A QUANTITATIVE MODEL

TO FINE-TUNE TOURISM AS A

BLACK RHINOCEROS (*DICEROS BICORNIS)*

CONSERVATION TOOL

IN NORTH-WEST NAMIBIA

By

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Declaration

By submitting this thesis electronically, I declare that the entirety of the work contained therein is my own original work, that I am the sole author thereof (save to the extent explicitly otherwise stated), that reproduction and publication thereof by Stellenbosch University will not infringe any third party rights, and that I have not previously in its entirety or in part submitted it for obtaining any qualification.

December 2016

DEDICATIONS

I have chosen to dedicate my dissertation to three groups of individuals that have been instrumental in shaping both my personal and professional life, without which I would not and could not have completed this dissertation.

First, to my amazing parents, Bob and Jean, and my only little sister, Carie, to whom I owe my foundational sense of awe and character. I would not be where I am without your support and smiles, even when it meant moving my life to the other side of the earth.

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Last, but certainly not least, to my witty, wonderful wife, Basilia Andoroone Shivute, and our two children, Nelalakano and Pwatema, who instilled in me the importance of knowing and practicing real patience and living an authentic life. This is for you.

‘SENTIMENT WITHOUT ACTION

IS THE RUIN OF THE SOUL’

~ Ed Abbey

‘IF YOU WANT TO GO FAST, GO ALONE.

IF YOU WANT TO GO FAR, GO TOGETHER’

~ African Proverb

Desert Rhino Camp (DRC) Anthem

The DRC anthem was written by Raymond Roman, Wilderness Safaris Guide and local resident of the Torra Conservancy, in 2011. The song is performed by the entire DRC camp staff in both English and Damara-Nama language each night at Bush Dinner with hands together (resembling a rhino horn) over your heart.

We are protecting our wildlife
Fauna and flora for future generations
Desert Rhino Camp, we love you
Save the save the Rhino

Our Concession
Sesfontein
Anabeb
Torra

Save the save the Rhino (repeat)

Sida ge !Nawa na ra !ui.
Netse tsi /aris !aroma
Desert Rhino Camp /nam du da
!Ui-ao !Ui-ao !Nawa

!Ui-ao !nani /aus
Sesfontein
Anabeb
Torra

!Ui-ao !Ui-ao !Nawa (repeat)

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Desert Rhino Camp (DRC) has essentially been my home away from home away from home in north-west Namibia for the past thirteen years. This camp, where it started, what it stands for, how it has grown and where it continues to lead us in our efforts to secure a future for the world's last truly wild black rhinos continues to captivate and inspire me ever since the tent-flaps opened in April 2003. I consider myself privileged to have been given the opportunity to contribute to this noble effort. Like most efforts of this size and magnitude, many people have made valuable contributions over the years. The body of research compiled in this dissertation is all but one of the inner cogs that make up DRC.

While I began my research at DRC shortly after the camp opened, I was not a part of the visionary team that first inspired the concept. For that, I (and many others) owe a huge debt of thanks to the late Mike Hearn, the late Blythe Loutit, Rudi Loutit, Simson !Uri-≠Khob of Save the Rhino Trust (SRT) and Dave van Smeerdijk, Dr. Jennifer Lalley, and Chris Bakkes all previously of Wilderness Safaris. Their big dreams gave DRC the spark it needed and the bold goals to which we still aspire towards. Much of this research is an extension of preliminary research designed and conducted by the late Mike Hearn, Namibian graduate student Michael Sibalatani and my student research assistants under my previous employer, Round River Conservation Studies. I also wish to express the deepest admiration and respect for the managers, guides and trackers based at DRC in the early years who somehow found a way to 'put up with' a young, overly-ambitious American transplant especially Wilderness Safaris' Chris Bakkes, Emce Vervey, Kapoi Kasaona, Willy Kasupi, and Harry Ganuseb, and SRT's John Hendricks and Sebulon Hoeb. I am especially thankful for Chris Bakkes' willingness to tell me

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Note to Reviewers

It is with great pride and honor that I am able to present this dissertation to you for review, comprising more than a decade of my professional life in Namibia. My dissertation is comprised of six chapters. Chapter 1 is the introduction which describes the context and theoretical underpinnings to the research. Chapters 2 through 5 contain the analytical components of the dissertation. Chapter 6 concludes by providing a summary of key findings and future direction. Although Chapters 2 through 5 are prepared as research articles, I have edited each chapter to read in first person form as a means to standardize the text. Chapter 2 has been published, chapters 3 and 4 have been submitted for publication and chapter 5 is destined to be submitted for publication (possibly split into two manuscripts) by the end of August 2016. Since the chapters have been written in this manner, considerable repetition was unavoidable and is evident in the Introduction Chapter (1) and the introduction of all analytical chapters. Despite specific formatting required for each relevant journal, I have edited all chapters to maintain a consistent format for this dissertation including a single referencing style. A bibliography containing complete citations is compiled at the end of the dissertation. A modified version of the 6th edition of the APA style was used to ensure that maximal information is provided for each reference in a clear format. All figures and tables are included at the end of each chapter in which they are associated. I have also included Chapter 2's published title page as an appendix and some photographs that depict the rhinoceros conservation tourism operation model in practice at DRC. In addition to achieving academic standards, I hope you will find this dissertation as a valuable contribution towards advancing rhinoceros conservation in Africa.

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Abstract

The conservation of valued species is challenging given the complexity, diversity and dynamism of the social-ecological systems (SES) within which conservation problems are situated. The dramatic escalation in poaching and illicit trade in high-value species such as tiger *Panthera tigris*, elephant *Loxodonta africana*, and white and black rhinoceros (*Ceratotherium simum* and *Diceros bicornis*), exemplifies these challenges and solutions largely remain elusive. While the policy response has primarily called for increased investment in enforcement strategies, effective solutions will likely require a context-specific, stakeholder-driven mix of top-down and bottom-up mechanisms grounded in theory that more realistically represents human behaviour. In this context, designing and implementing mechanisms that change how high-value species are valued by developing or strengthening local institutions that embody these values can become the basis for a shift in social norms that portrays poaching as an intolerable act. In this dissertation, I make a case for initiating such behavioral change in rural communities living alongside many highly valued wildlife species in north-west Namibia by developing an economic and socio-political relationship between rhinoceros and local communities that harness human values to deliver greater return-on-investment for rhino conservation initiatives.

My primary goal in this study was to describe in both theory and practice tourism's potential as a rhinoceros conservation tool and to fine-tune a sustainable operational model grounded in quantitative interdisciplinary analysis. I applied a problem-oriented approach that illustrated in theory and practice how such community-based strategies, specifically an evolving rhinoceros-based tourism case in north-west Namibia as a case, that explicitly incorporate local values and institutions, are a foundation for effectively combating rhinoceros poaching. I then described

and analyzed key operational challenges associated with both design and delivery that could threaten the long-term sustainability of a rhinoceros conservation tourism enterprise. By employing an information-theoretic approach, I modelled the key factors that drive rhinoceros disturbance directly during encounters with tourists and indirectly from other tourism-related activity and infrastructure. Model outputs yielded an evidence-based encounter protocol that reduced rhinoceros disturbance events from 26% to 5% in just two years and a rotational use policy for the operating area that reduced the total amount of tourism-induced habitat loss from 15.7% to 7.1% and high-value habitat loss from 32.8% to 20.7%.

Governance problems were also examined by employing a policy sciences approach to characterize the decision context and appraising the decision process. My appraisal of the decision process identified strengths such as the inclusive nature within each function, comprehensive intelligence gathering, and the participant's willingness and ability to reconcile different perspectives and objectives by finding common interest solutions based on shared values such as respect for human and rhinoceros well-being. The policy process could be improved by mandating top management conduct more site visits with deeper interactions with site-level managers, guides and trackers and more frequent and independent appraisals are compiled. Lastly, a series of prototypic elements that are transferable include the establishment of a shared decision-making arena, adopting a fully inclusive management-oriented research agenda, employing a strategic messaging approach as a means to motivate compliance and increase philanthropic behavior by tourists, and emphasizing a learning approach through role reversal opportunities that harness values for guides and trackers. In order to facilitate effective replication, I recommend establishing deeper engagements with conservancy(s) who host

emerging rhinoceros tourism enterprises and expanding the research agenda to include tourism's broader role towards influencing pro-rhinoceros behavior change in both tourists and neighboring communities.

Overall, this body of novel research demonstrates how an evidence-based, policy-oriented management approach can help improve tourism's contribution towards the conservation of an endangered species. Furthermore, it establishes a clear, transferable set of prototypical elements that are projected to help ensure any future expansion of rhinoceros tourism ventures are built upon solid foundations.

Chapter 1: Introduction

The complexity, diversity and dynamism of the social-ecological systems (SES) within which conservation problems are typically situated continues to challenge the conservation of valued species. This is particularly the case for highly complex "wicked" conservation problems (Game *et al.*, 2014) and is common for species that are rare and highly valued but threatened by legal (i.e. sustainable harvesting) and illegal (i.e. poaching) human-caused mortality. In such cases, solutions often remain elusive as problems cannot be isolated due to their highly connected nature with other problems across multiple scales in space and time (Brown *et al.*, 2010; Rittel & Webber, 1973).

The dramatic escalation in poaching and illicit trade in high-value species such as tiger *Panthera tigris*, elephant *Loxodonta africana*, and white and black rhinoceros (*Ceratotherium simum* and *Diceros bicornis*) has risen to become one of the most urgent and critical challenges facing conservation. The policy response has primarily called for increased investment in enforcement strategies particularly conventional military-style anti-poaching (Ferreira & Okita-Ouma, 2012; GTRP, 2012). However, enforcement-based protection strategies focus narrowly on poaching and promote increasingly militarized responses (Ferreira & Okita-Ouma, 2012). They do not contextualize the problem and do not address the underlying forces driving the killing (Challender & Macmillan, 2014). Although effective and dependable species protection should be supported by sound governmental enforcement, investing in community-based strategies that are explicitly founded upon local values and rights facilitated through locally-devised institutions can improve our collective efforts to combat poaching.

Values are the basic medium of exchange in all human interactions and underline the things and events in life that people desire and demand (Lasswell, 1971). People seek to shape and share values through exchanges structured through the norms embedded within societal institutions (Lasswell & Holmberg, 1992) significantly influencing behavior (Kahler & Gore, 2012; Keane *et al.*, 2008). Relationships, norms, and values routinely reduce the likelihood that individuals act in their short-term self-interest (Ostrom, 2000). Thus, designing and implementing socio-economic mechanisms that change how high-value species are valued, both monetarily and non-monetarily, while developing or strengthening local institutions that embody these values can become the basis for a shift in social norms, even after poaching has become a normative behavior.

Reconciling socio-economic development and wildlife conservation objectives is vital for ensuring the maintenance and improvement of both human well-being and biological diversity. The effects of human disturbance on wildlife behavior, often predicated by a development goal, have gained significant attention (Bennett *et al.*, 2009, 2011; Marchand *et al.*, 2014; Nelson *et al*., 2006). Research examining cumulative effects of human activity upon free-ranging wildlife populations suggests impacts occur at multiple scales, temporal and spatial, and range from individual animals to entire populations (Johnson *et al.*, 2005). These effects require proactive strategic planning to effectively manage the balance between development and wildlife.

Wildlife-based tourism has been heralded as a key conservation mechanism (Buckley & Castley, 2012; Alexandra *et al.*, 2012) and has recently experienced tremendous growth globally (Tapper, 2006), particularly within developing countries (Balmford *et al.*, 2009). However, wildlife-based

tourism can produce negative outcomes for species (Bejder *et al.*, 2006; Corkeron, 2004; Griffin *et al.*, 2007; Lott & Mccoy, 1995; Lusseau, 2004; Lusseau, 2003; Preisler *et al.*, 2006; Trathan *et al.*, 2008) highlighting the need for evidence-based management especially as the demand for experiences that provide opportunities to interact directly and in close proximity with wildlife continues to escalate (Higham *et al.*, 2009). In order to ensure conservation benefits derived from increasing numbers of tourists seeking encounters with rare and endangered wildlife exceed the costs (e.g., Karanth & DeFries 2011) it is vital that research be translated into management approaches that are both user-useful and user-friendly (Pierce *et al.*, 2005). The availability of science-based management approaches, unfortunately, does not necessarily ensure their implementation (Fazey *et al.*, 2005; Knight *et al.*, 2008; Knight *et al.*, 2006) and there is often a mismatch between conservation needs and research practice undermining the positive influence science can provide to improve endangered species, such as rhinoceros, management (Linklater, 2003).

Black rhinoceros conservation trends and conditions

Once widely distributed across sub-Saharan Africa, Africa's black rhinoceros population was decimated from approximately 65,000 as late as 1970 to less than 2,500 in 1992 (Amin *et al.*, 2006). This unprecedented decline has largely been driven by the demand for the use of rhinoceros horn in Asia primarily for medicine (Amin *et al.*, 2006; Milliken *et al.*, 2009) and, more recently, business gifts (Milliken & Shaw, 2012) and investment opportunities (Mason *et al.*, 2012). After more than a decade of relatively low levels of poaching between the mid-1990s and 2007 (Emslie, 2008), the alarming rate at which rhinoceros poaching has escalated over the past five years poses a serious threat to the long-term persistence of extant rhinoceros

populations once again (Duffy *et al.*, 2013; Knight, 2012b). Recent estimates suggest that 93% of the world's rhinoceros could be extinct by 2025 (Ferreira *et al.*,2012) if the current poaching rate continues unabated.

Namibia is home to approximately one-third of the world's extant critically-endangered black rhinoceros (*Diceros bicornis)* and 90% of the *D. b. bicornis* subspecies (IUCN, 2014). The black rhinoceros inhabiting northwestern Namibia is recognized by the International Union for Conservation of Nature (IUCN) African Rhino Specialist Group as a Key 1 population for species recovery due to its large size (Emslie, 2008). It is also the largest population of any rhinoceros species persisting outside a formally protected area (Hearn, 2003), heightening both its conservation and tourism importance.

In north-west Namibia, collaborative efforts to establish local value-based institutions that secure the common interest (i.e., resilient populations of black rhinoceros that can be sustainably managed as an important component of eco-tourism activities that benefit local communities) in conserving black rhinoceros were formally initiated in the early 1980s (Owen-Smith, 2010) and included a locally-devised and managed auxiliary game guard system (Loutit & Owen-Smith 1989). A series of stakeholder engagement workshops helped strengthen the foundation for long-term strategic partnerships between government, local communities, NGOs, and, more recently, private sector tourism operators that have demonstrated a deep recognition and understanding of local values, perspectives and desired collective outcomes for rhinoceros conservation (Hearn *et al.*, 2004). Namibia's community-oriented approach has helped instill in local communities a genuine sense of rhinoceros *de facto* ownership and acceptance, despite all black rhinoceros being owned by the state (!Uri-≠Khob, 2004). An ambitious restoration

program was initiated in 2005 to achieve biological management goals and fill an emerging demand from local communities to receive and manage rhinoceros back on their lands primarily for tourism (!Uri-≠Khob *et al.,* 2010). This provided a unique opportunity to further strengthen existing local values and institutions that support rhinoceros conservation and created a clear, grassroots-driven need to fine-tune tourism as a rhinoceros conservation tool.

Tourism as a rhinoceros conservation tool

Black rhinoceros may be especially susceptible to tourist-induced disturbance due to their tendency to avoid humans and their activities (Cunningham & Berger, 1997; Walpole *et al.,* 2003). Evidence suggests that even benign exposure to tourism activities may produce negative consequences for some species, such as increased predation or poaching risk (Geffroy *et al.,* 2015) following the often associated habituation-like processes that increase wildlife tolerance towards human activity (Knight, 2009). Thus, despite the benefits tourism may provide, irresponsible practices can threaten the sustainability wildlife populations, conservation initiatives and tourism businesses.

In addition to the negative consequences for species exposed to poorly planned and implemented tourism activities, poor decision making, especially within unconventional conservation-oriented tourism partnerships, can also severely limit tourism's contributions towards conservation (Garen, 2000). Disciplines such as behavior change (Akerlof & Kennedy, 2013), systems thinking (Cundill *et al.* , 2012; Jackson, 2003; Norberg & Cumming, 2008), scenario planning (Carpenter *et al.,* 2006; Peterson *et al.,* 2003), appreciative inquiry (Cooperrider *et al.,* 2008) evaluation (Jenks *et al.,* 2010; Kleiman *et al.,* 2000; Patton, 1990) and the policy sciences (Clark,

2002; Sabatier, 2007) have put forth various approaches to describe and analyze decision-making contexts to address and improve procedural problems in complex systems.

The policy sciences, developed more than 50 years ago (Lasswell, 1971), has been historically employed to help solve complex problems for many sectors including law, international relations and public health, and more recently, natural resource management (Clark, 2002). Although rarely applied in a tourism context, the policy sciences fundamental assertion that the ongoing interaction of people in their efforts to obtain what they value is the foundation of all decision-making aimed at securing the common good (Clark *et al.*, 2010; Clark & Willard, 2000). It is well suited to dealing with disentangling the complexities inherent within multi-stakeholder partnerships that strive to protect highly valued and threatened species (Clark & Brunner, 2002). For example, the approach provides both a theory and practical framework for effective problem solving to help clarify and secure common interest solutions (Clark *et al.*, 2010) that can be generally described as people carrying out decision processes in order to allocate and use resources affecting how values are shaped and shared (Figure 1.1).

Central to the policy sciences' approach is an understanding of human values and their dynamics when decision-making. While many classifications of human values have been described that motivate human behavior (Maslow, 1954; Schwartz & Bilsky, 1987), the policy sciences classify human values into eight base values including power, wealth, respect, enlightenment (knowledge), skills, affection, well-being and rectitude (Lasswell & Holmberg, 1992; Lasswell, 1943). How these values are shaped and shared (i.e. who gets what, when and how) between participants is fundamental to decision-making (i.e. policy) processes. Participants often use

existing values (base values) to acquire or improve upon value demands (scope values) (Clark & Wallace, 2002). Such 'value dynamics' are useful to help characterize and unravel complex inter-relationships within an SES and can be 'mapped' for any situation by conducting a functional analysis of who participates, with what perspectives, in which situations, using which base values with what strategies to achieve desired outcomes (Clark, 2002). The social process can be summarized as people seeking values through institutions that affect and use resources (Clark *et al.*, 2010). Thus, the social context lies at the core of all decision-making and central to providing a fully contextual understanding of an SES.

The policy sciences framework characterizes the decision process in terms of seven inter-related functions or activities that include intelligence, promotion, prescription, invocation, application, termination and appraisal (Clark, 2002). Like the social process, each decision function can be systematically mapped and analyzed contextually in terms of who participated, with what perspectives, in which arenas, using what base values to acquire what scope values, in what strategic ways to generate desired outcomes (Clark & Willard, 2000) and is appraised against a series of recognized standards (Clark, 2002). Problem orientation is the process of clarifying goals, describing trends, analyzing conditions, projecting developments and selecting alternatives. Lastly, observational standpoint clarifies the author's standpoint relative to the policy problem and may include roles, problem solving tasks performed, motivations, and biases towards the role and tasks (Clark & Willard, 2000). Additional methods can also be utilized within the policy sciences framework to analyze a policy problem so as to promote creativity, innovation, adaptability and learning, including case studies (Clark, 1986), policy exercises

(Brewer, 1986), decision seminars (Clark, 1997; Lasswell, 1963) and prototyping (Lasswell, 1963).

Prototyping is a proven technique for enhancing the performance of a particular intervention or task specifically in contexts characterized by high complexity, uncertainty and potential for conflict among parties (Brewer & DeLeon, 1983; Brunner & Clark, 1997) such as wildlife-based tourism joint-ventures. A prototype is both a model product as well as the process of innovation and adaptation used to develop such a product. Although typically initiated on a small scale, prototypes are designed with learning and eventual replication in mind (Clark *et al.*, 2002). Prototypes establish a systematic process for detecting and rectifying errors and obstacles, for accumulating successes and filtering out failures. The goal of any prototype is to reach a level of operation that represents a new model of a SES and to lay a foundation that promotes the replication of fundamental features or key elements, along with knowledge and skills transfer, at a broader scale (Lasswell, 1971).

As a basis for my study, I proposed that tourism has the potential to make significant positive contributions towards large-scale rhinoceros conservation in Namibia. However, that potential is only likely to be fully realized and sustained if an empirically-based operational model is designed and delivered. I thus also aimed to demonstrate that basic research, if designed, conducted and interpreted in a practice-based, pragmatic and inclusive manner, can play a more effective role towards informing and improving the management of endangered species that mutually benefits ecological (rhinoceros), social (local communities) and economic (private

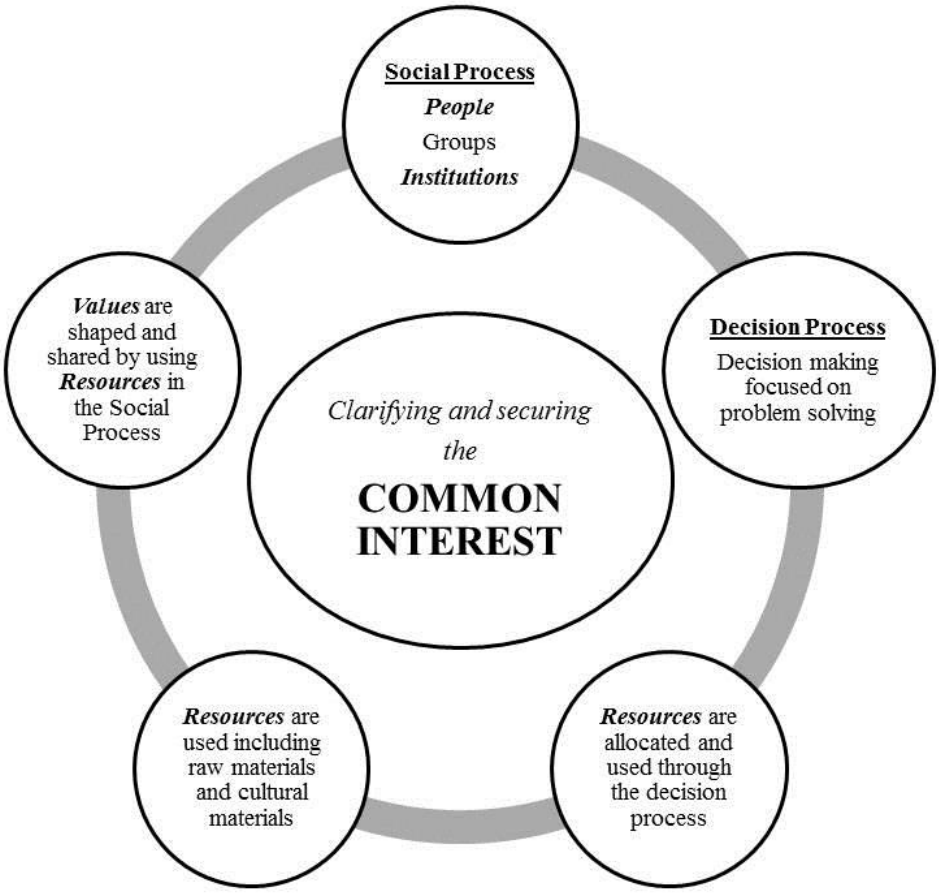
sector tourism) sustainability. Therefore, this dissertation sets out to acquire the insights and evidence necessary to build such a rhinoceros conservation tourism model to serve as a prototypical case for future enterprises to aspire towards.

My goal in this study was to describe in both theory and practice tourism's potential as a rhinoceros conservation tool and to fine-tune a sustainable operational model grounded in quantitative interdisciplinary science. Firstly, I apply a problem-oriented approach (Clark, 2002) to illustrate in theory and practice how a community-based strategy that explicitly incorporates local values and institutions can be a foundation for effectively combating rhinoceros poaching (Chapter 2). I use a case study from Namibia to demonstrate how coupling a locally-devised rhino monitoring regime with a joint-venture tourism partnership has helped reconcile individual values represented within a diverse stakeholder group and helped formulate common interest solutions to ensure the persistence of rhinoceros (Chapter 2). Thirdly, I narrow my focus to describe and analyze two technical problems and recommend alternative management solutions for improving the delivery of rhinoceros conservation tourism, inclusive of minimizing disturbances during rhinoceros – tourist encounters (Chapter 3) and rhinoceros displacement due to tourism activities and infrastructure (Chapter 4). Finally, I investigate how procedural or design problems might be resolved by employing a policy sciences approach to characterize the decision context and appraising the decision process to highlight a series of prototypic elements for effective implementation (Chapter 5).

Overall, this dissertation strives to demonstrate how an evidence-based, policy-oriented management approach can help improve tourism's contribution towards the conservation of an

endangered species. Furthermore, I set out to establish a clear, transferable set of prototypical elements projected to help ensure that any future expansion of rhinoceros tourism ventures are built upon sound, practice-based operational foundations. I believe that the pursuit and provision of these novel insights can play a positive role in enhancing the prospects to secure a future for the world's last truly wild population of black rhinoceros, as well as a theory-based and practical model for advancing our understanding and appreciation of wildlife-based tourism's role as a conservation tool.

Figure 1.1: A general description of the policy process in natural resource management.



Source: Adapted from S. G. Clark, *The Policy Process*, Yale University Press, New Haven, CT, USA, 2002, page 15.

Chapter 2: Harnessing values to save the rhinoceros - insights from Namibia

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Abstract

The rate at which rhinoceros poaching has escalated since 2010 poses a threat to the long-term persistence of extant rhinoceros populations. The policy response has primarily called for increased investment in military-style enforcement strategies largely based upon simple economic models of rational crime. However, effective solutions will probably require a context-specific, stakeholder-driven mix of top-down and bottom-up mechanisms grounded in theory that represents human behaviour more realistically. Using a problem-oriented approach I illustrate in theory and practice how community-based strategies that explicitly incorporate local values and institutions are a foundation for combating rhinoceros poaching effectively in specific contexts. A case study from Namibia demonstrates how coupling a locally devised rhinoceros monitoring regime with joint-venture tourism partnerships as a legitimate land use can reconcile individual values represented within a diverse stakeholder group and manifests as both formal and informal community enforcement. I suggest a social learning approach as a means by which international, national and regional governance can recognize and promote solutions that may help empower local communities to implement rhinoceros management strategies that align individual values with the long-term health of rhinoceros populations.

