall … promote international technical and scientific cooperation … special attention should be given to the development and strengthening of national capabilities, by means of human resources development and institution building …

SABONET was designed as a 'south-south' solution to capacity building, specifically to accelerate training and infrastructure rehabilitation, and to accelerate field work by young botanists in poorly documented African ecosystems. The project could also help break the dependency on the intellectual resources of the north by many African institutions. There was a wide, but not necessarily accurate, perception in the region that in post-colonial Africa the indigenous and local knowledge and skills-base had been eroded. It is true that many students had been drawn away from Africa (to study for higher degrees in northern universities, remote from the realities, needs and environmental circumstances of Africa) and many such graduates either did not return, or if they did, they rapidly entered administrative posts.

At a broader level, support for national or regional botanical diversity inventory, evaluation and monitoring had been superficial. Such interventions had seldom generated either human or institutional capacity. Where botanical surveys had been undertaken, they were often done by foreign consultants. In many cases no new, original field information had been added to the national repository of knowledge; at worst, old information had been erroneously interpreted or synthesised and had thus made a negative contribution to global knowledge on biological resources. It was felt that the situation could only be reversed by an African-based, in-service and carefully targeted human capacity and institution building programme – SABONET.

The project commenced from a zero base. Never before had the curators of the herbaria of southern Africa been able to meet on a regular basis, even less to participate in field trips, or training workshops; far less to receive funding for the basic needs of functioning modern herbaria. SABONET provided the opportunity for active partnerships to develop not only between the leaders of regional herbaria and botanical gardens, but also for in-service training of young technical and research staff. Perhaps most importantly, computers were introduced to herbaria that had never before had internet communications, nor the benefit of electronic data archiving and analysis. Vehicles and field equipment allowed for extended collecting trips to areas of high biodiversity interest (Fig. 6.3). As important as the tangible products resulting from the project was the culture of collaboration between countries – south-south and north-south – that evolved during the successive training sessions, workshops, field trips and joint publications. At the time of the project, the

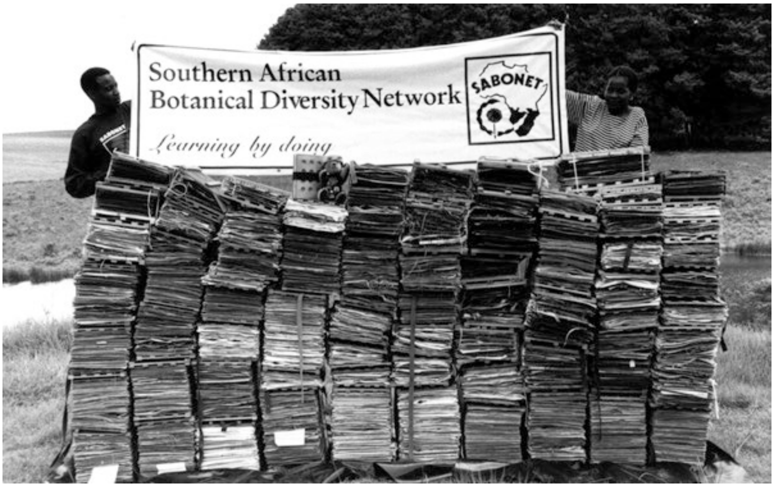

Fig. 6.3 Botanical collaboration in action: plant presses hold thousands of specimens collected during a SABONET expedition to the Nyika Plateau, Malawi, April 2000. (Photo: Christopher Willis)

internet and electronic social media were unavailable across most of southern Africa. Fortunately, the production of a hard copy *SABONET News* was a very effective medium to keep the work of all participants connected. The use of the *SABONET Report Series* also provided a rapid publication mechanism for the many technical guidelines, checklists, red data lists, field trip reports and progress reports that added to the tangible cohesion of participants and to the excitement that the project created among botanists throughout southern Africa.

The major works coming out of the *SABONET Report Series* (Fig. 6.4) including the massive compilations of the 19,518 species listed in the 892-page *Checklist of South African Plants* (Germishuizen et al. 2006) and the 50,136 species listed in the 1126-page *Checklist of the flowering plants of Sub-Saharan Africa* (Klopper et al. 2006a, b). By the early 2000s, the internet has become widely available and researchers were supported by online data bases and electronic versions of the SABONET publications, giving easy access to the project's results. The importance of these comprehensive compilations was in their provision of updated nomenclatural standards facilitating future botanical work, such as the African Plants Initiative, across the continent. The critical role of such standard checklists is frequently overlooked by the biodiversity conservation industry, where checklists or inventories of a site, a habitat, an ecosystem, a protected area, biome, country or continent are the basic building blocks of biodiversity knowledge. Until the SABONET project, such checklists did not exist for southern Africa nor for Africa south of the Sahara (Figueiredo and Smith 2008; Germishuizen et al. 2006). Nor were skills in electronic data management of herbarium collections available outside of South Africa.

Several reviews of the project have been published (Huntley et al. 1998, 2006; Siebert and Smith 2003, 2004; Steenkamp et al. 2006), while an independent GEF

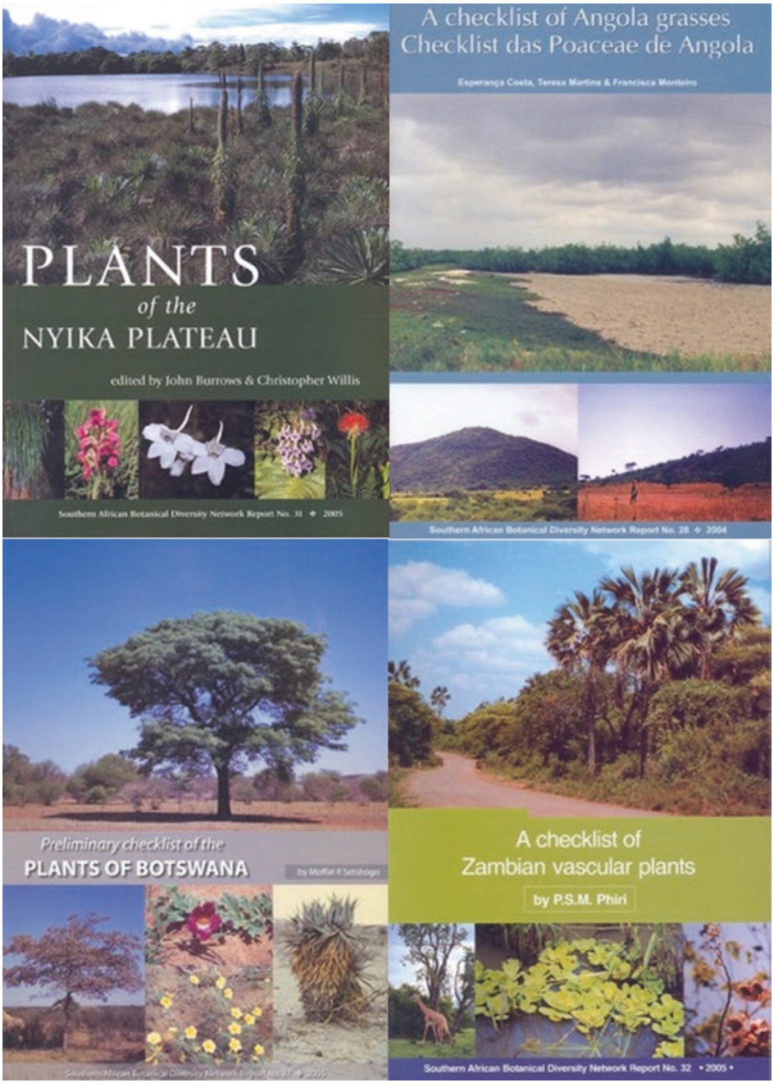

Fig. 6.4 Cover pages of some of the 43 volumes of the SABONET Report Series

terminal review (Simiyu and Timberlake 2005) gave the project a 'Highly Satisfactory' rating – the highest rank in the GEF evaluation system. Subsequent GEF publications have commented favourably on the quality of the project's products, most particularly on its publications, including 43 volumes in the *SABONET Report Series* and 24 numbers of *SABONET News*; its extended multi-national field trips in Botswana, Malawi and Mozambique; the compilation of floristic checklists for most of the 10 participating countries; plant red data lists; computerised data inventory of over 450,000 herbarium specimens; support of 26 students graduating with 36 higher degrees; and training of over 150 herbarium and botanical gardens technical staff. Many participants now hold senior positions in their national government and academic institutions. One is the Vice President of her country (Angola). In an extensive review of the history of plant taxonomy in South Africa, Victor et al. (2016) refer to SABONET as: “One of the most influential biodiversity capacity building initiatives globally.”

6.3 Lessons Learned from SABONET

The GEF independent Terminal Review (Simiyu and Timberlake 2005) concluded that “SABONET has some unique elements that were responsible for its huge success that may not be easy to replicate in other contexts.” These included:

- A strong project champion with institutional, regional and international support and presence;
- Visionary yet adaptable project leadership and management; a transparent and strong regional Steering Committee with consistent membership;
- Willing, focused and motivated team players in a regional context; and
- Highly experienced and committed support from the GEF Regional Advisor.

The above attributes were critical to the project’s operational success. However, many underlying drivers were also at play, which had both strategic and operational influence on the project results. These included:

- The political transition in South Africa dating from the date of the release of Nelson Mandela in February 1990 (and all political prisoners soon thereafter), followed by democratic elections;
- The rapid political changes in South Africa which opened up unprecedented opportunities for collaboration not only across Africa, but also to access to international donor funding;
- The changing global environmental policy agenda – triggered by the Rio conference and the resultant CBD, UNFCCC, GEF and related initiatives;
- Plant scientists from across southern Africa who found innovative mechanisms to strengthen their profession through a ‘south-south’ solution;
- The availability of seed funding from IUCN-ROSA to initiate the project during the lengthy negotiations to obtain funding from the GEF;
- The colonial legacy, which included many herbaria, and locally trained botanists, some with many years of experience, and with the capacity to mentor a new generation of botanists;
- The availability of a large and strong institution (NBI) with the capacity to provide a highly skilled Project Coordinator – Christopher Willis – to drive the founding years of the project. Strong project administration skills within NBI proved a critical ingredient for success;

- Key management skills, available to competently process financial transfers to ten different currency areas, to obtain visas for travel by participants between countries, obtain import licences for vehicles and equipment, to convene and report on meetings, publish high quality journals and newsletters, and the multiple administrative requirements attending the management of donor funds;
- The availability of an advanced computer-based data management system for herbarium collections (PRECIS) which could be extended for use in all southern African countries, and the staffing for the transfer of such skills;
- The ability to make special arrangements to support the participation of the two Lusophone countries – Angola and Mozambique – to ensure that their participants were not disadvantaged by language barriers; and
- Serendipity – the good luck and good timing of seed funding from NETCAB while GEF funding was delayed; and of the simultaneous availability of inspired and mutually supportive leaders across many countries and institutions.

SABONET had developed a new professional culture within the southern African botanical community, one that facilitated collaboration in complex, computer-aided data and information sharing systems. The region was ready for an even more ambitious project.

6.4 Taxonomy on the Fast Track: The African Plants Initiative

The individual species of plants, mammals, birds, reptiles, etc. are the fundamental units of biodiversity science and conservation action. The identity of individual species within a given community or ecosystem is the first step in any biodiversity assessment. The reliability of species identifications is dependent on sound and testable taxonomies – the system by which peers around the globe agree on what Latinised binomials (scientific names such as *Adansonia digitata* – the baobab) are given to each clearly circumscribed species. Such names are permanently attached to what are called type specimens. Type specimens are typically the original plant material collected in the field, usually dried and compressed in a plant press, mounted on a cardboard sheet and permanently preserved and archived in an herbarium. The type specimen is the point of reference for all further uses of the name, once this has been published in a scientific journal. Fine scale molecular and genetic analyses, no matter how sophisticated, should all refer back to the original herbarium-based type specimen or in the very least the herbarium specimen of the plant from which a sample has been taken.

So far, so good.

Over the past three centuries, several million herbarium specimens have been collected in Africa for scientific research purposes. These specimens were mostly collected by visiting naturalists, scientists and colonial officials and sent back to herbaria and museums in their home countries such as Britain, France, Germany, Portugal, Belgium and the United States. The vast majority of these specimens, including their type specimens, were thus deposited in European and North American herbaria (Figueiredo and Smith 2010; Greve et al. 2016). For researchers based in poorly-resourced African institutions, access to the original type specimens has therefore been almost impossible. Students of African botany have not easily been able to examine the type specimens that determine the name that must be applied to a particular species. This has created an almost insurmountable barrier for the nurturing of African plant taxonomists. Like many biologists in developing countries, they have suffered from what has become known as the 'taxonomic impediment'.

This 'taxonomic impediment' results from the combination of large gaps in taxonomic knowledge, limited taxonomic infrastructure and the decline of species experts (Hoagland 1996; Huntley 2003; Wheeler et al. 2004; Coleman 2015; Soltis 2017). The term was first used in 1995 at a meeting of the International Union for Biological Sciences (IUBS) Steering Committee on which I then served. It described succinctly a basic challenge to biodiversity science in Africa. The taxonomic impediment was what we were addressing through SABONET. It was a problem that was soon to be resolved – not through any international committee or convention – but by the innovative action by one man – William (Bill) Robertson, a senior administrator with the Andrew W. Mellon Foundation.

I first met Bill Robertson in the 1980s, when we both served on various international science committees. Bill was the respected 'éminence grise' of these research strategising bodies. His insight of what new directions in science were needed to understand environmental problems, and his wide experience of what initiatives might be expected to have remarkable results, were demonstrated in the many programmes that had their origin and impetus through the support he gave to projects of the IUBS and SCOPE.

In June 2003, after a visit to Royal Botanic Gardens, Kew, Bill Robertson came up with an unusual proposal. He had visited the Herbarium, where researchers were busy making digital images of type specimens. By carefully placing herbarium sheets, face-upwards, onto a cushioned platform, and by means of a mechanism that lowered a flatbed scanner face-down onto the specimen, the researchers were able to electronically scan the material without risk of damage to the fragile, often centuries-old, specimens. The process of using the 'HerbScan' was slow and costly. But Robertson could see the value to international botanical scholarship of being able to make the treasures of Kew, and of many other major repositories of plant collections, available at the click of a button via the internet, and through establishing a single integrated portal. The huge costs to researchers in travel, or risks to specimens through postage to partner institutions, could be vastly reduced. More importantly, it would mean that the information housed in the institutions of the north could be transferred back to the countries of origin in the south at low cost to the recipient institutions. A key objective of the Convention on Biological Diversity – for the repatriation of information, if not the physical specimens themselves, to the former colonies of European countries – could be achieved.

Shortly after his visit to Kew, Bill Robertson was in South Africa, where he visited the various projects funded by his institution – the Andrew W. Mellon Foundation. Before returning to New York, Bill called on Gideon Smith, then research director of the South African National Biodiversity Institute (SANBI – previously the National Botanical Institute). They discussed the idea of mobilising all major herbaria holding African material to digitise the type specimens in their collections for free dissemination of the images and associated information, of all the plants of Africa. The proposal matched an earlier concept for a *Types of African Plant Names* project that Gideon Smith had been developing – but the funding required was considerable.

But Robertson was not daunted. At that time, the Andrew W. Mellon Foundation was actively supporting initiatives to advance and preserve knowledge and to improve teaching and learning through the use of digital technologies. For African botany, it was a case of good luck and good timing. After a quick return to New York, Robertson was back in South Africa the following week, and met with me, as Chief Executive of SANBI, to test his ideas for a collaborative project involving Kew, SANBI and the Mellon Foundation as initial partners. The network, if his proposals were accepted, could be expanded to embrace all African and major northern hemisphere herbaria. On behalf of SANBI, I immediately agreed, and within months the proposal was tested with the leaders of over twenty African herbaria and international collaborators on the flora of Africa.

Gathered for the 17th meeting of the Association for the Taxonomic Study of the Flora of Tropical Africa/*Association pour l'Etude Taxonomique de la Flore d'Afrique Tropicale* (AETFAT) in Addis Ababa in September 2003, the directors of Africa's key herbaria convened an impromptu meeting to consider Robertson and Smith's proposal. The then director of Kew, Peter Crane, chaired the meeting, and outlined the proposal, which was eagerly received by all participants. That same evening a formal proposal was prepared by Gideon Smith, discussed the next morning with Alan Paton of Kew, and within the week this had been submitted to the Andrew W. Mellon Foundation and approved for funding. Never before in the history of botany in Africa had a major project been so rapidly conceived, formulated, scrutinised by peers from across the continent and approved for funding (Smith 2004; Smith and Figueiredo 2010; Smith et al. 2011; Nic Lughadha and Miller 2009).

The African Plants Initiative (API) moved rapidly, building on the experience of SABONET, with NBI/SANBI providing much of the guidance for African herbaria (Walters et al. 2010). A meeting of partners was held at Kirstenbosch in February 2004, and subsequent meetings in South Africa (Fig. 6.5), Cameroon and Kew guided the programme to success. By the end of the API project in 2008, 291,289 images of specimens were available electronically, 51,822 from African, 231,171 from European, and 8296 from North American herbaria (Smith et al. 2011).

Guided by an earlier user needs assessment (Steenkamp and Smith 2002, Fig. 6.6), the combined activities of SABONET and the African Plants Initiative stimulated a number of satellite projects, such as the checklist of the flora of sub-Saharan Africa (Klopper et al. 2006b, Fig. 6.7); a checklist of the flora of Angola

Fig. 6.5 Plant taxonomists from 45 partner institutions meet in Kirstenbosch, Cape Town, for the 5th African Plants Initiative workshop, November 2008. (Photo: Chris Cupido)

(Figueiredo and Smith 2008; Smith and Figueiredo 2010) and of the lycophyte and fern flora of Africa (Roux 2009).

What had seemed an insurmountable challenge in 2003 – to digitise the type specimens of sub-Saharan Africa's over 50,000 species – was completed by 2008 through a network of 73 global partners and was available, electronically, to the world botanical research community. This vast Africa plants electronic database is hosted by JSTOR, a subsidiary of Ithaka, a not-for-profit organisation founded by the Andrew W. Mellon Foundation and dedicated: "to help the academic community use digital technologies to preserve the scholarly record and to advance research and teaching in sustainable ways." The products of the API are available online to participating African institutions at JSTOR Global Plants website http://plants.jstore.org.