Introduction

The rate at which rhinoceros poaching has escalated (Knight, 2012) since 2010 poses a threat to the long-term persistence of extant rhinoceros populations (Duffy *et al.*, 2013). Resurgent global trade and unprecedented black market prices for rhinoceros horn are implicated as the major drivers of the killing (Ferreira & Okita-Ouma, 2012; Biggs *et al.*, 2013). Although

rhinoceros conservation scientists and practitioners promote a variety of strategies to safeguard the rhinoceros (Duffy *et al*., 2013), military-style law enforcement and demand reduction (Biggs, 2013; Challender & MacMillan, 2014; Ferreira & Okita-Ouma, 2012; IUCN *et al*., 2015) have dominated the response to protect Africa's remaining 20,000 white rhinoceros *Ceratotherium simum* and 5,000 black rhinoceros *Diceros bicornis*. Despite courageous efforts to combat poaching, and some positive trends in end-user behaviour (Coghlan, 2014), rhinoceros poaching rates continue to rise, with a reported 184% increase across Africa during 2008–2012 (Standley & Emslie, 2013). I investigated what and how community-based strategies make military-style protection more effective but also provide innovative, longer-term solutions that are more resilient to the changing type and magnitude of threat. I use the Namibian experience to make a case for rhinoceroses and other wildlife-based tourism as a legitimate land use that embodies both collective and individual values, creating the pro-rhinoceros social foundation that enforcement-based strategies require to be successful. This is preferable to the prioritization of military-style strategies, and more successful. Although I affirm that effective and reliable rhinoceros protection should be supported by governmental enforcement, I illustrate both in theory and practice that investing in community-based strategies that are founded explicitly on local values and rights, and facilitated through locally devised institutions, can improve our collective efforts to combat rhinoceros poaching.

What is the problem?

Rhinoceros poaching is a complex problem (Brown *et al.*, 2010; Rittel & Webber, 1973) that is interconnected with other problems across multiple scales, making solutions elusive. Military-style protection strategies focus narrowly on poaching (Ferreira & Okita-Ouma, 2012) which

may lead to anger, resentment and a sense of disenfranchisement among local people (Dowie, 2009). This approach does not contextualize the problem, and reinforces fortress conservation, a product of Africa's late-colonial and independence history that reserved wild areas primarily for European leisure activities (Adams & Hulme, 2001; Brockington, 2002). Military-style protection, which is sometimes promoted by transnational conservation organizations (Dowie, 2009), tends to reinforce the benefits of biodiversity for powerful local and international elites. Fortress conservation has had significant political, social and cultural effects on indigenous people, including restricted access to, or exclusion from, both policy processes and areas important for their livelihood and cultural practices, and sometimes even physical relocation (Dowie, 2009). The erosion of culture, language and ultimately human dignity has resulted in retaliatory illegal hunting and other unsustainable use of resources, often referred to by conservationists as poaching (Dowie, 2009; Sullivan & Homewood, 2004). Thus, the response to conflict with local people, who are typically framed by conservationists as being part of the problem, has often been to tighten control through more weapons, fences and fines (Dowie, 2009). This approach has resulted in mistrust and a sense of alienation among local people, and established barriers that compromised local support for conservation; for example, resettlement plans for communities residing in Mozambique's Limpopo National Park caused anger and distrust (Dressler & Büscher, 2008; Milgroom & Spierenburg, 2008) and may have contributed to the upsurge in poaching in neighbouring South Africa's Kruger National Park. In some cases, measures to increase militarization of government-led enforcement and anti-poaching activity have undermined the efforts of conservationists working to build trust and cooperation with communities (IUCN *et al*., 2015).

The social injustices of fortress conservation have inhibited multi-stakeholder responses to the poaching problem. Addressing these injustices in the search for solutions will require a shift in the way practitioners orient themselves to natural resource management problems, and a broadening of perspective. Motivational instruments are fundamental in fostering positive changes in local attitudes and behaviours that align with conservation objectives and facilitate collective action (Berkes, 2004). Whereas the military-style approach to governance typically does not enrich or motivate local people, illicit trade and organized crime often do, to the extent that marginal increases in security investment and effectiveness are unlikely to be a significant deterrent; for example, a sworn affidavit from a poaching case in north-west Namibia indicates that poaching syndicates offer up to three times the mean annual household income (National Planning Commission, 2007) for a single set of rhinoceros horns. Models of speculative behaviour suggest that when in situ population numbers approach the minimum viable population size (as is the case with the black rhinoceros) it is more profitable for buyers to collude by employing a 'bank on extinction' strategy than to reduce consumption. Banking on extinction encourages an increase in poaching to extirpate the species in the wild while achieving a private stockpile monopoly scenario to maximize returns (Mason *et al.*, 2012). Thus, without appropriate incentives to motivate compliance with government-imposed regulation and conservation objectives it is not surprising that in most cases local communities are unable or unwilling to stem the tide of organized criminal poaching, and are sometimes complicit in poaching activity. Lasting solutions depend on the availability of adequate resources, and changing the behaviour of local people in a manner that promotes rhinoceros conservation.

The poaching problem is often framed as a war against criminals, with response strategies seeking to catch poachers (Neumann, 2004). I suggest reframing the problem through two

pragmatic questions: (1) What mix of instruments, incentives and institutions could maximize the values local people attach to conserving the rhinoceros? (2) Who decides how rhinoceroses are managed? This framing shifts the focus from militaristic to community-based approaches, acknowledging the complex systems in which multiple stakeholders operate. Solutions emanating from this approach will promote strategies that keep poaching from becoming a normative behaviour. I make a case for initiating behavioural change in local communities by developing an economic and socio-political relationship between the rhinoceros and local communities that harnesses human values to deliver greater return on investment for rhinoceros conservation initiatives.

Behavioural change: more than just deterrence

In addition to detection and prevention, military-style enforcement attempts to change behaviour by means of coercion, in the belief that threats and punishment will deter rule-breaking behaviour. Knowingly or not, these strategies are based on a simple model of rational crime; that is, crime results when an individual chooses to contravene rules where the benefits are perceived to be greater than the costs of their rule-breaking behaviour (Becker, 1968). When applied to rhinoceros poaching, this model assumes that poachers consider the anticipated financial benefits directly against the risk of being caught and the severity of potential punishment (Milner-Gulland & Leader-Williams, 1992). More recent expansions of the model explicitly incorporate a poacher's ability to calculate and trade-off the benefits of poaching against the likelihood of being shot and killed (Messer, 2010). However, observations and experimentation suggest that human behaviour, including acts of dishonesty, is typically not an outcome of a simple, rational cost–benefit analysis (Ariely, 2012; Kahneman, 2011; Shogren, 2012).

Criminal and dishonest behaviour in general is a product of influences more complex and fundamental to an individual's decision making than those comprising a purely rational economic cost-to-benefit trade-off. Values are the basic medium of exchange in all human interactions and underline the things and events that people desire and demand (Lasswell, 1971). People seek to shape and share values through exchanges structured on the norms embedded within societal institutions (Lasswell & Holmberg, 1992), which have a significant influence on behaviour (Kahler & Gore, 2012; Keane *et al.*, 2008). Relationships, norms and values reduce the likelihood of individuals acting in their short-term self-interest (Ostrom, 2000). Mattson *et al.* (2012) provide an overview within a natural resource management and policy context of two dominant value concept schemes (Lasswell, 1943; Schwartz & Bilsky, 1987), with reference to Maslow's hierarchy of needs (Maslow, 1954). Each scheme has its own merits but I adopt Lasswell's policy-oriented value concept because it creates an explicit linkage between values and institutions, which I feel is critical in the context of rhinoceros conservation. Lasswell's value classification states human motivations are underpinned by personal, group and institutional values and can be categorized, regardless of age, gender, nationality or culture, as power, wealth, respect, well-being, affection, rectitude, skills or intelligence (Lasswell, 1971; Clark, 2002), and people use these base values to accumulate other sought-after values through institutions that use and have an impact on resources (Lasswell, 1971). Changing how the rhinoceros is valued, while developing or strengthening local institutions that embody these values, can become the basis for a shift in social norms, even after rhinoceros poaching has become a normative behaviour.

Other approaches that may be used to understand the complex factors that drive human behaviour include the theory of planned behaviour (Ajzen, 1991), value–belief–norm theory (Stern *et al*., 1999), and insights from conservation psychology on community-based social marketing (McKenzie-Mohr, 2000) and pro-environmental behaviour, including bounded rationality, willpower and self-interest (Steg & Vlek, 2009; Shogren, 2012). These may be applied to understand why poaching occurs and to design more effective and cost-efficient strategies for rhinoceros conservation.

Social capital is also critical to the power and continuity of social values and norms. Trust, cooperation and mutual support provide the foundation for the civil discourse required to secure solutions in the common interest (Putnam, 2000) and make values and norms explicit, agreed and observed. Social values, norms and capital commonly explain pro-environmental behaviour and collective action (Ostrom, 2000). Coercive deterrence of illicit behaviour does not harness the values and norms of local communities or have positive outcomes for social capital; for example, incarcerated community members can reduce social capital by breaking relationships or creating financial dependencies that may motivate retribution and retaliatory action. Strategies that recognize individual and communal values, harness normative behaviour, and invest in social capital are likely to hold greater promise for changing and sustaining pro-rhinoceros behaviour.

Increasing local intolerance to poaching

Top-down rule making and enforcement that ignores local norms and institutions can produce negative outcomes, particularly where government and law enforcement officials lack the necessary resources for effective implementation (Lejano *et al.*, 2007). Conversely, monitoring

and enforcement systems that are devised and build capacity at the local level have been found to be more successful over longer time periods towards maintaining sustainable use and limiting illegal offtake (Berkes *et al*., 2006; Ostrom, 2007). Military-style responses are understandable and necessary but could deliver more effective conservation if they were motivated by and incorporated local values. A balance between top-down military-style strategies and bottom-up community-based mechanisms is needed to ensure behaviour in the common interest prevails over individuals' short-term financial gains. Fundamental to this rebalancing is the need for our understanding of human behaviour to be applied within a practical decision making framework. Engaging established frameworks for effective problem solving, including characterizing any situation's context, from the policy sciences (Clark, 2002) can provide a comprehensive understanding of rhinoceros poaching across multiple temporal and spatial scales.

Understanding the individual and community values that motivate pro-conservation behaviour is central to solving natural resource management problems. Common-interest solutions require that resources (e.g. rhinoceros horn) are used and managed through local institutions, which is a critical factor in reducing over-exploitation, excluding roving bandits (Berkes *et al*., 2006; Ostrom, 1990) and mobilizing local support for rhinoceros conservation. Thus, an optimal combination of instruments, incentives and institutions that promote pro-rhinoceros behaviour should ensure that community values and the institutions within which they are shaped and shared are maintained or enhanced.

Namibia's practice-based approach

Namibia's community-based natural resource management programme was founded and formalized in the mid 1990s following a series of socio-ecological surveys with residents of communal land, and policy reform that would return rights over wildlife and tourism to these residents through the establishment of a common property regime called a conservancy (Jones & Murphree, 2001). Based on Ostrom's design principles for effective, sustainable common property natural resource management institutions (Jones, 2010), Namibia's community-based natural resource management framework seeks to create conditions that promote pro-conservation behaviour by rural communities. This is achieved primarily through provision of property rights and incentives through locally accrued and distributed benefits from wildlife and tourism (MET, 2013). Benefits are typically realized in power-sharing or financial terms whereby rural residents registered with a gazetted conservancy receive clearly defined, conditional user rights over wildlife and tourism development (Jones *et al.*, 2015). These devolved rights have been used to help secure significant local income and jobs. In 2013 communal conservancies received NAD 72,200,000 (c. USD 6.5 million) and facilitated 6,472 jobs through 167 joint ventures with conservancies (NACSO, 2014). To date, 79 conservancies have been registered in Namibia, incorporating 8.3% of the population (c. 175,000 people) and 19.4% of the land area (c. 16 million ha; NACSO, 2014). Although not without criticism (Sullivan, 2002; Hoole, 2010), these conservancies have probably contributed to a decrease in poaching (Owen-Smith, 2010) and a general widespread increase in wildlife on communal land, including threatened mammals such as the black-faced impala *Aepyceros melampus petersi*, Hartmann's mountain zebra *Equus zebra hartmannae*, cheetah *Acinonyx jubatus*, lion *Panthera leo* and black rhinoceros (IUCN, 2014; NACSO, 2014).

Collaborative efforts to establish local value-based institutions that secure the common interest in conserving the black rhinoceros were initiated formally in north-west Namibia in the early 1980s (Owen-Smith, 2010) and included a locally devised and managed auxiliary game guard system (Loutit & Owen-Smith, 1989). A series of stakeholder engagement workshops helped strengthen the foundation for long-term strategic partnerships between government, local communities, NGOs and, more recently, private-sector tourism operators, based on a recognition and understanding of local values, perspectives and desired outcomes for rhinoceros conservation (Hearn *et al.*, 2004). Namibia's community-oriented approach has helped to instil in local communities a sense of ownership and acceptance of the rhinoceros, despite all black rhinoceroses being owned by the state (Uri-Khob, 2004).

In 2005 the innovative Rhino Custodianship Programme established by Namibia's Ministry of Environment and Tourism spearheaded a large-scale initiative to achieve biological management and rural development goals by restoring black rhinoceros to their historical rangelands while meeting an emerging demand from local communities to engage in rhinoceros tourism (Uri-Khob *et al.*, 2010). This provided an opportunity to strengthen existing local values and institutions that supported rhinoceros conservation, demonstrated by the government's willingness to share key values identified by communities, including power (through the establishment of co-management institutions that have granted custodial rights to landholders or communal conservancies that wish to utilize the rhinoceros for tourism on their land), wealth (through rights for local people to benefit from non-consumptive use of rhinoceroses, without any requirement to share profits with central government) and respect (through assigning joint

responsibility for local conservation activities). Other values sought by local people, notably skills, knowledge and well-being, have been fulfilled through partnerships with local and international NGOs, and with tourism operators that have contributed towards rhinoceros conservation, especially through co-financing rhinoceros monitoring. Since the reform of Namibia's community-based conservation policy in the mid 1990s (Owen-Smith, 2010), and the adoption and expansion of joint-venture tourism enterprises, the rhinoceros population has more than doubled (Beytell & Muntifering, 2009) and sustained consistent positive growth rates (Brodie *et al.*, 2011) despite persisting almost entirely on formally unprotected lands. Although 51% of the rhinoceros population persists on communal conservancy land, only 4 of the 18 confirmed incidents of poaching in 2014 occurred in these areas (Muntifering *et al.*, 2015).

Designing a tourism product that serves as an effective community-based conservation mechanism requires reconciling the individual values of a diverse group of stakeholders, in particular those of local communities. The rhinoceros tourism model developed in north-west Namibia has evolved through learning what approaches are effective in practice, and through an inclusive and comprehensive decision making process. Aligned with conservation tourism principles (Buckley, 2010), best practices have been developed to minimize disturbance of rhinoceroses, maintain tourist satisfaction, and sustain sufficient profit to produce net conservation benefits. Allowing local trackers to showcase their tracking skills and local knowledge has instilled a sense of pride in traditional skills and rhinoceros protection. In one conservancy benefits from rhinoceros tourism have significantly improved local attitudes towards rhinoceroses (Uiseb, 2007), and intolerance of poaching has contributed towards formal and informal community enforcement. In December 2012 a rhinoceros poacher was identified, apprehended, arrested and had a firearm and horns confiscated within 24 hours of the discovery

and immediate reporting of the carcass by a local farmer near the north-east boundary of the Palmwag Tourism Concession Area. Tourism initiatives currently finance ongoing monitoring of 25% of Namibia's north-west free-ranging rhinoceroses. Of the 18 confirmed cases of rhinoceros poaching that have occurred in north-west Namibia during 2012–2014, none were in an area where rhinoceros tourism is practised, or in a conservancy wildlife tourism area with permanent activity and direct benefit-sharing agreements between the private sector operator and the host conservancy.

As the demand for rhinoceros tourism opportunities is likely to increase, it will become essential to design and implement benefit-sharing mechanisms that ensure security, quality monitoring, and community support for rhinoceroses. One promising policy intervention that has emerged has been the development of a conservancy-led rhinoceros ranger initiative. Since 2012 26 rangers have been appointed by and accountable to 13 communal conservancies. These 'Conservancy Rhino Rangers' have been provided with training, state-of-the art monitoring equipment and field gear, and performance-based bonus payments to improve the quantity and quality of conservancy-led rhinoceros patrols (Muntifering *et al.*, 2015). The number of trained, equipped rhinoceros monitoring personnel in Namibia's north-west has tripled since 2012 and the number of conservancies actively engaged in monitoring has increased twelve-fold; in 2014 there were 1,013 ranger patrol days and 727 rhinoceros sightings by rangers in the 13 participating conservancies.

The sustainability of the initiative will depend on an institutional arrangement ensuring that the benefits from rhinoceros tourism return to the conservancy. Under a user-pays principle the local

communities that bear the monitoring and opportunity costs of rhinoceros conservation would receive royalty payments. The initiative would thus not only enhance the quality and quantity of community-led monitoring efforts but would also reinforce rhinoceros tourism as a legitimate and profitable land use. Successful implementation will require an integrated, comprehensive, inclusive and transparent decision-making process that includes planning, open debate, and setting rules and guidelines that secure the common interest (Clark, 2002). Rigorous appraisals of contextual, practice-based prototypes will help facilitate the identification of best practices (Hohl & Clark, 2010), quantify causal effects (Ferraro & Hanauer, 2014), and apply lessons learned to evolving contexts.

Let the locals lead

Understanding local perspectives and values is fundamental to solving complex natural resource management problems effectively (Clark, 2002). Yet the top-down command and control approach, with associated emphasis on military-style regulatory and enforcement strategies, continues to drive the discourse in the search for solutions to poaching (Biggs, 2013; Challender & MacMillan, 2014). Law enforcement is critical to effective prevention of wildlife crime but our experience in Namibia suggests that bolstering investments that seek to engage and empower local communities in rhinoceros protection efforts will probably yield greater returns than continuing to focus narrowly on fighting fire with fire. However, shifting our priorities will probably require a reassessment of how we orient ourselves to the poaching problem and the theories we apply towards devising strategies. To do this we need to unlearn much of what traditional economic theory and the simple model of rational crime have taught us regarding how people think and behave, by acknowledging the evidence, embracing new insights on human

decision making from behavioural economics and applying them to conservation problems (Cowling, 2014). By refocusing from a simplistic cost–benefit world view to incorporating cognitive, emotional and social factors, in particular values and institutions, to drive behavioural change, longer-term solutions can be developed.

I have argued for the role of values, norms, social capital and institutions in changing the pay-off structures of wildlife crime, and illustrated its application in north-west Namibia. Although much of the theory is universally transferable in terms of both location and target species, it should be noted that this case study is context-specific and may be influenced by contextual factors such as the region's high tourism draw, low human population density, arid and rugged terrain less suitable for domestic livestock, and cohesive social and institutional networks. Replication in other locations may be confounded by different political, social and ecological environments. I therefore emphasize that harnessing local community values to save the rhinoceros should not be viewed as a universal panacea for poaching but rather as a fundamental factor that provides the necessary social foundation upon which other policy instruments, incentives and institutions (Young & Gunningham, 1997) may require to be effective. Policies that do not engage, empower and benefit local communities living alongside rhinoceroses will have limited success. I assert the fundamental importance of letting the locals lead (Smith et al., 2009), as it has been demonstrated that the long-term effectiveness of biodiversity conservation programmes depends on the support of local people, the ability to harness local knowledge and cooperative capacity, and the degree to which solutions are devised and owned by local people (Berkes, 2004; Brooks *et al.*, 2012; Lejano *et al.*, 2007; Ostrom, 2000, 2007; Young & Gunningham, 1997).

Although solutions ultimately depend on creating and sustaining pro-rhinoceros behaviour at the local level, the problem must be addressed at multiple scales (Berkes, 2007). International, regional, national (notably major horn markets and rhinoceros range countries) and local governance bodies need to recognize and promote local governance and resource rights regimes that align individual self-interest with the long-term health of rhinoceros populations (*Berkes et al.*, 2006). This may best be achieved through a social learning process that disseminates information on a regular basis to solve the problem in a way that is consistent with local practices. Such a multi-tiered approach will help design and deliver bottom-up strategies underpinned by human values and facilitated through local institutions that, when combined with top-down regulation, will be more effective in securing a future for the rhinoceros.

Chapter 3: Close encounters of the sustainable kind - a protocol for ensuring positive rhinoceros and tourist interactions

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ABSTRACT

Tourism is one of the fastest growing economic sectors worldwide, with eco- or nature-based tourism comprising a large proportion of that sector. Namibia has pioneered innovative, effective community-based conservation strategies emphasizing nature-based tourism's role towards achieving rural development and conservation goals. One such venture, Wilderness Safaris' Desert Rhino Camp (DRC), is providing tourists with a unique opportunity to view the critically-endangered black rhinoceros (*Diceros bicornis*) on foot. Despite the benefits tourism may provide, irresponsible viewing practices may threaten the sustainability of both business and conservation initiatives. I employed a statistical modeling approach to: (1) explore and identify human-rhinoceros encounter variables that led to rhinoceros disturbance; and (2) design sustainable rhinoceros-human encounter guidelines. Encounter variables and associated rhinoceros disturbance levels were captured during 123 rhinoceros viewing events. A model-averaging, information-theoretic approach identified closest approach distance, viewing time and individual encounter exposure as the most significant predictors of rhinoceros disturbance level. A suite of rhinoceros viewing scenarios were modeled for acceptable disturbance risks, and adopted as DRC's rhinoceros tourist viewing policy. Following implementation, rhinoceros displacements were reduced from 26 to 5% within two years. My results demonstrate how an evidence-based, policy-oriented management approach can help improve tourism's contribution towards the conservation of an endangered species

INTRODUCTION

The multi-trillion dollar global tourism industry presents both challenges and opportunities to secure biodiversity (Buckley, 2011). Wildlife tourism, specifically, continues to grow rapidly (Tapper, 2006), fueled by an escalating demand for experiences that provide unique opportunities to interact directly with wildlife (Higham *et al.*, 2009). This may be of particular significance in developing countries where wildlife tourism forms a more substantial portion of their economy (Balmford *et al.*, 2009). Reconciling tourism as a business and conservation practice has led to negative impacts on wildlife reflected in the large literature documenting these conflicts (Buckley, 2011). Species impacted by wildlife tourism include penguins (Trathan *et al*., 2008), Olympic marmots *Marmota olympus* (Griffin *et al*., 2007), Rocky Mountain elk *Cervus elaphus* (Preisler *et al*., 2006) and a variety of marine cetaceans (Corkeron, 2004; Higham *et al*., 2009).

While tourism generally has provided significant benefits for endangered species conservation (Buckley *et al.*, 2012; Morrison *et al.*, 2012), examples of impacts and costs to species protection also exist (Morrison *et al.*, 2012) especially because increasing numbers of tourists seek opportunities to view and interact with threatened and endangered wildlife (e.g., Karanth & DeFries 2011). For example, excessive tourism-induced disturbance may displace wildlife from protected areas or trigger aggressive and threatening behavior towards humans (Ranaweerage *et al.*, 2015). Even benign tourism exposure may produce negative consequences for some species such as increased predation or poaching risk (Geffroy *et al*., 2015) following the often associated habituation-like processes that increase wildlife tolerance towards human activity (Knight, 2009).

The growing challenge of balancing wildlife tourism's pros and cons was highlighted in 2012 when India's Supreme Court banned tourism activities in core areas of all the country's tiger reserves. International debate followed on the circumstances that led to judicial intervention and whether the ban might, in fact, leave tigers worse off (Buckley & Pabla, 2012). Most importantly, however, the event illustrates the importance of establishing evidence-based, policy-oriented adaptive approaches to guide the design and implementation of conservation tourism initiatives (Higham *et al.*, 2009).

Since its independence in 1990, Namibia has embraced wildlife tourism as a key conservation and socio-economic development mechanism (Jones *et al.*, 2015). Namibia is home to approximately one-third of the world's extant critically-endangered black rhinoceros (*Diceros bicornis)* and most of its *D. b. var bicornis* subspecies (IUCN, 2014). The black rhinoceros inhabiting northwestern Namibia is recognized by the IUCN African Rhino Specialist Group as a Key 1 population for species recovery due to its large size (Emslie, 2008). It is also the largest population of any rhinoceros species persisting outside a formally protected area (Hearn, 2003), heightening both its conservation and tourism importance.

Namibia has pioneered and legislated a model for community-based tourism that allows decision-making to be led by, and economic benefits to accrue directly to, local communities (Jones *et al.*, 2015; NACSO, 2014), creating a strongly supportive local constituency for conservation (Naidoo *et al.*, 2011). Community-based conservation tourism and the associated improvements in local livelihoods have catalyzed improved species protection and a large-scale rhinoceros population recovery in northwest Namibia between 2005 and 2010 (Chapter 2: Muntifering *et al*., 2015). Black rhinoceros, however, may be especially susceptible to tourist-induced disturbance due to their tendency to avoid human disturbance (Cunningham & Berger, 1997; Walpole *et al.*, 2003) coupled

with northwest Namibia's extremely arid environment (Mendelsohn *et al.*, 2003). Poorly conceived and implemented tourist-viewing practices could threaten the sustainability of both community livelihoods and conservation efforts, as displacement high quality, more heterogeneous resource patches may have a greater cost or a cost that cannot be so easily mitigated traveling to another resource patch. Empirically understanding the key factors driving rhinoceros disturbance from tourism is critical to guiding the development of tourist viewing protocols that ensure community economic and conservation goals are sustainably and equitably reconciled.

I developed an evidence-based viewing protocol to minimize tourism-induced rhinoceros disturbance. Specifically, I sought to: (1) identify and quantify the extrinsic and intrinsic influences of tourist-viewing events on rhinoceros behavior, particularly their vigilance and displacement; and (2) develop a model for tourist-rhinoceros encounters to guide policy-making and rhinoceros tourism practice.

STUDY SITE AND METHODS

Study Site

My study was conducted within the government-administered Palmwag Tourism Concession (13º 56'13"E, 19º 53'12"S) which occupies approximately 5,826 km² or 8% of state-owned communal land within the Kunene Region, located in the north-west corner of Namibia. My research was based at Desert Rhino Camp (DRC) (13º 50'45" E, 20º 1'30"S), a remote tourist facility joint venture between a private sector tourism company, Wilderness Safaris, and a non-governmental conservation organization, Save the Rhino Trust (SRT) since 2003. DRC specializes in black rhinoceros tourism, and supports research and rhinoceros monitoring (Buckley, 2010), having exclusive access to approximately 1,365 km² of desert wilderness for black rhinoceros tracking safaris. The area receives approximately 50-100 mm of rainfall per annum across an elevation range from 300 m on the gravel

plains to 600 m on the largest flat-topped Etendeka mountains (Mendelsohn *et al.*, 2003). Except for approximately twenty permanent staff residing at DRC, no other human settlements occur within Palmwag Concession. Approximately 3,666 people reside within the Sesfontein, Anabeb and Torra Conservancies which border the concession (NACSO, 2014).