6.5 The African Plants Initiative Tradition Expands to Latin America and Australasia

The success of the API led the Mellon Foundation to add its support to a similar initiative, the Latin American Plants Initiative (LAPI), which together with the API, soon morphed into the Global Plants Initiative (GPI) (Ryan 2013). The global reach and influence of the herbarium digitisation agenda and the chain of activities linking API to LAPI to GPI is no better illustrated than the timely access to Mellon Foundation support by Australian herbaria to digitise their collections. During the

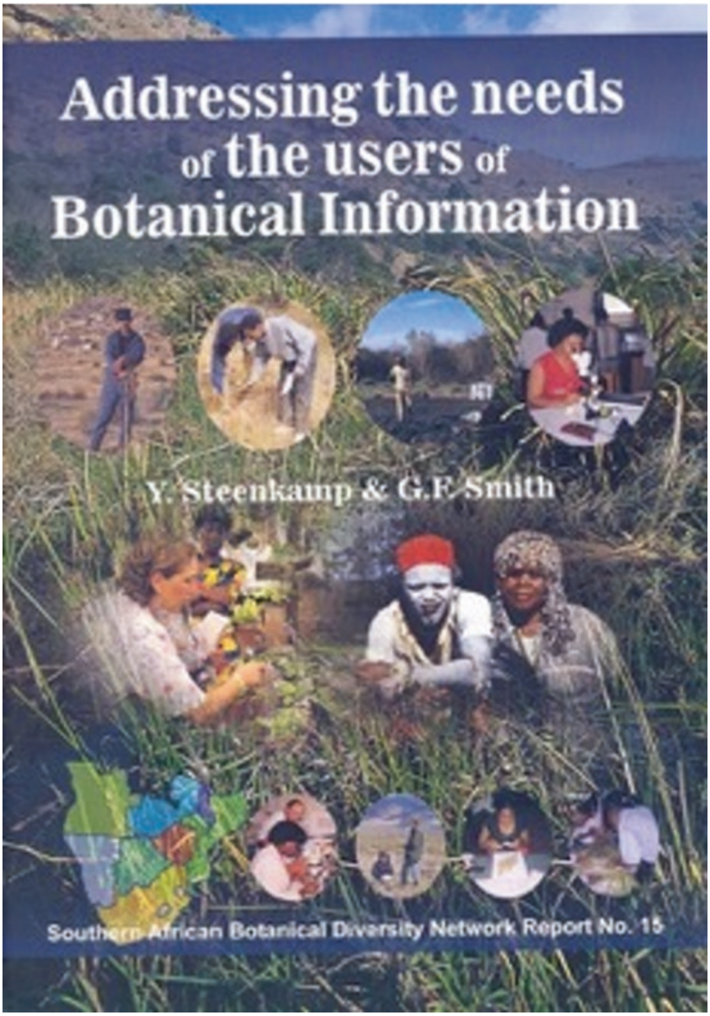

Fig. 6.6 Volume 15 of the SABONET Report series identified the user needs for botanical information. (Steenkamp and Smith 2002)

global financial crisis of 2008, the Australian government was investing in national infrastructure capabilities, including the Atlas of Living Australasia (ALA). The Mellon grant of US$540000 helped launch what was to become a major programme of biodiversity information systems – fortuitously at the moment when such a catalyst was critically needed. The grant facilitated the acquisition of imaging equipment and supported the digitisation of 71,281 types. In the words of David Cantrill, Executive Director, Science, at Royal Botanic Gardens Victoria, the GPI: "Is a phenomenal resource for the Plant Systematic and Taxonomy Community. Staff in my institution use it continually. Australian herbaria continue to supply type images to JSTOR." (Cantrill, pers. comm. 2019).

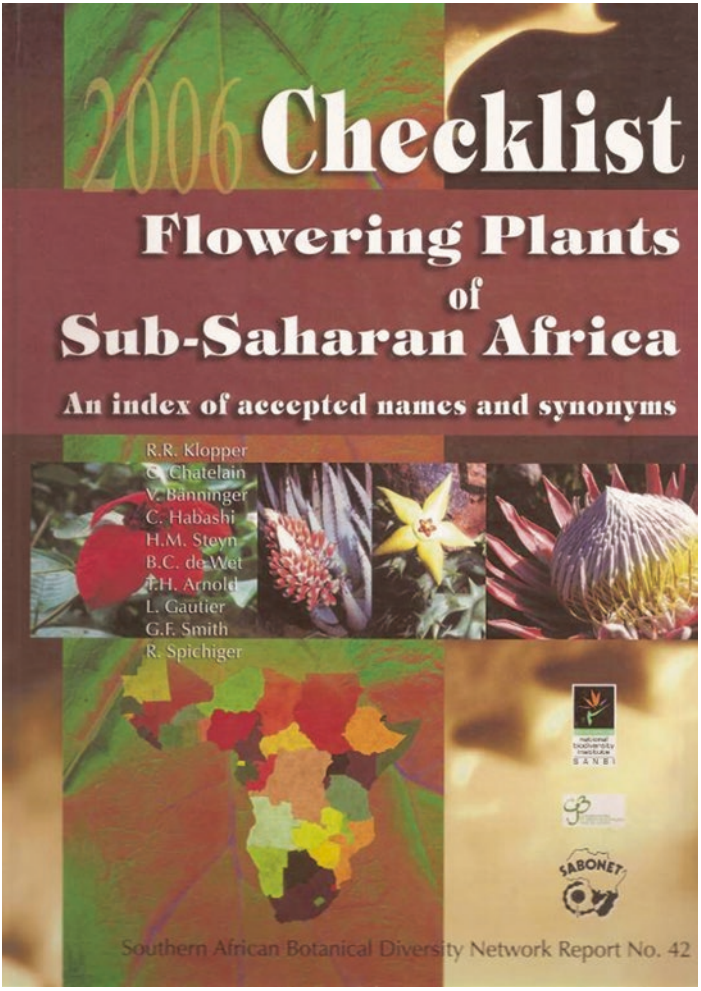

Fig. 6.7 Volume 42 of the SABONET Report series provided the first comprehensive checklist of the 50,136 species of sub-Saharan flowering plants. This listing formed the backbone of the African Plants Initiative. (Klopper et al. 2006b)

By 2017, at the conclusion of Mellon Foundation funding, the consortium of initiatives involved 329 partner herbaria worldwide, imaging and data-basing over 2.4 million herbarium sheets including nomenclatural types ('type specimens'), historic and original material, and specimens of plants endemic to a single country. Following the model of the API, the GPI products are hosted by JSTOR, in Global Plants – the world's largest database of digitised plant specimens and associated information. The investment by the Andrew W. Mellon Foundation in the suite of projects – (API, LAPI and GPI) – over 14 years of feverish activity, was several score million dollars, making possible unprecedented advances in the access to knowledge and training for botanists across Africa and beyond (Victor et al. 2016).

Unlike many multi-national projects funded by agencies such as GEF, UNDP, UNEP, etc., a formal and independent terminal review of the results and impact of the privately funded API and GPI has not been undertaken. The enormous value of the programme, however, is seen in the daily use of the digitised herbarium specimens by researchers around the globe. An early assessment was that of Nic Lughadha and Miller (2009) within a broader review of digitised botanical information. With reference to the API and GPI, these authors note: "Arguably the most significant innovation in electronic resources for botanists in the past decade has been the ability to capture, store and present high-quality images of the objects of interest, rather than simply recording the metadata relating to that object. This change, enabled by cheaper imaging technology, improved file compression standards, reduced storage costs and far-sighted funders has had a profound impact on the development and utility of botanical databases."

The evidence base is clear: the application of digitised herbarium resources has served to advance many fields of botanical research, functional ecology, climate change and biodiversity conservation in Latin America (Willis et al. 2003; Nic Lughadha and Miller 2009; Canteiro et al. 2019), Africa (Greve et al. 2016); and Australasia (Cantrill 2018).

6.6 Lesson Learned from the African Plants Initiative

In common with SABONET, the African Plants Initiative owed its success to a coincidence of many factors. These included:

- User demand for the product (from African taxonomists and conservationists needing easy access to information);
- Intellectual and institutional leadership (from Kew/SANBI/Mellon and the AETFAT membership);
- Innovation (the HerbScan device developed at Kew);
- An already tried and tested model for African collaboration (SABONET);
- Global policy incentives (CBD); and
- Generous, flexible and sustained funding (Andrew W. Mellon Foundation).

From the humble beginnings and tentative discussions of botanists in Maputo in February 1990, through the difficult and frustrating search for funding to establish SABONET, the experience gained in southern Africa stimulated a momentum that embraced similar initiatives around the globe. Plant taxonomists have overcome many of the serious impediments to their profession, and herbaria now serve a much wider spectrum of users in biodiversity conservation, environmental management and sustainable use of living resources. Herbaria and plant taxonomy have now entered the mainstream of modern approaches within the environmental sciences.

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Chapter 7
Building Biodiversity Knowledge: Mobilising Citizen Science

We are drowning in information, while starving for wisdom. The world henceforth will be run by synthesisers, people who are able to put together the right information at the right time, think critically about it, and make important choices wisely.

Edward O. Wilson (1998) *Consilience: The Unity of Knowledge p 294*

7.1 The Development of a Conservation Science Ethos

When the great Carolus Linnaeus was working on his revolutionary system of botanical classification (*Genera Plantarum* Linnaeus 1737; *Species Plantarum* Linnaeus 1753), he was able to examine the increasing number of botanical collections arriving in Europe from the far corners of the globe. One collection in particular excited his interest – that of the German physician Paul Hermann. Hermann was on a Dutch East Indiaman en route to Sri Lanka when the ship called into Cape Town in 1672. Here he made the first known herbarium collection of Cape plants (Gunn and Codd 1981). Hermann's collection included 791 items. Linnaeus was astounded by the richness of the collection. He also recognised its historical importance. In his brief *Flora Capensis*, Linnaeus (1760) wrote:

> *In this land of the Cape of Good Hope in farthest Africa no botanist ever before had trod. Oh Lord, how many, how rare and how wonderful were the plants that presented themselves to Hermann's eyes! In a few days Hermann simply and solely discovered more new African plants than all the botanists who ever before him made their appearance in the world.*

The beauty and diversity of the South African flora has captured the attention of botanists for more than three centuries, but so too has its vulnerability to the impact of human activities. As early as 1658, the Dutch colonial government published a regulation prohibiting the cutting of yellowwood *Podocarpus latifolius*, a valuable hardwood, from the forests above Cape Town (Karsten 1951). During the late eighteenth century many botanists (Anders Sparrman, Carl PeterThunberg, Francis

B. J. Huntley, *Strategic Opportunism: What Works in Africa*, SpringerBriefs in Environmental Science, https://doi.org/10.1007/978-3-031-24880-1_7

Masson) collected extensively in the Cape and had expressed their amazement at the diversity, beauty and fragility of the flora. By the late nineteenth century serious concern regarding threats to the Cape flora was noted by the founder of Australian botany, Baron Ferdinand Mueller, after visiting the Cape. In a letter dated 1895, to Sir Hercules Robinson, the High Commissioner of the Cape Colony, Mueller wrote:

> *The vegetation of South Africa is the richest in the world … special and peculiar plants are sure to be swept out of existence altogether unless special provision is made for their preservation. … these beautiful and remarkable plants will be unknown save by dried specimens preserved in State Herbaria.*

Fortunately, Mueller's grim prediction has not been realised. In the century following his call for action, much has been done in South Africa to describe, document, protect and promote its remarkable flora and fauna. In the first assessment of the proportions of major taxonomic groups falling within protected areas Siegfried (1989) estimated that more than 70% of the vascular flora (and more than 90% of amphibian, reptilian, avian and mammalian species) were to be found in the 582 publicly owned nature reserves which then occupied 5,8% of southern Africa. Today, much more detailed biodiversity statistics are available for South Africa. The country's latest National Biodiversity Assessment (Skowno et al. 2019) reported that the protected area estate of South Africa now covers nearly 9% (108,000 km^2) of the country's land area, with three-quarters of terrestrial ecosystem types now having some form of representation. The marine systems have also received attention. In 2018, twenty new Marine Protected Areas (MPAs) were accepted for declaration, covering 5% of the country's marine territory. At species level, South Africa's birds and reptiles are the best protected of the seven taxonomic groups assessed in the NBA, with more than 85% of these species considered 'Well Protected', marginally lower than Siegfried's 1989 estimates, but still very high by any international standard.

7.2 How Did this Happy State of Biodiversity Conservation Arise?

There is no simple answer to this question, but the early fascination with the fabled *Flora Capensis* by explorer-naturalists – Carl Peter Thunberg, Anders Sparrman, Francis Masson – of the eighteenth century (Gunn and Codd 1981), and a succession of hunter-naturalists – Gordon Cumming, Cornwallis Harris, Courtney Selous – in the nineteenth century (Pringle 1982; Beinart 2003), might have had something to do with the growth of a strong natural history tradition in the country. British settlers and colonial administrators arriving in the Cape from the early 1800s brought from Europe a fascination with the unusual – establishing private 'cabinets of curiosities' and public museums and herbaria. The first natural history museum established in Africa south of the Sahara was the South African Museum in Cape Town in 1825. By the late nineteenth century South Africa had five natural history museums – more than all other countries of Africa combined. This interest in natural history, and in hunting, mobilised the creation of the first protected areas and national parks in South Africa from the late nineteenth and through the twentieth century, continuing to this day.

By the mid-twentieth century, South Africa had a strong conservation culture, driven both by passion and by politics. But it lacked a shared vision and a focused direction. A new conservation agenda arose immediately following the Second World War, in the late 1940s and 1950s. The establishment of the International Union for the Conservation of Nature and Natural Resources (IUCN) in 1948 provided stimulus to like-minded people around the globe. In South Africa, provincial parks boards and nature conservation departments were created during this period. In the early years, conservation on-the-ground was focused mainly on protected areas, managed by para-military 'rangers on horseback' (Steele 1968; Huntley 1978). Ecologists and conservation scientists had little influence on protected area management. In her comprehensive history of conservation in South Africa, Carruthers (2017) characterised the pioneer years (1900–1960) as the era of 'protecting, preserving and propagating'.

Science entered the conservation endeavour with the development of an identifiable programme of ecological studies through the 1960s and '70s. Research programmes in national parks focused on 'measuring, monitoring and manipulating' – activities conducted somewhat in isolation from the broader academic and research communities of the country (Carruthers 2017). Significant changes came in the 1980s, when biodiversity science began to assert its role in the conservation of South Africa's biota (Huntley 1989), with academic and government institutions offering both training and careers in the profession. Conservation research had emerged from relative obscurity to prominence in the increasingly visible and respected arena of the environmental sciences and within the context of the challenges of rapid socio-economic development (Huntley et al. 1989). Before examining specific models of successful project implementation, it is instructive to understand the origins of South Africa's conservation science tradition.

7.3 The Emergence of Cooperative Approaches to Conservation Science

The first broad-based syntheses of South African conservation science were those of Davis (1964) and Werger (1978). These works provided benchmarks on the state of the art before the term 'biodiversity' had entered common usage. This was a time of major changes in approaches to biological research, strongly influenced by the International Biological Programme (IBP). Launched by the International Council of Scientific Unions (ICSU) in 1964, the IBP lasted for ten years (Worthington 1975). South Africa was a minor player in the IBP, but the excitement created by the introduction of 'big science' thinking, funding and action in biome projects in

Australia, Britain, Canada, Germany and the USA triggered a series of national initiatives that played a significant role in laying the foundation of modern conservation science in South Africa (Huntley 1977, 1987; Carruthers 2017).

Carruthers (2017) describes the evolution of the country's involvement in international environmental science, driven by the CSIR's Cooperative Scientific Programmes (CSP) from 1975 to 1990, more specifically by the work of the CSP's Ecosystems Programmes group. At the time, the IBP was given continuity by the Scientific Committee on Problems of the Environment (SCOPE), and through the activities of IUCN commissions and of the International Union of Biological Sciences (IUBS). South African researchers played an increasingly important role in these programmes, laying the foundations for much of the country's current leadership positions in conservation science and action. The institutional history of this process has long been forgotten, but the principles developed through the CSP remain the cornerstones of success and merit consideration.

Established by ICSU in 1969, SCOPE focused on globally important environmental problems that 'lend themselves to solution through collaborative multidisciplinary research'. The philosophy can be traced through two closely linked streams in the development of conservation science in South Africa. The first embraced a holistic approach to developing a predictive understanding of the structure and functioning of South African ecosystems. Following the 'big science' model of the biome projects, and led by Brian Walker (then at the University of the Witwatersrand), the savanna ecosystem project at Nylsvley in the bushveld of Limpopo Province studied the flows of energy, water and nutrients through a savanna woodland (Walker et al. 1978; Scholes and Walker 1993). More importantly, the Nylsvley project provided a learning exercise in the management of large projects. This early experience guided the conceptualisation of other projects in fynbos, karoo, grassland and forest biomes. The pursuit of ambitious whole ecosystem computer-driven models soon fell away, and a much broader approach was followed to study and understand the nature, distribution, evolutionary history and dynamics of fynbos and karoo systems. These whole biome studies eventually led to a series of synthesis volumes (Cowling 1992; Cowling et al. 1997; Dean and Milton 1999).

The second stream in conservation science in South Africa was initially stimulated by the IBP but brought to focus by the various SCOPE initiatives. The programme examined specific ecological processes that cut across biomes – threats to species and ecosystems, the ecological impacts of fire, of invasive species, and of land transformation. The first project responded to the need for Red Data Books (RDBs) on the levels of threat being felt by plant and animal species. This caught the attention and support of taxonomists, conservation agencies, amateur naturalists and the national and provincial environmental authorities. The voluntary effort of academics led the way. Between 1976 and 1980, Ecosystem Programmes published the first series of RDBs for southern Africa, covering birds (Siegfried et al. 1976), mammals (Meester 1976), freshwater fishes (Skelton 1977), reptiles and amphibians (McLaghlan 1978), and flowering plants (Hall et al. 1980). All these early RDBs were published in the *South African National Scientific Programmes Reports* – a series initiated by the CSP to ensure rapid publication and free dissemination of the results of the projects it was coordinating. In the following decades, these pioneer volumes were succeeded by multiple revisions and far more detailed accounts covering a wider range of taxa.

The funding and coordinating activities of Ecosystem Programmes coincided with the emergence of conservation biology as a 'self-conscious science' in the 1980s (Soulé 1985). The thinking of scientists such as Michael Soulé, Jared Diamond, Paul Ehrlich, Peter Raven and others provided a fertile platform for debate and progress in the South African research community, most especially in progressing from studies in ecosystem structure to ecosystem function and dynamics. To accelerate the process, a series of international workshops was convened by Ecosystem Programmes. The format comprised an open symposium addressed by international and regional leaders on a chosen research question, followed by a field trip to South African case studies, and concluded with a three-day writing retreat. The first workshop addressed the determinants of the structure and dynamics of savanna ecosystems (Huntley and Walker 1982), followed by similar workshops on the conservation of threatened habitats (Siegfried and Davies 1982; Hall 1984), on nutrients in Mediterranean-climate ecosystems (Kruger et al. 1983), management of large mammals (Owen-Smith 1983; Ferrar 1983), on the ecological effects of fire (Booysen and Tainton 1984), the biology of invasive species (Macdonald et al. 1987), and on long-term data series (Macdonald and Crawford 1988; Macdonald et al. 1988) (Fig. 7.1). During the period 1975–1990, over 500 participants from 13 universities, five provincial departments, seven statutory institutes, seven museums and three NGOs were involved in the identification, study and implementation of results arising from projects coordinated by the CSP.

By the end of the CSIR-hosted and CSP-coordinated Ecosystem Programmes in 1990, a culture of multi-institutional cooperation in complex environmental research had been laid (Huntley 1987, 1989). These field research and synthesis processes consolidated knowledge and identified questions for further study, but more importantly, built a strong national and international science network that mobilised

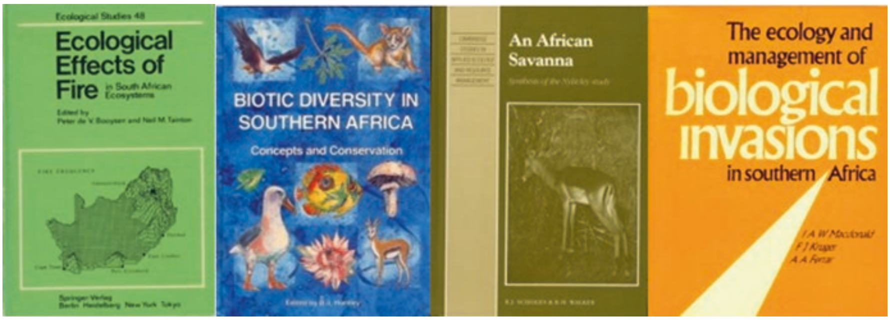

Fig. 7.1 Covers of some of the many synthesis volumes produced by the Cooperative Scientific Programmes during the 1980s

careers, introduced new thinking, and internationalised the results of South African and regional scientists (Carruthers 2017). It was the era of Wilson's 'synthesisers'.

7.4 Lessons Learned from the Cooperative Scientific Programmes

Three drivers stimulated the establishment of the CSP. First was the wave of international concern regarding the negative impacts of various environmental processes that had led to the launch of the IBP and SCOPE. The world, in the view of the scientific community, was faced by the crises of air pollution and acid rain, toxic and persistent chemicals, deforestation of tropical forests, the rise in carbon dioxide concentrations in the atmosphere and of the 'greenhouse gas effect', loss of species and habitats, and other emerging global problems. Second was the recognition, by the then President of the CSIR, Chris van der Merwe Brink (1978) of these trends and their probable deleterious impact on South Africa's growing economy. Third, the belief by the local science community that such environmental problems could not be solved simply by importing approaches and technologies from northern 'developed' countries. The IBP and SCOPE had provided a radically different philosophy to that prevailing in South Africa before the 1970s. The strongly hierarchical tradition of ivory-tower scientists working in silos, isolated from the end-users of research results, needed change.

The operational structure of the CSP evolved from a top-heavy committee system to a fairly informal network of working groups in specialist fields, gradually developing an 'invisible college' of like-minded collaborators. Workshops drew together generators of ideas and synthesisers of results, with steering committees facilitating decisions and allocating resources and ensuring open communication between participating stakeholders and the orderly progression towards agreed central goals. Projects had to meet four criteria:

- A multi- or inter-disciplinary approach;
- The cooperative endeavor of researchers from several organisations;
- New research approaches developing new skills, rather than following conventional prescriptions; and
- The commitment and active participation by decision-makers and end-users.

Towards the conclusion of the CSP, an informal evaluation of the activities of Ecosystem Programmes provided insights on the success factors, and failures, of the approach (Huntley 1987). Key factors and criteria for success included:

- The clear definition of the research objectives and the early development of conceptual models and testable hypotheses relating to their execution – developing what are now termed 'theories of change';

- Bringing together leading thinkers in ecology and environmental sciences through participation in international projects and national workshops – IUCN, SCOPE, IUBS, etc.;
- Bringing researchers together with the real-world end-users – the ultimate implementers of results – within an 'invisible college';
- Ensuring a good mix of idea-generators and idea-needers;
- Securing a critical mass of leaders and resources – but retaining an opportunistic approach to involve young 'rising stars';
- Developing trust and openness in neutral fora, and abandoning traditional academic and professional hierarchies;
- Adapting to flexible timetables and avoiding the 'tyranny of logframes' and permitting rapid responses to new challenges and opportunities;
- Avoiding data-rich, understanding-poor approaches to information gathering; and
- Facilitating the informal transfer of ideas, information, experience and learning, which often proved more effective than structured interactions.

The CSP approach was not universally accepted. A strong body of 'blue sky' academics was opposed to structured and coordinated projects, while some government institutions feared an overlap with their responsibilities by the applied nature of the CSP research focus. Without the vision and tenacity of some leaders within the network, the whole endeavour might have been disbanded during its formative years.

7.5 The Post-1990 Years – The Democracy Dividend

The major sea-change in South African conservation science and action came in 1990, coincident with, and strongly influenced by, the nation's transition to democracy. This period – continuing to the present – is what Carruthers (2017) characterised as the era of 'integration, innovation and internationalisation'. One must recall that the release of Nelson Mandela from prison in February 1990 triggered the most fundamental change in African politics since the independence events of the 1960s. While the 1960s had profound importance for those colonies granted independence at that time, the 'winds of change' (Macmillan 1960) did not reach South Africa for another 30 years. With democracy came the opportunity for South African conservationists to participate in the wave of new global policies and practices, such as those of the Convention on Biological Diversity and the Global Environment Fund.

The dramatic political changes in South Africa progressed coincident to institutional changes at national level. At the moment when the CSIR Cooperative Scientific Programmes came to an end in 1989/1990, the National Botanical Institute was established through the amalgamation of the National Botanic Gardens of South Africa and the Botanical Research Institute to form the National Botanical Institute (NBI). The NBI initiated several new programmes in response to the global priorities identified by the United Nations Conference on Environment and Development (1992) – in biodiversity, climate change and land transformation.

More specifically, NBI partnered with Botanic Gardens Conservation International (BGCI) in developing a Global Strategy for Plant Conservation, which was later accepted and approved by the Convention on Biological Diversity in 2002. In turn, many of the targets of the GSPC morphed within the broader, all-taxa targets of the CBD's Targets for Biodiversity, adopted at Aichi, Japan, in 2010. But once again, institutions had been changing, with the NBI broadening its brief by becoming the South African National Biodiversity Institute in 2004. In terms of its founding legislation – the National Environmental Management: Biodiversity Act (NEMBA 2004) – SANBI was legally required to monitor and report on the conservation status of species and ecosystems. What had been a rather informal arrangement – coordinated by CSP to produce and publish Red Data Books – became a SANBI responsibility vested in law.

Across this period of institutional change, new activities emerged to meet the demands of broader strategies. What had become clear during the heady days of the Ecosystem Programmes was the need for finer-scale data on the distribution, abundance and dynamics of the flora, fauna and vegetation of the country. The first-generation Red Data Books of the 1970s and '80s had identified large gaps in the knowledge base. The early assessments of invasive species, and the exploratory uses of systematic conservation planning indicated the need for a finer definition and mapping of vegetation, especially of those habitats that were poorly represented in or absent from the existing protected area system of South Africa. NBI, and its successor, SANBI, took their responsibilities seriously (Cherry 2005). Following the CSP tradition of collaboration among multiple institutions and across disciplines, NBI/SANBI embarked on several key information-gathering and synthesis projects. Three main thrusts brought focus to its activities.

First, as a consequence of its century-long role in plant taxonomy and herbaria, and the regional stimulus to floristic survey, inventory and electronic data-basing resulting from the SABONET project, NBI/SANBI produced updated checklists of the national, regional and continental floras (Germishuizen et al. 2006; Germishuizen and Meyer 2003; Klopper et al. 2006).

Second, it was recognised that the classic *Veld Types of South Africa* that John Acocks had single-handedly prepared based on decades of field work across the country (Acocks 1953), was at too broad a scale to serve as the base for advanced conservation planning. In 1990, NBI, with 94 contributors, initiated a 16-year project to classify, describe and map at a detailed scale, the 428 vegetation types occurring in South Africa, Lesotho and Eswatini (Mucina and Rutherford 2006).

Third, from 1990 and following IUCN guidelines, NBI/SANBI brought together the contributions of 169 botanists, both professional and amateur, to produce assessments for South Africa's 20,456 plant species indigenous to the country (Raimondo et al. 2009) – as outlined later in this chapter.

Simultaneous to these three activities, an ambitious project to gather bird distribution data from six southern African countries was launched in 1987 by what later became the Avian Demography Unit at University of Cape Town. As described below, the largely volunteer contributions of over 5000 'citizen scientists' generated a database of over seven million bird distribution records by the time of the conclusion of the first phase of the project and the publication of *The Atlas of Southern African Birds* (Harrison et al. 1997).

These were monumental efforts, involving hundreds, indeed thousands, of collaborators. The electronically accessible, geo-referenced data sets underpin floristic, avian and vegetation maps and descriptions as well as associated RDBs for selected taxa of terrestrial, freshwater and marine ecosystems. They provide the basis for the successive National Biodiversity Assessments that guide modern environmental management in South Africa (Skowno et al. 2019). Here I describe the profiles of three citizen science projects.

7.6 The Southern African Bird Atlas Project: The Evolution of Citizen Science in Southern Africa

In early 1987, when large multi-institutional projects such as the Fynbos Biome and Savanna Ecosystem projects were at peak activity, supported by generous funding from government sources, a very different biodiversity research model was being launched within the Department of Statistical Sciences at the University of Cape Town. A small team of enthusiasts embarked on an audacious mission to document the current distribution and seasonal movements of the 932 species of birds occurring in six southern African states – Botswana, Eswatini, Lesotho, Namibia, South Africa and Zimbabwe. Ten years and seven million records of bird sightings later, the project concluded – in what was and remains one of the largest completed projects of its kind, anywhere (Harrison et al. 2008). Despite its modest beginnings and budget, the Southern African Bird Atlas Project (SABAP) rapidly captured the imagination and passion of more than 5000 'citizen scientists' across the region. Each volunteer recorded sightings of birds seen around their homes or on informal travels. The efforts of citizen scientists were supplemented by professionally-led expeditions to outlying regions that would otherwise not have been adequately covered.

The success of the project can be attributed to its simple but efficient and cost-effective three-tier operational model (Harrison 1992). At the base were the volunteer observers, mostly amateurs drawn from the general public, each submitting bird lists to a network of regional committees. These honorary regional committees, comprising well informed 'birders', vetted submissions for obvious errors, and forwarded the processed field cards to the project coordinator, James Harrison, based at what became the Avian Demography Unit at the University of Cape Town (UCT). Behind this structure was the power of the statistical skills and computer hardware of the Department of Statistical Sciences at UCT, led by the project's conceptualiser, Leslie Underhill. A key strength was the protocol developed by statisticians which while simple for amateurs was designed to infer useful information such as the absence of certain birds and recording rates. Technical sophistication was matched by simplicity of application.

The network, in an era preceding modern social media, was kept informed on progress and priorities through a regular hardcopy *SABAP Newsletter*. The database consolidated records with a temporal and spatial resolution of monthly reports and quarter-degree grid cells. This was and remains SABAP's simple yet elegant formula for success.

Given the dimensions of the database, it took a team of seven editors and 62 authors four years to compile the two-volume, 1500-page product of the project – *The Atlas of Southern African Birds* (Harrison et al. 1997).

Since publication and the electronic availability of datasets on which it is based, have become watershed resources for southern African ornithology. They provide fine-scale information on the general ecology, direction and timing of migration, and the seasonality of breeding of the region's avifauna. The book provides an unmatched reference and baseline for monitoring, biogeography and conservation, and a stimulus to further research. The direct academic results include more than a dozen theses based on the project data. The impact on the competence, interest and confidence of amateur bird enthusiasts has been significant, as Harrison et al. (2008) note:

> *Not only did the simple yet scientific methods of SABAP give many birders a first introduction to how science works, but the scientific output from the project showed how small contributions could be amalgamated into a meaningful and impressive whole. This new perception of their role as citizen scientists helped many birders make the transition from the relatively straightforward activity of atlasing to the more challenging requirements of bird monitoring projects.*

Although initially conceived by South African researchers and citizen scientists, SABAP has served as a model and driver for similar projects in several southern African countries, and in other taxa such as the Protea Atlas, Frog Atlas, Reptile Conservation Assessment, South African National Survey of Arachnida, and the Southern African Butterfly Assessment.

The first SABAP (now referred to as SABAP1) has been succeeded by SABAP2 which started in 2007. SABAP2 is even more ambitious than its predecessor (Fig. 7.2). It aims to move from a 'snapshot' of bird distribution to a 'movie' of ever changing distributions, without a fixed closing date. SABAP2 has proven a valuable tool for picking up range shifts that can be linked to climate change, and to tracking invasive species dynamics. As Harrison et al. (2008) conclude: "Collectively, the atlas projects represent a new era in biodiversity field research in the region." SABAP2, now in its twelfth year of operation, has expanded into the umbrella African Bird Atlas Project, using the SABAP model across Africa (Lee et al. 2022). Key to the success of both SABAP1 and SABAP2 has been the collaboration of three distinct institutions and organisations: SANBI (governmental), BirdLife South Africa (NGO) and UCT (academic). This network overcame the challenges faced by so many conservation research and monitoring projects in Africa (human capacity, financial and technical resources, and implementing conservation recommendations). It is a model of an African solution to African problems.

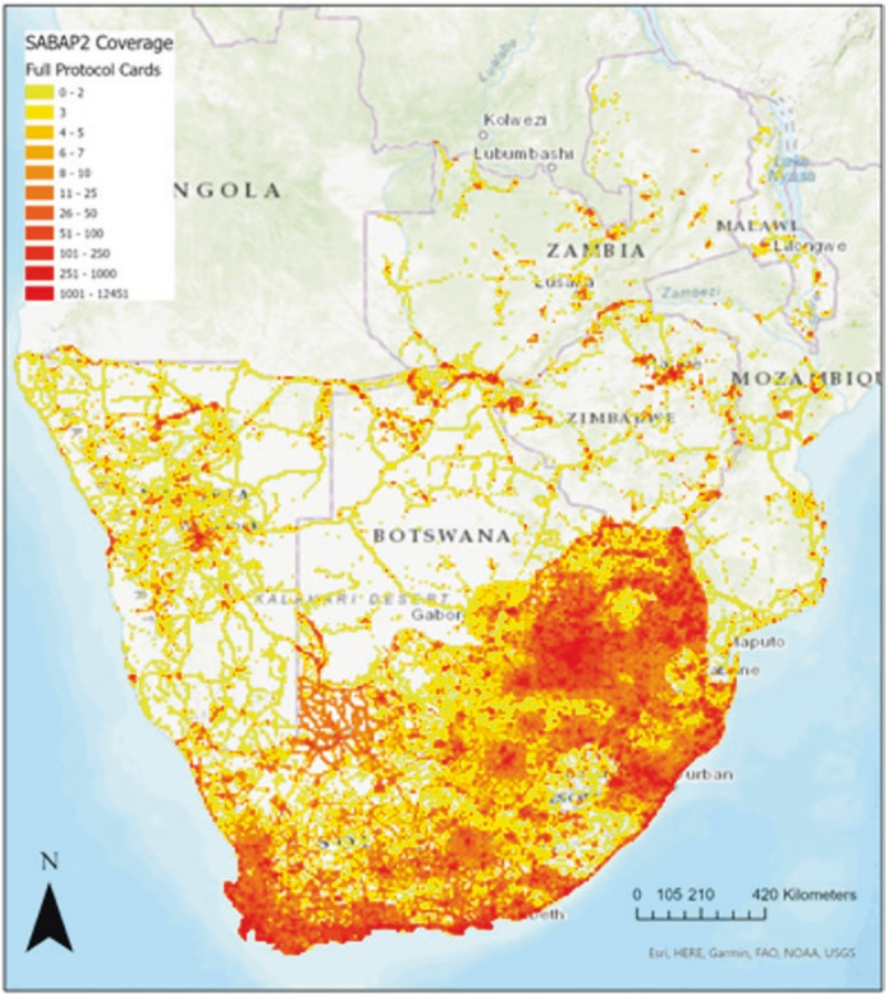

Fig. 7.2 Coverage of the Full Protocol Cards submitted by citizen scientists participating in SABAB2 during the period 2007–2022. The expanded coverage of data collection across Southern Africa during SABAB2 is impressive. (Graphic prepared by Ernst Retief)

All these atlasing projects gradually integrated into the wider network and developing role of the NBI as it transformed into SANBI, contributed to the essential and vast evidence base for national biodiversity assessments, spatial development planning and the detection of responses of species and ecosystems to environmental change (Driver et al. 2005).

7.7 Threatened Plants: A Model for the Red Listing of Endangered Species

The early history of interest in and study of the South African flora has been outlined in the introduction to this chapter and detailed in many books and papers (Hutchinson 1946; Gunn and Codd 1981; Victor et al. 2016). A long tradition of indefatigable collectors filled our herbaria with fascinating material. By the 1970s South African herbaria held over two million specimens. But this treasure trove of information was almost wholly inaccessible to potential users. At the time, Bernard de Winter, the then Director of the Botanical Research Institute (a predecessor of the NBI/SANBI), saw the need for electronic access to the vast information held in the collections. De Winter had represented South Africa on IBP committees, and was no doubt inspired by the breadth and innovation of the IBP vision. Recognition must be given to him for introducing many new approaches to plant taxonomy in South Africa (Victor et al. 2016), and for initiating what was at the time a revolutionary project to create a computerised information system for the holdings of the National Herbarium in Pretoria. This was the Pretoria (PRE) Computerised Information System (PRECIS), the first of its kind in the world. In its early years, PRECIS used punch cards for data entry and enormously large and painfully slow IBM computer housed in the Department of Agriculture's Head Office for processing. In the decades since PRECIS was established, the use of electronic data, including images of all type specimens of the flora of Africa, has become standard practice. It was the availability of computerised information on a national scale that made the second generation of Red Lists for South African taxa an achievable objective. Here I focus on just one, the Red List of South African Plants (Raimondo et al. 2009) (Fig. 7.3), which provides lessons for sharing across southern Africa.

In their succinct synthesis of the critical success factors that resulted in the assessment of South Africa's megaflora of 20,456 species being completed within just five years (2004–2008), Raimondo et al. (2013) concluded with seven key messages to help guide other large assessment processes:

- *Establish a Red List team to coordinate and conduct assessments.* The inputs of 169 professional and amateur botanists were coordinated by a dedicated full-time Red List team comprising a project manager, three ecologists and two support staff. The team ensured standardised application of the IUCN Red List categories and criteria. It provided continuity, cost-effective training, and the incorporation of the field knowledge of ecologists, of wide taxonomic expertise, and of strong computer literacy.
- *Streamline the assessment of high numbers of species via automation*. The availability of electronically accessible herbarium specimen data (backed by PRECIS and the results of SABONET) allowed rapid and automated assessment of 20,456 species in five years, assigning 9387 widespread taxa into the IUCN category of Least Concern (LC). Electronic specimen data prioritised 6000 taxa of restricted distributions that had never before been assessed. These species were targeted for

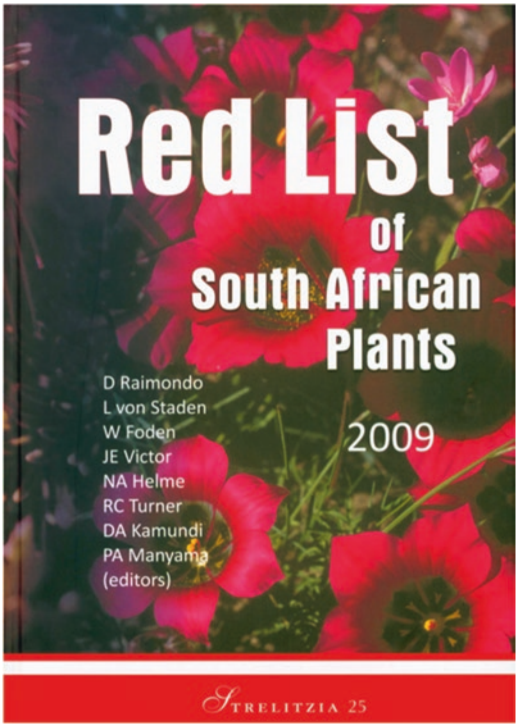

Fig. 7.3 The Red List of South African Plants synthesised expert assessments of the country's 20,456 indigenous species within five years. (Raimondo et al. 2009)

further investigation. Electronic specimen data served as a first step in threat assessment to identify those species that were clearly widespread, abundant, and unlikely to be in danger of extinction.

- *Develop a data management system that serves local conservation needs.* The project had the benefit of South Africa's PRECIS database which saved significant time. The data management system developed was more simplified than the complex and generalised IUCN Species Information System. It targeted local needs and linked directly to key information from PRECIS, in particular to spatially geo-referenced data for sub-populations of threatened species. This facility proved to be the single most useful dataset generated as part of the assessment process, and allowed intersection with other spatial information – such as vegetation maps, protected areas, topographic or climatic data, etc.
- *Invest in using the IUCN system.* In order to meet robust and testable criteria and standards for the conservation status of species and ecosystems, SANBI adopted the IUCN Red List Categories and Criteria Version 3.1 (IUCN 2001). The IUCN categories and criteria provide a quantitative, objective system that can be consistently applied across a range of taxonomic groups worldwide. According to Raimondo et al. (2013): "The value of the data obtained as part of the threat assessment process for strategic, informed conservation decision-making outweighed the effort in capturing it."

- *Focus on relevant information.* Quantitative assessments can be done with very little data. Most assessments were desktop assessments with only three basic information resources: taxonomic literature, electronic herbarium specimen data, and spatial land cover data. Threatened plant species tended to be concentrated in specific areas where high levels of endemism coincide with high levels of threat, especially the impacts of land use.
- *Save Costs*. The Red List project cost US$593291 for 20,456 taxa, or $29 per taxon. This compared well with other similar projects. Costs were contained by investing in a small team of assessors over the full period. Consultation with experts was pivotal to success, through a combination of workshops and interviews with individual specialists – the latter being more efficient than the former.
- *Achieve comprehensive assessments to ensure conservation attention for a greater proportion of the flora.* Previous RDB studies (Hall et al. 1980, Hilton-Taylor 1996; Golding 2002) had covered less than 20% of South Africa's flora. By covering all 20,456 taxa, the study added 2045 taxa to the Red List, of which 942 were threatened with extinction. The comprehensive survey also identified knowledge gaps in both conservation needs and taxonomic research (Von Staden et al. 2013).