Methods

Data were collected during four periods totaling eight months between 2003 and 2005. A single observer (five in all) recorded encounters between black rhinoceros and tourists on foot while accompanying the SRT tracking team during day trips from DRC averaging 5 per week. Observers were trained for standardized data collection by the lead author (J. R. Muntifering). Each foot tracking event was led by a team of two to three trackers ($\chi = 6.5$ years' experience +/- 3) and one to two guides with the approach and withdraw always under the control of the trackers. Following each viewing event the observed rhinoceros disturbance level (Unaware, Aware, or Displaced) was recorded by the lead tracker.

I framed the analysis within the vision agreed at DRC between Wilderness Safaris and Save the Rhino Trust in 2004 that sought to 'provide tourists with a rare opportunity to view the rhinoceros in its natural setting whereby the rhinoceros remains completely unaware and unaltered by our presence'. I defined disturbance as any human-induced behavioral change that resulted in (1) awareness of human presence exhibited by an observed rhinoceros or (2) physical displacement of the encountered rhinoceros in direct response to a visiting tourist group. Awareness was defined and identified by the lead SRT tracker who noted a change in the behaviour of rhinoceros in response to the tourist group (i.e. ears directed in the direction of the viewing group). Displacement was defined as any movement following an awareness state whereby the rhinoceros ran in excess of 50 meters. I

included the distance aspect to restrict the definition to true flight behaviour as opposed to trivial small-scale displacements (typically less than 50 meters) that often occur as a result of curiosity to a potential threat.

In the absence of any previously developed hypotheses or tests for tourism-induced rhinoceros disturbance, I quantified nine independent variables theorized by five local rhinoceros and tourism experts, with approximately 60 years of cumulative experience monitoring rhinoceros on foot, and further supported by literature review (Stankowich, 2008) to influence the likelihood of rhinoceros disturbance when encountering viewing groups (Table 3.1; see Appendix 3.1 for details).

Individual animals within species, populations and even small groups may respond differently to disturbance (Nakagawa & Schielzeth, 2010). Black rhinoceros are typically easy to distinguish using unique natural and man-made ear notches, horn shape and size, and eye and nose wrinkles. SRT have been monitoring individual Namibian north-west black rhinoceros since the early 1990s (Brodie *et al.*, 2011) and most are well-known. The identity of 'marked' rhinoceros was recorded at each encounter, with rhinoceros catalogued as unknown where unique identification features were absent or obstructed. I expected disturbance levels to vary between individual rhinoceros and so included rhinoceros identity as a random effect in a mixed effects Generalized Linear Model (Charles & Linklater, 2013; Hebblewhite & Merrill, 2008). Further, I also tested observer independence as a random effect using a similar approach.

Black rhinoceros have exceptional olfactory senses meaning encounters should be planned and pursued with favorable wind direction (i.e. rhinoceros is upwind from tourists). Rhinoceros tracked

at DRC are never approached in unfavorable wind conditions and therefore wind was not included as an explanatory variable as foot encounters only take place in favorable wind conditions.

All analysis was conducted using the statistical software package R, version 3.2.2 (R Development Core Team, 2015). Details of the methods used to develop the predictive scenario-based fixed effects Generalized Linear Models are provided in Appendix 3.2.

RESULTS

I recorded 123 rhinoceros encounter observations within the DRC operational area (n = 76) and the periphery (n = 47). These comprised 112 encounters with 33 known individuals and 11 encounters where individuals were unable to be identified. Sixty-eight sightings (55%) comprised six rhinoceros regularly encountered at DRC. Forty-five of the encounters (37%) resulted in the rhinoceros remaining unaware, 45 (37%) became aware but were not displaced, and 33 (26%) were displaced.

For the awareness model, key variables identified in the model-averaging were time at closest distance ($\Sigma\omega_i = 1$), closest approach distance ($\Sigma\omega_i = 0.95$), and composition ($\Sigma\omega_i = 0.89$), each accounting for roughly three times more importance than the other explanatory variables (Figure 3.1). The confidence set of models ($\Sigma\omega_I \geq 0.95$) included 94 (18%) of 511 total possible models or 95% of the cumulative model weight was represented by the top 18% of the fitted models. Habitat, initial behaviour and season did not feature in any of the top awareness models (Table 3.2).

For the overall displacement model, key variables identified in the model-averaging were again time at closest distance ($\Sigma\omega_i = 1$), closest approach distance ($\Sigma\omega_i = 1$), and individual encounter exposure ($\Sigma\omega_i = 0.97$) (Figure 3.1). The confidence set of models ($\Sigma\omega_I \geq 0.95$) included 53 of 511 total

possible models with 95% of the cumulative model weight represented by the top 10% of the fitted models. Habitat and initial behaviour did not feature in any of the top displacement models (Table 3.2).

Model-averaging results restricted to displacements for only rhinoceros that became aware (n = 69) yielded very similar parameter estimates, model rankings and weights as the overall displacement model except for the relative importance of cumulative time ($\Sigma\omega_i = 0.82$) that held a much stronger positive relationship with displacement.

Model-averaging did not deliver one dominant model, but rather a small set of models with similar, moderate levels of support for both awareness and displacement model sets. Five models for predicting awareness and displacement were found (ΔAICc < 2), which contained 31% and 33% of the cumulative model weight, respectively (Table 3.3).

Modeling awareness risk at 25% predicted encounters should approach no closer than 150 meters for 5 minutes, 200 meters for 20 minutes and 300 meters for 50 minutes (Figure 3.2). Modeled displacement risk at 10%, setting the individual encounter exposure to 1 for DRC rhinoceros, predicted encounters should approach no closer than 100 meters for 5 minutes, 150 meters for 15 minutes or 250 meters for up to 45 minutes (Figure 3.3). Preliminary follow-up assessment for 519 separate rhinoceros sightings during 2008 and 2009, following the implementation of the modelled viewing policy, found that rhinoceros displacements decreased from 26% to 5.4%.

DISCUSSION

Although previous research has strongly suggested that ecotourism, and rhinoceros-based tourism specifically, is positively contributing towards conservation and human well-being in Namibia (Jones *et al.*, 2015; Chapter 2: Muntifering *et al.*, 2015; Naidoo *et al.*, 2011), this study is the first to empirically measure and mitigate against adverse disturbance effects. If rhinoceros tourism is to remain a key mechanism enhancing conservation and human well-being in Namibia's northwest communal lands, inclusive of combating illegal poaching, effort must be placed in unraveling these complexities to improve tourism's resilience. This study aimed to assess one of the fundamental aspects underpinning the long-term sustainability of rhinoceros conservation tourism ventures by understanding key factors that can minimize rhinoceros disturbance during tourist-rhinoceros encounters. My results provide detailed insight on how a free-ranging, resource-limited rhinoceros population responds to tourism pressure and how tourism impact can be reduced.

My key finding confirmed that, similar to other large mammal species under direct tourism pressure from close approach distances (Ranaweerage *et al.*, 2015), there is a direct and strong behavioural response (i.e. displacement) towards human proximity to rhinoceros. This is particularly of interest for tourism, which often depends upon delivering intimate personal experiences with wild animals. Fortunately, approach distance, and the other key driver variable - associated viewing time, is managed by tourist group leaders. Appropriately designed and delivered policies should therefore aim to reduce rhinoceros disturbance. For tourists and tourism operators, while this decision may reduce the 'intimacy' of encounters the clear scientifically-established viewing policy recommendations is also a tool that can support guides and managers' explanation to tourists for why viewing events are restricted and how these restrictions were conceived to pre-empt the pressure to rule-break (Sandbrook & Semple, 2006). Since the vast majority of rhinoceros viewing at DRC is conducted on foot, this research may also enhance tourist safety – a clearly important trade-off

against encounter intimacy, given the size, weight (~1,000 kilogram) and speed rhinoceros possess (Estes, 1999).

Subtle signals found in the effect of both cumulative time and individual encounter exposure upon awareness and displacement suggest some tourism-induced habituation is occurring. This is also evident in the skewed individual rhinoceros sighting frequencies (i.e. 55% of the sightings comprised 18% of the known individuals) documented here, despite trackers using a relatively random search pattern and not seeking out specific individuals (Nawaseb, *pers. com.*). Although not significant, cumulative time was nearly twice as important (relatively) in the awareness model than the displacement model, suggesting rhinoceros become less vigilant when regularly encountering people. Rhinoceros with greater encounter exposure (i.e. exposed to regular tourism) are much less likely to become displaced than rhinoceros with less encounter exposure, indicating an increased level of tolerance towards humans. Despite the advantages that habituation may provide to enhance the viewing experience for tourists, especially for rare, elusive species (Shutt *et al.*, 2014), the costs may exceed the benefits for species at high risk of human-induced mortality, such as illegal poaching, that could be exacerbated by an increased tolerance towards humans (Geffroy *et al.*, 2015). In this context, the current escalating rhinoceros poaching rate across Africa (Knight, 2012a) certainly is cause for concern despite relatively low poaching rates recorded on Namibia's communal lands (Chapter 2: Muntifering *et al.*, 2015). Therefore, monitoring and managing for limited habituation is critical for ensuring even benign tourism activities do not result in placing rhinoceros at greater risk of human-induced mortality. Tourists must be sensitized to this critical issue before partaking in rhinoceros tracking activities to temper pre-conceived expectations of close encounters placing additional emphasis on the need for a viewing protocol that minimizes disturbance.

The modeling approach, while grounded in statistical and behavioral ecology, contributes a practical, user-friendly output allowing guides, trackers and managers to identify acceptable disturbance probability targets and associated observation times and distances. Model outputs have been simplified into management tools, including a Rhino Viewing Card listing a suite of rhinoceros viewing scenarios (i.e. the group may approach to 100 meters for 5 minutes to keep rhinoceros displacement risk to 10%) to help guide the delivery of individual rhinoceros encounters. My preliminary *post hoc* evaluation recorded a significant reduction in rhinoceros displacements at an acceptable level well below 10% suggesting that the viewing protocol is minimizing disturbance. My estimates and recommendations are also reasonably consistent with other research which estimated that, despite having a reputation for poor eyesight, black rhinoceros could readily distinguish a 30 centimeter wide human up to 200 meters away (Pettigrew & Manger, 2008). However, for rhinoceros tourism to be sustainable, tourists must also be satisfied with the opportunity offered. While this might constrain tourist satisfaction, unpublished research conducted at DRC concluded that distance and time observing rhinoceros did not significantly reduce tourist satisfaction (Sibalatani, 2005). While these results are preliminary and cannot be interpreted to have direct causal relationships with rhinoceros disturbance, it certainly suggests that management interventions are reducing impacts, maintaining tourist satisfaction while enhancing overall sustainability.

As human-induced pressures continue to infringe upon Africa's last remaining wildlands outside of protected areas, incentive-based, sustainable use strategies may be the only practical solution to conserve viable populations of wildlife in a human-dominated landscape. Designing and delivering evidence-based, policy-relevant research that reduces risks and uncertainty while enhancing ecological and social sustainability will play a major role towards ensuring these practices are successful for the wildlife and people they are meant to serve.

Table 3.1: Summary descriptions for explanatory variables included in the awareness and displacement models

Variable	Category	Numeric Class	Description (hypothesized relationship with disturbance response variable)
1) Composition	Dichotomous	0 = Single, 1 = Cow/calf	Whether the rhinoceros encountered was single or a cow/calf pair. (+)
2) Distance from closest location	Continuous	Meters	The closest distance that the group approached the rhinoceros (measured by laser rangefinder -- see Appendix 3.1). (-)
3) Cumulative time	Ordinal	1-24	The consecutive month when the encounter occurred beginning within the month the study was initiated. (-)
4) Time at closest distance	Continuous	Minutes	The total elapsed time (in minutes) of the encounter from the closest distance. (+)
5) Number of people	Continuous	Count total number of people in group	The total number of people in the rhinoceros encounter including all guides and trackers. (+)
6) Individual encounter exposure	Dichotomous	0 = low, 1 = high	For each rhinoceros encountered, whether the individual had experienced a relatively higher exposure to humans. (-)
7) Season	Dichotomous	0 = dry, 1 = wet	The season within which each encounter took place. (-)
8) Habitat	Dichotomous	0 = open, 1 = closed	Whether the encounter occurred in relatively open cover (such as plains or rocky hills) or closed vegetation (such as riverbeds) (-)
9) Initial behavior	Dichotomous	0 = inactive, 1 = active	Whether the rhinoceros encountered was initially found inactive (sleeping) or active (walking, standing, laying but alert). (+)

Table 3.2: Model-averaging results for the awareness and displacement logit models.

	Logit Awareness			
Variable	Parameter	Std. error	Lower 95% CI	Upper 95% CI
Composition*	-1.178	0.478	-2.115	-0.241
Distance from closest location***	-0.018	0.005	-0.027	-0.008
Cumulative time	-0.064	0.040	-0.142	0.015
Time at closest distance**	0.055	0.021	0.014	0.097
Number of people	-0.049	0.067	-0.181	0.083
Individual encounter exposure	-0.169	0.574	-1.295	0.956
Season	0.211	0.636	-1.037	1.458
Habitat	-0.030	0.451	-0.915	0.854
Initial behaviour	0.021	0.456	-0.871	0.914
	Logit Displacement			
Variable	Parameter	Std. error	Lower 95% CI	Upper 95% CI
Composition	-0.477	0.528	-1.511	0.558
Distance from closest location***	-0.027	0.006	-0.040	-0.015
Cumulative time	0.035	0.051	-0.066	0.135
Time at closest distance***	0.114	0.026	0.062	0.165
Number of people	0.060	0.077	-0.090	0.210
Individual encounter exposure *	-1.748	0.615	-2.954	-0.543
Season	0.760	0.701	-0.614	2.135
Habitat	-0.072	0.498	-1.048	0.904
Initial behaviour	-0.061	0.491	-1.024	0.902

$p = 0.01$*, $p = 0.001$**, $p < 0.001$***

Table 3.3: Best models for both awareness and displacement logistic regression with Δ Akaike's Information Criterion for small sample sizes (AICc) ≤ 2.

Model	df	logLik	AICc	Δ AICc	Weight ωi
Awareness Model Set					
1259	5	63.2009	136.91	0.000	0.0976
129	4	64.4919	137.32	0.408	0.0796
12569	6	62.9179	138.56	1.645	0.0429
1269	5	64.0671	138.65	1.732	0.0410
12579	6	62.9697	138.66	1.749	0.0407
Displacement Model Set					
279	4	55.5905	119.52	0.000	0.1080
2789	5	55.0605	120.63	1.114	0.0620
1279	5	55.1353	120.78	1.263	0.0576
2679	5	55.1976	120.91	1.388	0.0541
2579	5	55.3771	121.27	1.747	0.0452

Composition = 1, Distance from closest location = 2, Habitat = 3, Initial behavior = 4, Cumulative time = 5, Number of people = 6, Individual encounter exposure = 7, Season = 8, Time at closest distance = 9

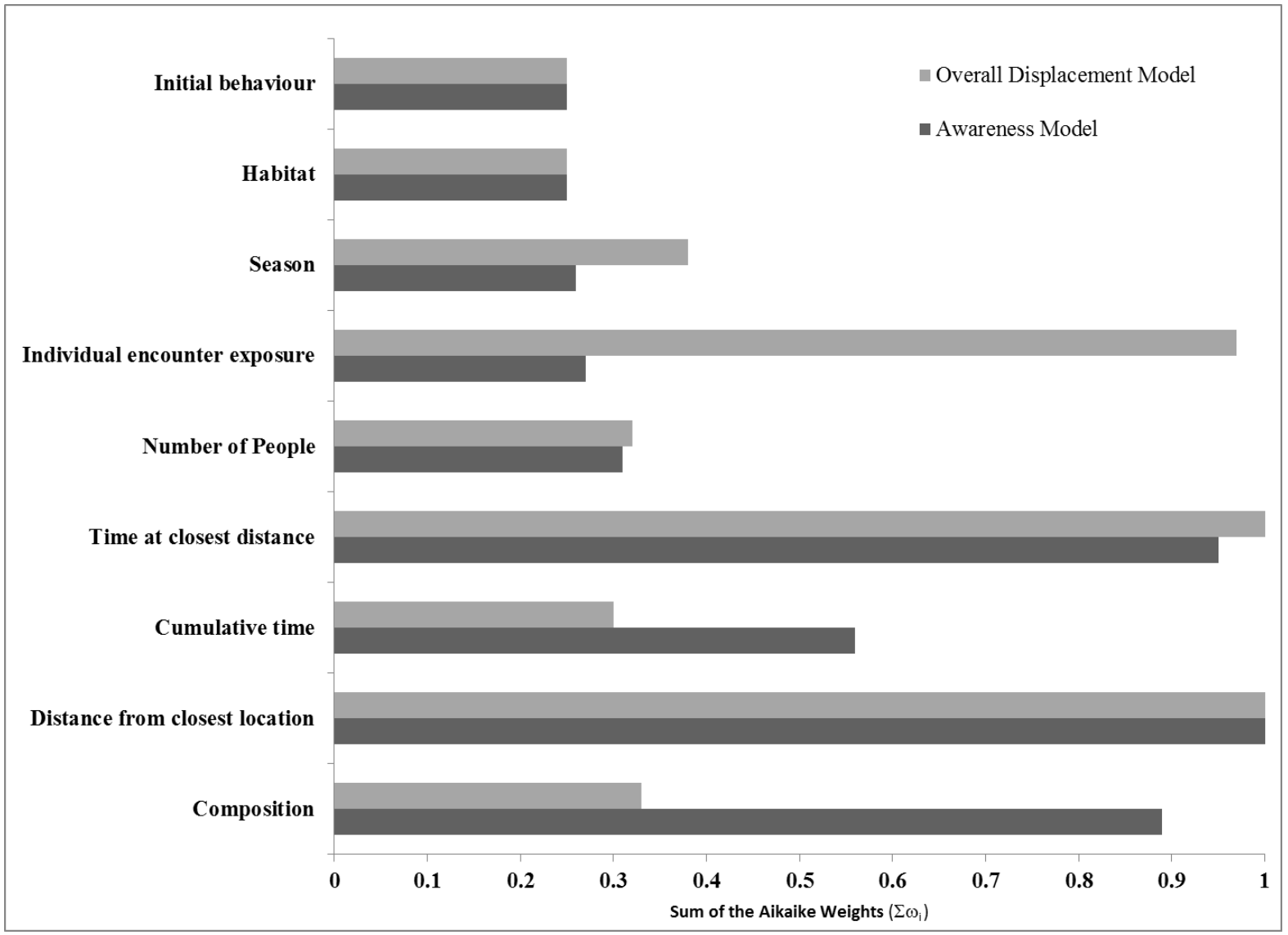

Figure 3.1: Relative importance of the explanatory variables in both awareness and displacement logistic regression models

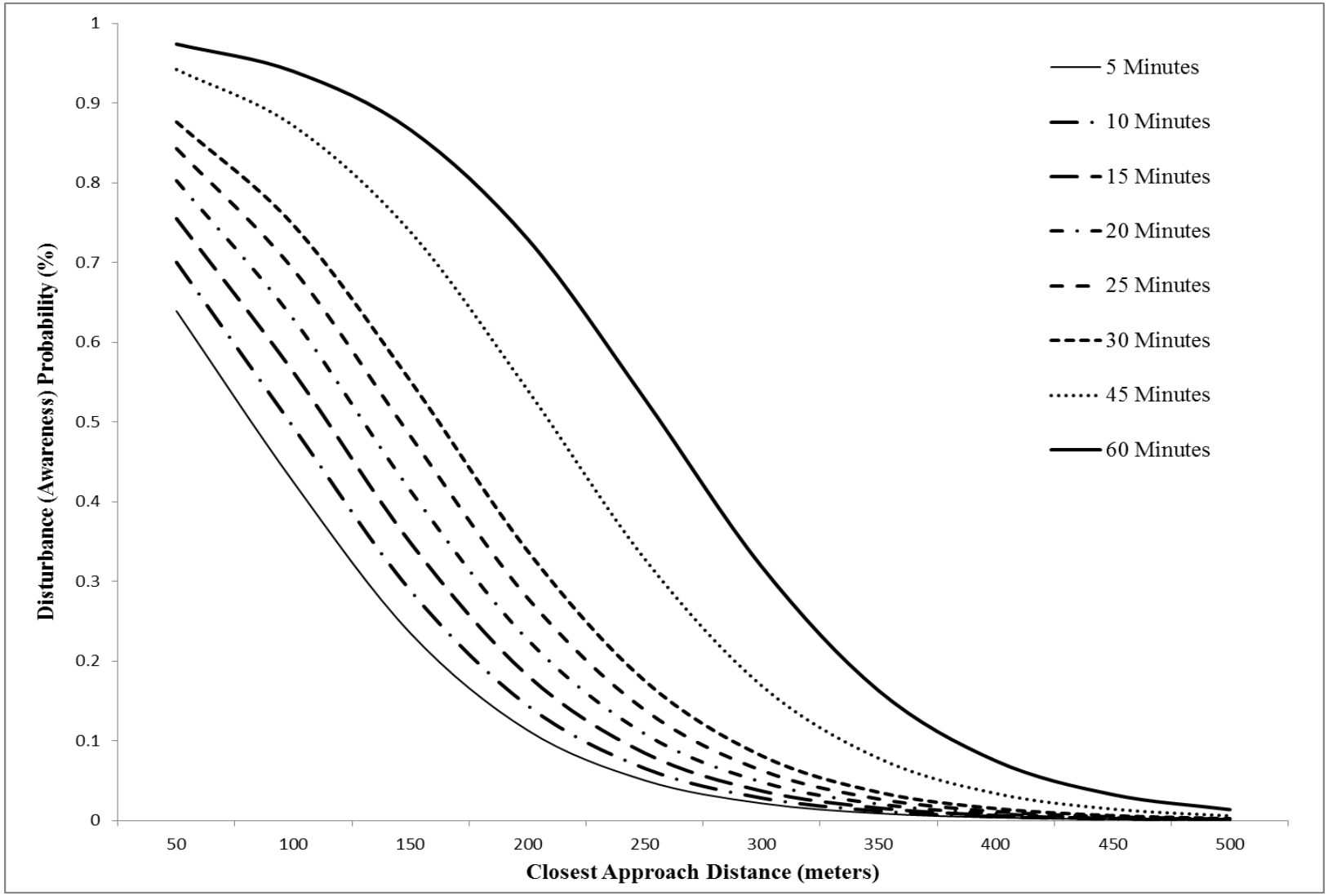

Figure 3.2: Scenario projections for the awareness model illustrating the relationships between closest distance, viewing time and predicted rhinoceros awareness likelihood

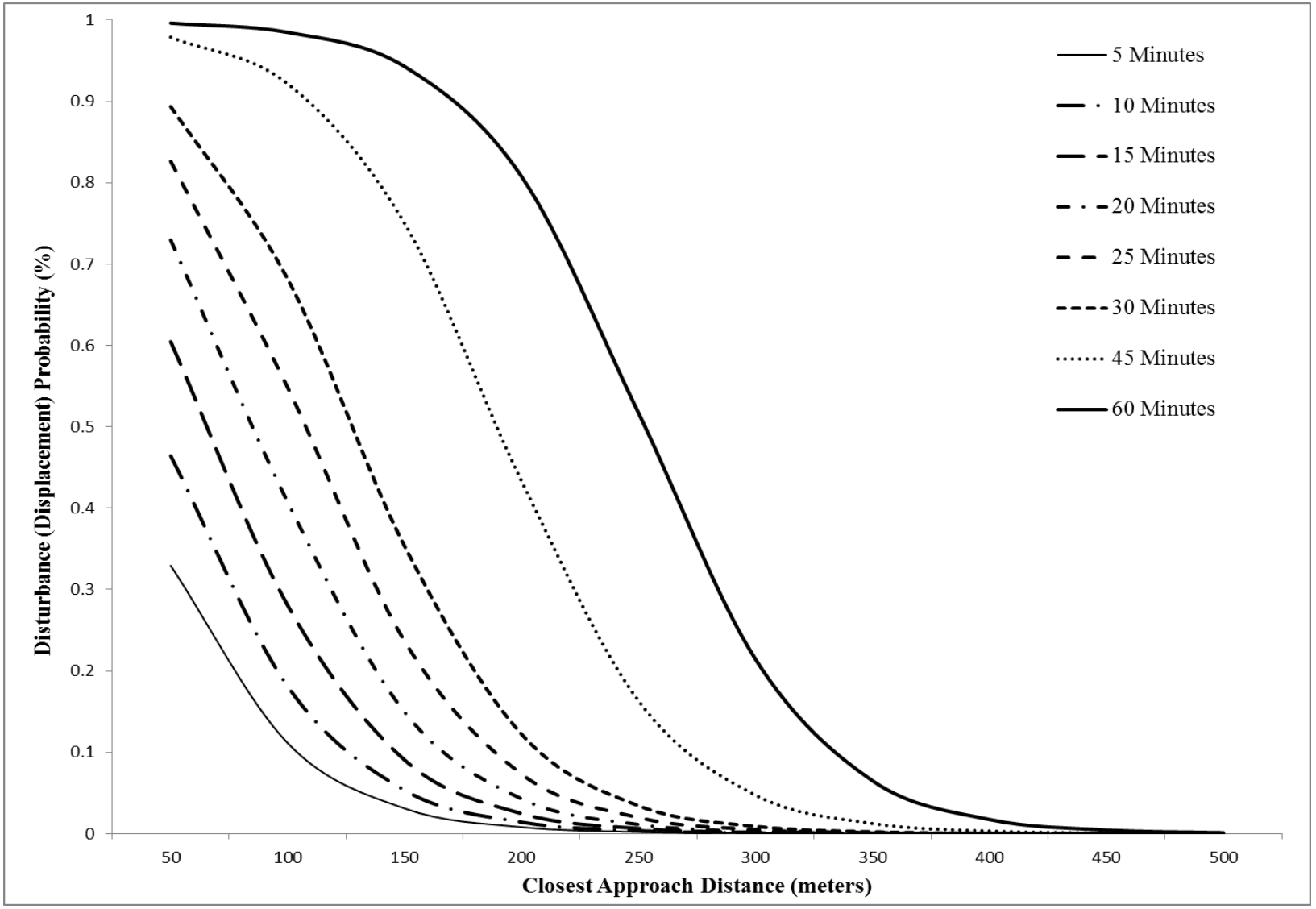

Figure 3.3: Scenario projections for the displacement model illustrating the relationships between closest distance, viewing time and predicted rhinoceros displacement likelihood

Supplementary Material

Appendix 3.1

Detailed definitions and rationales for the nine independent variables hypothesized to influence the likelihood of rhinoceros disturbance when encountering viewing groups

Cumulative time: Habituation is a process that changes an animal's behavioral response to human exposure (Geffroy *et al.*, 2015) over time. Tourism often elicits such habituation processes and sometimes is encouraged to improve the tourism experience (Knight, 2009; Shutt *et al*., 2014). Cumulative time, not to be confused with viewing time discussed below, was classified as an ordinal variable with the month that each sighting took place recorded as a running total from the first month the study began. Thus, the values for cumulative time ranged from 1 to 24. I expected disturbance likelihoods to decrease over time due to potential habituation effects.

Season: Namibia has two distinct seasons: wet and dry. The wet season is typically from January through April and the dry season from May through December (Mendelsohn *et al.*, 2003). I expected rhinoceros to be more prone to disturbance in the dry season when resources are scarce.

Individual encounter exposure: I collected rhinoceros encounter data from rhinoceros that have been exposed to both high and low encounter frequencies. For example, the DRC rhinoceros are encountered on average at least once per month while rhinoceros outside of the DRC operation area might only be seen every two to three months. This variable might represent some habituation effects due to increased exposure to human activity. Thus I classified encounter exposure for each individual rhinoceros sighted in the study as a binary

variable with sightings for rhinoceros exposed to tourist encounters at least once per month coded as a 1 and anything less frequent a 0. I expected the rhinoceros with greater exposure to human encounters to be less sensitive to human disturbance than others.

Viewing group size: Group size has been previously recorded as a factor that can induce disturbance in wild animals (Stankowich, 2008). For each sighting I recorded the total number of people, including tourists, guides and researchers, who approached the rhinoceros. I expected that group size would be positively related to disturbance likelihood.

Closest approach distance: Reviews of tourism and wildlife viewing research suggests that physical proximity between humans and the wildlife they seek to view plays a major role in driving disturbance (Stankowich, 2008), particularly for Asian rhinoceros (Lott & Mccoy, 1995). For each sighting I measured how close the group approached to the rhinoceros, using laser rangefinders (± 1 meter accuracy). I expected approach distance to be negatively related to disturbance likelihoods, i.e., the closer a group was to a rhinoceros, the more likely it was to have been disturbed.

Viewing time at closest distance: As time increases during each viewing event, so does the likelihood of noise and wind change. Time at the closest distance was recorded in minutes for each sighting. I expected viewing time to be positively related to rhinoceros disturbance likelihood.

Rhinoceros group composition: While mature black rhinoceros can be seen in groups, especially when a female is in estrus (Estes, 1999), I only observed two group compositions in this study; females with calves and single male individuals. Thus, the group composition

is also indicative of gender since every independent female in the study had a calf and all single, independent rhinoceros were males. Female black rhinoceros with young are often more sensitive to human disturbance (Cunningham & Berger, 1997). I coded rhinoceros as either a single individual, or a cow with calf. I expected rhinoceros cows with young calves to be more sensitive to disturbance.

Initial behavior: Animal activity has an influence on their likelihood to detect a threat. More active animals are more likely to detect threats. I treated initial behavior, classified as either active (standing, browsing, walking or running) or non-active (sleeping). I expected rhinoceros that were active (i.e. more vigilant) to be more sensitive to disturbance.

Habitat: Generally, an animal's detection sensitivity increases with a decrease in cover such as vegetation density or other physical barriers that may obstruct anti-predatory senses including sight, smell or sound. Other studies found increased levels of habitat cover decreased levels of vigilance and flight response (Stankowich, 2008). Thus, I dichotomously categorized each sighting into a dominant habitat classed by open landscapes (i.e. plains, hills or slopes) or closed (i.e. riverbeds). I expected open habitats to produce high disturbance likelihoods.

Appendix 3.2

Detailed description of the methods used to develop the mixed effects Generalized Linear Models of black rhinoceros-human encounters.

For model selection and averaging procedures I used the *MuMIn* package (Bartoń, 2016) to perform the multimodel inference analysis (model-averaging) and the *lme4* package (Bates *et al.*, 2016) to perform the mixed-effects modeling in R software (R Development Core Team, 2015). I first assessed all variables for multicollinearity using Spearman's rank, point biserial and phi correlation coefficients for continuous-continuous, continuous-dichotomous and dichotomous-dichotomous variable pairings, respectively. Correlations among independent variables found only time at closest distance and closest approach distance slightly correlated ($\boldsymbol{R_s}$, – 0.381), but I retained both variables in the analysis due to their direct importance in policy development.

I also assessed the intra-class correlation of individual rhinoceros and observer using a repeatablility analysis (Nakagawa & Schielzeth, 2010) and comparing variance contributions, as measured by R^2_{GLMM}, of the fixed effects only general linear regression model and the full mixed-effects model (Nakagawa & Schielzeth, 2013). To assess the proportion of intra-class correlation between individual rhinoceros observed the repeatability was low at 0.049. Further, the percent of variance explained gained by including the random effect, as measured by R^2_{GLMM} for the random effect built into the mixed model, was also low at 3.6%. The proportion of intra-class correlation between individual rhinoceros observed the repeatability was extremely low at <0.0001. There was absolutely no variance explained gained by including the random effect, as measured by R^2_{GLMM} for the random effect built into the mixed model. These results suggest

that each individual rhinoceros sighting, whether repeated individuals or not, can be considered independent. Similarly, I found no evidence to suggest any intra-observer correlation. I thus proceeded by fitting two separate fixed-effects generalized linear models with binary outcome variables as rhinoceros awareness and rhinoceros displacement. I also examined factors that may drive the transition from awareness to displacement to compare with the overall displacement model and fine-tune our assessment of habituation.

I used a model-averaging information-theoretic approach (Anderson, 2008) to assess the effects our independent viewing variables had on both awareness and displacement disturbance levels. Multi-model inference enables all information across multiple working hypotheses to be used in estimating model coefficients, thus removing the constraints of being restricted to one 'best model'. This approach improves accuracy and precision and is especially useful for predictive purposes when multiple variables may be contributing moderately to various plausible models or in the absence of any *a priori* information or established hypotheses regarding which factors contribute what influence on the response variable of interest (Anderson, 2008; Naidoo *et al.*, 2011; Singh *et al.*, 2014).

I measured the magnitude and direction of each independent variable's coefficients on our rhinoceros disturbance using multi-model averaging across the full set of candidate models that contained all possible variable combinations of our nine explanatory variables for a total of 512 models. The likelihood of each candidate model being the best (Akaike weights), and the relative importance for each independent variable was calculated and compared using Akaike Information Criterion adjusted for small sample size (AICc) and by summing the weights of each model that included each variable, respectively (Anderson, 2008).

Following the model selection and evaluation process, a series of predictive scenario-based models were estimated to demonstrate the practical utility of the analysis in guiding the rhinoceros viewing activities at DRC. The predictive modelling of viewing scenarios set all variables to their mean values and allowed the two key variables, closest approach distance and time at closest distance, to vary over a suite of distance / time associations that maintain a maximum management-accepted disturbance risk of 25% and 10% for awareness and displacement, respectively. I modelled disturbance likelihoods for both awareness and displacement for closest approach distances of between 50 to 500 meters (10 intervals) relative to the time at closest distance between 5 to 60 minutes (8 intervals) for a total of 80 management-oriented predictions for each model.

Chapter 4: Quantifying free-ranging black rhinoceros tolerance towards tourism - managing for coexistence

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ABSTRACT

Wildlife-based tourism poses opportunities and challenges for species conservation. Negative outcomes are often a consequence of poorly managed human impacts associated with various types and intensities of tourism activity. Minimizing such impacts, particularly for rare and endangered species or habitats, is critical to ensuring business and conservation enterprises can coexist for mutual benefit. In north-western Namibia, tourism is promoted and practiced as a key conservation mechanism for the world's largest free-ranging population of critically-endangered black rhinoceros (*Diceros bicornis*). Anecdotal evidence suggests black rhinoceros exposed to a tourism enterprise are displaced from high quality habitat, threatening not only the security and health of the rhinoceros population but also the sustainability of the business. I sought to characterize areas avoided by black rhinoceros to better understand how this free-ranging rhinoceros population responds to the various types and magnitudes of tourism development while evaluating a series of alternative management scenarios. I employed an information-theoretic approach to evaluate a suite of data-defined *a priori* cumulative zones of influence models including various buffer widths for an airstrip, lodge and roads used daily. Evidence strongly supported a cumulative zone of influence (ZOI) model comprised of a six kilometer airstrip buffer merged with a one kilometer buffer around roads used daily. Quantitative comparisons of a suite of alternative management scenarios using the top cumulative ZOI model informed a road use policy and airstrip re-location that minimized the total amount of overall degraded area to 7.1% and high-value habitat loss to 20.7% of the camp's operational area. Conversely, the worst case presented option represented a total area and high value habitat loss to be 153% and 85% greater, respectively, than the selected management

scenario. My findings provide a user-useful and user-friendly decision-support tool actively being used to improve a tourism enterprise' contribution towards rhinoceros conservation.

INTRODUCTION

Reconciling socio-economic development and wildlife conservation objectives is vital for ensuring the maintenance and improvement of both human well-being and biological diversity. The effects of human disturbance on wildlife behavior, often predicated by a development goal, have gained significant attention (Bennett *et al*., 2009, 2011; Marchand *et al.*, 2014; Nelson *et al.*, 2006). Research examining cumulative effects of mining, forestry and recreation upon free-ranging wildlife populations suggests impacts occur at multiple scales, temporal and spatial, magnitudes and range from individual animals to entire populations (Johnson *et al*., 2005). These effects require proactive strategic planning to effectively manage the balance between development and wildlife.

Wildlife-based tourism has been heralded as a key conservation mechanism (Buckley & Castley, 2012; Coghlan *et al*., 2012; Reynolds & Braithwaite, 2001) and has recently experienced tremendous growth globally (Tapper, 2006), particularly within developing countries (Balmford *et al*., 2009). However, wildlife-based tourism can produce negative outcomes for species (Bejder *et al*., 2006; Corkeron, 2004; Griffin *et al.*, 2007; Lott & Mccoy, 1995; Lusseau, 2004; Lusseau, 2003; Preisler *et al*., 2006; Trathan *et al.*, 2008). A growing demand for experiences that provide opportunities to interact directly and in close proximity with wildlife (Higham *et al.*, 2009) has inspired a large body of research to quantify the direct impacts of human-wildlife encounters (Buckley, 2011). However, human activity occurring within wildlife habitat, including conservation-oriented tourism, may often create 'zones of influence' (ZOI) from which certain wildlife species may be displaced from otherwise suitable, and/or preferred, habitat (Boulanger *et al.*, 2012; Frair *et al.*, 2008; Noss & Cue, 2001; Polfus *et al*., 2011; Taylor &

Knight, 2003). Few studies have targeted the indirect effects of infrastructure and operational development typically required to sustain tourism activities. An incomplete understanding of both direct and indirect effects of tourism on wildlife can result in poor management planning (Buckley & Pabla, 2012) reducing the net positive outcomes for conservation (Buckley, 2010). In order to ensure conservation benefits derived from increasing numbers of tourists seeking encounters with rare and endangered wildlife exceed the costs (e.g., Karanth & DeFries 2011) it is vital that research be translated into management approaches that are both user-useful and user-friendly (Pierce *et al.*, 2005). The availability of science-based management approaches, unfortunately, does not necessarily ensure their implementation (Fazey *et al.*, 2005; Knight *et al.*, 2008, 2006).

Namibia supports roughly one-third of the world's extant critically-endangered black rhinoceros (*Diceros bicornis)* (IUCN, 2014). The free-ranging sub-population persisting in the north-west communal rangelands of the Kunene region is recognized by the IUCN African Rhino Specialist Group as a Key 1 population (Emslie, 2008). It represents the last substantial population of any species of rhinoceros outside a protected area (Hearn, 2003), and one of the last truly wild rhinoceros populations (!Uri-≠Khob *et al.*, 2010). These characteristics ensure high conservation and tourism values (Chapter 2: Muntifering *et al.*, 2015).

As all tourism enterprises leave impacts, so understanding the thresholds and trade-offs at the rhinoceros-tourism interface is paramount for ensuring sustainable coexistence. While preliminary studies have confirmed that rhinoceros-based tourism is feasible under specific conditions (!Uri-≠Khob *et al*., 2010; Beytell, 2010; Hearn, 2003), black rhinoceros are especially

susceptible to human-induced disturbance due to their behavioral tendency to avoid human areas of activity (Cunningham & Berger 1997; Walpole *et al.* 2003; Muntifering *et al.* 2008). Anecdotal evidence suggests that specific sites (i.e., favored natural water points primarily located in dry ephemeral riverbeds with a high predicted probability of rhinoceros use) located within an area under tourism pressure were consistently avoided by black rhinoceros (Muntifering *et al.* 2008). Characterizing such 'rhinoceros avoidance areas' may provide better understanding of black rhinoceros tolerance levels towards specific types and intensities of human-induced tourism and how to manage sustainable coexistence.

My analysis aimed to quantify the impacts occurring at the second-order (i.e. home range determinants for individuals or a social group) selection scale (Johnson, 1980) for a group of free-ranging black rhinoceros exposed to tourism. Specifically, I sought to characterize the cumulative effects of various common types and magnitudes of tourism development on rhinoceros space use to develop a simple yet effective management tool that enables quantitative comparisons to be made among a suite of alternative management options to inform conservation-oriented rhinoceros tourism.

STUDY SITE AND METHODS

Study Site

My study was conducted within the government-administered Palmwag Tourism Concession (13º 56'13"E, 19º 53'12"S) which occupies approximately 5,826 km² or 8% of government-administered communal land within the Kunene Region, located in the north-west corner of Namibia (Arnold, 2001). The area receives approximately 50-100 mm of rainfall per annum

across an elevation range from 300m on the gravel plains to 600m on the largest flat-topped Etendeka mountain tops (Mendelsohn *et al.*, 2003). Except for approximately twenty permanent staff residing at one remote tourism lodge, no other human settlements occur within Palmwag Concession. Approximately 3,666 people reside within the Sesfontein, Anabeb and Torra Conservancies which border the concession (NACSO, 2014). My research operated from Desert Rhino Camp (DRC) (13º 50'45" E, 20º 1'30"S), a remote tourist facility run as a joint venture between a private sector tourism company, Wilderness Safaris, and a non-governmental conservation organization, Save the Rhino Trust (SRT), since 2003. In 2011, the three Conservancies bordering Palmwag Concession joined the partnership after the government granted them tourism rights (Thouless *et al.*, 2013) (Figure 4.1). DRC specializes in black rhinoceros-based tourism, and supports rhinoceros monitoring and research (Buckley, 2010). DRC has exclusive access to roughly 1,265 km² of remote desert wilderness for black rhinoceros tracking safaris.

Methods

Defining black rhinoceros avoidance zones

Black rhinoceros show very high site fidelity towards natural water points. Proximity to these sites can be the most important factor defining high-probability use areas based on natural features such as vegetation, topography, and resource variables (Muntifering *et al.*, 2008). A one hundred meter radius around sixteen natural water points predicted as high probability rhinoceros use areas (Muntifering *et al.*, 2008) within the DRC operating area were systematically searched for rhinoceros signs, tracks between June and October 2009 (i.e., the dry season to the beginning of spring rains). Each water point was visited at least once per week to ensure that any tracks

would be observable and all old tracks and sign that were observed were subsequently erased to avoid re-sampling on future visits. Water points used by rhinoceros after fewer than 10% of visits were classified as avoided, as these very infrequent events were inferred to represent transient use and not be part of permanent ranging behavior.

Characterizing black rhinoceros avoidance zones

Sampling design

Rhinoceros occupancy may decrease substantially when the distance from the nearest natural water point exceeds five kilometers (Muntifering *et al.*, 2008). This ecologically-relevant proximity threshold was used to buffer, using a Geographical Information System (ArcGIS 9.3), the 16 used and avoided water points in the DRC operational area. These buffers were dissolved by each water point's classification (i.e., used or avoided) to create two distinct sampling areas. Any area of overlap was classified as actively used (Figure 4.2). I chose to target complete avoidance as the response variable as it was more straightforward to define, and more likely to be recognized and endorsed by managers. I used Hawth's Extension Tool (Beyer, 2004) in ArcGIS 9.3 (ESRI, 2008) to generate 200 random samples within both actively used and avoided zones. The mean value for proximity of the random samples to the selected tourism features reached an asymptote at a sample size of 200 supporting this sampling procedure (Stander, 1998). I then derived measures of proximity to a selected set of potential tourism infrastructure (i.e., airstrip, lodge, roads) for each random sample location within both avoided and used areas (Figure 4.2).

Zones of Influence (ZOI)

The ZOI around tourism infrastructure can be characterized (Knight & Cole, 1995) to represent a focal species' tolerance towards a specific human impact. Univariate ZOIs can be merged to create multivariate ZOIs to better characterize the cumulative effects of multiple impacts while accounting for high inter-variable correlation (Polfus *et al.*, 2011). I selected a set of infrastructure and activity variables common to many safari-based tourism enterprises in Africa, including: (1) an airstrip to access the remote site, (2) a lodge to accommodate tourists and serve as an activity base, and (3) a road network to provide access to the scenic and wildlife-viewing areas.

All air transport (i.e. arrival and departure) is restricted to a single airstrip located approximately 5.5 kilometers from the lodge. However, the full area of influence is much greater since each plane typically circles before landing and immediately after take-off. All flights arriving and departing from DRC between June 2009 and February 2010, covering both peak and low season, were recorded.

To assess the impact of road use on black rhinoceros avoidance, I mapped the entire road network utilized by DRC-based vehicle safaris in a GIS. I then recorded separate daily activity routes for all vehicles operating from DRC between June 2009 and March 2010 using commercially available GPS tracking devices (Trackstick Pro, Trackstick, Cailfornia, USA). This enabled me to quantify mean monthly vehicle use intensity along the entire road network utilized from DRC. I then re-classified each road segment into one of the following average use categories: daily use, used every second day, or used once per week.

I used two methods to determine which road use intensity class had the greatest influence upon black rhinoceros avoidance behavior. First, I assessed the relationship between road use intensity, measured as observed vehicle visitation rate at natural water points, and the associated use frequency by black rhinoceros using simple linear regression (Figure 4.3). I then tested the influence of three different road use intensity classes (road used at least daily, road used at least every second day, and roads used at least weekly) by modeling the binary response avoidance as a function of whether the randomly sampled avoided or used locations fell within or outside of a 1 kilometer ZOI buffer width for each road use intensity class. The road use variable that produced the lowest Akaike's Information Criterion (AIC) value (Anderson, 2008) was applied in the final analysis. In addition to road use, flight frequency was also recorded during the sampling period noted above.

Information-Theoretic Modeling Framework

Types and magnitudes of human activity impacting wildlife are often highly correlated (Johnson *et al.*, 2005; Polfus *et al.*, 2011). In a regression framework, including all of these collinear variables can result in unstable regression coefficients and poor predictive capacity when using conventional procedures (Smith *et al.*, 2009). The comparison of airstrip proximity - lodge proximity, airstrip proximity - roads used at least daily, and lodge proximity - roads used at least daily were all highly positively correlated (partial $r = 0.885$, $p < 0.0001$, partial $r = 0.938$, $p < 0.0001$, partial $r = 0.941$, $p < 0.0001$, respectively). To account for the high collinearity, I adopted a two-step approach when developing our candidate model set. First, I selected a series of ZOI buffer widths for each tourism impact variable that characterized avoidance by examining the proximity values for the random points within each avoided zone ranging between the mean

and 3rd quartile for each variable rounded to the nearest kilometer (Table 4.1). I confirmed these values for each variable by visually inspecting density distribution plots (Figure 4.4). Having selected the range of plausible ZOI buffer widths for each variable, a series of cumulative ZOI were created by merging each possible combination of selected ZOI buffer widths across all variables to create a candidate model set. This single variable represented the cumulative effect of tourism activity and accounts for the high correlation between the 'distance to' tourism impact variables. Based upon this selection procedure, I developed 19 plausible cumulative ZOI models as our *a priori* candidate model set including the null model.

I used logistic regression to test how well each cumulative ZOI characterized avoidance by modelling the binary response 'avoided' as a function of whether or not an avoided or used random sample location fell within or outside each cumulative ZOI in the candidate model set (Polfus *et al.*, 2011). I then employed an information-theoretic approach which quantitatively ranked each model within the candidate model set, identifying the model with the greatest support as that represented by the lowest AICc value and Akaike Weight (Anderson, 2008). Analyses were conducted using the R statistical environment version 3.2.2 (R Development Core Team, 2015).

Evaluating Management Options

Following the model selection and evaluation process, I used the best cumulative ZOI model to quantitatively estimate the potential extent of both area and high value habitat loss for a series of proposed management options (see below), including the *status quo*. Both the existing black rhinoceros habitat modeling (Muntifering *et al.*, 2008) and this study were conducted at a second

order population-level. Modeled relative likelihoods of use were used as a proxy for habitat quality and adopted as a baseline habitat metric for re-classifying the continuous surface into ordinal quartiles. To simply interpretation for managers, I defined high value habitat as the top quartile of predicted probability of use values for the DRC operational area. Although subjective, this definition recognizes the increasing strength of habitat selection within each class and provided a more fine-tuned impact proxy than just cumulative habitat loss. All spatial statistics were calculated using the Spatial Analyst extension in ArcGIS 9.3 (ESRI, 2008)

I evaluated two controversial changes to the then management approaches that emerged at DRC during the study period. First, anecdotal evidence provided by both guides and trackers based at DRC in 2008 suggested that black rhinoceros were avoiding areas, especially natural water points, visited by vehicles on a daily basis. Rotating activity areas across four patrol zones to provide a 1-2 day 'resting' period for each area was suggested to reduce avoidance. Second, despite DRC operating an airstrip for over a decade with a perfect safety record, an investigation in 2013, triggered by new air safety regulations, found the airstrip fell below standards. An airstrip design expert visited the area and recommended three potential sites that met the new safety regulations. A fourth, existing airstrip on the edge of the DRC operating area was also assessed, although its distance (a one hour drive) from the lodge would be a major drawback for the tourism operation. Quantitative comparisons of rhinoceros avoidance for all scenarios, including the *status quo*, provided a set of defensible metrics for identifying the scenario most likely to deliver reliable coexistence.

RESULTS

Patterns of Avoidance

An average of 21.3 flights per month (+/- 13.2 S.D.) or 5.3 flights per week (+/- 3.3 S.D.) occurred at DRC during the sampling period. In addition, a total of 313 individual vehicle track logs were recorded and used to map vehicle use intensities across the entire DRC operational area.

Four of the 16 natural water points assessed were categorized as avoided, with no rhinoceros occupancy at three sites and only 8% frequency of occurrence at the fourth. There was a strong, negative relationship (β = - 0.04585, SE = 0.008, $p < 0.001$, $R^2 = 0.685$) between frequency of natural water point use and road use intensity (Figure 4.3). The scatterplot clearly suggested a major decrease in likelihood of spring use by black rhinoceros when vehicle visitation rate exceeds 16 per month or approximately once every second day. However, all springs visited 12 times or less on average per month (i.e. approximately once every 3 days) maintained a 60% use rate by black rhinoceros (Figure 4.3).

Roads used at least daily were the predicted to be the most avoided areas ($\omega_i = 1$) and was the only model to have substantial support (Δ AICc ≤ 2). Neither roads used at least every second day or at least weekly carried any weight in the model set, and ranked well below roads used at least daily (Δ AICc = 89.4 and Δ AICc = 465.5, respectively). Accordingly, roads used at least daily was the only roads variable retained for further analysis.

Selecting and evaluating the cumulative zone of influence model set

Proximity parameter ranges for the avoidance area were selected by inspecting the summary descriptive statistics where the range in mean, median and 3rd quartile proximity values from

random avoided locations to the airstrip and lodge ranged from 4.4 to 6.8 kilometers and 0.6 to 1.0 kilometers for roads used at least daily (Table 4.1). Density distribution plots for each variable corroborated the descriptive findings and suggested testing three ZOI buffer widths for the variable airstrip (4, 5 and 6 kilometers), three for the lodge (4, 5 and 6 kilometers), and only a 1 kilometer buffer for roads used at least daily (Figure 4.4).

The cumulative ZOI model that included a 6 kilometer airstrip buffer and 1 kilometer buffer from roads used daily was found to have the greatest support for characterizing avoidance areas (ω_i = 0.975) with the second best model, which comprised the top model plus a 4 kilometer buffer from the lodge, ranked significantly lower (Δ AICc = 7.327, (ω_i = 0.025). No other ZOI model contained any weight or likelihood of being selected as the best model (Table 4.2).

Impacts and improvements to habitat

The total area and high value habitat estimated to be under DRC's operating influence was 142,489 hectares and 30,792 hectares, respectively. Based upon these figures, an estimated 15.7% of the total area and 32.8% of high value habitat within DRC's operational area was effectively being lost through avoidance by black rhinoceros prior to a management decision that adopted a rotational road use strategy that limited the extent of daily road use. Following the decision to restrict daily road use by rotating activity areas around the lodge, the extent of predicted area avoided and amount of high value habitat loss was reduced by 61% (15.7% to 6.2%) and 43% (32.8% to 18.7%), respectively.

The proposed airstrip re-location scenarios would all result in an increase in the area avoided and high value habitat loss, compared to the *status quo*. The least impactful alternative was Scenario

1 which was predicted to increase area avoided and high value habitat loss by 14.5% and 10.7%, respectively. Scenario 4 (i.e., utilizing the existing airstrip an hour's drive away) was predicted to actually decrease the extent of high value habitat loss by 5.3% but increase area avoided by 43.5%, relative to the *status quo*. However, Scenario 4 was ruled unviable, due to the long drive required to reach the lodge. Scenarios 2 and 3 increased area avoided by an average of 83% (91.9% and 74.2%, respectively) and high value habitat loss by an average of 34% (43.9% and 24.6%, respectively) relative to the *status quo*. When the rotational road use scenario was combined with the best airstrip re-location option (Scenario 1), the potential impacts (had Scenario 2 been selected without rotational road use) on the extent of area affected were reduced by 154% (7.1% instead of 18%) and the amount of high-value habitat loss by 86% (20.7% instead of 38.4%) (Table 4.3).

DISCUSSION

Although previous research has strongly suggested that ecotourism, and rhinoceros-based tourism specifically, is providing positive contributions towards conservation in Namibia (!Uri-≠Khob *et al.*, 2010; Jones *et al.*, 2015; Chapter 2: Muntifering *et al.*, 2015; Naidoo *et al.*, 2011), few studies have empirically examined potential risk factors and/or mitigation approaches for sensitive species, such as black rhinoceros. My approach sought to provide a tool to encourage scientifically-defensible tourism planning that could be easily understood and applied by managers and that would be endorsed by government.