South Africa's Plants Red List process was not a once-off project. Continuity is provided by a small dedicated team of plant ecologists which updates the status of South Africa's species on an annual basis. This same team ensures that priority threatened species are included in a variety of conservation interventions ranging from identifying and raising funds for the plants that need recovery and reintroduction to developing and implementing projects to identify key sites for the protection of high concentrations of threatened plants. Fine-scale spatial data on the distribution of plants of conservation concern, collected as part of the assessment process, are continuously fed into spatial biodiversity planning, land-use decision making and protected area expansion strategies. The Red List has been the foundation on which many elements of South Africa's plant conservation strategy have developed.

The South African Plants Red List experience is currently being shared not only across southern Africa, but also in the megafloras of Columbia and Brazil. What started as one taxonomist's passion for the rare wildflowers of the Cape fynbos (Hall et al. 1980), has now evolved into a global model.

7.8 CREW: Custodians of Rare and Endangered Wildflowers

In conservation, success breeds success. Building on the experience of the Southern African Birds Atlas project, a second large citizen science project was launched in 2003 – the Custodians of Rare and Endangered Wildflowers (CREW) project. While SABAP surveyed the distribution and seasonality of 928 species of birds, CREW has in its portfolio no less than 4809 species of plants (23.5% of the national flora) considered in the Red List of South African Plants (Raimondo et al. 2009) to be under threat. CREW tackles the challenges of assessing the status of rare and threatened plants directly, in the field, through the support of volunteer citizen scientists. It is an initiative of the Botanical Society of South Africa, affectionately known as the BotSoc. Established in 1913, simultaneous to the founding of the National Botanic Gardens of South Africa, the BotSoc has served effectively as a public support organisation for Kirstenbosch and other National Botanical Gardens for more than a century (Huntley 2012). The BotSoc is the oldest plant conservation NGO in Africa.

The CREW model differs from other citizen science projects in that it is spatially targeted, with nodes of citizens established and focused on threatened ecosystems spread across South Africa. This approach of embedding capacity across South Africa's landscapes has been incredibly valuable allowing the development of local experts on the country's unique plants and ensuring there are eyes and ears close to the ground to respond to development pressures.

In the *CREW Newsletter* of April 2019, project founder Domitilla Raimondo (2019) reported that since 2003 CREW citizen scientists have collected accurate, reliable and recent plant species data, amounting to a total of 100,570 field records for 8973 plant species (44% of the national flora). The data set included 2120 threatened and rare plants across South Africa and from a highly diverse array of families and genera. As important as the collection of data, is the collection of herbarium specimens in order to confirm identifications. The field data collected by volunteers has been used to either confirm a plant species' Red List status or to correct erroneous classifications of previously poorly known species. CREW has added 19,437 specimens to SANBI's herbaria, material that has allowed taxonomists to describe 30 plant species new to science (Figs. 7.4, 7.5, 7.6, and 7.7). The CREW teams have also participated in SANBI's ongoing collaboration with the Millennium Seed Bank (MSB) of the Royal Botanic Gardens, Kew, contributing 25% of the species of South African plants banked by the MSB since 2005.

Fig. 7.4 CREW Volunteers search for rare, threatened and poorly documented species in the highland grasslands of Mpumalanga. (Photo: Mervyn Lotter)

Fig. 7.5 New, rare and threatened plant species re-discovered by CREW field workers: *Oxalis* sp. nov. (Photo: Brian du Preez)

In common with the SABAP projects, CREW provides data essential to formal Environmental Impact Assessments, and specifically to the new and mandatory Environmental Screening Tool being developed by SANBI and the Department of Environmental Affairs. Raimondo (2019) noted that this integration of citizen science data into government land-use planning and decision making is globally novel.

Although the use of volunteer and amateur botanists in threatened plant surveys was conceived within the floristically megadiverse Cape Floristic Region, where the vast richness of rare and often narrowly endemic species challenges the time and energy of the small core of professional workers, CREW rapidly expanded its activities across South Africa, with 'nodes' of volunteers in every biome and major vegetation type of the country. Although closely linked to the activities of central government agencies, CREW teams now work with provincial, metropolitan and non-governmental organisations, and in particular with the Biodiversity Stewardship programmes, identifying key sites to be brought under protection. CREW volunteers are true custodians: they alert relevant government officials to any threats impacting endemic rare and threatened plants such as the spread of invasive alien species within nature reserves, or the possibility of inappropriate development on fragments of threatened vegetation where threatened plants are concentrated.

Fig. 7.6 New, rare and threatened plant species re-discovered by CREW field workers: *Lobostemum belliformis.* (Photo: Dave Underwood)

The impact of CREW is best summed up by an independent review (Stewart 2019) of the project:

> *By leveraging the goodwill, expertise, time and financial resources of volunteer citizen scientists, SANBI and the Botanical Society have been able to acquire vastly more data and contribute far more widely to conservation initiatives than if the programme had been implemented only by employed staff. In light of the vast geographical extent of the country, the immense diversity of South Africa's flora, and the depth of skills and experience needed to accurately identify species, which take an extensive period of time to acquire, the programme has to date delivered a very high return on investment.*

Fig. 7.7 New, rare and threatened plant species re-discovered by CREW field workers: *Erica pilulifera.* (Photo: Cliff Dorse)

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Chapter 8
Bridging the Gap: Community Conservancies in Namibia and Zimbabwe

We need to see process as an end as well as a means, and to accept that the core objective of Community Based Natural Resource Management (CBNRM) is increased communal capacity for adaptive and dynamic governance in the arena of natural resource use. It is about local capacities to handle change and to negotiate the human impact on nature from past to future. It is as much about resourcefulness as it is about resources … The core objective of CBNRM is increased communal capacity for adaptive and dynamic governance in the arena of natural resource use.

Marshall Murphree, quoted by Rowan Martin (2009)

8.1 Introduction: The Parallel Development of Community Based Natural Resource Management in Southern Africa

This is the story of two remarkable initiatives rooted in a common concern – how to ensure sustainable benefits to rural communities while conserving the natural resources of remote arid ecosystems in southern Africa. It is a story of 'rare combinations of people and circumstances' (Child 2019).

These parallel narratives have as their actors a handful of people of great passion, fortitude and unwavering commitment to overcoming challenges. To the west of southern Africa, in the Kaokoveld of Namibia, Garth Owen-Smith was driven by a socio-ecological perspective – a romantic vision of an arid Eden occupied by Herero and Himba pastoralists living in peace with elephants, rhinos, oryx, springbok, cattle and goats, sharing dramatic desert landscapes. Owen-Smith's point of departure was empathy with rural subsistence pastoralists living without legal title to land nor access to the values of the wildlife among which they lived (Owen-Smith 1971, 2010).

To the east, in the Zambezi valley of Zimbabwe, Rowan Martin, Russell Taylor and Brian Child, using economic and ecological principles, sought the transformation of the degraded rural rangelands surrounding national parks into profit centres

B. J. Huntley, *Strategic Opportunism: What Works in Africa*, SpringerBriefs in Environmental Science, https://doi.org/10.1007/978-3-031-24880-1_8

based on a sustainable-use model financed primarily through trophy hunting (Martin 1986; Child 1988; Taylor 2001). Their initial worldview was that of managers of protected areas – threatened islands of biodiversity in a sea of rapidly degrading landscapes.

Across southern Africa, these young visionaries of the 1980s were seeking the ultimate nirvana of sustainable, well-governed community-based natural resource management (CBNRM) systems. Observing the failure of prevailing 'command and control' or 'fortress' approaches to conservation, they sought new paradigms. Their transformational agendas required over two decades of commitment, building on the firm tradition of wildlife conservation in the region.

During the 1950s and '60s, southern Africa had established a world-class body of conservation professionals. Pioneers such as Jack Vincent, Ian Player and Tol Pienaar in South Africa, Reay Smithers and Roelf Attwell in Zimbabwe, and Bernabie de la Bat in Namibia had built globally respected national park organisations. They were followed by a younger generation influenced by the writings of Aldo Leopold on wildlife management, and by visitors such as Ray Dasmann, Archie Mossman and Thane Riney on the sustainable use of wild ungulates (Leopold 1933; Dasmann and Mossman 1961; Riney 1964; Mossman and Mossman 1976). In the 1970s, Graham Child sowed the seeds of community engagement in Zimbabwe, Ken Tinley had championed 'peripheral development' to involve the communities living in and adjacent to parks in Botswana, Namibia and Mozambique, and John Hanks promoted the importance of extending conservation benefits to people surrounding the protected areas of Zambia. But it was in the Kaokoveld and the Zambezi valley that the real crucibles of new paradigms were gaining heat. It is on these regions that this narrative will focus.

8.2 Passion, Vision and Strategy – Taking the Long View in Namibia

In August 1967, 23-year-old Garth Owen-Smith (Fig. 8.1) made his first brief visit to the Kaokoveld of north-west Namibia (then the mandated territory of South West Africa). Having dropped out of university in early 1962, he had worked as a forester in KwaZulu-Natal for several years before taking a shaft-setter job in a copper mine at Tsumeb, Namibia – a far cry from the life of a game ranger envisioned in his youth. A chance visit to the basalt hills, gravel plains and sandy grasslands of the arid Kaokoveld was to change his life. Abandoning his brief mining digression, and to clear his mind, he bought a bicycle and headed off across the Kalahari – through central Namibia, across Botswana and into and across Zimbabwe – and then back through South Africa to KwaZulu-Natal.

On reaching home, Owen-Smith promptly applied for a posting in the Department of Bantu Administration and Development – the Apartheid-era organisation responsible for the Black 'Homelands' of South Africa and Namibia. Somewhat miraculously, through good luck and good timing, he was offered a position as an

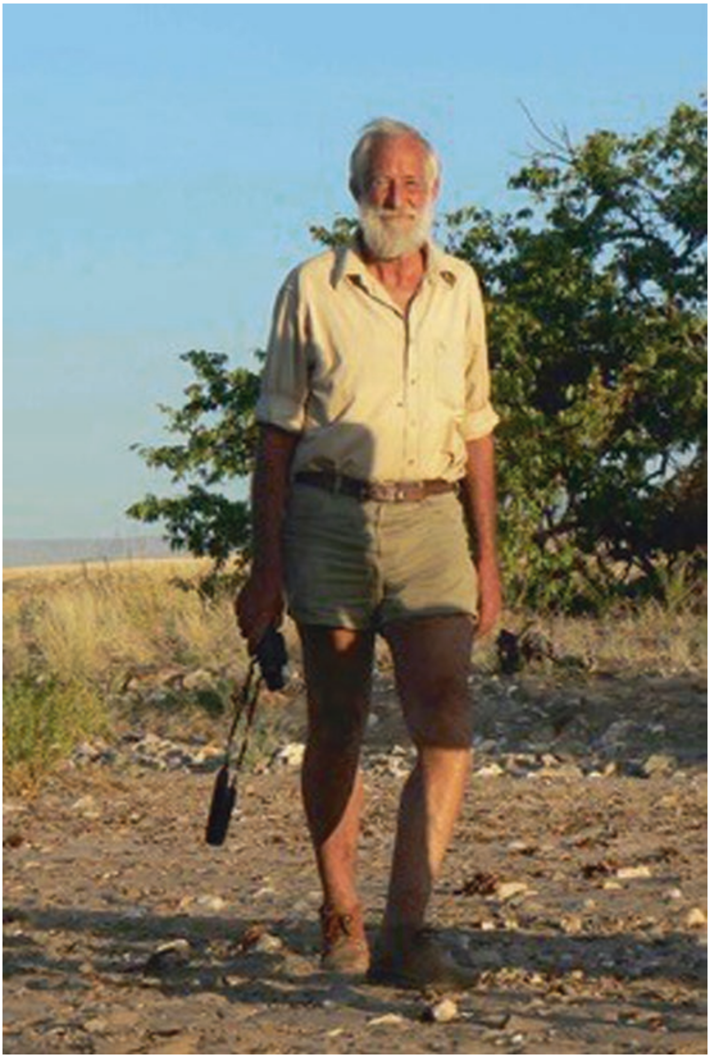

Fig. 8.1 Garth Owen-Smith – a visionary in community-based natural resource management. (Photo: John Mendelsohn)

agricultural officer in Opuwo in August 1968. This placed him back in the heart of the Kaokoveld, which stretches from Namibia northwards across the Cunene River into Angola (Figs. 8.2 and 8.3). He spent the next three years studying the region's landscapes, geology, vegetation, animals, and most importantly, getting to know the local tribal people, their culture, lifestyles, grievances and expectations. His genuine empathy with the Himba and Herero pastoralists soon placed him at loggerheads with the deeply conservative administrators of the Apartheid institution into which he had, opportunistically, placed himself.

Fig. 8.2 The intermontane plains of Iona National Park, Angola, stretches across the Cunene River as the Marienfluss of the Namibian Kaokoveld

Fig. 8.3 The Cunene River cuts deep gorges through the mountains that straddle the border between Namibia and Angola. Garth Owen-Smith and two companions walked down the final 100 km stretch of the Cunene River, through the Kaokoveld as seen in this aerial view

In the 1960s, the wildlife populations of the Kaokoveld were healthy – Garth estimated 5000 Burchell's and 1200 Hartmann's zebra, together with thousands of springbok and oryx and hundreds of kudu and elephant. The Himba and Herero cattle herds numbered over 120,000 head. He was soon the best-informed authority on the general ecology and peoples of the region, which due to its isolation and the prohibition of entry to all but government-approved visitors, had long remained a *terra-incognita*.

In 1970 the South African government implemented a major programme of social engineering in Namibia. The Odendaal Commission de-proclaimed the western section of Etosha Game Reserve to create the Apartheid homelands of Damaraland and Kaokoland. These vast territories soon became a hunter's paradise for resident government officials and visiting VIPs. Quick to offer outspoken criticism of the government's Apartheid policies and the absence of control of poaching practices, Garth was transferred out of Kaokoveld in 1971. He landed back in KwaZulu-Natal and decided to return to university. He endured three months of what he described as 'Stone Age Biology', and was soon once more an unemployed dropout. But once again good luck and good timing came his way. He was encouraged by friends to write up his Kaokoveld work and present it at the annual congress of the South African Association for the Advancement of Science. The audience included Nolly Zaloumis, soon to become president of the Wildlife Society of South Africa, and a key player in Garth's future. Nolly introduced Garth to Neil Alcock, a revolutionary thinker testing pasture restoration by rotational grazing in one of the most degraded tribal lands of the Tugela Valley. Neil's wife, Creina Bond, dynamic editor of *African Wildlife*, arranged for the publication of Garth's report.

The Kaokoveld: An Ecological Base for Future Development and Planning (Owen-Smith 1971) challenged both the government's controversial Odendaal Report, and the proposals of the leading ecologist in Namibia at the time, Ken Tinley (Tinley 1971). Garth drew 13 conclusions, including:

- 1. Although considerable numbers of elephant, zebra, kudu, impala and springbok still survive on the Kaokoveld plateau, a realistic assessment of the position on these fertile highlands, *dictates that the requirements of the human population must take precedence in any conflict of interest* – even if it means the disappearance of much of the local fauna.
- 5. In the context of South West Africa's rapidly expanding tourist industry, a game reserve in the western Kaokoveld has vast potential as a tourist attraction. In time this potential can be turned into an economic asset to the country as a whole, *but particularly to the people of the neighbouring homelands.*
- 10. Conservation education is essential, and local participation should be encouraged at all levels. *In future a considerable portion of any revenue derived from tourism should be channeled directly to the existing tribal trust funds* and when established, to the homeland treasuries. (My italics).

The report caused some controversy, but presciently foresaw key elements of a future community-based approach to conservation.

Ever restless, Garth then took off for nearly a year wandering across Australia. He was in search of answers to arid zone rangeland management questions, but as described in his fascinating autobiography (Owen-Smith 2010), he failed to learn anything from the unsophisticated cattle ranchers of the outback of the vast country. Soon after his return to South Africa, he was back in Namibia, to assist in an ethnobotanical study of the Kaokoveld. But his attempts to obtain employment in the then South West Africa administration was blocked by his lack of a security clearance, a consequence of his critiques of government policies. He was able, however, to obtain a post at the Cwaka Agricultural College in Zululand – a college reserved for Black students – where he would teach ecology. Despite having twice dropped out of university, he was a typical autodidact. Through reading widely and through observant field work he soon developed as good a grasp of the fundamentals of ecology as any graduate. As a teacher, he realised the he had to bring ecology "down from its scientific pedestal and make it into a commonsense subject that anyone could understand." He delayed taking up the Cwaka post until after a brief trip to Iona National Park in the Angolan Namib, during July 1974. The objective of the visit was to walk down the final 100 km of the Cunene River as it passed through the deep gorges that separate Namibia and Angola on its way to the Atlantic Ocean at Foz do Cunene (Fig. 8.3). Here he recorded the poaching, in Angola, of elephant by helicopter-borne South African soldiers. His photographic evidence reached me in Luanda within weeks. At the time I was ecologist to the national parks of Angola, and I was able to present the incriminating photos to the South African Consul General in Luanda – triggering quick but probably ineffective disciplinary actions within the military based in the Kaokoveld.

By early 1975, Garth had left Cwaka and had joined the Wildlife Society's African Conservation Education project based in Mtunzini. But this rich experience of working with Zulu school children and teachers did not last long. In late 1976 Garth had moved to Zimbabwe (then Rhodesia) – to the vast Leibig's Ranch in the war-torn eastern Lowveld. Responsible for thousands of head of cattle on the most extensive private ranch in Africa, he learnt much about animal husbandry and commercial farming operations. Key to his experience was his work with innovative range scientist Allan Savory, who was testing his 'Advanced Rotational Grazing' system (Savory 1988) of non-selective, high intensity grazing in arid savanna.

As Rhodesia descended into full-scale civil war, the call of the Kaokoveld proved too strong, and Garth headed back to Windhoek early in 1980. Bernabie de la Bat, Director of Nature Conservation, enticed Garth with the hint of a possible posting in Kaokoveld. But the only vacancy available was in the south, based at Keetmanshoop. Here he learned about commercial small-stock farming on the margins of the Namib desert – about farmers, poachers, legislation and the machinations within government departments. As he notes: "Another decade had drawn to a close … it had been a nomadic experience … in four countries and many different fields … government, NGOs and the private sector. I learned most 'on the job' from three visionary men: Nolly Zaloumis, Neil Alcock and Allan Savory."

From Keetmanshoop Garth proceeded not to the Kaokoveld but to Etosha National Park. Here he did not settle well in the competitive circle of professional egos. In late 1981 he was offered a position in a new NGO – the Namibia Wildlife Trust (NWT). He joined on a two-year contract, funded by the South African Endangered Wildlife Trust, in March 1982. His posting was at Wereldsend (World's End). "The last farm before rainfall became too low even for karakul sheep" and 120 km from Khorixas, the last petrol depot.

The objective of the NWT Damaraland/Kaokoveld project was to stop poaching, a problem that had accelerated in the decade since Garth had left the area. In 1982, Garth's colleague in the Department of Nature Conservation, Chris Eyre, reported that 76 lions, 33 cheetah and 9 leopards had been killed by farmers and trophy hunters. Unknown numbers had died of starvation, as drought devastated the wildlife and domestic stock of Damaraland and the Kaokoveld in the late 1970s and early '80s. Estimates in 1977 for Kaokoveld wild ungulates gave 1199 Hartmann's zebra, 667 Burchell's zebra, 1191 oryx and 4 859 springbok. For 1982 the counts gave 193 Hartmann's zebra, zero Burchell's zebra, 164 oryx and 217 springbok. Although not truly comparable, these estimates gave a clear indication of trends. More alarming to conservationists was the poaching of Namibia's charismatic 'desert' elephants of Damaraland and the Kaokoveld (Fig. 8.4). In 1980/82 over 100 elephant carcasses were found, and estimates reflected a decrease in the elephant population of north-west Namibia from 1200 to less than 300 over the 12 years since 1970. The majority had been poached for ivory. The incidence of poaching of black rhino was also rapidly increasing.