My modeled cumulative ZOI provides the first quantitative approximation of human infrastructure and activity impacts on a free-ranging black rhinoceros population exposed to

tourism. My findings suggest that black rhinoceros will tolerate limited levels of tourism development but demonstrate strong avoidance of areas under chronic tourism-induced disturbance. Similar tourism-related results have been documented for other sensitive species such as wild reindeer *Rangifer tarandus tarandus* (Nellemann *et al.*, 2000) and mountain goats *Oreamnos americanus* (Richard & Côté, 2015), and can be extended to mountain woodland caribou *Rangifer tarandus caribou* (Polfus *et al.*, 2011), barren-ground caribou *Rangifer tarandus groelandicus*, brown bears *Ursus arctos*, and gray wolves *Canis lupus* (Johnson *et al.*, 2005) when mining activities are included. Previous black rhinoceros behavioral research suggests a strong avoidance response towards chronic levels of human-induced disturbance (Cunningham & Berger, 1997; Lott & Mccoy, 1995; Muntifering *et al.*, 2008; Walpole *et al.*, 2003). My results confirmed this and identified that black rhinoceros tourism-induced avoidance is best characterized by a cumulative ZOI specified as a six kilometer airstrip buffer and one kilometer buffer around roads used at least daily. Despite clearly avoiding the lodge, the spatial configuration of the daily road network appeared to be a better approximation of black rhinoceros' avoidance response. This is likely due to the fact that the road network does not follow a perfectly circular radiation from the lodge and is spatially aligned with key resources, such as natural water points, that black rhinoceros prefer. This finding also suggests that the ZOI for the roads used daily effectively 'masked' the lodge's spatial influence possibly due to its larger and more ecologically-configured extent. This seems reasonable given the human noises and scents that may trigger black rhinoceros avoidance behavior are relatively small from a fixed remote lodge when compared with daily activity zones for large diesel four-wheel drive vehicles. Aircraft engine noise, especially during take-offs and landings when sound is able to travel much

farther, is significantly greater than the lodge or vehicles, hence its clear influence in the top model.

The best model estimated DRC's current 'footprint' at only 6.2% of the total area and high value habitat loss at 18.7%. These results demonstrate that even relatively small areas of human use can have disproportionately large impacts on key ecological features (i.e., habitat quality) that could result in significant population performance effects, although this was not assessed in this study. Regardless, this emphasizes the need for careful consideration, especially when designing vehicle activity patterns and aircraft access into black rhinoceros rangeland.

I focused this analysis on the spatial effects of road use and fixed infrastructure placement on black rhinoceros avoidance behavior primarily because of our knowledge of the disturbance context at DRC, but also because the planning and management of these impacts can be evaluated and modified within an adaptive management framework. When guides and trackers reported rhinoceros avoiding some natural water points but not others, a collaborative inquiry led to a hypothesis that daily vehicle activity was driving the observed avoidance response. The road network and its use frequency was comprehensively mapped enabling avoidance to be modelled as a function of different use intensities. A ZOI for daily road use was clearly the best fit model, simple to explain to all staff and a management decision was immediately taken to restrict daily use of roads to a smaller area around the lodge. Despite a relatively small overall impact on the extent of land affected (only 2.7% less), the reduction of high-value habitat was substantial. In addition, the decision ultimately informed a new policy mandating daily tracking excursions be rotated between four zones within the lodge's operating extent, indirectly

benefiting monitoring efforts, which resulted in greater numbers of individual rhinoceros sightings without compromising tourist satisfaction (L.Nortje, *pers. com.*). In other words, the new rotational system increased the number of individual rhinoceros observed at DRC without compromising general sighting frequency (i.e. assuming tourists do not care which rhinoceros they see, so long as they see a rhinoceros).

The model-based predictions for a set of three airstrip placement options identified two as having only minor impact increases, while an existing but unused peripheral airstrip actually had less impact than the *status quo* (but was deemed unviable due to extensive travel time to the lodge). The option of placing the airstrip next to the lodge (< 1 km) produced less than 2% additional impact on the amount of area and high-value habitat loss, likely due to its masking effect on the higher amount of roads used daily radiating from the lodge. Following open debate framed around easily understood ZOI buffers (as opposed to complex statistical models), management agreed to compromise and select this option, which thwarted an initial un-informed decision that would have selected the worst airstrip development option (Option 3 in Table 4.3), which would have increased the loss high-value habitat by over 40% from the chosen option. Although I did not specifically test for a casual mechanism, I feel that this management-relevant and user-friendly analysis (sacrificing some statistical sophistication without over-simplification) applied here played a major role in facilitating an acceptable decision that is based upon sound empirical inquiry, not detrimental to the business, and improves black rhinoceros well-being and hence conservation outcomes. Minimizing impact is essential for ensuring rhinoceros remain visible both to tourists (sustaining the business and financial support for rhinoceros protection) and monitoring teams (so as to detect potential poaching and to monitor population performance).

This reduces the likelihood of any habituation effects that may place the rhinoceros exposed to tourism at greater risk of being poached (Geffroy *et al.*, 2015).

To scale up these findings, future efforts could explore integrating modeling outputs with GIS-based simulation conservation planning software to optimize tourism impact feature configuration to maximize monitoring while minimizing tourism-induced habitat loss. Such tools could be employed in workshop settings to negotiate potential options and support near-optimal decisions that trade-off conservation and tourism needs at multiple scales. Such an approach would enable a broader assessment on tourism's role in securing regional connectivity to maximize black rhinoceros population growth while offsetting high management and protection costs (Chapter 2: Muntifering *et al.*, 2015). This operational-level approach also has wide application across Africa, since the vast majority of tourism in key black rhinoceros conservation areas operates with remote access, a lodge and safari vehicles.

The consistent growing demand for wildlife-based tourism opportunities, including black rhinoceros viewing, places increasing pressure upon the very species the activity seeks to protect. Whilst tourism impacts are unavoidable, I have demonstrated they can be significantly reduced by integrating carefully designed, pragmatic research, expert knowledge and collaborative decision-making. This, however, prompts questions concerning the potential negative effects on tourist satisfaction when implementing new, conservation-oriented management practices. For example, does restricting the extent of roads used daily significantly reduce a guide's ability to provide a safari experience that maintains high tourist satisfaction? Does placing an airstrip near a lodge increase the number of tourist complaints about the additional noise with longer-term

impacts on occupancy rates? Do these tourism-related consequences manifest in an unviable business?

While answering these questions was well beyond the scope of this paper, formal evaluations completed by most visiting tourists at Desert Rhino Camp between 2007 and 2013 indicate that tourist satisfaction has continued to exceed expectations (L. Nortje, *pers. com.*). Future research that explicitly tests these hypotheses could improve the sustainability of both the black rhinoceros population and the DRC business. Finally, although I expect that spatial displacement due to tourism-induced disturbance will be associated with increased stress levels and other indirect effects of habitat reduction, more research is necessary to ascertain whether avoidance behavior translates into actual reductions in population performance. Fine-tuning our understanding of the complexities of managing social-ecological systems, such as conservation-based tourism enterprises, will be critical for effectively trading-off achievements of conservation goals and human well-being.

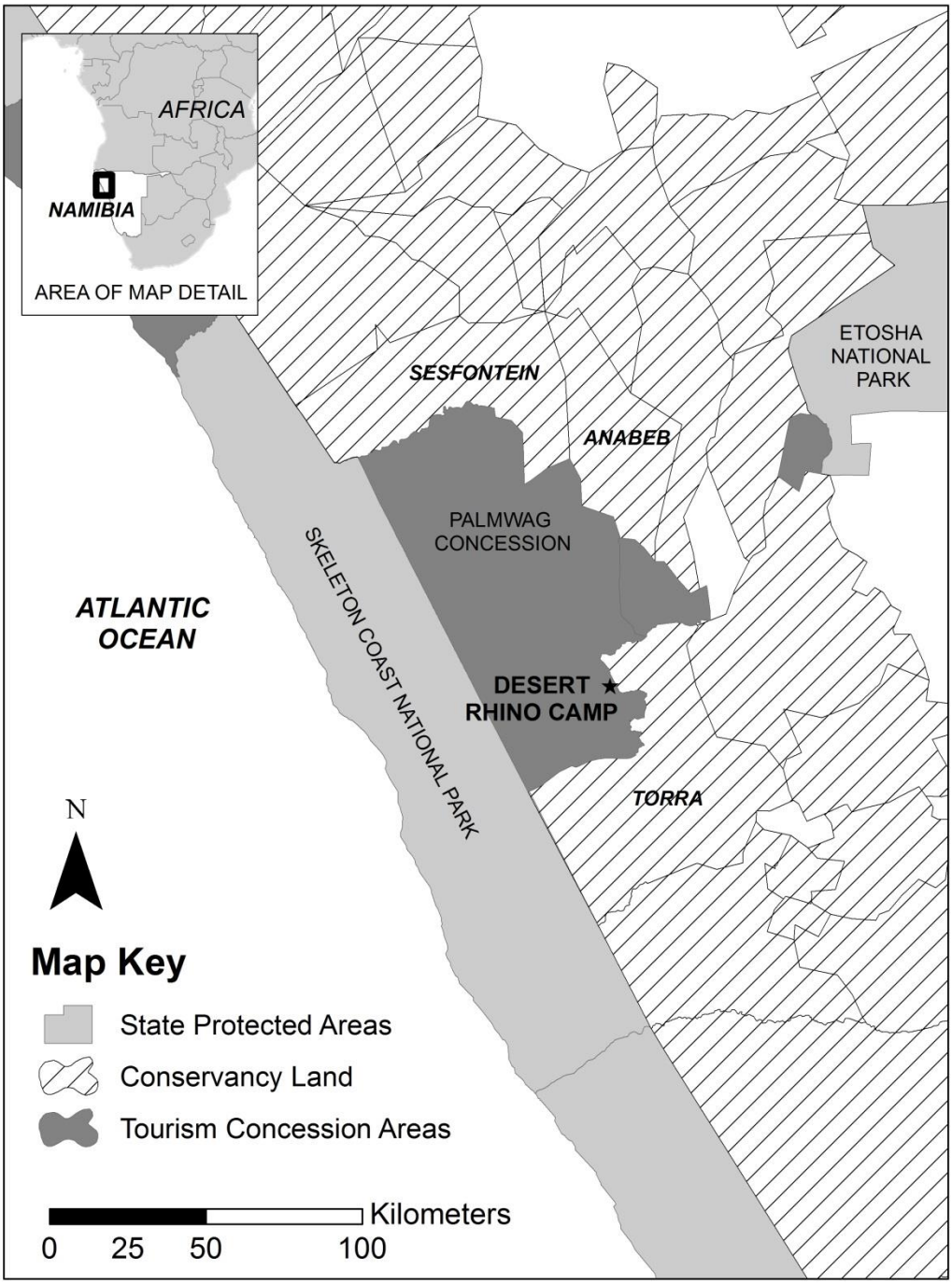


Figure 4.1: Map of the study area within the Palmwag Tourism Concession surrounded by Protected Areas and Conservancy lands

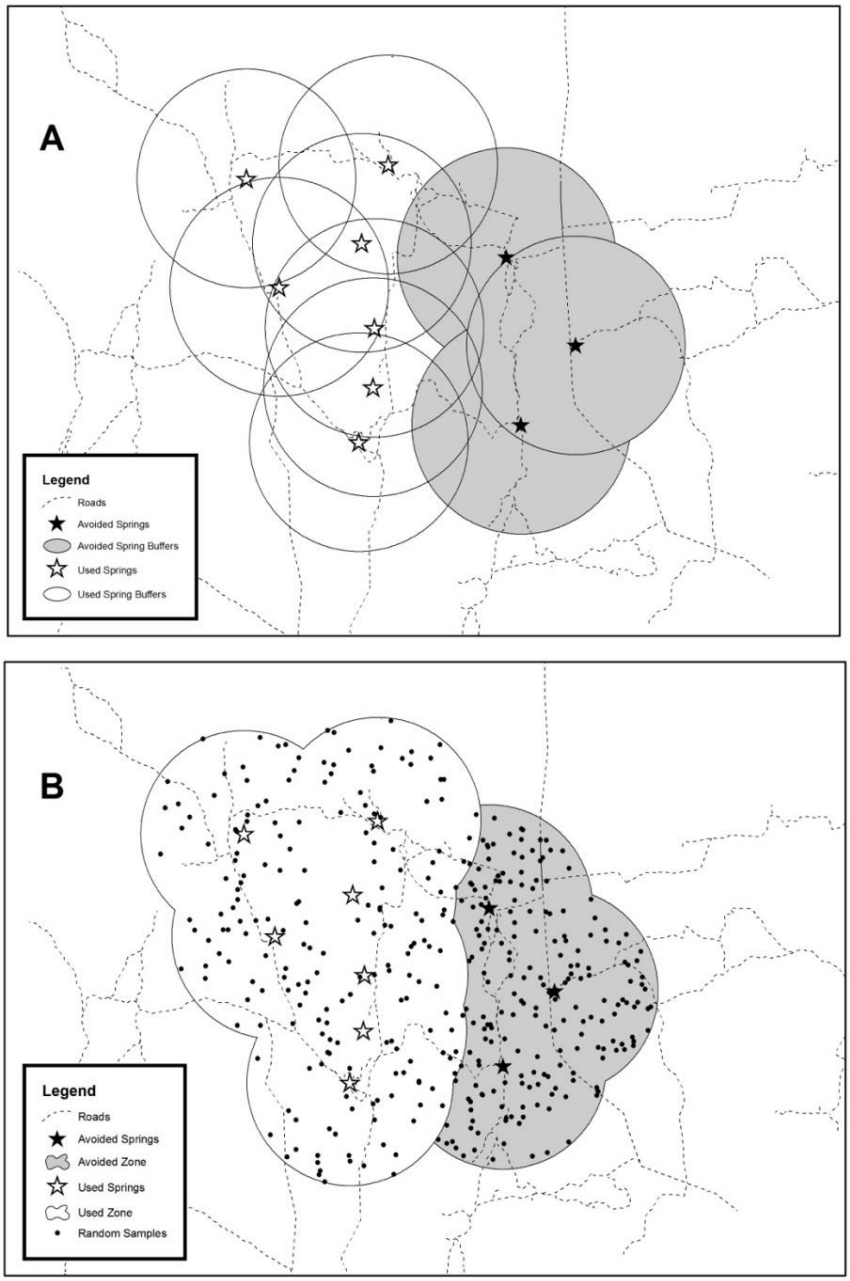


Figure 4.2: Hypothetical (to avoid placing sensitive rhinoceros information in the public domain) sampling design for areas used and avoided by black rhinoceros and distance from tourism impact features using hypothetical natural water point locations to avoid placing sensitive natural water point information in the public domain. [1]

[1] First, buffers were created around each classified used and avoided natural water point within the DRC operational area (A). Second, all avoided buffers and used buffers were dissolved to create two distinct sampling areas, with areas of overlap being classified as used (B). Lastly, 200 sample locations were randomly generated within each sampling category.

Figure 4.3: Relationship between observed frequency of rhinoceros sign at natural water points and mean monthly vehicle visitation rates

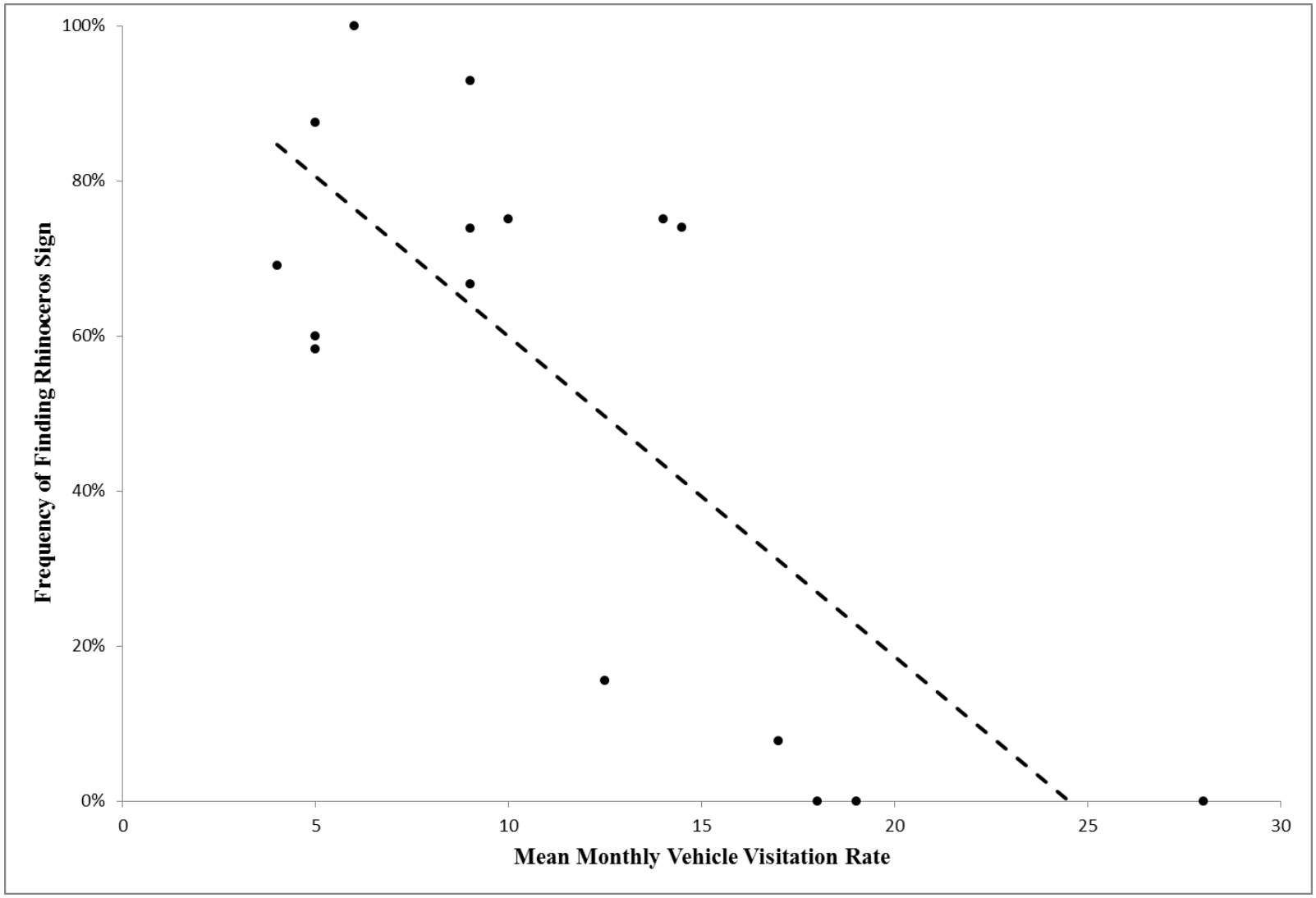
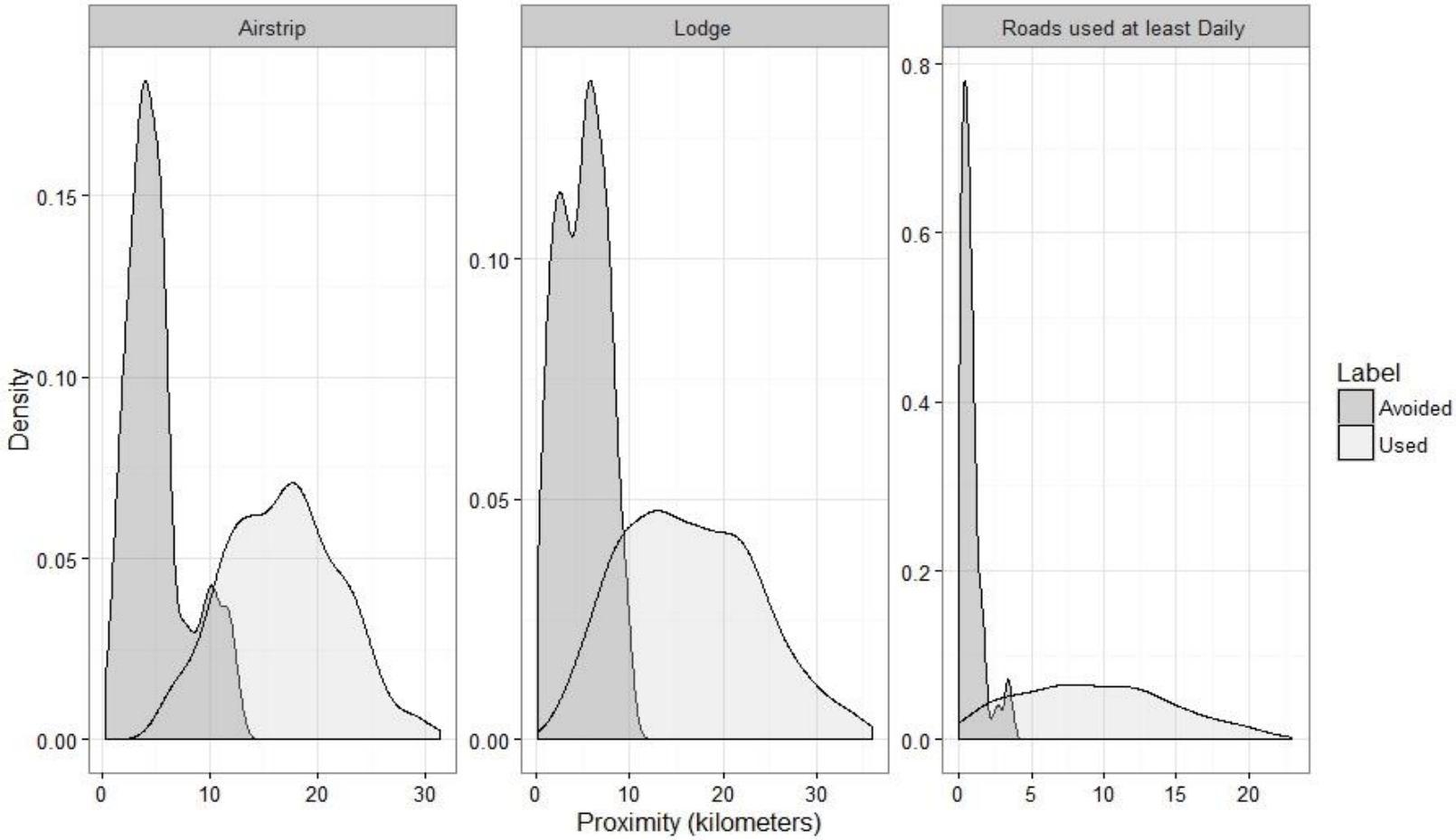


Table 4.1: Summary statistics for variables included in the candidate ZOI model set for characterizing black rhinoceros avoidance areas.

Proximity to (kilometers)	*Min*	*1st Quartile*	*Mean*	*Median*	*3rd Quartile*	*Max*
1) Avoided						
Airstrip	0.3	3.1	5.0	4.4	5.9	12.8
Lodge	0.1	2.7	4.8	5.0	6.8	10.1
Roads used Daily	0.0	0.3	0.8	0.6	1.0	3.9
2) Used						
Airstrip	5.3	12.5	16.0	16.4	19.3	24.4
Lodge	1.9	10.2	15.5	15.2	20.8	28.0
Roads used Daily	0.1	4.9	8.6	8.6	12.2	17.7

Figure 4.4: Density distribution plots for variables included in the candidate ZOI model set.[2]



[2] We based our ZOI buffer width selection starting from each variable's avoided (shaded areas) density distribution peak and two additional proximity values observed between the peak and the intersection with used (unshaded area) density distribution

Table 4.2: Candidate cumulative ZOI model set for logistic regression of binary response variable avoidance as a function of combined tourism impact variable proximity buffers. [3]

Model	Variable Buffer Width (kilometers)			AICc	Δ AICc	ω_i
	Airstrip	Lodge	Roads used ≤ Daily			
1	6	-	1	443.0	0	0.975
2	6	4	1	450.3	7.33	0.025
3	6	6	-	466.4	23.44	0.000
4	6	4	-	470.6	27.58	0.000
5	6	5	1	473.5	30.47	0.000
6	5		1	474.1	31.14	0.000
7	6	5	-	478.0	34.99	0.000
8	5	4	1	478.3	35.34	0.000
9	5	5	1	502.7	59.72	0.000
10	4		1	512.1	69.09	0.000
11	4	4	1	512.9	69.92	0.000
12	4	5	1	537.1	94.09	0.000
13	5	6	-	589.9	146.92	0.000
14	5	5	-	599.5	156.54	0.000
15	5	4	-	608.5	165.54	0.000
16	4	6	-	708.1	265.12	0.000
17	4	5	-	719.1	276.13	0.000
18	4	4	-	732.0	289.04	0.000
19	-	-	-	1111.0	668.04	0.000

[3] Models are ranked from best to worst based upon change in Akaike's Information Criterion (AICc) score with best model (lowest AICc) listed at the top.

Table 4.3: Summary of the reduction in effectiveness of area and habitat for management scenarios for (1) road use (restricting extent of roads used daily by rotating activity areas) and (2) airstrip re-location. [4]

	Area Reduction		**High value Habitat Reduction**	
Management Option	Area (ha)	%	Area (ha)	%
1) Road use				
Un-regulated road use (< 2009)	22,319	15.7%	10,089	32.8%
Rotational use policy *(Status quo)*	8,859	6.2%	5,763	18.7%
2) Airstrip re-location				
Scenario 1 (Lodge-side)	10,102	7.1%	6,375	20.7%
Scenario 2 (Achab)	17,004	11.9%	8,276	26.9%
Scenario 3 (Salvadora)	15,392	10.8%	7,186	23.3%
Scenario 4 (Wereldsend)	12,706	8.9%	5,458	17.7%
3) Un-informed worse-case				
Un-regulated road use + Scenario 2	25,691	18.0%	11,820	38.4%

[1] The top quantile of predicted relative probability of use values within the DRC area

[4] Total area available and high value habitat[1] was estimated at 142,489 hectares (ha) and 30,793 ha, respectively, for the DRC operating area.

Chapter 5: Designing wildlife-based tourism programmes for managing species of high conservation value

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ABSTRACT

Wildlife-based tourism is widely heralded as a potential conservation tool yet controversy surrounds its actual contributions to conservation. While negative consequences typically target technical problems in delivery, procedural or governance malfunctions such as inadequate and ineffective decision making are often overlooked. Although rarely applied within a tourism context, the policy sciences provide a theoretical and practical framework to understand the context of and improve the content for designing an effective natural resource management policy process. I applied a policy sciences approach to describe how an understanding of decision context embedded within the policy process can help lead to common interest solutions that ultimately improve the general sustainability of wildlife-based tourism. I demonstrate its utility by documenting and appraising a real-world rhinoceros-based tourism enterprise prototype in north-west Namibia operating since 2003. Strengths observed in the decision process were the inclusive nature and participant's willingness to reconcile different perspectives by finding common interest solution based on shared values such as human and rhinoceros well-being. The policy process could have been improved by mandating top management conduct more site visits and more frequent and independent appraisals are compiled. My results suggest a series of prototypic elements that are transferable including the establishment of a shared decision-making arena, adopting a fully inclusive management-oriented research agenda, employing a strategic messaging approach as a means to motivate compliance and possibly increase philanthropic behavior by tourists, and emphasizing a learning approach through role reversal opportunities that harness values for guides and trackers. In order to facilitate replication, attention should target establishing deeper engagements with conservancies who host emerging rhinoceros tourism enterprises, expanding the research agenda to include tourism's role towards influencing

pro-rhinoceros behavior change in both tourists and local community members. I suggest that conservation tourism, designed and managed holistically as a complex SES, has the potential to serve as a critical social foundation upon which additional protection measures for high-value, highly-threatened species such as law enforcement can function more effectively.