The anti-poaching approach taken was unconventional. Garth Owen-Smith insisted that the prevailing paradigm of conservation being a 'whites only' profession had to be changed. Rather than having khaki-uniformed (white) rangers hunt the poachers, he insisted that members of the local Himba and Herero pastoralists be drawn into the project. His approach was incremental. He first engaged with the tribal headmen that he had grown to know over more than a decade, and who respected his genuine concern for their welfare. While arguing the potential benefits of restoring the devastated wildlife populations, through the prospect of tourism and

Fig. 8.4 Elephant in an arid valley in the heart of the Kaokoveld. (Photo: John Mendelsohn)

ultimately the sharing of harvested game, Owen-Smith was well aware of the Himba's perspectives. Traditional headman Joshua Kamgombe confided: "It is easy for us who have full stomachs to talk about protecting wild animals, but it is hard for a man to put his firearm away if his children are hungry. When a man has no cattle left, his stomach is the only thing he listens to" (Owen-Smith 2010).

Owen-Smith convinced his NWT trustees that neither they, nor the government Department of Nature Conservation (DNC), should employ the 'community game guards'(CGGs). These should be selected by, and report to, their traditional leaders, not the government or an NGO. NWT would provide rations for the guards, and would mentor and train them, receive monthly reports from them, and keep them actively engaged in the dynamics of the anti-poaching project. While the CGGs revealed multiple illegal hunting events, they ensured that each investigation was conducted with respect for the dignity of the perpetrators, avoiding the antagonisms resulting from conventional law enforcement approaches. The first year of CGG project cost the donors less than US$1000.

It was not long before the activities of the NGOs started to irritate some ultra-conservative members of the DNC. Owen-Smith's open fraternisation with the Himba pastoralists, and his involvement with anti-poaching activities (seen as the exclusive responsibility of the DNC) led to the termination of the Damaraland/Kaokoveld Project in early 1984. The Endangered Wildlife Trust (EWT) threw him a lifeline until the end of 1984, and provided funding for the CGGs. Sadly, the highly competent DNC senior conservation officer, Chris Eyre, a strong supporter of the NWT, was transferred out of the north-west to the conservation Siberia of Keetmanshoop. Ever financially straightened, Owen-Smith limped through 1985 and into 1986. Slender support kept the CGGs operational, and the effective poacher control and improved rains brought rapid growth to the game populations. Between 1982 and 1986, aerial surveys showed a 90% increase in Hartmann's zebra, 180% for oryx and 300% for springbok. In Garth's view: "The populations of the desert-adapted ungulates were well on their way to recovering."

In 1986 Garth Owen-Smith met a new life-partner, journalist and ethnologist Margaret Jacobsohn. While accepting Garth's belief that local people did *care* about wildlife, Margie challenged him to show how they could tangibly *benefit* from conservation. How would his impact extend beyond the older generation of Himbas and Hereros, to the young school children who had grown up in urbanising communities, isolated from the natural environment and the traditions that regarded wildlife as part of their cultural heritage? How could black people, excluded from any benefits from wildlife for generations of colonial policy, be expected to adopt protective measures for troublesome elephants, rhinos, lions and leopards? Margie negotiated with the Endangered Wildlife Trust, whose new director, John Ledger, promised to fund Garth and the CGGs from April 1987. After a break of two years, Garth was again earning a salary. He set about writing an article for the EWT magazine *Quagga*. Reflecting on the gulf between conservation thinking, policy and action as applied within privileged white and disadvantaged African communities in the three southern African countries (Namibia, South Africa and Zimbabwe) he made several key points (Owen-Smith 1987):

- "With few exceptions, no attempt has yet been made to promote wildlife utilisation to the material benefit of African subsistence farmers.
- Far too many game rangers/nature conservation officers still carry out their duties with an arrogance that implies little sympathy or concern for rural blacks and their legitimate endeavours in overgrazed and overcrowded 'homelands'.
- In many areas wild animals still prey on black subsistence farmers' livestock and damage crops.
- With the rural black man on our side, wildlife could once more take its rightful place as one of Africa's greatest resources. With the him against us, little of what conservationists hold dear is likely to survive the twentieth century."

Owen-Smith's article concluded: "Only the government has the authority to change legislation, and in the long-term only it has the financial and staff resources to undertake effective conservation and education programmes. Non-Governmental Organisations can and must accept this challenge. It is not their role to usurp the legitimate functions of government, but to act as pathfinder and catalyst. Once a new way has been tried and proved, the NGO should withdraw, leaving it to the government agency to entrench and extend those projects that were successful."

Shortly after his article appeared in *Quagga*, Garth and Margie attended an IUCN conference in Harare on 'Sustainable economic benefits from wildlife utilisation and its contribution to rural development'. Here they learned of the emerging community-based conservation projects CAMPFIRE in Zimbabwe and ADMADE in Zambia. While differing in drivers and approach, there was much in common across these initiatives. Most importantly, they met up with the key innovators in Zimbabwe – Rowan Martin, Russell Taylor, David Cumming and Brian Child. Garth wondered how different things would have been if the relationships with tribal leaders and communities had commenced much earlier in Zambia and Zimbabwe, before the mass killings of elephant and rhinos in those countries. He also regretted that Namibian and South African conservation authorities, still locked in 'command and control' paradigms, had not attended the workshop.

Garth and Margie returned to their Kaokoveld base at Purros, where Margie was studying the life of the Himba community, and Garth continued his CGG project, wrestling eternally with the bureaucrats in Windhoek. In 1989 he applied for funding from WWF headquarters in Switzerland, where John Hanks was conservation director for Africa. John had spent his formative years as a wildlife ecologist in Zambia and Zimbabwe and had written extensively on the importance of the sharing of rights and benefits of natural resources with local communities (Hanks 1976, 1979). In 1990, this fortuitous connection between Garth and John resulted in a new era of funding from WWF, via the EWT, to continue the community game guards project in Kaokoveld and in the Caprivi. At last, implementing the Kaokoveld vision had the promise of strong and predictable funding.

8.3 Changing Tides: Independence and Innovation

On 21 March 1990, independence was celebrated in Namibia, with Sam Nujoma, leader of SWAPO (South West Africa Peoples' Organisation) as its first president. The winds of change sweeping across Africa since 1960 had finally reached Windhoek – the 'windy corner'.

The first sign of real change was the response Garth and Margie received to an article that they had published in *The Namibian* newspaper the day before the final election results were released. It concluded: "The challenge now facing wildlife conservationists is to reconcile the needs and aspirations of people – particularly those communities that are living in or around our wildlife areas." Brian Jones, a former journalist who had frequently promoted Garth's views, had joined DNC. He asked Garth and Margie to meet with him and Chris Brown, a leading young progressive voice within the still conservative department. The meeting formed the basis of a formidable partnership that changed the face of conservation policy and practice in Namibia over the following decades.

Change was further propelled by the appointment of a new Minister of Wildlife, Conservation and Tourism, Nico Bessinger, a SWAPO veteran who turned to Brown and Jones for assistance in drawing up conservation policy within the country's new constitution. The appointment of Chris Brown as head of the newly created Directorate of Environmental Affairs reinforced the transformation process. The CGG project was gaining momentum, and soon needed an institutional home to receive funding from the British High Commission. When asked by the High Commissioner what he and Margie were doing in the Kaokoveld, Garth replied that they were trying to "integrate rural development and nature conservation". The informal, nomadic, somewhat chaotic project that had been stumbling along for over a decade became a new NGO – Integrated Rural Development and Nature Conservation (IRDNC). Three decades later it continues to serve Namibia and the world as a model for Community Based Natural Resource Management (CBNRM).

In the 1990s the CBNRM concept was on steroids, as major donors leapt to support the concept of communities – formerly excluded from wildlife conservation agendas – being given centre-stage. The United States Agency for International Development (USAID) invested hugely in IRDNC's projects until 1998, when the UK's WWF took over as main sponsor, while WWF US implemented the USAID programme together with a network of Namibian NGOs, the government, and other sponsors. CBNRM was transforming from a small personalised vision of people like Garth Owen-Smith and Rowan Martin into a rapidly growing industry. A workshop in Zimbabwe formulated the 'Hwange Principles', bringing together the thinking of socio-economists Elinor Ostrom (1990) and Marshall Murphree (1991), with the idealistic visions of Garth Owen-Smith (1987) and Graham Child (1995), the pragmatic experience of conservation ecologists such as Chris Brown, Russell Taylor (2001) and Rowan Martin (Martin and Taylor 1983; Martin 1986), and economists such as Brian Child (1988) and Ivan Bond (2001) and social scientists such as Brian Jones (Jones 1999, 2016; Jones and Murphree 2001). The thinking was elegantly summed up by Martin Holdgate's words in his preface to Graham Child's (1995) book *Wildlife and People*: "If wildlife and protected areas are to survive, they must be socio-politically acceptable, economically viable and ecologically sustainable."

The Hwange Principles can be reduced to four main legs:

- Maximisation of economic benefits from the valorisation and sustainable use of natural resources to achieve both conservation and development goals;
- Devolution by governments of authority, proprietorship and decisions over wildlife resources to the de facto land users, including rural communities;
- Collective ownership and responsibility for, and inclusive, face-to-face governance of all common property resources; and
- Adaptive policy frameworks and collaborative management strategies embracing cross-scale learning from the bottom up, building local capacities.

The development of CBNRM from an ambitious vision into a formal socio-ecological science was progressing in parallel, in Namibia and Zimbabwe through the 1990s. As Garth Owen-Smith had stated in his 1987 *Quagga* paper, only governments could create the legislation needed to formalise the CBNRM process. Such legislation would build on the conceptual thinking and testing of models initiated through the innovation of free-thinkers in NGOs, unconstrained by the rigours of bureaucracies. Having originated much of the thinking, Garth Owen-Smith and Margaret Jacobsohn, stepped back from centre stage, allowing new players to take the lead. In 2010, after a collective 60 years of dedication to the Kaokoveld, they stood down from the leadership of the IRDNC.

In 1993, Chris Brown and Brian Jones started to formulate outlines for future CBNRM policy in Namibia. They had strong models to follow. The Hwange Principles drew on a wide base of theoretical and regional experience. Further, Zimbabwean and Namibian legislation had granted freehold farmers rights over the wildlife on their farms in 1975. After initial challenges, the new policy soon resulted in a massive increase in game numbers and a surge of benefits to land owners from trophy hunting and tourism. If similar wildlife ownership rights could be extended to rural communities, could they not share in the benefits? The road forward was not smooth, but Chris Brown and Brian Jones were a powerful team, drawing on the experience of the drivers of the Zimbabwean CAMPFIRE project – Rowan Martin, Russell Taylor, David Cumming, Brian Child and Ivan Bond. These were all optimistic visionaries, and within Namibia Brown and Jones became labelled, somewhat ironically, 'the dream team'. But their seemingly unrealistic dreams came to fruition after three long years of consultation, negotiation, forceful debate and compromise. In 1996 the Nature Conservation Amendment Act was approved by the Namibian National Assembly and National Council. Key changes introduced by the Act were the devolution of rights over wildlife to rural communities (denied before independence), including sustainable use through adaptively managed extractive (hunting) and non-extractive (tourism) approaches. The barriers to effective CBNRM had been removed.

Two years later, the first three communal conservancies were gazetted. In September 1998, President Sam Nujoma received the WWF-US Gift of the Earth Award for his support of the Namibian CBNRM programme. But in reality, it was Garth Owen-Smith, Margaret Jacobsohn, Chris Brown and Brian Jones, and many traditional leaders of the Kaokoveld, who deserved the highest accolade as the real 'dream team'.

8.4 From Vision to Reality – Community Conservation in Namibia

In 2020, twenty years after the first communities were entrusted with the management of wildlife and natural resources, and were to directly derive benefits from them, the network had expanded to 86 registered communal conservancies and 43 community forests, covering 180,000 km^2, with over 233,000 rural residents participating in the programme (NACSO 2021, Fig. 8.5). The protected area system of Namibia covered 14% of the country at independence in 1990. By 2018, 44% of the country was under recognised conservation management systems. Community

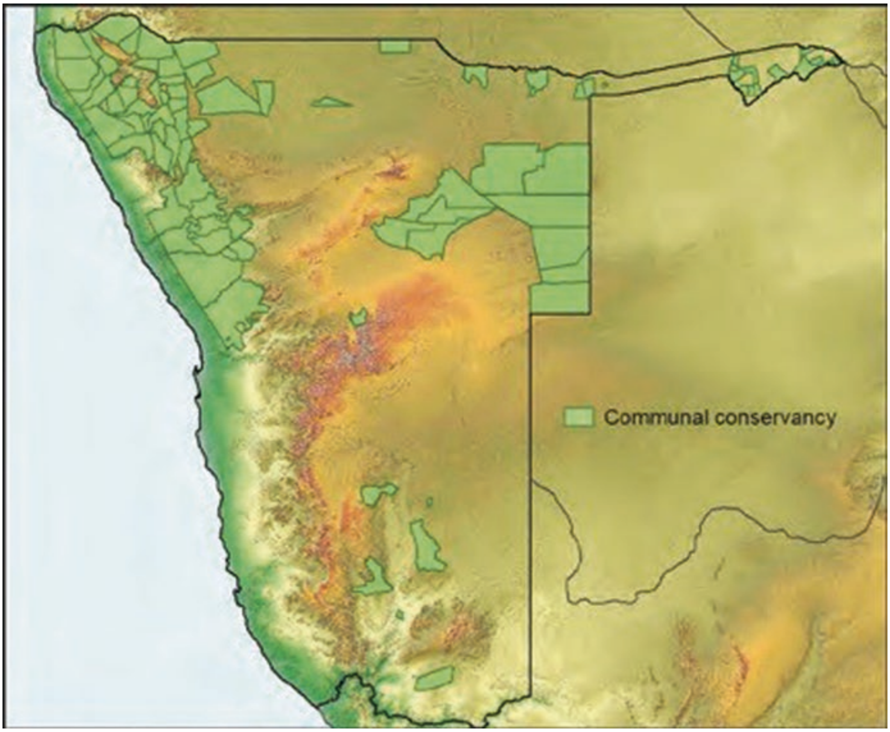

Fig. 8.5 Community Conservancies occupy over 20% of Namibia. (From NACSO 2021)

conservancies account for 20% of the nation's total land area and 53% of communal land.

The ranges of many species were re-established following the impacts of severe droughts and intense poaching in the 1970s and early 1980s. Giraffe, black-faced impala, Burchell's zebra, blue wildebeest, eland, sable and black rhino populations were re-introduced or reinforced by translocations by the Department of Nature Conservation (DNC). The magnitude of these exercises can be gauged by their results. From 1999 to 2013 a total of 10,568 animals of 15 species were translocated to 31 registered conservancies. According to official census data, the elephant population grew from 7500 in 1995 to around 22,800 in 2016. Populations of predators also fared well, with 'desert' lions increasing from 25 individuals in 1995 to 150 in 2017. However, the good rains of the 2005–2011 period were followed by extended droughts, taking a heavy toll on herbivores in the northwest of Namibia, ultimately having an impact on predator populations. But the dynamics of rainfall, grazing production, local migration or dieback of wildlife, and recovery, are typical of arid ecosystems.

Guided by the Hwange Principles and real-world experience, three pillars of Namibia's community conservation programme evolved: innovative resource management; good governance; and incentive-based conservation. As the concept and its implementation developed, so too did the institutional arrangements face complex challenges, transition, and ultimately, achieve consolidation as a national cooperative endeavour. Today the programme comprises a diverse set of partners led by the Ministry of Environment and Tourism (MET) and the Namibian Association of CBNRM Support Organisations (NACSO). Annual Community Conservation Reports, published since 2004, provide a rich resource on the performance of the programme. A few indicators of results illustrate the progress made in the implementation of the programme.

- Since the beginning of 1990 to the end of 2020, the programme has contributed an estimated N$10.8 billion to the country's net national income (NACSO 2021, Fig. 8.6). During the same period, an estimated N$2.9 billion was invested in the programme, mainly by international donors. Conservancy income is derived from two main sources: tourism and hunting. Total cash income and in-kind benefits to rural communities increased from less than N$1 million in 1998 to over N$96 million in 2020 (NACSO 2021).
- Prior to independence, while many tourism ventures within or adjoining the rural communities of the Kaokoveld had been initiated by the private sector, benefits to the communities were negligible, even though these communities carried the costs of losses of livestock to predators or damage to crops by elephants. The new legislation, and support from NGOs, donors and government agencies, created the enabling conditions for conservancies to benefit directly from joint-venture lodges and conservation hunting concessions. By 2020, 64 joint-venture tourism enterprises had been established, employing 902 full time and 62 part time staff. NACSO describes the joint ventures as the 'engines of economic growth' in conservancies (NACSO 2021).

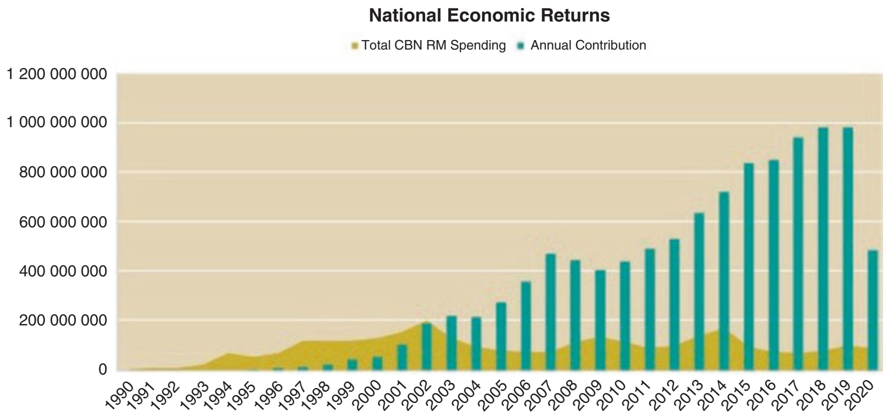

Fig. 8.6 Estimates of the yearly contribution to national economic returns from Namibia's CBNRM programme compared with economic investment costs. The sharp decline in 2020 was due to decreases in tourism receipts due to the COVID 19 pandemic. (From NACSO 2021)

Formal agreements oblige operators to share profits and train staff, while the communities are responsible for wildlife management and anti-poaching activities. Typically, 8–12% of lodge income and 30–75% of trophy price is received by the conservancy. Overall returns to conservancies from lodges and from hunting were more or less on par until recent years, with lodges responding positively to a surge in tourism before the Covid 19 pandemic dramatically placed severe challenges on the global tourism industry. Fortunately, the Namibian government responded immediately to assist conservancies and lodges, through the Conservation Relief, Recovery and Resilience Facility. As a result, conservancies are now recovering from the downturn of 2020/2021 (NACSO 2021).

Given the great diversity of landscapes, climate, ecosystems, game populations, human demography and communication infrastructure, the benefits accrued by conservancies differ widely. A detailed analysis of the 77 conservancies established by 2012 (Naidoo et al. 2016), found that 25 were reported as not generating any benefits. Of 52 conservancies deriving some benefits from wildlife, 28 derived all or almost all benefits from hunting, and six mostly from tourism. The role of highly experienced lodge, tourism and hunting operators, providing technical support, employment, capacity building and mentorship to community members, has been critical to success. Tourism operations, although taking longer to move from establishment to full financial activity, generate more cash income to households through employment than that received from hunting.