INTRODUCTION

The conservation of valued species is challenging given the complexity, diversity and dynamism of the social-ecological systems (SES) within which conservation problems are situated. In this context, having a precise and accurate understanding of the entities, processes, interrelationships and activities that comprise a SES is essential for designing solutions to conservation challenges. This is particularly the case for highly complex "wicked" conservation problems (Game *et al.*, 2014; Levin *et al.*, 2012) and is common for species that are rare and highly valued but threatened by legal (i.e. sustainable harvesting) and illegal (i.e. poaching) human-caused mortality.

Although rarely recognized as a SES, wildlife-based tourism initiatives are often comprised of complex social and ecological interactions across multiple spatial, institutional and temporal scales. It has also been heralded as a key conservation mechanism (Buckley & Castley, 2012; Buckley, 2009) and has recently experienced tremendous global growth (Tapper, 2006), particularly within developing countries (Balmford *et al.*, 2009). However, wildlife-based tourism can also have negative outcomes for species (Bejder *et al.*, 2006; Corkeron, 2004; Griffin *et al.*, 2007; Lott & Mccoy, 1995; Lusseau, 2004; Lusseau, 2003; Preisler *et al.*, 2006; Trathan *et al.*, 2008). While these negative outcomes for wildlife viewing activities are typically linked to technical and/or operational errors of delivery (i.e. getting too close, observing for too long, or degrading critical habitat to improve visibility), dysfunctional policy processes (i.e. poor decision-making) underlie superficial consequences that can limit, or even counter, tourism's contribution to conservation. Such fundamental limitations are often driven in practice by partnerships failing to clarify and secure common interest goals such as endangered species recovery and protection (Clark & Brunner, 2002; Garen, 2000; Hoole, 2010). In the case of

wildlife-based tourism, making key decisions may be dominated by aggressive dogmatic business entrepreneurs or local elite individuals or groups capturing a disproportionate share of benefits (Garen, 2000; Hoole, 2010). Thus, conducting structured, systematic appraisals of decision-making processes within a conservation-oriented wildlife-based tourism operation is well warranted to minimize the potentially detrimental effects of poorly designed and executed initiatives and to maximize the opportunities for successful endangered species protection and recovery.

Towards Understanding Social-Ecological Systems

Several approaches are available for developing a fine-tuned understanding of decision-making contexts. These include approaches from a diverse range of fields and disciplines such as behavior change (Akerlof & Kennedy, 2013), systems thinking (Cundill *et al*., 2012; Norberg & Cumming, 2008; Jackson, 2003) including scenario planning (Peterson *et al.*, 2003; Carpenter *et al*., 2006), appreciative inquiry (Cooperrider *et al.*, 2008), evaluation (Jenks *et al.*, 2010; Kleiman *et al.*, 2000; Patton 1990) and the policy sciences (Clark, 2002; Clark & Brunner, 2002). The policy sciences, a well-respected discipline more than 50 years old (Lasswell, 1971), is underpinned by the assertion that the ongoing interaction of people in their efforts to obtain what they value is the foundation of all decision-making aimed at securing the common good (Clark, 2002). The approach provides both a theory underpinning and practical framework for effective problem solving, notably of complex problems, that includes a systematic, analytical process for integrating biophysical information with a rational theory for societal decision-making. This holistic process is critical to help clarify and secure common interest

solutions and is particularly important for adequately addressing conservation challenges that are deeply embedded within a complex SES. While the policy sciences approach has been applied to managing a small suite of species of high conservation priority (Table 5.1), it has rarely been applied to a conservation tourism context (Garen, 2000).

Dimensions of the Policy Process

Embedded within the policy sciences framework are four primary dimensions, including the social context, decision process, problem orientation, and observational standpoint along with a suite of analytical methods for directing policy inquiry to improve large-scale conservation (Clark, 2002).

Social context

Understanding the social context of a SES is fundamental to problem solving and effective decision making. The social context can be examined or 'mapped' as a functional process in terms of the perspectives, situations, base values, strategies and outcomes that underlie each participant's behavior and interaction with other participants. While many classifications of human values have been described that motivate human behavior (Fishbein & Ajzen, 2010; Maslow, 1954; Schwartz & Bilsky, 1987) the policy sciences classify human values into eight base values including power, wealth, respect, enlightenment (knowledge), skills, affection, well-being and rectitude (Lasswell, 1943; Lasswell & Holmberg, 1992). How these values are shaped and shared (i.e. who gets what, when and how) between participants is fundamental to policy

processes and decision-making specifically. Participants often use existing values (base values – i.e. values that are being used) to acquire or improve upon value demands (scope values – i.e. values that are being sought) (Clark & Wallace, 2002). Such 'value dynamics' are useful to characterize to help unravel complex interrelationships within a SES. The social process can be summarized as people seeking values through institutions that affect and use resources (Clark *et al.*, 2010). Thus, the social context lies at the core of all decision-making.

Decision process

The policy sciences framework characterizes the decision process in terms of seven inter-related functions or activities that include intelligence, promotion, prescription, invocation, application, termination and appraisal (Clark, 2002). Like the social context, each decision function can be systematically mapped and analyzed contextually in terms of who participated, with what perspectives, in which arenas, using what base values to acquire what scope values, in what strategic ways to generate what outcomes (Clark & Willard, 2000) and appraised relative to a series of recognized standards (Clark, 2002; see Table 5.4).

Problem orientation

Problem orientation is the process of clarifying goals, describing trends, analyzing conditions, projecting developments and selecting alternatives. Clarifying goals can be summarized as simply defining, what ought to be preferred. Describing trends is the process of identifying the most important elements of the problem relative to the goal. Analyzing conditions requires

assessing the conditions that have influenced the observed trends. Projecting developments is the task of taking the current situation (trends and conditions) and projecting it into the future with no proposed interventions. Lastly, selecting alternatives involves creating, reviewing and choosing objectives and strategies that may achieve the goals set forth (Clark & Willard, 2000).

Observational standpoint

Observational standpoint clarifies a participant's (and hence myself as the author's) worldview relative to the policy problem and may include roles, problem solving tasks performed, motivations, and biases towards the role and tasks (Clark, 2002). Knowing one's own behavior and role in the policy process at hand requires not just being aware of the biological issues but also about oneself. Often, people assume that other people will view and appreciate their good work and good intentions. Being clear about one's standpoint is critical in overcoming personal and professional biases while aiding in successful teamwork and ultimately more effective conservation (Clark & Willard, 2000). While defining one's observation standpoint, five questions should be addressed. First, what roles are you and others engaged in throughout the policy process? Second, what problem solving tasks do you undertake? Third, what factors determine how you perform your tasks? Fourth, what conditioning factors have shaped your professional and personal approach to problem solving? Fifth, how does this approach shape how you perform the analytical tasks associated with your role in the policy process? (Clark & Willard, 2000).

Additional methods can also be drawn upon to be utilized within the policy sciences framework to analyze a policy problem that promote creativity, innovation adaptability and learning including case studies (Clark, 1986), policy exercises (Brewer, 1986), decision seminars (Clark, 1997; Lasswell, 1963) and prototyping (Lasswell, 1963).

Prototyping

Prototyping is a well-proven technique for enhancing the performance of a particular intervention or task specifically in contexts characterized by high complexity, uncertainty and with potential for conflict among parties (Brunner & Clark, 1997; Brewer & DeLeon, 1983) such as joint-venture wildlife-based tourism initiatives. A prototype is both a model product as well as created through a process of innovation and adaptation. Although typically initiated on a small scale, prototypes are designed and implemented with learning and eventual replication in mind (Clark *et al.*, 2002). Prototypes establish a systematic process for detecting and rectifying errors and obstacles, for accumulating successes and filtering out failures and learning through adaptive governance (Maris & Béchet, 2010; Jenks *et al.*, 2010; Leys & Vanclay, 2011) . The goal of any prototype is to reach a level of operation that represents a new model of a SES and to lay a foundation that promotes the replication of fundamental features or key elements, along with knowledge and skills transfer, at a broader scale (Lasswell, 1971).

Here, I applied a prototyping approach set within a policy sciences framework (Clark, 2002) to contextually describe and analyze key aspects of a conservation-oriented rhinoceros tourism enterprise including: (1) the social context; (2) the decision process successes and failures; and

(3) recommend a series of prototypic elements that characterize an effective operational model (*sensu* Knight *et al.*, 2006) for improving black rhinoceros conservation in the common interest.

A prototyping approach was appropriate and preferable since conservation tourism can be characterized by high levels of complexity, uncertainty and conflict between special interests groups (Brewer & DeLeon, 1983). Several additional attributes made this case ideal for prototyping, such as an initial low profile, a small decision making body with no hard fixed perspectives on how the activity should be conducted, and very little bureaucracy (Clark *et al.*, 2002). Further, as a sustainable rhinoceros-based tourism model was in high demand (Chapter 2: Muntifering *et al.*, 2015), a clear practical utility existed for developing prototypic elements that could facilitate successful replication (Clark *et al.*, 2002). The policy sciences framework, as refined and adapted generally to natural resource management, and to endangered species management specifically, by Clark (2002), provided a well-established stable frame of reference that enabled a holistic, theory-based functional analysis of the policy process while promoting an open learning environment, well suited for a complex SES.

STANDPOINT& METHODS

My interest in sustainable wildlife-based ecotourism spawned through my professional training and experience practicing conservation biology, primarily in northwest Namibia over the past 15 years. In 2003, I became involved with a local field-based non-government organization, Save the Rhino Trust (SRT), to primarily support research-related activities for a free-ranging population of black rhinoceros that persisted across Namibia's north-west communal lands. My

first task was to lead a scientific investigation into understanding and mitigating potential negative impacts associated with a novel rhinoceros-based tourism partnership between SRT and a private tourism company, Wilderness Safaris (WS). Initially, I focused my efforts and attention towards solving technical ecological problems using conventional science-based methods such as standard experimental design, statistics and ecological modelling techniques. However, it became apparent that solving these technical problems did not fully capture the complexities that characterized the system we sought to examine and improve. I realized that science, although necessary, was insufficient to solve real-world problems. As I became more familiar with the larger-scale community-based conservation context within which I operated (Chapter 2: Muntifering *et al.,* 2015; NACSO, 2014; Owen-Smith, 2010), I became increasingly interested and captivated by the prospects that wildlife-based ecotourism, if designed and delivered effectively, could contribute towards rhinoceros conservation. I also began to believe that a more holistic, value-based view of rhinoceros tourism could ultimately help restore the human dignity that had been degraded during decades of oppressive rule by colonial powers (Dowie, 2009) and coercive, command and control conservation strategies. I believed restoring human dignity by finding creative means to engage and empower local people in rhinoceros protection would provide a critical social foundation upon which lasting rhinoceros conservation could be achieved.

In other words, I became alert to the need to move beyond basic research toward learning and applying tools and techniques that develop a more holistic perspective that recognizes the integrated social and ecological systems within which many, if not all, conservation challenges are embedded. In my pursuit of this new knowledge, I was fortuitously introduced to the policy

sciences by Professor Susan Clark from Yale University. I immediately began translating this newly acquired knowledge back to retrospectively examine my previous work using Desert Rhino Camp (DRC) as a prototypic case. As the camp is an experiment in a unique conservation partnership, I was particularly interested in examining our decision-making process throughout the policy process. In this context, my primarily roles in DRC's policy process were to serve as a scientist and an adviser. Through my professional and formal link to SRT, my primary concern was the welfare of the rhinoceros and the benefits that could accrue to SRT. However, as I indirectly gained more practical tourism experience during extensive time spent at DRC working alongside WS staff and tourists, I obtained an appreciation for the business aspects of tourism. I often found myself playing 'neutral-broker of policy alternatives' between SRT and WS during joint management meetings. This role enabled me to not only mitigate gridlock, but also observe the value dynamics and decision process at play.

Data for this analysis were collected primarily from published and unpublished stakeholder meeting reports and joint management meeting minutes of which I often directly participated. I base much of the synthesis and recommendations on the analysis of these reports and filled information gaps with informal and formal focus group discussions and personal interviews with SRT trackers and WS guides over the past decade. Lastly, as a science advisor, my main interest in this analysis is the creation and dissemination of knowledge to improve large scale rhinoceros conservation in the common interest.

Specifically, I employed a prototyping technique (Clark *et al.*, 2002; Lasswell, 1971) to retrospectively document and appraise the decision context and process embedded within a real-

life conservation-oriented tourism setting at DRC in order to improve tourism contribution towards rhinoceros conservation. This analysis characterized the context and effectiveness for all seven decision functions (Table 5.2) framed around a problem definition (stated later). In order to establish the social context, we employed a feature analysis which characterized who participated, with what perspectives, in which arenas, using what base values to acquire what scope values, in what strategic ways to generate what outcomes in reference to each of the decision functions (Clark & Willard, 2000). We then assessed how well the presented criteria for each decision function, as posited by the policy sciences (Clark, 2002), were met. Rather than examine the entire myriad of large and small decisions made at DRC over the past 12 years, I chose to analyse two key decision points: 1) the management of the operational area; and 2) the encounters between tourists and rhinoceros. While many smaller decisions affected the operation at DRC, we chose to focus on these two tasks specifically because they were both directly linked to the main policy problem (defined below) and had both direct and indirect effects upon nearly all other decisions.

This study was conducted within the government-administered Palmwag Tourism Concession (13º 56'13"E, 19º 53'12"S) which occupies approximately 5,826 km² or 8% of government-administered communal land within the Kunene Region, located in the north-west corner of Namibia (Arnold, 2001). The area receives approximately 50-100 mm of rainfall per annum across an elevation ranging from 300m on the gravel plains to 600m on the largest of the flat-topped Etendeka mountains (Mendelsohn et al., 2003). Only one human settlement is located within Palmwag Concession - approximately twenty permanent staff residing at a single remote tourism lodge. Approximately 3,666 people reside within the Sesfontein, Anabeb and Torra

Conservancies which borders the concession (NACSO, 2014). This research was based from DRC (13º 50'45" E, 20º 1'30"S) which specializes in black rhinoceros-based tourism, and supports rhino monitoring and research (Buckley, 2010). DRC has exclusive access to roughly 1,265 km² of remote desert wilderness for its rhinoceros tracking safaris.

THE DECISION CONTEXT FOR DRC'S MULTI-STAKEHOLDER PARTNERSHIP

Tourism, when designed and delivered wisely by individuals, groups or partnerships with conservation as a shared primary goal has the potential to produce net positive conservation benefits (Buckley, 2009). For example, tourism helps protect 22% of the global population of black rhinoceros and greater than 20% of 12 other endangered wild animal populations on the IUCN Red List including other iconic African species such as elephant *Loxodonta africana*, lion *Panthera leo* and Grevy's zebra *Equus grevyi* (Buckley *et al.*, 2012). With only 5,000 black rhinoceros persisting in the wild (Emslie & Knight, 2014), tourism's contribution is significant. Moreover, the majority of Namibia's black rhinoceros population, which accounts for approximately one-third of the global population and 89% of the southwestern subspecies *D. b. bicornis* (Emslie & Knight, 2014) is sustained within high-value tourism areas, such as Etosha National Park and the northwest Kunene and Erongo Regions. While management activities within national parks, such as Etosha, are typically planned and implemented solely by government, management on communal areas often occurs through partnerships including government, local communities, non-government organisations (NGOs) and, more recently, private sector tourism (!Uri-≠Khob *et al.*, 2010; Hearn *et al.*, 2004). Although partnerships have been used successfully to improve conservation effectiveness, they can also pose serious challenges if policy differences cannot be reconciled to secure common interest solutions (Clark

& Brunner, 2002). For example, tourism activities controlled by more powerful participant groups with primarily economic interests may not include guidelines or regulations to protect the wildlife their business depends upon (Wells *et al.*, 1992; Garen, 2000).

Multi-stakeholder discussions between government, local communities, conservation organizations and private sector tourism in the early 2000s broadly defined successful black rhinoceros-based tourism in Namibia's northwest as improving protection measures through sustainable financing and the increased field presence that rhinoceros tracking tourism may provide (Hearn *et al.*, 2004). Goals expanded in 2006 following the initiation of a prototypical rhinoceros tracking safari camp (DRC) to include broader values sought by local people including respect, shared power and skills (Chapter 2: Muntifering *et al*., 2015). The general roles and relationships of the various stakeholders in the evolving partnerships for regional rhinoceros tourism are formally linked through a network of contractual arrangements at various spatial scales (Figure 5.1) from national-level through the Ministry of Environment and Tourism (MET) down to the local-scale of an individual enterprise. Specifically, the MET used their power and rectitude to uphold their responsibilities as formal owners of all Namibia's black rhinoceros by leading law enforcement, all biological management activities (e.g., such as translocation, reintroductions and de-horning operations) and coordinating contracts for leasing tourism rights on government-administered tourism concessions (such as Palmwag Concession) back to Conservancies. Conservancies, who had registered as Communal Rhino Custodians with MET, used their power and rectitude to increase benefits from rhinoceros tourism to their local constituencies by entering into contractual agreements with private sector tourism (i.e. WS) to improve income generating opportunities. Traditional authorities also exercised their power over

land allocation to maintain local respect and affection by ensuring only land uses compatible with conservation (i.e. wildlife-based tourism) are practiced in areas that support black rhinoceros. WS exercised their wealth, skills, knowledge and rectitude to obtain more wealth and respect by supporting conservation and rural development while enhancing their business by engaging in unique conservation partnerships with conservation organizations like SRT. SRT improved their financial base and extended their knowledge and respect as a leading rhinoceros conservation organization by utilizing their skills and knowledge that helped pioneer a novel approach to integrate tourism with rhinoceros monitoring while upholding their mandate with MET to provide rhinoceros monitoring information. Minnesota Zoo used its knowledge, skills and rectitude to gain more knowledge and respect as a key on-the-ground partner for a leading *in situ* conservation programme in Africa (Table 5.3).

In April 2003, DRC became the first formalized rhinoceros conservation tourism enterprise developed in the northwest region although SRT had previously led *ad-hoc* rhinoceros tracking activities for tourists in return for a small donation from the late 1990s based from the same site chosen for DRC (S. Uri-Khob, *pers. com.*). While MET, the Traditional Authorities and Conservancies were actively engaged at a high-level during the establishment of DRC, the operational policies and procedures were largely defined and implemented through a bilateral partnership between a private sector tourism (WS) and conservation organization (SRT) with scientific and technical support provided from the Minnesota Zoo (JM).

While the tourism experience at DRC is marketed and managed by WS, SRT trackers lead the camp's primary activity, rhinoceros tracking, whilst also engaging with tourists throughout the

experience. A portion of the camp's revenue goes to SRT to fund the rhinoceros monitoring team based at DRC, effectively providing (at a minimum) a cost-neutral consistent monitoring coverage for approximately 20% of the region's black rhinoceros population (Chapter 2: Muntifering *et al.*, 2015). A Memorandum of Understanding was signed between the WS and SRT that clarified goals, roles and responsibilities and formally adopted operational protocols and financial arrangements (Figure 5.1).

Since the purpose of this study is to describe, analyze and recommend on operation-level decision-making at DRC, I have chosen to focus my analysis on the bilateral partnership between WS and SRT, recognizing that Minnesota Zoo operates under SRT's auspices (Figure 5.1). I aim to produce a series of prototypic elements that characterize both the successes and failures of the DRC experience to ultimately enhance learning and future improvements on rhinoceros conservation tourism effectiveness.

GOAL CLARIFICATION AND PROBLEM DEFINITION

Together, WS and SRT defined operational success as providing an authentic wilderness experience that enables tourists to observe free-ranging black rhinoceros on foot that is safe, enjoyable and minimizes disturbance while maximizing rhinoceros protection efforts. In order to achieve this goal, DRC's operations had to explore, evaluate and implement creative and innovative ways of dovetailing business savvy hosting and guiding with conservation-minded rhinoceros tracking that would offer and produce a unique, authentic experience for tourists to view black rhinoceros in the wild, completely unaware of any human presence, while simultaneously financing effective rhinoceros monitoring.

A typical rhinoceros safari experience entails a full day out on a guided vehicle in pursuit of a rhinoceros sighting as per monitoring objectives (i.e. to observe, record and photograph each rhinoceros at least once per month in the DRC area). SRT trackers depart camp early by vehicle and radio the guide(s) as soon as a rhinoceros is sighted either by vehicle or by tracking. The guides promptly re-unite with the trackers and, upon arrival at a distance typically greater than 1 kilometer, the entire group approaches the rhinoceros on foot. The foot tracking typically ranges between one and three kilometers, but can stretch to several kilometers (Nawaseb, *pers. com.*). SRT complete their standard rhinoceros monitoring duties while the tourists are free to take photographs. A short presentation is provided by the SRT tracking team at a bush lunch about the area's rhinoceros population. Previous research identified key factors that drive rhinoceros disturbance at the individual, sighting (Chapter 3) and the population scale (Chapter 4). Findings produced a series of policy recommendations to minimize disturbance costs and maximize rhinoceros conservation benefits.

The primary challenge with developing and sustaining the operation was the innate behavioural sensitivity black rhinoceros typically demonstrate towards human activity. If not properly managed, excessively disturbed black rhinoceros can result in complete displacement from accessible viewing areas and pose an extreme danger to approaching tourists when encountered on foot. Both negative consequences could threaten the sustainability of both the business and the conservation enterprise.

While research on rhinoceros behavioral responses towards various levels of human activity can help address technical problems, such as encounter (Chapter 3) and area use (Chapter 4) protocols, I believe an inadequate decision-making framework that fails to clarify and secure the common interest could undermine the entire operation, with or without solid science-based recommendations. Therefore, we defined the rhinoceros tourism policy problem by asking two related questions: 1) how can a sustainable rhinoceros tracking activity be operationalized; and 2) who gets to decide? We focused this study towards developing a process of fine-tuning research design, delivery and feedback that is both user-useful and user-friendly (Knight *et al.,* 2006; Pierce *et al.,* 2005) to both improve implementation at DRC but also facilitate future replication to other rhinoceros conservation tourism enterprises.

MAPPING AND APPRAISING THE DECISION PROCESS

Intelligence function

The intelligence function primarily includes gathering, analyzing and disseminating relevant information, clarifying goals, planning and discussing possible outcomes that will eventual inform the entire decision process. Both WS and SRT participated in the intelligence function to varying degrees, with clear emphasis on providing specific information. Both contributed equally in the initial steps of assessing trends (i.e. rhinoceros were being displaced), projections (if we don't adapt both the business and conservation efforts will suffer) and goal setting (minimize rhinoceros disturbance while maximizing tourist experience and monitoring outcomes). The collection, compilation and dissemination of information was divided whereby SRT focused almost exclusively on providing ecological information on rhinoceros and WS focused upon recording tourist experiences (standard hospitality plus general activity

satisfaction) and occupancy (i.e. bed nights) according to company policy (L. Nortjie, *pers. com*.). Information on rhinoceros collected and analyzed by SRT was made available in internal reports and presentations to WS and external parties (such as MET) and various information boards and booklets on display at DRC, while tourist information from WS was available upon request.

Despite both parties clearly having different priorities and expectations for information, efforts to exchange and transfer skills (i.e. training for trackers as guides and for guides in research methods and data collection) improved collaboration. For example, SRT trackers gained an appreciation of the importance of delivering a world-class tourist experience and WS guides' interest and respect of rhinoceros behavior and welfare also increased evident through their increased amounts of collaboration with the SRT trackers. This transformation was likely catalyzed by a milestone decision to create a joint management committee, known as the DRC Forum, which served a critical purpose in facilitating the shaping and sharing of values, perspectives and ultimately common interest solutions. The DRC Forum meets every three months beginning in 2006 and led to the early establishment of a collectively-defined common goal for the rhinoceros tracking activity that embodied both SRT and WS's expectations and fulfilled value demands. For example, the open, transparent and respectful nature of the DRC Forum meetings created an environment that motivated and enabled both SRT and WS to demonstrate a willingness to share power, show mutual respect and opportunities to gain enlightenment and skills through creating new knowledge and offer inter-organizational training. The DRC Forum also served to facilitate an emphasis on diplomatic or ideological strategies to solve disagreements regarding how intelligence is shaped and shared which resulted in joint

decisions or compromises that both sides were content acting upon. This is noteworthy, as evidence suggests conservation tourism partnerships are often marred by emphasis on economic (e.g., bribes) or coercive (e.g., public defamation) strategies employed by either business elites or conservation officials and produce outcomes that promote division and suspicion (Garen, 2000).

Certain failures in intelligence also existed but most were rectified. Firstly, broad, vague operational goals defined DRC during the early years but were later refined to reflect the more specific goal definition mentioned above (p.101). The lack of clarity in the initial goal definition was reflected by the *ad hoc* nature of the rhinoceros tracking activities that took place between 2003 and 2005 with the majority of the encounters resulting in rhinoceros displacement (C. Bakkes, *pers. comm.).* Secondly, WS guides and SRT trackers reported some natural water points commonly used by rhinoceros were being avoided. Although the trends caused concern on both sides, uncertainty on how best to solve the problem persisted. Finally, both SRT and WS agreed to support subsequent research that addressed two key decision points regarding how the area is used (Chapter 4) and how to handle a rhinoceros encounter (Chapter 3) reduced uncertainty and provided a set of clear guidelines that fulfill both SRT and WS's expectations and align values.

Despite the lack of a clear goal at the onset, both studies (Chapters 3 and 4) helped make the intelligence function dependable, comprehensive, selective, creative and available.

Promotion function

The promotion function is characterized by open debate and discussion on management options. Through the DRC Forum, both SRT and WS promoted and debated how the rhinoceros tracking activity should be conducted. Managing rhino-human encounters was a critical topic during early DRC Forum meetings. Some veteran SRT trackers and WS guides preferred the *ad hoc* approach claiming 'they didn't need instructions on how to approach rhinoceros' and 'they have been doing this for years', also arguing that the rhinoceros would likely run away and not charge the group in any case. This was countered with concerns about permanently displacing the rhinoceros or yielding more agitated and potentially aggressive behavior increasing the likelihood of an accident. On the other hand, it was also suggested that this temporary over-exploitation could lead to habituation and thereafter lower stress levels, as found with gorilla (Shutt *et al.,* 2014). This was countered with concerns about the potential negative effects of habituation which may place species at higher risk of human mortality, such as poaching (Geffroy *et al*., 2015). In the end, consensus was reached on a decision to establish rules for the common sake of human safety and respect for rhinoceros. Modeling outputs from earlier research provided a series of encounter guidelines that aimed to achieve acceptable disturbance levels (Chapter 3) that both SRT and WS agreed upon.

Managing the use of the wider operational area was also a major concern based upon the intelligence that clearly suggested the current tourism activity was impacting the rhinoceros population. All partners accepted the fact that the airstrip, lodge and a road network were all essential features for the tourism activity to operate. It was also agreed that the most logical and feasible activity to reduce or regulate would be the extent of road use intensity. SRT promoted the research findings, which clearly demonstrated the negative impact that roads used daily was

having upon rhinoceros distribution (Chapter 4), presented during one of the DRC Forum meetings further supported this option. Since all the WS guides also partook in the research there was little opposition or challenge to the results. Some WS guides argued the practical need to access large areas during their safaris due to the relatively sparse and unpredictable wildlife sightings. However, the simple fact that DRC's trademark activity, which was contingent upon locating and being able to safely approach a rhinoceros on foot, was in jeopardy convinced everyone that reduced vehicle activity would likely improve the sustainability of rhinoceros encounters. A handful of options were diplomatically discussed including a rotational use strategy that would require daily vehicle activity to be restricted to specific zones, although separate vehicles are free to roam within the zone to personalize the experience while remaining complicit with the policy. The promotion function appeared to be rational, integrative, comprehensive and effective.

Prescription function

The prescription function establishes rules and regulations that govern an activity. It should entail three key elements of content, authority signature and control intent. Following extensive collective discussion and debate on research findings, the DRC Forum initiated two key prescriptions to improve the sustainability of the rhinoceros tracking activity. Firstly, a rhinoceros encounter protocol was jointly developed based on the research modeling outputs. For example, with a collective agreement to strive for a 25% or less risk of rhinoceros awareness during encounters, predicted approach and viewing time guidelines were 150 meters for 5 minutes, 200 meters for 20 minutes and 300 meters for 50 minutes (Chapter 3). Statistically, a single scenario should be selected and followed for each rhinoceros sighting (see Muntifering,

Chapter 3). However, as a compromise to maintain tourist satisfaction, an option for extended viewing time is permitted given the rhinoceros is unaware of the group and a greater distance is chosen as per policy. Secondly, following the debate on vehicle impacts and reduced vehicle activity, both WS and SRT agreed that the operational area should be divided into four distinct activity zones and that no more than two zones per day would be traversed by the vehicle(s) and no zones would be used on a daily basis (Chapter 4).

In order to help proactively mitigate a possible reduction in tourist experience (due to restricted area access and conservative rhinoceros encounter aspects) the DRC Forum also chose to prescribe additional enhancements to the messaging at DRC. Specifically, WS requested SRT to help them provide an overview on the threats facing rhinoceros in Africa, the strategies employed to help protect them including tourism, and an introduction to, and justification for, DRC's rhinoceros viewing policies, to all tourists on their first night around the campfire. As this was in both SRT and WS's best interests, it was wholeheartedly accepted by SRT. It was also decided that SRT would be given a chance to present their monitoring work to the tourists following the morning rhinoceros tracking activity at lunchtime. Based upon shared respect, power and rectitude for the rhinoceros' well-being, it was felt that these integrative activities would not only minimize rhinoceros disturbance but also enhance the overall rhino conservation experience for tourists.

The prescription function was carried out using diplomatic and ideological strategies based upon both SRT and WS newly acquired knowledge and a shared respect and rectitude towards the rhinoceros.

Invocation function

Invocation is the initial steps to invoke or enforce the prescriptions. It is the preliminary effort to enact a prescription and should catalyze implementation (application). The first step to invoke the DRC rhinoceros viewing policy was to display the evidence-based encounter guidelines on a 'Rhino Viewing Card' that became a tool for guides and trackers to use during rhinoceros tracking activities, as well as communicating the encounter policy with tourists. The collectively-designed Rhino Viewing Cards (Figure 5.2) also removed pressure typically placed upon guides by tourists wanting to get excessively close to wild animals as it was a fully endorsed camp policy presented jointly by both WS and SRT *a priori* rhinoceros tracking. Once the Rhino Viewing Cards were created and distributed, the DRC Forum mandated that it was the role of SRT's trackers to regulate the proximity of a tourist group to rhinoceros and how long they remained viewing the rhinoceros. This was justified, as SRT trackers were also held responsible for diverting a rhinoceros charge from the group and, as such, was much more likely to avoid dangerous situations. This established a clear, collectively authorized chain of command, based on respect for both human and rhinoceros well-being, to enforce the encounter policy.

In order to invoke the rotational use policy, the DRC Forum members created a zonation scheme and mapped the boundaries for the four activity zones with the DRC operational area based on their collective experience of both the area and rhinoceros behavior. Enforcement took place by a decision to continue to monitor all vehicle activity based at DRC with remote tracking devices despite choosing not to use the tracking devices as a policing tool.

Application function

The final characterization of how invoked prescriptions are enacted or implemented represents the application function. It transforms policy into on-the-ground action. Initially, the Rhino Viewing Cards were only used by SRT trackers to help guide their approach and viewing time as each viewing situation is unique and requires careful individual assessment. The cards were not shared with tourists and even the WS guides had to just follow orders during each rhinoceros encounter. This created a both a sense of disconnect for the WS guides and often left the tourists wondering how and why the encounter was abruptly ended. Alas, complaints were common and frustration built between the WS guides and SRT trackers. SRT was abusing its power to regulate the activity. In order to make the application process more contextual, constructive and effective, the prescription (p. 107) for SRT trackers alongside WS guides to jointly present the Rhino Viewing Cards, and the rationale behind them, during campfire briefings to tourists was implemented. It also served to re-calibrate any preconceived expectations tourists may have developed through uninformed travel agents or outdated marketing material about rhinoceros encounters. Special emphasis was placed on explaining the unique features of the DRC rhinoceros (e.g. the last truly wild population) and the scientifically defensible rationale for keeping them wild (safer from poachers) while maximizing breeding performance (Emslie & du Toit, 2006) to gain understanding and appreciation from the tourists.

The collectively created zonation maps, formatted as a one-by-one meter high-quality poster encased in plexi-glass and prominently displayed in DRC's main lapa, helped serve the dual purpose of providing an overview of the area to the tourists during their arrival introduction and

an opportunity to present and discuss the rotational area use policy. Following the tracking activity, WS guides would return to the map with their tourists to explain where they traveled. This process served as an effective self-check on vehicle activity as the guide would have to explain why he chose or not chose to follow the camp policy. Sometimes other staff would standby for this mapping discussion and any WS guides that broke the rotational policy rule would also be reprimanded by their peers at DRC as it often affected the success of the following day's tracking activity. Each evening the WS guide(s) scheduled for the next day's rhinoceros tracking and the lead SRT tracker would jointly discuss which zone the rhinoceros tracking activity would focus on the following day. The context of the application function within DRC's decision process can be characterized by multiple examples of power sharing, mutual respect, concern for human well-being, and rectitude for rhinoceros.

Termination function

Activities or behaviors that cease to exist or are discontinued because they no longer align with the common interest form the termination function. Once the Rhino Viewing Cards were created, the new policy governing the rhinoceros encounters was immediately invoked and applied. This abruptly ended the previously accepted *ad hoc* viewing approach. The rotational use policy by default immediately restricted daily vehicle activity based out of DRC to less than a few kilometers. Thus, vehicle impacts on rhinoceros movement were significantly reduced from the previous arrangements whereby WS guides would often drive extensive distances following the rhinoceros encounter, sometimes to conduct their own rhinoceros encounter. There was very little animosity or regression back to prior practices. This was testament to the

process that established the shared decision-making context that underpinned this decision which ensured that termination was respectful, dependable, comprehensive and ameliorative.

Appraisal function

Efforts to evaluate and learn from experiences relative to the goals set forth define the appraisal function. More specifically, appraisals should target how well the activities performed relative to the seven decision functions. Evaluating our efforts to improve the sustainability of rhinoceros encounters at DRC was appraised (i.e. evaluated) at multiple time steps, some formal and some less formal. The first informal appraisal took place in 2008, followed by a more formal appraisal in 2011. Overall, evaluation results suggested the operational model developed at DRC was indeed successful. Specifically, analysis demonstrated rhinoceros monitoring occurring at DRC between 2006 and 2010 produced on average each month between 15 and 40 completed rhinoceros identification forms and associated photographs including between 75-95% of the known individual rhinoceros (n = 33) within the DRC operating area which comprises approximately 20% of the northwest subpopulation. There was no significant difference in breeding performance between rhinoceros under tourism pressure at DRC (Inter-calving Interval = 43 months +/- 13 S.D.) and other rhinoceros persisting in similar nearby habitat but not exposed to tourism (Inter-calving Interval = 42 months +/- 14 S.D (Muntifering, unpublished data). Within two years after the viewing policy was enacted rhinoceros displacements decreased from 26% to 5.4%. Further, preliminary tourist surveys indicated that 90% of tourists are more than satisfied with the rhinoceros encounter experience, with 96% stating a willingness to recommend DRC to family and friends (Muntifering, unpublished data). The tourist experience improvements were also evident in DRC's consistent internal high scores

on internal tourist surveys (L. Nortjie, *pers com*) and external global recognition including the Authentic Travel Experience Award announced at the London World Travel Market in 2013 (Travel News Namibia, 2013)

The appraisal function was primarily led by SRT and had the potential to be viewed by WS as somewhat biased. We recognize that ideally this should be conducted by a fully independent individual or group (Garen, 2000) and should be considered in the future. However, using a standard set of measures, many of which are promoted by the IUCN African Rhinoceros Specialist Group as key rhinoceros performance indicators (Emslie & du Toit, 2006) and WS's industry standard criteria, should minimize evaluator variability. I present a summary of DRC's major decision process milestones in a timeline (Table 5.5)

DISCUSSION

This analysis sought to first demonstrate the importance of employing a systematic, contextual approach to understanding and evaluating a conservation tourism enterprise's decision process while secondly also documenting assessing successes and failures through a prototyping approach. It has also illustrated how an inclusive, comprehensive, applied and pragmatic perspective can help improve the relevance and usefulness of research to conservation needs (Linklater, 2003). It is hoped that both objectives will help advance the practice of wildlife-based tourism both for rhinoceros specifically and conservation tourism enterprises generally.

Lessons learned: prototypic elements transferable to other conservation tourism ventures

The policy sciences provided a widely-tested theoretical and practical framework to guide a policy analysis. We outline below ten prototypic elements that we believe are fundamentally linked to designing and delivering effective conservation tourism policy that can support endangered species recovery and conservation for black rhinoceros, and potentially for other similar species and contexts:

1. *Create a shared decision-making arena between all participants involved in implementation from the onset*

In order to ensure that all participants' views are integrated and contribute towards establishing a common goal, I believe an open and universally respected arena to facilitate a shared decision process is absolutely essential. The lack of such a fundamental structure would likely result in uninformed decisions driven by individual agendas dominated by elite interests. The establishment of the DRC Forum was one of the most important steps taken by the participants to ensure that policy development and implementation was an authentically collaborative initiative that delivered positive outcomes for both business and conservation.

2. *Maintain a level of independence yet cooperative relationship between conservation (trackers) and tourism (guides) staff*

I discovered multiple reasons why maintaining a clear level of independence between guides and trackers are important. First, due to the extremely dangerous and potentially life-threatening consequence of untimely detection and aggressive reaction by an encountered rhinoceros, skillful approach techniques are essential. This is challenging enough when attempted alone much less with a handful of unskilled, typically elderly tourists who also demand expertise in tourist

relations (e.g. how to handle a difficult, overly-demanding or slow-moving tourist). In my experience, this is simply too much to ask and too great of a risk for any single individual no matter how much dangerous animal or tourism experience or skill they possess. In this regard, it is clear that conservation (trackers) staff must focus attention on a rhinoceros' behavior while tourism staff (guides) focuses their attention on their tourists. Trackers and guides may also have slightly different objectives for the encounter and counter-balance any negative consequences of being biased towards either. For example, guides may be more inclined to get closer in expectation for greater tips (Butynski & Kalina, 1998; Sandbrook & Semple, 2006) while trackers, who may or may not receive tip money, may be less amenable to this temptation. This preferred context should emphasize trackers' role to obtain accurate information and lead any highly dangerous diversion should the rhinoceros charge the group, both of which could be compromised from approaching too close. Equally, both trackers and guides need to appreciate and respect each other's roles to ensure a solid synergy is established and maintained to deliver a fully successful rhinoceros encounter experience that achieves both business and conservation goals.

3. *Explicitly define the roles between the guide(s) and the tracker(s)*

I found that one of the most critical aspects of a rhinoceros viewing event is the communication between the guides and trackers. Trackers must not approach the rhinoceros until the entire group arrives. Before the group approaches the rhinoceros, ensure that the division of roles (ensuring tourist safety and minimal rhinoceros disturbance) is clearly established and respected. In general, ensure that the lead tracker is responsible for all decisions related to the approach and viewing of the rhinoceros, including early withdrawal from the viewing site if the animal is

unduly disturbed so as to ensure the safety of the viewing group. The lead guide is responsible for maintaining tourist safety and can demand that tourists direct their attention towards guides under all circumstances. This level of teamwork can make or break a successful rhinoceros tracking activity and even the entire enterprise.

4. *Integrate strategic messaging to strengthen the application of encounter regulations*

Evidence suggests that wildlife tourism guides may often be tempted to rule-break by actual or potential tourist tipping behavior (Butynski & Kalina, 1998; Sandbrook & Semple, 2006). However, my experience discussing this issue with hundreds of rhinoceros tracking tourists suggests that most actually prefer not to get close to dangerous wildlife (such as rhinoceros) because they are indeed dangerous and the experience is on foot with little to no protection. Further, I found that those who come with unrealistic expectations of getting up-close-and-personal can be convinced otherwise by providing sound scientific, logical and authentic justifications for being conservative. I therefore recommend a staged and strategic messaging approach to improve compliance without compromising the experience. Firstly, introduce tourists to the threats a species is facing and behavioral sensitivities that renders them even more susceptible to human-induced harm (i.e. how habituation could lead to increased vulnerability to poaching). Secondly, guides and trackers must emphasize their role as local stewards and state their goal is to minimize disturbance and safety risks whilst maximizing a unique wilderness experience that benefits conservation. Thirdly, camp policy should be carefully articulated, noting its scientific basis and making reference to scientific articles and peer-recognized scientists for support. Having applied this simple process for more than a decade with high-paying, well-traveled tourists, I have found that rule-breaking demands are extremely rare.

Furthermore, when guides and trackers recite policy to tourists they also are more likely to hold themselves more accountable.

5. *Ensure all participants actively participate in, or at least recognize and authorize all aspects of, any management-oriented research*

In general, research should be both user-useful (i.e. relevant) and user-friendly to improve implementation prospects (Pierce *et al.*, 2005). Unfortunately, rhinoceros research has a long history of being poorly matched to conservation needs, especially in crisis management situations when it is most needed (Linklater, 2003). In this study, I discovered that effective uptake of research occurred by taking time, often a lot of time and tedious meetings and discussions, to collectively define a problem, design a study, systematically collect specific information, interpret findings and discuss alternative management actions together with managers, guides and trackers. The process helped ensure the research was relevant to decisions and simpler to understand than a typical peer-reviewed scientific journal article. This inclusive approach, albeit at times tedious and time-consuming, helped facilitate a smooth and relatively simple transition from scientific manuscript to policy to on-the-ground action. A simplified camp manual was also created and helped ensure that all new staff were brought quickly up-to-speed on the unique policies and the justification behind them.

6. *Provide opportunities for role reversals between guides and trackers that harness value demands*

Since guides typically are from cities and trackers are local, there is often an educational imbalance between them that can alienate the latter. On the other hand, due to their local

upbringing, trackers often possess a more intimate local knowledge of natural history – beyond simply regurgitated guide book facts – that impresses tourists and attracts attention. Either way, these imbalances can cause negative tension between guides and trackers competing for acknowledgement, respect and tips. I recommend that the guides take time to learn from the trackers and trackers learn about tourist behavior and hospitality from guides. For example, when no tourists were in camp, the trackers were encouraged to take out both managers and guides to experience their work firsthand. WS management also arranged to allow SRT trackers to participate in their tourism training programme alongside guides on a voluntary basis. This sharing of skills and knowledge also helped build the friendships and teamwork that is absolutely critical for maintaining sound working relationships under sometimes stressful, dangerous rhinoceros tracking activities.

7. *Establish a clear, collectively-endorsed rhino encounter policy as earlier as possible and create tools to communicate it to tourists*

An ideal rhinoceros encounter should aim to minimize the likelihood of a rhinoceros disturbance event. At most, a rhinoceros disturbance event should represent a 'displacement,' but a more responsible goal would consider even an 'awareness' behavior as unsatisfactory. A few important issues should be highlighted regarding the rhinoceros viewing policy: (1) the policy should be communicated to tourists before the group begins there viewing approach, preferably during the safety briefing or the night before around the campfire; and (2) the message must contain an explanation why this policy is necessary. The Rhino Viewing Cards (Figure 5.2) are tools that present multiple viewing scenarios that minimize the likelihood of a rhinoceros becoming aware of the group and provide brief description on how the guidelines were

generated. This tool has been valuable not only to help articulate and justify the camp's rhinoceros encounter policy, but also to relieve the guides and trackers of the responsibility of making what might seem to tourists to be a subjective or uninformed or personal decision. There is a trade-off between time and distance of an encounter, for example, the closer the group approaches the less time they should spend at that distance to maintain an acceptable disturbance risk. The vast majority of tourists were found to be perfectly happy with not approaching closer than 100 meters for 5-10 minutes (Chapter 3).

8. *Establish a clear, evidence-based method for how a tourism area will be managed that maximizes conservation benefits, minimizes impacts on rhinoceros and ensures the best possible tourism experience*

When deciding how best to manage a tourism operating area, it is prudent to refer back to the original conservation objectives for an activity. In the case of DRC, maximizing rhinoceros monitoring effectiveness was critical; even though tourists do not necessarily care whether they encounter the same rhinoceros as they did on a previous day (most tourists at DRC only partake in one day of rhinoceros tracking). It is important to ensure that the activity provides monitoring coverage for the largest number of rhinoceros as permitted by a full day driving range from camp in different directions, especially since monitoring teams are limited. Considering the research findings on rhinoceros displacement by tourism activity (Chapter 4), the policy decision at DRC was to rotate the tracking activity between four zones around the camp. This decision helped maximize the diversity of individual rhinoceros sightings each month with no measurable reduction in successful sightings or tourist satisfaction. In fact, anecdotal evidence suggests that

tourist's satisfaction likely improved following the guides description and conservation-oriented justification of the policy during short presentations using large format maps (Figure 5.3).

9. *Allow opportunity for conservation staff (trackers) to formally present their work back to tourists*

Rhinoceros monitoring is a job and a livelihood for some Africans. Often, the individuals tasked with these duties are underpaid and overworked, a dangerous combination in the current poaching crisis given the potential for high-dollar rewards for collusion with criminals who seek to illegally poach rhinoceros. Every attempt must be made to ensure rhinoceros monitoring teams feel valued and attach value to their work beyond financial gain. Tourism presents a unique opportunity for rangers to receive positive reinforcement from foreigners who demonstrate appreciation and recognition for the work rhinoceros conservation requires. I found this opportunity to be most effectively harnessed by ensuring the conservation staff (trackers) is provided by the guides with a direct, undivided engagement with the tourists to showcase their work to protect the rhinoceros during formal concise presentations. This means the guides must introduce the trackers to the tourists and provide a lead into their presentation. To help facilitate the tracker's presentation, I compiled Rhino Log Books (Figure 5.4), using the tracker's monitoring information, to display long-term encounter trends and some unique characteristics of each individual rhinoceros that the trackers monitor from DRC. These books have helped track long-term sighting trends relative to our monitoring goals for the camp and provided a constant reminder and motivation to both guides and trackers to continue improving monitoring effectiveness (Figure 5.5) as well a useful ques during presentations for individuals which English is typically a fourth or fifth language. Although I have not quantified the direct impact,

my sense is that this Rhino Log Book, representative of years of hard-won effort to safeguard DRC's rhinoceros, has been well received by tourists who in return happily share how impressive the work appears. In my observational opinion, this positive feedback has helped uplift morale and enhances pride in both the rhinoceros they protect and the work they carry out to accomplish this. Overall, it is also evident in the advanced level of performance relative to other monitoring teams not engaged in rhinoceros-based tourism that I have witnessed.

10. Ensure key personal information for each participating tourist is recorded and archived as a security measure

Despite scant direct evidence to suggest that would-be poachers may scope an area first disguised as paying tourists, taking proactive measures to counter this possibility is prudent especially considering the current crisis. Ideally, operators could pre-screen tourists using available criminal background databases with global organizations such as INTERPOL. However, this is typically not feasible due to the time required to transfer information and receive feedback. Yet, in my experience, ensuring that key profile information for each paying tourist that participates in the rhinoceros tracking activity is recorded and collated is feasible. It may also require little, if any, additional paperwork since most of the key background information can be found on standard tourism indemnity forms. Rhinoceros tourist background checks could be routinely conducted with any possible suspicious individuals investigated. Also, if a poaching incident were to take place, a list of guests could easily be sourced from archived records and inspected for possible suspects using criminal background checks. Albeit reactive, it may help produce a list of leads for law enforcement and should be a part of any rhinoceros tourism enterprise's commitment to ensure security measures are upheld.

MOVING FORWARD – POTENTIAL FOR LEARNING

This study has provided a sound, practice-based set of prototypic elements upon which emerging rhinoceros tourism enterprises can trial to help facilitate implementation. However, a few issues remain unresolved or unattended to and warrant future consideration. First, DRC was, by and large, an isolated operational system with only a one-way flow of monetary benefits from the tourism operator (WS) to the conservancies (i.e. DRC contributed monthly monetary benefits to neighborning conservancies via benefit-sharing contractual agreements). This one-way, passive relationship could be improved to become a two-way, active partnership by directly engaging partner conservancy staff in various aspects of the operation (i.e. decision-making or delivery). Learning how best to accomplish this will be especially critical as new rhinoceros tourism enterprises expand into more conservancy areas where they may come into increased conflict with local land use planning initiatives that are otherwise absent from government-administered tourism concession areas (such as Palmwag Concession).

Despite the monitoring and monetary benefits DRC has provided, another opportunity that has gone largely untapped is the potential to leverage philanthropic behavior from visiting tourists. Evidence elsewhere, particularly with enterprises that cater for high-end tourism markets such as the Galapagos Islands, suggests that targeted conservation messaging can indeed significantly improve pro-conservation behavior (Skibins *et al.*, 2013) and specifically motivate conservation philanthropy (Powell & Ham, 2008). Like previous key decision points at DRC, addressing this gap would benefit from initiating applied social research on behavior change and social marketing with the goal to re-visit and revise the messaging strategy at DRC to increase

philanthropy. In addition to camp-level research on messaging, broader social research on DRC's impact towards improving attitude and behavior in surrounding local communities has remained a large assumption, mostly untested, and could also help address the engagement gap identified above between the enterprise and host conservancy(s).

Finally, while increased monitoring and improved local value for rhinoceros certainly can help protect rhinoceros, there are clear limits to tourism's contributions towards combating poaching. Thus, rhinoceros tourism and the monitoring activity that drives it should be viewed only as part of a more widely-bounded solution that comprises a mix of policy instruments, incentives and institutions (Young & Gunningham, 1997). When designed and delivered strategically, rhinoceros-based tourism can provide a critical and necessary social foundation upon which other key protection strategies (i.e. law enforcement) can operate more effectively (Chapter2: Muntifering *et al.*, 2015). The DRC experience provides a unique case and prototypical elements that will help ensure future rhinoceros tourism ventures are built upon solid foundations enhancing our prospects to secure a future for the world's last truly wild population of black rhinoceros and a model to advance and improve other wildlife-based tourism initiatives towards achieving conservation goals.

Table 5.1: Summary of conservation cases that demonstrate the utility of the policy sciences approach to map the social and decision process to the assessment and management of threatened species.

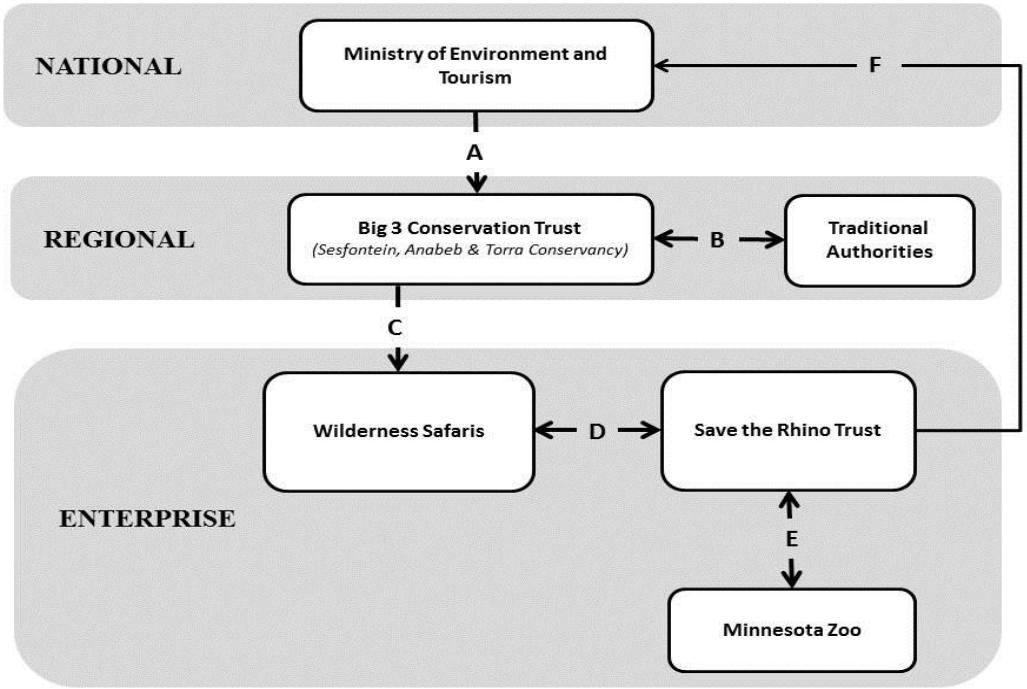
Species	**Location**	**Study**
Koala *Phascolarctos cinereus*	South Australia	Clark *et al.* , 2000
Eastern Barred Bandicoot *Perameles gunnii*	Victoria, Australia	Clark *et al.*, 2002
Tapir *Tapirus terrestris*	Costa Rica	Newcomer, 2002
Elk *Cervus canadensis*	Wyoming, USA	Cherney & Clark, 2008
Grizzly bear *Ursus arctos*	Banff, Canada	Rutherford *et al.*, 2009
Large carnivores: gray wolves *Canis lupus*, grizzly bears *Ursus arctos* and cougars *Felis concolor*	Northern Rocky Mountains, USA	Clark *et al.*, 1996; Mattson *et al.*, 2006
Black-tailed praire dog *Cynomys ludovicianus*	Great Plains, USA	Reading *et al.*, 2005
Great apes: gorrillas *Gorilla gorilla* spp., chimpanzees *Pan troglodytes* ssp. and bonobos *Pan paniscus*	Central Africa	Eves *et al.*, 2002
Protected area management: jaguar *Panthera onca*, spectacled bear *Tremarctos ornatus* and romerillo *Podocarpus glomeratus*	Podocarpus National Park, Ecuador	Cherney *et al.*, 2009; Clark *et al.*, 2009
Black rhinoceros *Diceros bicornis*	Northwestern Namibia	This study

Table 5.2: Summary of the seven decision function tasks, examples and key questions related to DRT in the Palmwag Concession of Namibia

Decision Function	Primary tasks	Conservation tourism examples	Key questions or issues to consider
Intelligence	Clarify goals, identify threats, plan and predict outcomes, gather reliable data	Field work and data collection including methods from social, political and ecological sciences	What are the present threats in the area? Why are some areas being degraded? What are the perspectives, values and strategies of each participant in the tourism partnership? What is the broader social context within which the tourism enterprise is situated? How can conservation (wildlife protection) be achieved?
Promotion	Discuss management alternatives	Forums, discussion groups and formal recommendations that includes both tourism and conservation agencies	Which groups promote which options using which values and strategies? How do the existing power structures impede or improve effectiveness? Do existing institutions have the required capacity to design and deliver a successful conservation tourism experience? How does conservation tourism leverage and promote appreciation of rhino conservation?
Prescription	Set rules, policies and guidelines	Any written plans or policies for the tourism activity in question	Will the prescriptions align with rules or will they conflict? Are they binding or are they open to abuse by some individuals?
Invocation	Establish enforcement mechanisms and begin implementation	The tourism activity is organized, marketed, sold and execution begins.	Is the implementation consistent with prescriptions? Are the groups or individuals responsible for enforcement provided with the necessary authority and means to enforce the rules?