Forty-five conservation hunting concessions employed 109 full time and 25 part time staff in 2020. Conservation hunting generates higher fees to conservancies, more rapidly from the date of establishment, contributing to operational costs, development projects, and in-kind benefits of game meat. Many conservancies would not be able to cover operational costs if trophy hunting were discontinued. Trophy hunting is especially important for conservancies in areas that lack spectacular landscapes or other attractions to photographic safaris. Conservation hunting, strictly managed by quotas set by MET, utilises an insignificant percentage of the wildlife and is unlikely to have a negative impact on any species. Of 303 animals harvested in 2013, Naidoo et al. (2016) found that buffalo and elephant accounted for 78% of hunting revenue, and elephants alone contributed 55% to the total.

Dependence on trophy hunting is potentially vulnerable to changes in global policies on animal rights such as their influence on CITES, and on national policies on the import of trophies. However, the incentives from sustainable income sources, such as those from conservation hunting, are critical for the long-term viability of conservancies. Without them, rural communities might return to the downward spiral of subsistence livelihoods – goats, cattle and minor crops, supplemented by poaching, which would lead the ultimate extinction of rare species in hyper-arid ecosystems. At the same time we should not underestimate the importance of the intrinsic value that rural Africans place on wildlife. Jones (1999, 2010) points out that in every Namibian community he has worked with, they all said they wanted to keep wildlife for future generations. Furthermore, there are often spiritual and cultural associations with different wildlife species. Essentially the Namibian approach was founded on agreement between rural people and external conservationists that wildlife should be conserved for its intrinsic value and for the potential benefits from sustainable use.

Beyond the impact of conservancies on the local and national economies, less tangible benefits are reported by NACSO (2021), including:

- *Environmental sustainability*: sustainable use, reduced poaching, a precautionary, science-based approach to management, landscape-scale connectivity, reduction of land degradation and deforestation, etc.;
- *Good governance*: empowering previously disenfranchised communities through instituting democratic systems of participation in decisions, strengthening accountability, transparency, capacity enhancement, in-service training, business development; and
- *Social transformation*: increased gender equity and empowerment of women, improved health facilities and health education, improved household food security and the promotion of cultural pride.

The above outline of benefits derived from the CBNRM programme should not suggest that it has been free of any challenges, or that significant rewards have reached all 233,000 members of the 86 community conservancies. Despite the encouraging return of N$96 million to conservancy communities in 2020, after deductions for operating costs such as game guard salaries, vehicles, office administration and management committee grants, little is actually left for individual community members. As is frequently the case in rural communities, 'elite capture' of benefits, decision making and information sharing can lead to financial mismanagement and conflict. The Namibia CBNRM project has experienced all of these challenges, inherent in managing the commons – it remains a 'work in progress'. But unlike the fate of so many similar ventures in Africa, the Namibian model deserves the many accolades that it has received from the global conservation community.

8.5 CAMPFIRE: Has the CBNRM Gold Standard Lost Its Glitter?

Any discussion on CBNRM projects must refer back to what is arguably the foundational and most widely cited initiative of its kind in Africa – the Zimbabwean CAMPFIRE (Communal Areas Management Programme for Indigenous Resources) project. CAMPFIRE has been described as a major turning point in global conservation (Borgerhoff Mulder and Coppolillo 2005). For two decades it was the Gold Standard of CBNRM and it has contributed enormously to the development of the principles and practises of community-based approaches to natural resource conservation in poorly resourced countries.

The magnitude of the challenges confronting the founders of the CBNRM approach in Namibia and Zimbabwe, and more broadly, of biodiversity conservation in tropical countries, are elegantly explored by Barrett et al. (2001). However, their comprehensive review of the problems facing CBNRM does not give due emphasis to the pivotal role of politics in Africa, and of governance at all levels of society. As described later in this chapter, governance is the Achilles' Heel of CBNRM.

The CAMPFIRE project reached its zenith at the start of the 2000s, when it encompassed 36 of Zimbabwe's 57 districts and included 13% of the country's area (Fig. 8.7). From the early 2000s, its activities were challenged by the political and socio-economic turmoil of the increasingly dysfunctional regime of the former Zimbabwean president, Robert Mugabe. The CAMPFIRE model is instructive, because it demonstrates the vulnerability of CBNRM approaches in countries where governance systems fall prey to the vicissitudes of politics, power play and personal greed. It provides a sobering lesson for those who are unfamiliar with the dynamics of African institutions and the rapidity with which robust conceptual models and effective programmes can be overturned.

Few conservation ventures in Africa have enjoyed the deep conceptual analysis and philosophical debate that the CAMPFIRE project stimulated. From the founding studies by Martin and Taylor (1983), Martin (1986, 2009), Child (1988, 2004), Murphree (1991, 1993, 1994, 2009), Metcalfe (1994), Hulme and Murphree (2001), Child and Murphree (2004), Taylor (2001, 2009), Bond (2001) and many others during the 1980s and '90s, to the recent major synthesis of Child (2019), CAMPFIRE has been the subject of intense self-analysis. What has emerged is a rich body of lessons learned, principles and guidelines. The initial simplicity of objectives – that CBNRM should be economically, ecologically and socially acceptable – has evolved into a complex of 'best, promising and emerging practices' (Tambara and Chiles 2016) with no less than 54 guiding practices for policy, governance, economic, socio-political and ecological viability.

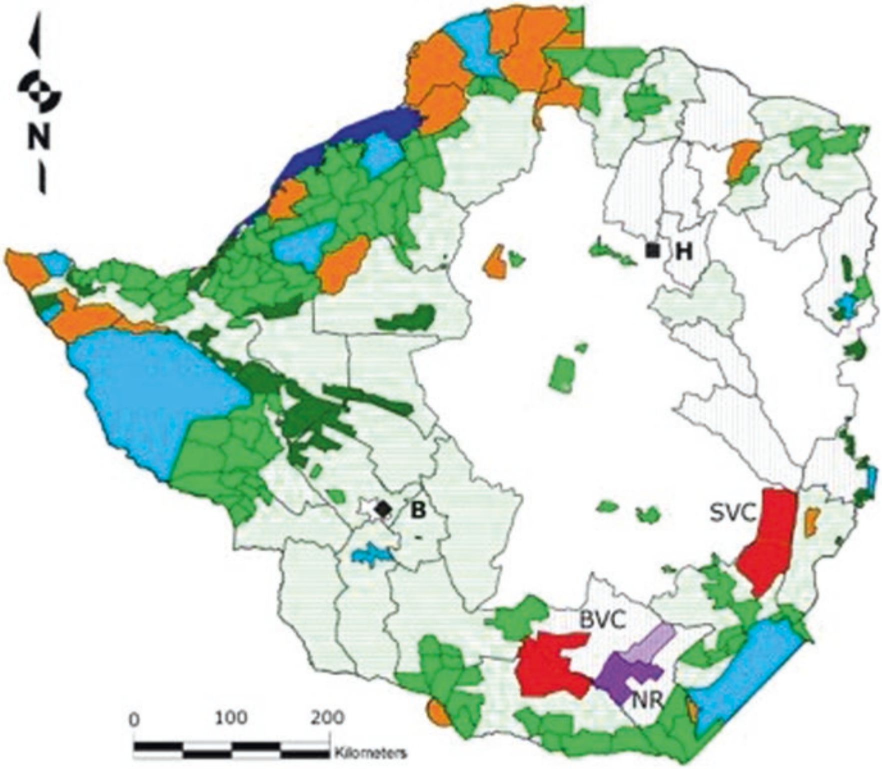

Fig. 8.7 The location of CAMPFIRE areas (in light green) relative to National Parks (blue), State protected Safari Areas (orange), Forest Areas (dark green) and Conservancies (red). (From Booth 2016)

While much has been written on the mechanisms of CAMPFIRE during its heyday, few studies comment on the fortunes of CAMPFIRE since its peak in 2002. By that year, according to a study by Khumalo (2003), it encompassed 53 Regional District Councils with 'appropriate authority' over wildlife use. Even at its peak, however, only 23 districts really functioned as intended, while only 12 received regular income from wildlife (Khumalo 2003). Between 1989 and 2001, CAMPFIRE's self-generated revenues approximated US$20.3 million, of which 97% came from the original 13 districts established with appropriate authority. Of this, 49% was dispersed to communities in these 13 districts (121,500 households – equivalent to 850,000 persons) amounting to a trickle down of less than US$2 per capita per year. During the same period, investments in CAMPFIRE by donors included US$40 million for start-up costs, consultants, capacity building, safari hunting operations, joint venture lodges, the establishment of the CAMPFIRE Association and the development of natural resource products. The concept's fragility given its dependence on donor support was obvious, with donors contributing close to twice the self-generated income resulting from CAMPFIRE activities.

Donor support collapsed to a total of US$515000 between 2003 and 2016 (Booth 2016). The promise and scale of sustainable and meaningful income streams to local communities had not been realised, even at the peak of CAMPFIRE's success.

Problems of scale relate not only to that of own-generated to donor funding imbalances. With specific reference to CAMPFIRE experience, Cumming et al. (2006) draw attention to the problems resulting from the mismatch between the scale of management intervention and the scale of the ecological processes being managed within socio-ecological systems. They also point to the critical importance of devolution of authority to local communities, a factor also emphasised by Taylor (2009). Russell Taylor, one of the pioneers of CAMPFIRE, provides a detailed assessment of the project to 2006, noting declines in hunting income and of the transfer of benefits to communities, governance failures, and lack of government commitment to strengthening the devolution of authority through policy changes supported by legislation.

What is lacking in all the recent syntheses of CBNRM experience in Africa is an example of a CAMPFIRE project that has survived and prospered since the Mugabe era. Most reviews of CAMPFIRE focus on the processes and results of the golden years of the project, while reports for more recent activities tend to focus on site-specific impacts and case studies. Four papers (Booth 2016; Pole 2016; Muyengwa and Child 2017; Tchakatumba et al. 2019) provide insights into the more recent performance of community-based conservation in Zimbabwe.

In a detailed review of the role of elephant trophy hunting (mainly by foreign – mostly American hunters, Fig. 8.8) in supporting CAMPFIRE, Booth (2016) makes some interesting statements. He notes that CAMPFIRE projects embrace about 13% of Zimbabwe's land area and benefit 25% of Zimbabwe's households (5,439,000 persons), providing incentives to conserve wildlife and prevent poaching. The report, prepared in order to answer challenges raised by the US Fish and

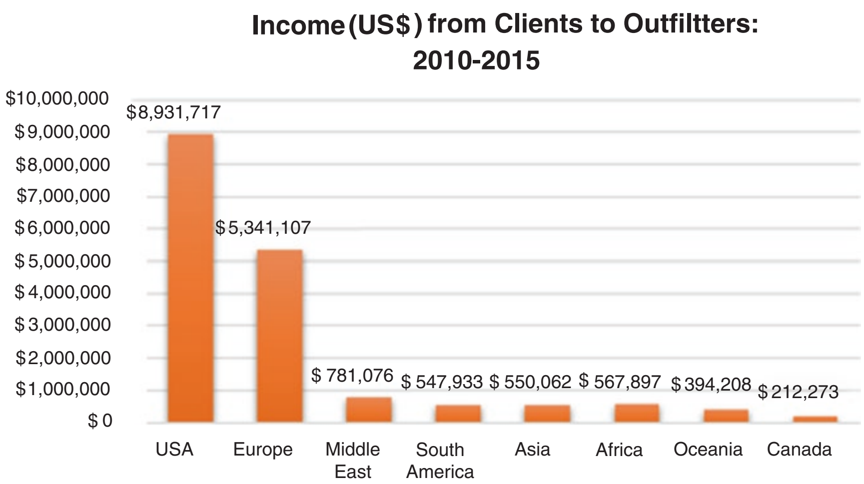

Fig. 8.8 Contribution of hunting clients to the CAMPFIRE programme. (From Booth 2016)

Wildlife Service (which had imposed a ban on the import of elephant trophies to the USA in 2014), notes that about 90% of CAMPFIRE's revenue comes from hunting, to which elephants contribute 64%. The hunting quota approximates 0.5% or 400 elephants of the national total of 80,000 elephants. Trophy fees from elephants approximated US$1.2 million per year (Fig. 8.9). Removing the income derived from elephant trophy hunting by Americans removes the incentives to local communities to conserve wildlife, and will ultimately result in their return to unsustainable pastoralism and agricultural practices and the degradation of ecosystems and the wildlife and livelihoods that they sustain (Booth 2016). As is the case elsewhere in Africa, human/wildlife conflicts will not be tolerated by local people living adjacent to protected areas, unless compensation is provided, in cash or in kind. Booth also points to an increasing human population and the lack of investment in infrastructure and human capital in the CAMPFIRE areas as challenges to sustaining the benefits of the programme.

In the Zambezi valley, one of the most successful CAMPFIRE projects – Masoka – collapsed as a result of 'elite capture' between 2009 and 2011, with a reversal of the socio-economic and environmental benefits embedded over the previous decade by the project (Muyengwa and Child 2017). The Masoka CAMPFIRE project had changed from a highly participatory model (Taylor 2009) to a personalised programme controlled by the elite.

A study of 569 households in the southern lowveld of Zimbabwe in 2014, during the post-donor period, found that income from CAMPFIRE was less than 0.5% of total household income (Tchakatumba et al. 2019). The wildlife income for the study area in 2014 totalled US$305000 and was directed mainly to community facilities, with less than 30 full-time jobs provided within an estimated population of 28,000. Tchakatumba concludes: "These aggregate amounts are considerable,

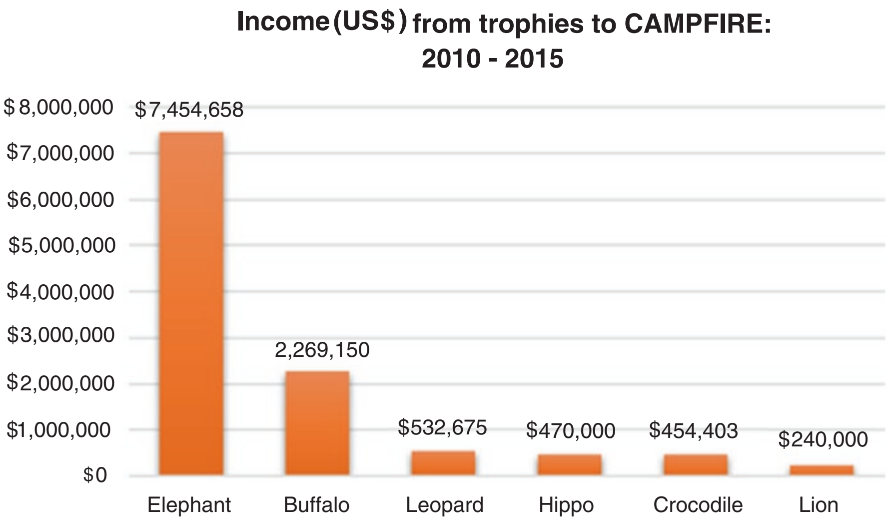

Fig. 8.9 Income (US$) generated from key trophy species (2010–2015). (From Booth 2016)

compared to what is trickling down to households." Community perceptions indicated that benefits decreased and costs in terms of human-wildlife conflict increased in the post-donor period. Communities were considered the last to benefit from CAMPFIRE, when compared to safari operators, hunters, district and ward councillors and government. The household survey found a lack of transparency resulting from a top-down approach from the district and community leadership with a lack of devolution of power. In short, the findings contradict the best intentions of CAMPFIRE.

It is not only the rural community-based conservation projects that have suffered as a result of collapsing systems of governance. The large private land conservancies (e.g. Save Valley Conservancy (SVC) in the semi-arid south east Lowveld of Zimbabwe (Lindsey et al. 2009) have experienced serious challenges due to policy changes driven by the then Mugabe regime, a process described in detail by Pole (2016). The SVC comprises a mix of private, local community, and government properties, originally totalling 3442 km^2 (but later reduced to 2500 km^2 by land invasions). Developed as a cattle ranching area in the 1970s, the industry collapsed during an extended drought in the 1980s. After private (white) landowners were granted rights over wildlife in 1975, it was found that exploiting the commercial value of indigenous wildlife exceeded that of domestic stock. From the early 1990s, a consortium of 18 ranchers formed the SVC through a complex process of negotiation between partners, motivated and financially supported by the rhino conservation project. Donor funding was raised to re-introduce black rhino, elephant and 11 other species – a total of 3128 head of game – to repopulate the savannas. By 1995 the 350 km boundary of SVC was game-fenced and provided with effective management systems, particularly focused on reducing poaching from neighbouring communities. The combination of teamwork, donor funding and highly skilled technical advice, led to rapidly increasing wildlife populations, with significant income flows from safari hunting and photographic tourism.

This positive trajectory of the Save Valley Conservancy suffered a reversal from 2000, with the start of Mugabe's Fast Track Land Reform Programme (FTLRP). By 2003, SVC had lost 33% of its land area through government-sanctioned land occupation by 4500 households. Much of the fencing was torn down, often to be used for wire snares. A continuing series of government interventions placed impossible challenges on maintaining the conservancy, with the once coherent cooperative team beginning to collapse in response to land occupation, poaching, cancellation of hunting permits and absence of donor support (Pole 2016).

Despite the reverses suffered by the CAMPFIRE programme during the 2000s, strategic opportunism seemingly came to the rescue during the 2010s. In September 2013, the mass poisoning and death of over 100 elephants in Hwange National Park attracted international media attention and public outrage. Furthermore, the Zimbabwean Minister of Environment was coming under severe pressure from traditional leaders due to dissatisfaction with the CAMPFIRE programme. The urgent and existential crisis triggered a thoughtful and perhaps opportunistic response from the Zimbabwe government and from the CAMPFIRE Association. The latter approached donor agencies for support. Generously funded by the European Union, a national stakeholder's review of the CAMPFIRE project was commissioned. The review was led by a team of consultants with wide experience in CBNRM and their findings published in 2018. The review revealed that the programme was experiencing institutional, operational, legal and external challenges (GoZ 2018).

Exactly seven years after the mass poisoning of elephants, and following five years of workshops and deliberations, on 15 September 2020, the Zimbabwe government released the following Cabinet Statement (GoZ 2020): "Cabinet considered and approved proposals to re-focus and revitalize the Communal Areas Management Programme for Indigenous Resources (CAMPFIRE). Implementing the proposals will result in a more effective and transparent CAMPFIRE that will benefit communities and further operationalise the devolution concept." The statement recognised that 90% of CAMPFIRE income came from trophy hunting and that there was need to diversify income streams. The proposed solutions focus on legislative and administrative arrangements between levels in local government to strengthen the devolution principles described 30 years earlier by Murphree (1991). Devolution should not end at District Council level, but at the local communities most effected by the costs and benefits of wildlife conservation. Prominent in the language of the review was the need for strong and effective – and scale sensitive – governance. CAMPFIRE, in policy at least, had come full circle.

8.6 The Lowveld Conservancies: Different Approaches Produce Different Outcomes

The ongoing socio-economic turmoil during the Mugabe era was not devoid of conservation success stories. Somewhat surprisingly, the project that has achieved the most notable and sustained success is that of the Lowveld Rhino Conservation project, implemented in the heartland of the Save River and adjoining conservancies. Despite the challenges faced by the Lowveld conservancies through the early 2000s (land invasion, human population growth, poaching, rejection of the CAMPFIRE system by traditional leaders) remarkable success has been achieved through a focused programme of rhino capture, translocation, reintroduction and protection within the conservancies. The project developed in parallel to CAMPFIRE, but with a different design and more focused objectives.

In the 1980s, the poaching of black rhino in the Zambezi valley was reaching alarming levels. The drama and intrigue that characterised the rhino poaching saga that embraced southern Africa is described in captivating detail by John Hanks in his book *Operation Lock and the War on Rhino Poaching* (Hanks 2015). In the late 1980s Hanks was Director for Africa at WWF International. Hanks sought funding to implement a proposal made by Zimbabwean ecologists Raoul du Toit and David Cumming to translocate the remaining rhino in the Zambezi valley to more secure areas, particularly the privately owned ranches of the arid southeast of the country. The rhino conservation project was instrumental in triggering the conservancy concept among some owners of very large cattle ranches. As described earlier, severe droughts in preceding years had convinced cattle ranchers that the more resilient and species-rich wild ungulate populations offered better returns on investment than monospecific livestock. But the cost of capture, translocation and protection of rhino and other species rescued from the Zambezi valley and other vulnerable areas was a major financial challenge.

Serendipity catalysed an unexpected solution. In early 1988 John Hanks was alerted to a possible source of funding – the UK-based Beit Trust. The Trust, founded in 1906, had strong ties to Zimbabwe, where it had generously supported education, health and welfare projects over many decades. In 1988, Sir Alfred Beit, the nephew of the Trust's founder, learned of the plight of rhinos in the Zambezi Valley. He lobbied other Trustees to support a conservation project to save the rhino, a proposal that differed markedly from the long tradition of directing grants to people-focused applications. John Hanks, always agile in responding to such opportunities, worked with Raoul Du Toit, the scientific officer in Zimbabwe of the IUCN's African Elephant and Rhino Specialist Group, in preparing a compelling proposal to the Trust. The Trustees replied promptly, and ultimately approved not the usual US$50000 level of grant, but a major US$1 million grant which extended over eight years, on condition that the funding was administered by an NGO, and led by professionals such as Hanks and Du Toit. A protracted process of negotiation followed, with Zimbabwean government officials endeavouring to control both the project and the funding. The 87-year-old Alfred Beit did not compromise, and Hanks and Du Toit were respectively appointed Project Director and Executive Director of the Beit/WWF initiative from January 1991. Through a process reflecting all the elements of strategic opportunism, Du Toit succeeded, over the course of three decades, to rescue the Zimbabwean black rhino population. Globally, the Lowveld black rhino population is now second in number only to the rhino population of Etosha National Park, Namibia.

Du Toit (2016) describes the approach followed by the Lowveld Rhino Trust as a variant of the CBNRM model embraced by CAMPFIRE. His approach is based on a re-think of the traditional CBNRM model, pragmatically responding to a situation in which the essential enabling conditions for CBNRM had been eroded through the Mugabe era. He concluded that what reads well as the golden rules of CBNRM in theory can be untenable in practice (Du Toit 2016). Within the conservancies of the southeast Lowveld, a more sharply defined incentive scheme, targeting selected communities, has been successful. Support is linked to performance indicators such as the proportion of rhino poaching incursions reported by the local community, gradually changing negative perceptions of rhino to their being more useful to household economies. Positive engagement with the selected communities has been fundamental. The results are impressive.

In 1992, the Save Valley and other conservancies in the southeast Lowveld had a population of 81 rhinos (17% of the national rhino population). In mid-2022, the population of both black and white rhino (Fig. 8.10) had increased to 911 (87% of the national population). In common with many conservation success stories in Africa, the recovery of Zimbabwe's rhino population can be attributed to the vision

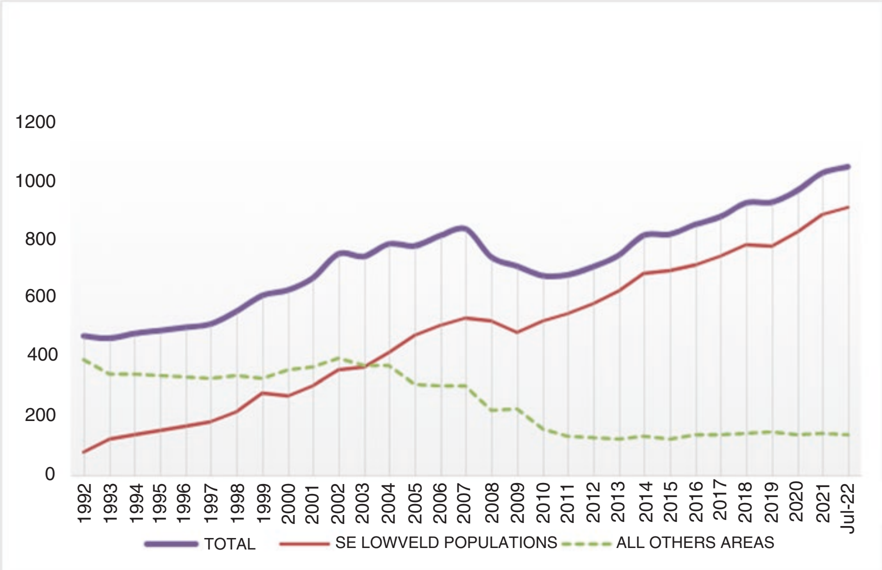

Fig. 8.10 Total black and white rhino population numbers in Zimbabwe, 1992–2022. (Graphic: Raoul du Toit)

and leadership of one person – Raoul du Toit – supported by the richness of Zimbabwean conservation experience, expertise and dedication.

8.7 Lessons Learned: Good Governance, CBNRM's Achilles' Heel

"There are no quick fixes but, properly done, effective CBNRM is attainable and worth fighting for" (Child 2019: p. 356).

It is beyond the scope of this chapter to repeat the elements of the rise and decline of Community-Based Natural Resource Management as experienced in Zimbabwe. The message in Child's scholarly volume, cited above, suggests that the devil is in the detail: 'properly done'. This sentiment applies to any conservation endeavour, most especially in Africa.

Child's succinct conclusion reflects the robust body of field experience on which it is built. But it is in the title of his book that his key message is located: "Sustainable Governance of Wildlife and Community-based Natural Resource Management." His thesis is that without good governance, all approaches to CBNRM will fail. CAMPFIRE, the project in which he played a central role, is a classic example of the critical importance of good governance in community-based programmes. Yet the paramountcy of good governance is ignored by nearly every starry-eyed conservation biologist who sets grand goals in Africa. It is the topic on which most reporters on the success or failure of projects in Africa prefer to fall silent.

In the broader arena of governance, political history is also key. In southern Africa, especially South Africa, the failure of CBNRM initiatives is seldom attributed to the deep negative legacy of land expropriation (and consequent overcrowding of 'homelands') and the criminalisation of wildlife use (poaching) that extended from the 1880s until today. In the case of Zimbabwe, Murphree (2009) points to the dispossession of land and access to wildlife during colonial times, which led to the breakdown of ancient customs of governance of land and wildlife use. CAMPFIRE contributed effectively to the rebuilding of such customs and benefits, only to be eroded by the collapse of governance systems.

Child (2019) devotes a full chapter to the evolution of governance systems. He uses, as examples, the Glorious Revolution of 1688 and the subsequent declaration of the Bill of Rights of 1689 as the founding transformations leading to modern social order. The divine rights of kings and the feudal systems of land tenure were replaced by the rights of ordinary people to security and the ownership of property. But models of the importance of good governance in sustaining social, economic and environmental health go back much further than the Glorious Revolution, and need no scholarly reading of social history to comprehend.

Good governance is not a new concept, although treated by many conservation biologists as though it were a modern phenomenon – like capitalism, socialism and globalisation. The central role of good governance is nowhere better illustrated than in the fresco panels by the early Renaissance artist Ambrogio Lorenzetti, in the Palazzo Pubblico (Town Hall) of Siena, Tuscany (Lorenzetti 1339). The frescoes are as relevant to contemporary Africa as they were to fourteenth century Europe. Painted in 1339 as 'The Allegory and Effects of Good and Bad Government on the City and the Country', these huge frescoes adorn the walls of the hall in which the nine elected magistrates of the city state of Siena would meet to take decisions on government. The frescoes illustrate the benefits and costs of good and bad decisions taken by the nine councillors. Six panels occupy the three principal walls of the council chamber. Four scenarios are presented. A prosperous city with vibrant trade, commerce, teaching, people dancing in the streets and buildings under construction, is compared with a city of corruption, crime, poverty and collapsing infrastructure. A countryside of flourishing crops, forests, healthy livestock and prosperous farmers (Fig. 8.11) is contrasted with a landscape of burning fields and forests, eroded hills, abandoned buildings, roving bandits and mounted soldiers (Fig. 8.12). The contrast of peace and prosperity under the rule of law, with the chaos of anarchy and desolation, was a daily reminder to the city's governing body. Any observer of the towns and countryside of Zimbabwe today might appreciate the prescience of the allegory.

It is in this context that the Namibian model is so important. As the contributors to two detailed reviews of CBNRM projects across Africa have concluded, despite the general similarity of intent, the projects studied demonstrate wide divergences in approaches and levels of success (Roe et al. 2009; Africa Wildlife Foundation 2016).

Fig. 8.11 Good governance in the countryside – productive landscapes, with prosperous farmers taking their products to the market. (Ambrogio Lorenzetti (1339): Fresco, Palazzo Pubblico, Siena, Tuscany. Wikimedia Commons)

Fig. 8.12 Bad governance in the countryside -degraded landscapes, ruined villages, roaming bandits. (Ambrogio Lorenzetti (1339): Fresco, Palazzo Pubblico, Siena, Tuscany. Wikimedia Commons)

The Namibian model stands apart from all others in several respects (Jones 2016). First, Namibia has a very low population density. Second, it is an arid country with very low agricultural potential. Third, it has a great diversity of spectacular landscapes and charismatic wildlife species. Fourth, community rights over wildlife and tourism have been entrenched in legislation and clearly defined. Fifth, it has enjoyed strong support from government, NGOs and donors for over two decades. Sixth, and most importantly, it has, since independence in 1990, enjoyed a stable, transparent and relatively corruption-free system of governance. It is this last factor that separates it from its neighbours, and from most wildlife-rich countries in Africa. The hope for CBNRM is vested in the hope for Africa: good governance through democracy and the rule of law.

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Part III
Conclusions: Lessons Learned on the Ground

Chapter 9
Twelve Fundamentals for Conservation Success

9.1 Identify an Urgent and Existential Crisis

The case studies of successful conservation and research projects described in Part ll illustrate the breadth and depth of experience built across southern Africa over the past several decades. The lessons learned from these projects demonstrate the value of strategic opportunism in overcoming challenges presented by the socio-political uncertainties and human and financial resource constraints in Africa. Part lll condenses the diversity of messages coming from the project narratives into twelve fundamentals, which, if applied in the conceptualisation and implementation of projects, might lead to the realisation of goals. The first fundamental is to identify an urgent and existential crisis.

Michael Soulé, in his seminal paper on the emerging science of conservation biology (Soulé 1985), characterised conservation science as a 'crisis discipline'. "In crisis disciplines" he noted "one must act before knowing all the facts: crisis disciplines are thus a mix of science and art, and their pursuit requires intuition as well as information. Tolerating uncertainty is often necessary."

All the case studies of this review relate to identified crises. Each demanded urgent action. In each case, the combination of crisis and urgency provided a compelling story on which interest in, and support for, action was mobilised. Crises come in many guises. In Africa, the most frequently published papers urging conservation action relate to species under threat, degrading ecosystems, or vulnerable protected areas. Here, this focus is exemplified by the chapters on Angola's giant sable antelope, feral cat eradication on Marion Island and the rehabilitation of Gorongosa National Park in Mozambique. Broad-scale approaches to address rural poverty and land degradation include the development of community-based natural resource management in Namibia and Zimbabwe. At a regional scale, the taxonomic impediment to botanical inventory in ten southern African countries, and the databasing of bird distribution, abundance and dynamics, were approached through new opportunities for collaboration which followed dramatic political change. Crises

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might thus relate to threats to biodiversity on the ground, the challenges of weak information resources with which to plan strategies, or political barriers to regional partnerships – all of which are of fundamental importance to conservation in Africa.

The downside of a crisis management approach is the misuse of crises as instruments to raise funds – by governments, NGOs or by individuals. However, in none of the case studies has a crisis been invented or exaggerated to exploit or attract funding. The problems have been existential and urgent, and responded to by thoughtful governments, donors and stakeholders.

9.2 Present an Inspiring Vision, Clear Goals and Realistic Strategies

As the Cheshire Cat in Lewis Carroll's (Carroll 1866) *Alice in Wonderland* points out, "*If you don't know where you are going, any road will take you there*." An ambitious but clearly defined vision provides the necessary inspiration and focus for success in any challenging project. Each of the reviewed projects had clear vision statements and focused goals. The goals of some projects were narrow – 'Save the giant sable' or 'Eradicate feral cats', 'Rehabilitate Gorongosa'. Others were broad – 'Remove the taxonomic impediment', 'Assess the threats to the megaflora of South Africa' or 'Empower rural communities to take ownership of their wildlife resources'. In each case the vision and goals were backed by a convincing strategy to communicate with and embrace the commitment, over many years, of a wide diversity of stakeholders. An approach of 'think big, start small' guided implementation.

Some projects challenged existing paradigms and presented alternative models. Such were the CBNRM projects, reversing the 'command and control' tradition embedded in colonial-era protected area management practices. These initiatives presented new 'theories of change' before the concept entered the conservation lexicon. The projects were tested within specific communities where the proponents had long and respected knowledge bases and trusted community relations. Graham Child and Garth Owen-Smith saw the writing on the wall, and it was writ large – 'build socio-ecological resilience'. The method was to engage with local communities and empower bottom-up transformation.

Adaptable and flexible timetables are essential. The tyranny of logical framework approaches must be avoided. Work plans must accommodate changing funding frameworks, integrate feedback from research and implementation findings, and permit rapid response to new challenges and opportunities. The Marion Island project built on several decades of research and progressed through seven phases implemented over 25 years. Each phase, costing hundreds of thousands of dollars, required elaborately designed project plans, budgets and team structures. Each had to be modified as new information from research became available, or new logistical or financial challenges arose. Pedro Vaz Pinto had no elaborate strategy, no theory of change, and no budget. He used guts and grit to press on through nearly impossible institutional challenges, unreliable technology and a hostile physical environment. Learning by doing, failing and failing again, but never giving up. Despite repeated setbacks, ultimate success was achieved and has saved the giant sable antelope from extinction.

9.3 Develop Networks of Synergistic Collaboration

While crises provide the triggers and catalysts for immediate conservation action, the development of collaborative networks and synergistic coalitions are important longer-term responses. Such conservation networks go back to the early 1900s, when the first conservation NGOs in Africa were established in South Africa (the Botanical Society in 1913, the Wildlife Society in 1926). These NGOs facilitated contacts across the region during the country's political and academic isolation from the 1950s to the 1990s, with amateurs and professionals remaining active in several conservation and scientific networks through the decades leading up to democracy. For more than a century, effective NGO involvement and the commitment of civil society stakeholders has remained essential for project success.

International non-governmental organisations were of major importance. Key among these were the Species Survival Commission (SSC) and the World Commission on Protected Areas (WCPA) of the IUCN (International Union for the Conservation of Nature) which provided novel approaches to conservation challenges. The International Union of Biological Sciences (IUBS) and the Scientific Committee on Problems of the Environment (SCOPE) of the umbrella body ICSU (the International Council of Scientific Unions) introduced new concepts to the global scientific arena. A simple process of 'thinking globally, acting locally' was followed. These new concepts, evolving in the debates on emerging problems of the environment (SCOPE), protected area management (WCPA), and global threats to biodiversity (IUBS, SSC), were communicated directly and implemented within southern African conservation and science agendas through interactions between local and visiting researchers. Especially valuable were the series of workshops involving leading thinkers from across southern Africa, and internationally, convened during the 1980s by the then Cooperative Scientific Programmes (CSP) of South Africa's Council for Scientific and Industrial Research (CSIR). These think tanks produced syntheses and conceptual models on savanna, fynbos and karoo ecosystems, fire ecology, the biology of invasive species, the conservation of threatened natural habitats, and on long-term environmental trends. Such syntheses, published locally as textbooks and freely distributed workshop reports, provided students with concise and accessible introductions to emerging ecological models and understanding.

The ICSU and IUCN traditions of voluntary networks were followed across southern Africa in the 1990s, and facilitated the creation of regional partnerships such as the SABONET, the African Plants Initiative and the Southern African Bird Atlas projects. At more local levels, coalitions between NGOs, universities, the private sector and government institutions mobilised large, interdisciplinary initiatives such as the Savanna Ecosystem Project, the Fynbos Biome Project and plant and animal Red Listing programmes. These projects strengthened ecological understanding and research capacity, increasingly applied in guiding land-use management and planning. A fundamental criterion for fund allocation to CSP projects was the inclusion of the end-users of research within the planning and implementation processes. Since the advent of democracy in South Africa, large programmes with direct socio-economic and developmental objectives, such as the Working for Water project, have enjoyed enormous government support, simultaneously controlling invasive woody plants, increasing water flows from mountain catchments, and providing tens of thousands of work opportunities.

The Namibian Association of CBNRM Support Organisations (NACSO) and the Zimbabwean CAMPFIRE Association (CA) were created in the 1990s to achieve synergies between the countries' many community conservancies, private lodge owners and hunting outfitters, and government institutions. The shared experience and learning of these networks ensured cost effectiveness and common approaches to the solution of problems in countries with limited technical expertise and poorly resourced scientific institutions. The associations have continued to play supporting roles through difficult transitions in leadership, institutions and governments. An important and influential regional network at the time was the IUCN's Southern African Sustainable Use Specialist Group (SASUSG), which comprised ecologists, natural resource economists, wildlife veterinarians, social scientists and others from diverse backgrounds. SASUSG refined concepts and principles around sustainable use and CBNRM, ultimately influencing the Convention on Biological Diversity's approach to sustainable use of wildlife.

While the focus must be on synergistic partnerships with like-minded individuals and organisations, attention should also be given to positive engagement with parties that might have opposing views or agendas. Conservation endeavours by their very nature often have to confront those who recklessly exploit natural resources – through greed, ignorance or sheer desperation. Positive engagement with perceived enemies is the first step to problem resolution. It is a fundamental component of strategic opportunism.

9.4 Communicate Effectively with All Stakeholders

It is perhaps overstating the obvious to suggest that any conservation project should capture the hearts and minds of all its stakeholders. Vision statements can be too ambitious to be taken seriously. Goals and strategies might be too comprehensive and too complex to attract the attention beyond immediate project partners. Communication should be simple but inclusive. It should capture passion and dedication – the *sine qua non* for conservation.

The SABONET project ran its course before the advent of easy internet access across the ten participating countries. Websites had not evolved, nor had any other form of social media. The project was held together by a quarterly magazine *SABONET News*, which published the outcomes of steering committee meetings, field expeditions, profiles of participating institutions and members, progress with national activities, contact lists, and much more. The hardcopy magazines were posted by normal mail to several hundred recipients. In the pre-internet days, postal services to even the most remote destinations were remarkably efficient. The SABONET Report series, which ran to 43 volumes, carried updated floristic check-lists, expedition reports, training manuals and needs assessments. These hardcopy newsletters and reports were the glue that held participants together between workshops, training sessions and field trips.

While communicating with the active network of project participants is the first priority, vertical and lateral communication with decision makers, donors and the ultimate end-users are both equally important. Simplicity is critical. The military adage 'generals do not read' is pertinent. Succinct reports on key aspects of progress should not exceed two pages if they are intended to attract the attention of busy government officials or donors. Modern electronic communication systems provide remarkable opportunities to transfer information – but can easily exhaust the capacity of recipients if not used effectively. The most important mechanism for project leaders remains the practice of 'walking the talk'. This is especially the case in rural development projects, where many participants do not have access to electronic media and some might even be illiterate.

Some projects require high-level communication interventions to mobilise transformational change. One example illustrates the point. In 1980, at a workshop on Mediterranean Type Ecosystems, held in Hermanus, Western Cape, the topic of invasive plants drew much interest, as invasive Australian acacias and hakeas had become a serious threat to the unique fynbos vegetation of the Cape Floral Kingdom. Hal Mooney and Fred Kruger suggested that a project on the broader problems of invasive alien species be launched by SCOPE – the Scientific Committee on Problems of the Environment. The project soon attracted international interest and action, and over the following decade generated an impressive compendium of research findings synthesised in hefty volumes. But the ongoing problem of alien invasions in sensitive ecosystems simply accelerated. In 1993, at the annual meeting of the Fynbos Forum (a coalition of researchers and land managers jointly seeking solutions to problems in fynbos ecosystems) it was suggested that a presentation be made to decision makers highlighting a recent finding that invasive woody plants were decreasing, by 30%, the water supplies to the city of Cape Town. Little did they foresee that by 2018 Cape Town approached 'day zero' of the city's depleted water resources.

By the time the 'roadshow' on invasive plants was ready to proceed, the new, democratic South African government had been elected, and the new Minister of Water Affairs, Kader Asmal, was quick to see the opportunity to combine the urgent need for alien plant control with the even more urgent need to create employment for the rural poor. The result was the Working for Water programme, which in the succeeding 25 years invested over US$1000 million on invasive clearing activities across South Africa, providing hundreds of thousands of work opportunities in the process – the largest investment in any such project, globally.

9.5 Synthesise Existing or Create New Biodiversity Knowledge and Understanding

A critical success factor in all the case studies has been the scientific evidence base underpinning project design and implementation. Whether driven by a lone biologist generating new knowledge from a zero base (giant sable), or by consortia of large scientific institutions with deep research traditions (Marion Island), the projects have been science-driven. The SABONET, African Plants Initiative, Southern African Bird Atlas and the Custodians of Rare and Endangered Wildflowers projects had large teams of professional and citizen scientists. Such collaboration focused on assembling large datasets backed by field observation, and systematic recorded in large and freely accessible electronic databases. Both the Namibian and the Zimbabwean CBNRM projects had, from their founding years, included strong socio-economic components, led by the thinking of innovators such as Elinor Ostrom and Marshall Murphree (Ostrom 1990; Murphree 1991). They were also founded on the richness of wildlife management and savanna ecological knowledge of Zimbabwean and Namibian researchers. Across southern Africa, the synthesis of knowledge and understanding in National Biodiversity Strategy and Action Plans, and National Biodiversity Assessments, supported by the CBD and the GEF, has guided policy and action and triggered many new and focused conservation initiatives. Emerging from these robust interdisciplinary conservation research agendas have been many new concepts on the resilience of socio-ecological systems and the dynamics of environmental change. Good science provides the essential evidence-base of successful conservation projects.

9.6 Secure Institutional Support and Develop Project Implementation Capacity

A key challenge in many African states is the weakness of national institutions, most especially those responsible for science. But conservation projects are not driven by researchers alone. They need many skills, most especially in the multiple tasks involved in project design, administration, convening meetings, preparing budgets, audits and reports to governments and donors. This is often where even the most elegant project plans can fail. Where local capacity has been lacking, national and especially international NGOs have stepped in. This has been both a blessing and a curse. While NGOs have played, and continued to play, essential roles in the design, funding and implementation of large conservation projects across Africa, the post-donor legacy has often resulted in the loss of continuity of leadership and sustainability.

Because of its institutional link with and support from SANBI, the SABONET project, at the point of conclusion, was almost seamlessly followed by the African Plants Initiative. In Zimbabwe and Namibia, the CBNRM projects have enjoyed a succession of NGO and donor mentors and benefactors. But the collapse of governance systems and donor financing in Zimbabwe was followed by the demise of nearly all the once effective (but NGO and donor supported) conservancies. The success of the Namibian community conservancies is as much a result of government endorsement as it is of the joint ventures with tourist lodges and hunting safaris operated by the private sector, which provide mentoring and business management support. The Gorongosa Project has invested heavily in capacity building and development of a strong leadership team of Mozambican professionals, both in park management and in research.

The appointment of talented, early career professionals to key positions – in government or as project managers – contributed to the rapid advance and success of several – perhaps all – of the projects in this study. Raoul du Toit in the Lowveld Rhino Project, Brian Child in CAMPFIRE, Christopher Willis in SABONET, Chris Brown in Namibia, Marthán Bester on Marion Island, James Harrison in the Bird Atlas and Domitilla Raimondo in the Red List projects are classic examples of fortuitous appointments. In Angola, Pedro Vaz Pinto simply took the initiative to grab the (sable) bull by the horns and create a long-term project without institutional or financial security or a formal management structure. It was a simple, pragmatic and impulsive case of *carpe diem*.

The comparative advantage of South Africa's large research community and strong national institutions has benefitted neighbouring countries through sharing technical skills as diverse as studies on the molecular genetics and conservation needs of frogs to the immobilisation and long-distance transport of elephants. Scientific and technological collaboration knows no political borders.

9.7 Promote Champions and Nurture Strategic Leadership Talents

David Attenborough (2009) has summed up the characteristics of what is needed to make a conservation project succeed: "That one individual that has passion, that one individual that has fire in the belly, that one individual that is determined that something should be done."

In each of the case studies, one or more project champions founded the project, or emerged during the implementation process. These are persons with passion, vision, charisma, high intellectual maturity and often with a Machiavellian ability to navigate through the minefields of implementation processes. In Namibia, Garth Owen-Smith spent a decade exploring the landscapes, wildlife and peoples of the

Kaokoveld and testing novel approaches to resolving poaching and land-use problems. His insights fed into the thinking of a next generation of leaders (Chris Brown, Brian Jones), who took the problem into the political and legislative arena with resounding success. Similarly, the early work of Graham Child, David Cumming and Marshall Murphree in Zimbabwe was mobilized by the next cohort of ecologists and economists (Rowan Martin, Russell Taylor, Brian Child, Ivan Bond) in the CAMPFIRE project. On Marion Island, a wide base of multi-disciplinary research, conducted by dozens of researchers over several decades, supported the design and implementation of the cat eradication project. From this rich assembly of workers, Marthán Bester took the lead over three decades and proved the value of a charismatic, firm but sensitive leadership role. The experience of Pedro Vaz Pinto in Angola differed markedly from that of other case studies. Alone in a vast country with few professional conservationists or ecologists, Vaz Pinto had to rely on passion, determination and resilience to drive, almost single-handedly, a species recovery project over two decades. The taxonomic impediment project, initiated through regional consultation and the development of SABONET, required many years of strategic leadership to navigate the complexity of national interests across ten countries with widely differing socio-economic and science cultures. In all projects, the congruence of charisma, courage, tenacity and adaptive management was key. In retrospect, the role of many young innovators was not overlooked. These young professionals were given the opportunity by their senior managers to be adventurous. Even to make mistakes. A learning culture passed from one generation to the next.

9.8 Create and Capitalise on Quick Wins: Success Breeds Success

Ambitious conservation projects can take years, even decades to achieve their goals. Regardless of how committed and loyal stakeholders might be, the long march to success can stumble if participants do not see tangible evidence of progress. Kotter (1996), in describing the principles of transformative change, emphasises the need for short-term targets to be met and celebrated to demonstrate that the journey is producing meaningful results.

Passion and energy fluctuate with the passage of time. In the Marion Island cat eradication programme, after initial frustration with hunting and trapping approaches, the introduction of the feline panleucopaenia virus, brought quick results. But as the cats developed immunity, momentum dropped. As Bester el al. (2002) describe “Despair set in. Some doubt was expressed that the cats could ever be eradicated.” But renewed efforts using an integrated approach with teams of hunters, trapping and poisoning brought further quick results – excitement returned. Ten years on, the project concluded successfully, after a roller-coaster ride of waves of jubilation and disappointment.

The SABONET project also suffered successive moments of frustration and elation, through funding delays, bureaucratic hurdles and logistic challenges. But the highpoints were celebrated as expeditions in Botswana, Malawi and Mozambique met with remarkable success and resulted in the production of some benchmark books such as the beautifully produced *Plants of the Nyika Plateau* (Burrows and Willis 2005) and the monumental *Checklist of Flowering Plants of Sub-Saharan Africa* (Klopper et al. 2006). Similarly, the regular appearance of *SABONET News* provided a popular medium to celebrate small and large successes – effectively communicating across the ten-nation network.

In Angola, after 6 years of blood, sweat and tears, Pedro Vaz Pinto was able to rejoice on the success of the capture and translocation of a breeding herd of giant sable to a quarantine camp in Cangandala in 2009. Small triumphs, and some deep despair, marked each step along the way. The first trap-camera records in 2005, the first live sighting of a group of cows in 2006, and the confirmation of small herds of sable surviving in Luando in 2007, gave much needed bursts of energy to the project.

A key lesson from all projects is that success breeds success. Victory should never be announced prematurely, but even the smallest contributions of participants, and humble successes, should be recognised. It is the integrity and demonstrated passion, commitment and productivity of project teams that create quick wins, attract attention and guarantee the achievement of goals.

9.9 Recognise the Critical Importance of Good Governance

The dependence on good governance systems as an essential determinant of socio-economic and environmental health has been recognised ever since their depiction in the allegorical frescos of Ambrogio Lorenzetti (1339) as described earlier. Nearly seven centuries later, transparent, inclusive and democratic governance systems have proven fundamental to sustainable conservation programmes.

The existence of supportive legislation, policies, clear lines of authority and effective management and monitoring systems are also critical. Change in the legal frameworks governing natural resource use by the private sector, and later, rural communities – was fundamental to the success of the community-based conservancies in Zimbabwe and Namibia. However, the assumption that sound strategies, workplans, management competence, technological innovations and generous funding will bring success has been shown to be poorly founded. In Zimbabwe, the CAMPFIRE programme, developed within the context of all the above criteria and initially highly successful, was undermined and ultimately failed because of the collapse of national and local governance systems. In Namibia the same CBNRM implementation model has prospered because of political stability. But rare exceptions exist. The giant sable project has demonstrated that even in countries with challenging governance systems, success is possible.

9.10 Embrace the Unexpected Opportunities of Serendipity, Good Luck and Good Timing

Over the decades, I have come to believe in the value of chance occurrences of good luck and good timing. The congruence of chance, timing and responsive minds is called serendipity, a key component of strategic opportunism. On serendipity, Louis Pasteur commented: "Chance favours the prepared mind" – in other words, serendipity requires a sharp mind to recognise it when it presents itself (Abdulai 2009). It is also a product of hard work. The South African golfer, Gary Player, winner of nine major championships and 167 professional golf tournaments, is quoted as having said: "The harder I work, the luckier I get." In reviewing the case studies, several instances of what could be described as serendipity became evident. Many more no doubt occurred.

In the spring of 1965, with a meteorologist colleague, I summitted the highest peak on Marion Island. It was the first recorded ascent of the then perennially cloud-covered volcanic peak. By lucky chance, as we reached the summit, the clouds opened and I was able to photograph the ice plateau that covered the higher reaches of the mountain. The panoramic view was published in the expedition report (Van Zinderen Bakker Sr et al. 1971). Many years later, Meiklejohn (2011) published paired photographs, showing the retreat of the ice plateau between 1965 and 2009, relating the disappearing ice-cap to global warming and decreased rainfall. These two factors were confirmed by the detailed records kept since the meteorological station was established in 1948 (Hedding and Greve 2018). The chance of fine weather and panoramic photos taken on that spring day in 1965 provided the evidence that triggered long-term studies on the warming and drying of Marion Island. These findings are of direct bearing on the recently observed drying of mire vegetation, a surge in house mouse populations, and the predator/prey transfer from invertebrates to vertebrates, as mice now attack and kill many ground-nesting seabirds, from small prions to the massive and magnificent wandering albatross.

When Pedro Vaz Pinto was searching for evidence of the survival of giant sable in Cangandala National Park, over 2 years of failed camera-trapping passed before his cameras revealed a female giant sable at a salt lick. Further photos built up a profile of 23 individuals. But many of the animals had strangely long droopy ears, and unusual markings. Another year passed before he actually saw a herd with the naked eye. No adult males were present, but a lone male roan antelope accompanied the herd. The giant sable population was being hybridised into extinction. No crisis could trigger action faster than this evidence, especially when confirmed by microsatellite genetic studies. Funds were mobilised, a game capture team from Zimbabwe was called in, military helicopters were made available, and a pure male giant gable was captured in Luando Nature Reserve and translocated to the nine Cangandala females. A dozen years later, over 100 genetically pure, safe and healthy giant sable are at peace in Cangandala.

A final example of serendipity was the chance meeting in 2003 of the programme manager of a major philanthropic trust with an improvised digital scanning device.

The device was used for preparing electronic images of rare herbarium specimens at Royal Botanic Gardens, Kew. When William (Bill) Robertson of the Andrew W. Mellon Foundation saw the 'HerbScan' in use, he immediately connected the dots to a vision of an African-wide project to scan and make accessible digital images of all the type specimens of the flora of Africa south of the Sahara. Such access would go far towards resolving the urgent need to repatriate information on Africa's flora held in northern hemisphere institutions. Bill Robertson pulled together a small team of leaders of botanical institutions to consider his idea. A proposal was prepared and presented at a meeting of AETFAT, the network of African botanists, which met shortly thereafter in Addis Ababa. Within weeks, a generously funded project to prepare images of type specimens held in 73 herbaria across the world, was approved for funding. Five years later, the African Plants Initiative had concluded, having digitised 231,171 images of over 50,000 African plant species. The vast resources of 'northern' herbaria were made electronically available to botanists of the global south, at the mere touch of a computer keyboard. The congruence of chance, timing and responsive minds is called serendipity, a key component of strategic opportunism.

9.11 Seize the Political Moment of Changes in Governance

Political will is a prime driver of conservation success. This often comes with changes in leadership. Dramatic political changes might be inevitable with the passage of time, but the timing and nature of their impacts are seldom predictable. In a speech before the South African Houses of Parliament in 1960, British Prime Minister Harold Macmillan described the 'Winds of Change' then blowing across the political firmament of Africa, bringing unprecedented change to the continent's socio-political trajectory. In less than 12 months, independence came to 15 former West and Central African colonies of Belgium, Britain and France. After sweeping across East Africa through the 1960s, the winds of change only reached Mozambique and Angola a decade later (1975), with Zimbabwe (1980), Namibia (1990) and South Africa (1994) even later, in the wake of bitter political struggles characterised by violence. In Mozambique and Angola, independence was followed by extended civil wars.

Political change in southern Africa led to radical and positive reforms to colonial policy and law, of critical importance to future trajectories of conservation actions. The rare coincidence of the political moment and of extraordinary personalities led to the devolution of power over wildlife resources from central government to rural communities in Zimbabwe (1983) and Namibia (1996), providing the enabling legislation for launching effective community-based natural resource management systems.

Even wider benefits to conservation came with politically-led global environmental initiatives. Of fundamental importance was the United Nations Conference on Environment and Development held in Rio de Janeiro in 1992, which established the Convention on Biological Diversity (CBD) and the Global Environment Facility (GEF). For the first time, biodiversity was placed on a global political platform, and provided with the financial means to implement its objectives. The impact of the CBD and GEF has been transformational across Africa. Its history is well beyond the scope of this study. But at a regional level, the simultaneous political transformation in South Africa, and the emergence of the CBD and GEF, had resounding positive impacts on all the success stories related in this narrative.

The 11th February 1990 was auspicious both for the release of Nelson Mandela from prison and for the evolving SABONET project, conceived in Maputo, Mozambique, on that day. The access to GEF funding was the financial driver of the project for 8 years. Law reform and new institutions, which followed close on the advent of democracy in South Africa in 1994, widened the scope and reach of conservation programmes such as those on threatened species and habitats. Free movement of scientists and technical support from Botswana, Namibia, South Africa and Zimbabwe, to Angola and Mozambique, facilitated the capture and relocation of giant sable between Luando and Cangandala, and of multiple species for repopulating Gorongosa. SABONET and the African Plants Initiative would have been unthinkable without a democratic South Africa, the achievement of which coincided with the launch of these projects. Like serendipity, the opportunities created by political change required both sharpness of mind and speed of action to seize the political moments as they appeared.

9.12 Develop Creative Financing Strategies

Two contrasting conservation financial models have emerged in the past few decades. At one extreme, the GEF and aid agencies such as USAID, GTZ, DFID, etc., have made available billions of dollars for biodiversity projects around the globe. Much of this funding now sustains the major international NGOs, such as the WWF, Conservation International and African Wildlife Foundation, to name a few. As laudable as these organisations are, many are overburdened with excessive bureaucratic demands, are designed and implemented by international consultants, and some have weak legacies of local capacity to ensure sustainability. However, the important mentoring role of such large NGOs should not be discounted. They carry the high opportunity costs and risks that are experienced in the early stages of complex projects in countries with weak institutions. These projects can often be characterised by high costs and often relatively low impacts.

At the opposite extreme of financial models, the rapid growth of citizen science activities, facilitated by the use of the internet and social media, and operating on slender budgets, have proven the value of volunteer networks. They can have low costs and high impacts.

Regardless of the funding source, successful projects are those that have been able to access multiple financial streams. The early history of community-based conservation in Namibia is a history of living from hand-to-mouth, with the project leader dependent on a series of minor grants interrupted by periods of anxious unemployment. The programme could only reach critical mass once a diversity of funding streams – government, donor, private and community-driven – came into play. The SABONET project had the good fortune of having a strong institutional base (SANBI), but even with such support, it would have failed if an unexpected source of seed funding from the IUCN regional office in Harare had not arrived, at a time when the goal posts for GEF approval kept moving. The Giant Sable Project has survived solely through the tireless efforts of the project leader to attract funds – large and small – from a wide range of sponsors and friends. The African Plants Initiative was somewhat unique. A single, philanthropic foundation provided for every need throughout the project, with generous, flexible and sustained funding, an absolute minimum of bureaucracy, and an admirable investment of intellectual support. Larger, long-term projects such as Gorongosa have required an innovative mix of strong donor, government, private sector, philanthropic and self-generated funding.

While the objectives and dimensions of projects might differ markedly, one characteristic is essential – transparent financial accounting and reporting. This is an area of great vulnerability in many African countries, not necessarily due to malign intent, but often due to inexperience in project management, monitoring and auditing. Risk management is part of any developmental programme. In Africa, the greatest risk is not to take risks.

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Chapter 10
Synopsis: Strategic Opportunism – Vision, Passion and Pragmatism

It is not the strongest of the species that survives, nor the most intelligent, but the one most adaptable to change.

A misquotation frequently attributed to Charles Darwin.

Fundamental changes have emerged in conservation thinking and wildlife management approaches in Africa over recent decades. The recognition that ecosystems are seldom in equilibrium, are usually heterogeneous, and are constantly responding to fluxes in external pressures, suggests that the utopian 'balance of nature' concept is a myth. Uncertainty and change in interactive social and ecological systems have stimulated the development of adaptive management approaches in conservation. Adaptive management requires pragmatism, flexibility and an experimental, learning by doing, philosophy.

Strategic opportunism is adaptive management writ large. It seeks to transform problems into solutions. It recognises serendipity and embraces unexpected opportunities and the political moment. The development and application of the concept is based on experience drawn from multiple projects, across ten countries, within biomes ranging from hyper-arid desert, to tropical savanna, and to sub-Antarctic tundra, and within dynamic socio-political landscapes. The concept and practice of strategic opportunism is not encountered in university curricula. It is found in practical applications in the real world. The selected projects demonstrate success that has been sustained for two or more decades, and which illustrate how goals can be met regardless of a nation's wealth, or of its cultural traditions.

The thesis of this book is that success depends on a clear and shared vision, within a flexible approach to project design and implementation, free of the straightjacket of development agency project formats and short-term funding horizons. These case studies provide guidance not only for the execution of conservation and research projects, but also for the development of the human and financial resources needed to achieve realistic goals. At the heart of success is the role of passionate and inspiring leaders committed to the long view of conservation and research.

B. J. Huntley, *Strategic Opportunism: What Works in Africa*, SpringerBriefs in Environmental Science, https://doi.org/10.1007/978-3-031-24880-1_10

In contrast to many 'northern' countries, the advantages of predictability and stability are not shared by the 'global south'. The demand for flexibility is particularly critical for much of Africa, where more than half of the continent comprises deserts and arid savannas, with widely fluctuating spatial and temporal patterns of rainfall, of vegetation productivity, and of ecosystem resilience. Realistic research and conservation goals must be based on a long-term vision, thinking big but starting small.

Even more than in politics, conservation is the art of the possible. It is a slow and iterative process. All the projects described have histories of slow but incremental progress, never linear but always opportunistic, seizing the moment while imagining the future.

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B. J. Huntley, *Strategic Opportunism: What Works in Africa*, SpringerBriefs in Environmental Science, https://doi.org/10.1007/978-3-031-24880-1