Application	Full implementation and conflict solution	Disputes are resolved and rules and regulations are upheld following execution	Are the agreements or operational protocols between the involved parties being effectively implemented? Do they conform to common interest prescriptions or do they favor special interests? How do the participants interact during dispute resolutions? Do applications mobilize consensus and cooperation?
Termination	Discontinue existing behavior	Past harmful practices are stopped as well as those that did not perform satisfactorily.	Who has the right to stop or amend the rules? Who benefits and who is harmed by terminating a policy? Some actions should be treated with extreme care such as the termination of any activity which represents traditional use or cultural significance to local people.
Appraisal	Evaluate successes and failures relative to desired goals	Results are evaluated relative to goals and recommendations for improvement made.	Who is being served by the tourism activity and who is not? Are appraisals independent and conducted regularly? Who is responsible for successes or failures and how are they managed?

Figure 5.1: Diagram illustrating the contractual linkages between the multi-stakeholder partnership that is Desert Rhino Camp. [5]



[5] Ministry of Environment and Tourism have a formal contract releasing tourism rights over the Palmwag Tourism Concession Area to the Big 3 Conservation Trust (A). The Big 3 Conservation Trust work with Traditional Authorities to ensure no harmful land use practices are allocated into the tourism area (B). The Big 3 Conservation Trust contractually sub-lease the tourism rights to Wilderness Safaris for the exclusive use of a portion of the Palmwag Concession Area (C). Wilderness Safaris and Save the Rhino Trust have a formal Memorandum of Understanding to guide the execution of a rhinoceros conservation partnership at Desert Rhino Camp (D). Save the Rhino Trust and the Minnesota Zoo have a semi-formal partnership to collaborate on research and evaluation (E). Save the Rhino Trust have a formal MOU with the MET to conduct rhinoceros research, monitoring and training in northwest Namibia particularly providing regularly monitoring information to MET (F).

Table 5.3: Feature analysis summary for all participants in the DRC policy process

Participants	Ministry of Environment and Tourism (MET)	Local Communities (Big 3)	Traditional Authorities	Wilderness Safaris	Save the Rhino Trust	Minnesota Zoo
Arenas	Government agency responsible for protected areas (including concessions) management. All black rhinoceros in Namibia are owned by the government who oversee all management including the Communal Rhino Custodianship Programme	Torra, Anabeb and Sesfontein Conservancies officially gazetted in 1998, 2003, and 2003, respectively. Received tourism rights over Palmwag Concession in 2011 from MET and re-negotiated tourism contract with WS for DRC in 2011. Registered Communal Rhinoceros Custodians with MET.	Responsible for allocation and dispute resolution of land primarily for human settlement under the Traditional Authorities Act embedded within Namibia's Constitution.	Founded in 1983 and operate over 40 high-end tourism lodges in 7 countries across Africa. Opened DRC in 2003 in partnership with SRT.	Founded in 1982. Extensive field experience and skills in rhinoceros monitoring and hold a mandate for this work with MET. Lead training activities in rhinoceros monitoring and tourism. Entered into first tourism partnership with WS at DRC in 2003.	US-based zoological institution founded in 1978. Partnered with Save the Rhino Trust in 2009 to provide science leadership and community-based support for rhinoceros conservation in Namibia.
Perspectives	Protected areas and rhinoceros management. Research oversight through permitting.	Improve rural livelihoods through local empowerment and sustainable wildlife-based income generation	Ensure local people have access to and benefit from land for grazing and other traditional land uses.	Deliver world-class, authentic tourism experiences that benefit conservation and rural economies	Rhinoceros conservation and improving the value local people attach to saving rhinoceros	Conduct credible applied research and help facilitate decision-making as 'honest broker'

Base values	Power, Rectitude	Power, Skills, Rectitude	Power, Rectitude	Power, Wealth, Skills, Knowledge, Rectitude	Skills, Knowledge, Rectitude	Knowledge, Skills, Rectitude
Scope values	Respect, Wealth	Wealth, Respect, Skills, Knowledge, Well-being	Respect, Affection	Respect, Wealth	Respect, Wealth, Knowledge	Respect, Knowledge
Strategies	Enforce national conservation laws and regulate research and rhinoceros management activities	Engage in contractual negotiations	Engage with Conservancies and individual households to apply Traditional Authorities Act	Manage tourist hospitality and DRC's operations	Lead rhinoceros monitoring activities	Second a fully-funded conservation biologist to serve as SRT's Science Adviser
Outcomes	Oversight on concession area and rhinoceros management activities is provided. The head contract for Palmwag Tourism Consession Area is upheld.	Benefits to local communities are increased.	Land is equitably allocated to local constituency and disputes are peacefully resolved	Business is viable (profitable). Conservation is achieved. Jobs and skills training for local people are increased	Rhinoceros population performance is enhanced and secured through consistent, standardized monitoring.	Management-oriented, interdisciplinary research is designed and delivered and an open, effective policy process that enhances rhinoceros conservation is facilitated

Table 5.4: Decision process appraisal summary relative to standard criteria

Decision Function	Criteria	Strengths	Limitations	Lessons learned
Intelligence	Dependable, comprehensive, selective, creative, available	Sound, scientifically-based research that addressed specific, relevant problems. Findings were made fully available to all participants through Forum meetings	Low sample size across individual rhinoceros limited applications to general guidelines	Include as many participants as possible in all aspects of problem definition and defining alternatives (via inclusive applied research). Make sure all participants see conservation as a primary goal and specify conservation-oriented targets for wildlife.
Promotion	Rational, integrative, comprehensive, effective	Multiple management alternatives were developed rationally with all participants integrated in debating benefits and costs.	SRT trackers were often sidelined due to a lesser command of English.	Establish an open policy arena (Forum) from the onset and ensure all participants are willing and able to fully engage. If language is a barrier, ensure that translators are available.
Prescription	Effective, rational, inclusive	Prescriptions were largely effective since the inclusive nature fostered through the DRC Forum helped establish common interest solutions with minimal dispute	Prescriptions did not include the senior management for the neighboring Conservancies which could have facilitated future expansion	Ensure prescriptions receive full support from both guides and trackers and can be adequately explained to tourists. Create and make available simple written descriptions of each prescription

Invocation	Timely, dependable, rational, nonprovocative, inclusive	Guides and trackers established their own internal enforcement system based on respect and shared power that was timely, dependable, rational and nonprovocative.	New guides were often not comprehensively trained in to all the policies and procedures and took some time to adjust to the conservative approach.	Provide both guides and trackers with appropriate tools to help explain policies to tourists which in turn drives a self-regulatory system
Application	Open, inclusive, rational uniform	Application involved support from all participants, did not favor any special interest, effectively reduced disturbance without harming tourist experience, and succeeded in fostering a sense of collaboration and teamwork amongst WS and SRT staff	Lack of English proficiency initially limited some SRT trackers' willingness to engage with tourists. Staff turnover, especially with WS, created some set-backs.	Identify and employ camp managers that are fair but firm. Management that is too coercive and controlling or too lenient creates a culture of limited-compliance. Ensure that descriptions and justification on all camp policies is readily available and easy to understand to facilitate quick uptake for new staff.
Termination	Timely, dependable, comprehensive, ameliorative	Harmful *ad hoc* management practices were quickly terminated following application of new polices. The termination appeared to be dependable (lasting) and comprehensive with minimal dispute,	Some WS guides continued to conduct *ad hoc* rhinoceros tracking on their own in hopes for larger tips	Spend extra time explaining why certain practices were harmful and why shifting towards new practices will make their job easier and more rewarding (i.e. greater tips and praise from tourists, respect from peers, etc.), especially with new staff

Appraisal	Comprehensive, selective, independent, continuous	Comprehensively assessed ecological (rhinoceros-related) impacts, tourist satisfaction and business viability. Adjusted policy based on evaluation.	Not fully independent and could be conducted more regularly.	Extend invitations for external appraisals at least once every couple of years while completing internal evaluations at least once per year. Ensure that measures are comprehensive and include social indicators (i.e. tourist satisfaction, revenue, policy process) as well as ecological.

Table 5.5: Timeline for DRC's major decision process milestones and the functions they represent

Year	Key milestones in decision process	Function(s)
2003	DRC opens and *ad hoc* rhinoceros tracking activities begin	
2004	Research begins on rhinoceros disturbance	Intelligence
2005	DRC Quarterly Forum is established and research findings are disseminated	Promotion
2006	Vehicle monitoring data collection begins	Intelligence
2007	Rhino viewing protocol established	Prescription
2007	Rhino Viewing Cards created	Invocation & Application
2007	*Ad hoc* rhinoceros viewing terminated	Termination
2008	Vehicle activity patterns and rhinoceros movement analysis is presented	Intelligence
2008	Alternative vehicle activity intensities are discussed	Promotion
2008	Rotational Use protocol is established	Prescription
2008	Guides and trackers initiate evening planning sessions to ensure zones are rotated	Invocation & Application
2008	*Ad hoc* vehicle activity is terminated	Termination
2009	First formal MoU drafted and signed by WS and SRT	Prescription
2010	First formal evaluation conducted on rhinoceros disturbance	Appraisal
2011	Evaluation results presented at Society of Conservation Biology meeting (NZ)	Appraisal
2014	MoU updated and signed by WS and SRT	Prescription
2015	Full decision process appraisal conducted	Appraisal

Figure 5.2: Rhino Viewing Cards used by WS Guides and SRT Trackers at DRC

FRONT

RHINO VIEWING CARD

Closest DISTANCE	Maximum TIME
100 *meters*	**5** *minutes*
150 *meters*	**15** *minutes*
200 *meters*	**25** *minutes*
250 *meters*	**45** *minutes*

REVERSE

Using the Rhino Viewing Card

What is the Rhino Viewing Card?

✓ The Rhino Viewing Card is Desert Rhino Camp's (DRC) rhino viewing policy.
✓ It provides rhino viewing guidelines under different conditions that minimize the chances of a rhino viewing event resulting in a disturbed rhino.
✓ This card is based upon research jointly conducted at DRC since 2003.

Why do we need a Rhino Viewing Card?

✓ Research has also confirmed that our rhino are very sensitive to human disturbance and will move into areas that are less safe (higher risk of being poached), lower quality habitat, and more difficult for tourists to see.
✓ Our ideal rhino sighting is achieved when we observe our rhinos completely unaware of our presence – providing guests with an authentic experience with wild rhino and Save the Rhino Trust with the ability to monitor them.
✓ The Rhino Viewing Card is thus a means to both illustrate our genuine intent to ***practice responsible rhino tourism*** to our guests while providing our guides with a ***simple tool*** for attaining a respectable number of ideal rhino sightings.

Where did the numbers come from?

✓ Our rhino viewing policy is the result of research designed specifically to help understand how to approach our wild rhino without disturbing them.
✓ Based upon detailed information collected during hundreds of rhino viewing events over many years, we now understand:

1. ***The main factors that drive rhino disturbance***: wind direction, whether the rhino is sleeping or active, the approach distance, and the viewing time;
2. ***Associated viewing times and approach distances that result in only a small number of rhino disturbance events***

✓ The research findings were then translated into a set of 'rhino viewing scenarios' displayed on this card to help guide each rhino viewing event.

Desert Rhino Camp is the only place on earth where guests may go on foot with Save the Rhino Trust trackers to observe the last population of truly wild black rhino living in their natural environment. You can help us sustain our responsible tourism business and rhino conservation project by respecting these simple guidelines so our success may endure for generations to come.

Figure 5.3: The map of DRC's rotational use approach used by guides to describe and justify the policy

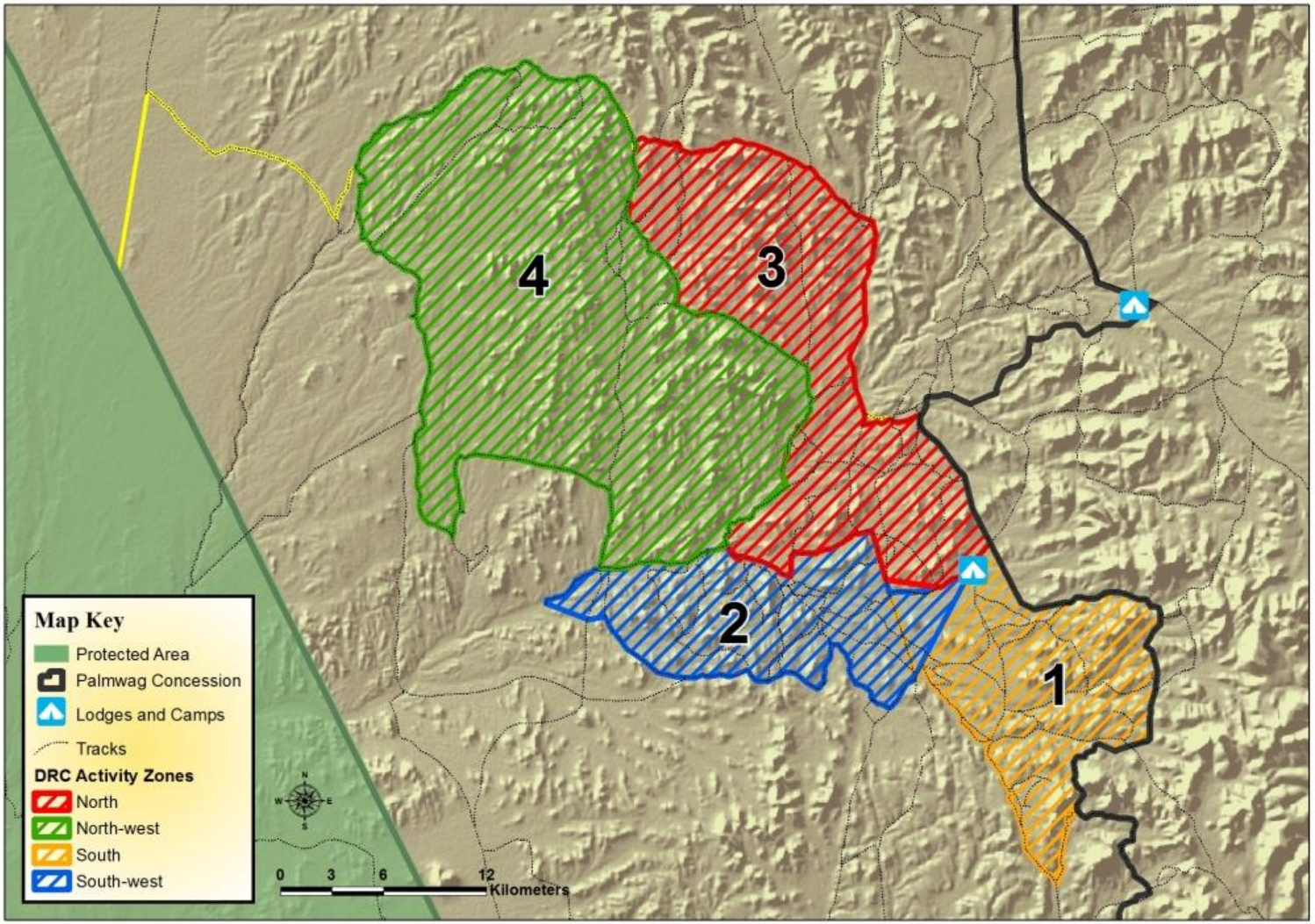


Figure 5.4: An example of a Rhino Profile page from the Rhino Log Book used as a tool during tracker-tourist presentations at DRC

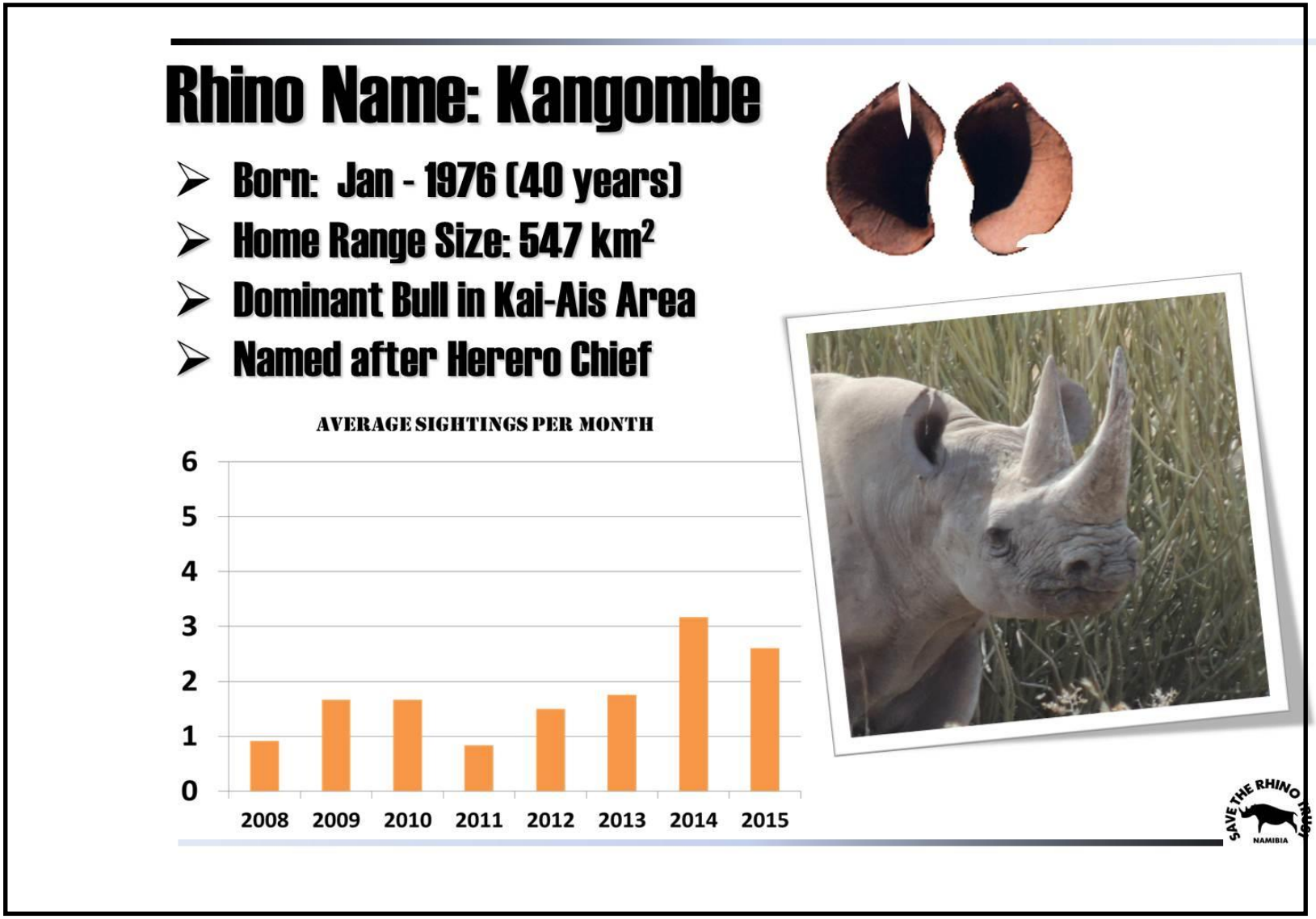


Figure 5.5: An example of the Monthly Sighting Chart from the Rhino Log Book used to track and motivate monitoring performance at DRC

GOAL = > 1 SIGHTING / MONTH
AT OR ABOVE GOAL
NEAR GOAL
BELOW GOAL

AVERAGE MONTHLY SIGHTING FREQUENCIES FOR DRC RHINOS

	2008	2009	2010	2011	2012	2013	2014	2015
Ben	3.9	3.2	3.5	2.5	3.3	2.3	4.8	2.3
Dave	0.0	1.2	2.9	2.2	1.6	0.8	0.7	1.0
Dessy	2.6	2.3	1.3	0.7	0.3	0.0	0.7	2.6
Dezery	2.6	2.6	2.9	2.2	2.6	0.5	DIED	
Don't Worry	1.8	2.0	3.0	1.6	2.8	1.6	5.3	4.3
Getaway	1.2	2.4	1.1	0.7	1.6	0.3	1.0	1.0
Harry	0.9	2.1	1.2	1.0	0.6	0.3	0.4	1.3
Hoagedi	0.9	2.1	1.2	0.5	1.3	0.8	0.6	1.6
Kai	0.3	0.1	0.2	0.0	0.3	0.7	DIED	
Kangobme	0.9	1.7	1.7	0.8	1.5	1.8	3.2	2.6
Oaheb	1.0	0.0	0.1	0.1	0.1	0.1	1.2	2.3
Pensi	0.1	1.4	1.0	0.8	0.7	0.3	0.4	1.0
Phura	0.3	0.1	0.0	0.0	0.1	0.5	0.3	1.7
Teabag	3.8	3.1	1.8	1.8	0.3	0.0	0.4	EMIGRATE
Tensie	3.1	4.5	4.0	2.4	0.4	0.0	0.1	EMIGRATE
Tjeveree calf 2010			BORN IN TORRA		IMMIGRATE	0.1	2.0	2.3
Tobias	1.3	0.3	0.2	0.0	0.1	0.0	0.1	0.5
Tony					BORN	1.1	2.0	0.5
Top Notch	1.3	0.7	0.2	0.2	0.3	1.1	3.9	3.9
Trudy		BORN	0.2	0.2	0.0	1.0	4.1	0.6
Tuta	0.2	2.4	1.5	0.3	1.8	1.4	2.7	1.1
Unies 2010			BORN	1.2	0.8	0.7	0.3	0.8
Uniab Cow	0.0	0.0	0.0	0.2	0.0	0.2	0.3	0.0
Verity	0.5	2.1	1.5	0.8	0.7	0.3	DIED	
% AT OR ABOVE GOAL	50%	70%	70%	36%	36%	29%	48%	74%

Chapter 6: Conclusion

The conservation of valued species is challenging given the complexity, diversity and dynamism of the social-ecological systems (SES) within which conservation problems are situated. This is particularly the case for highly complex "wicked" conservation problems (Game *et al.*, 2014) and is common for species that are rare and highly valued but threatened by legal (i.e. sustainable harvesting) and illegal (i.e. poaching) human-caused mortality. The alarming rate at which rhinoceros poaching has escalated over the past five years poses a serious threat to the long-term persistence of extant rhinoceros populations (Duffy *et al.*, 2013; Knight, 2012b). The policy response has primarily called for increased investment in military-style enforcement strategies largely based upon simple economic models of rational crime (Ferreira & Okita-Ouma, 2012). However, effective solutions will likely require a context-specific, stakeholder-driven mix of top-down and bottom-up mechanisms grounded in theory that more realistically represents human behaviour (Lejano *et al.*, 2007; Chapter 2: Muntifering *et al.*, 2015). While maintaining or even strengthening government-led law enforcement is critical to combat poaching, the effectiveness of these efforts can be improved if grounded upon a strong, pro-rhinoceros social foundation. As a basis for my study, I proposed that tourism, if designed and delivered in a manner that is sustainable and aligned with stakeholder values, has the potential to contribute towards rhinoceros conservation by serving as that social foundation while financing critical monitoring. Thus, my primary goal in this study was to describe in both theory and practice tourism's potential as a rhinoceros conservation tool and to fine-tune a sustainable operational model grounded in quantitative interdisciplinary analysis.

I began my study by re-defining the rhinoceros poaching problem, which is often framed as a war against criminals with response strategies seeking to catch poachers (Neumann, 2004)

exacerbated in the media with hundreds of headlines from popular sources including CNN and National Geographic that read 'Anti-poaching war to save rhinos' and 'South Africa regroups in war against rhino horn poachers', respectively. I proposed a new problem definition re-framed to provide answers to two pragmatic research questions: 1) who gets to decide how rhinoceros are managed; and 2) what mix of instruments, incentives and institutions could maximize the values local people attach to conserving rhinoceros? This framing immediately shifts focus from militaristic to community-based approaches acknowledging the complex SESs in which multiple stakeholders with diverse values and perspectives operate. I suggested that solutions emanating from this approach will promote strategies that keep poaching from becoming a normative behavior.

Namibia has pioneered innovative, effective community-based conservation strategies emphasizing nature-based tourism's role towards achieving rural development and conservation goals (Jones *et al.*, 2015; NACSO, 2014; Owen-Smith, 2010). In this context, I then applied a problem-oriented approach (Clark, 2002) to illustrate in theory and practice how such community-based strategies that explicitly incorporate local values and institutions are a foundation for effectively combating rhinoceros poaching. I then introduced a case study from Namibia that demonstrated how coupling a locally-devised rhinoceros monitoring regime with joint-venture tourism partnerships as a legitimate land use can and has helped reconcile individual's values represented within a diverse stakeholder group and helped formulate common interest solutions to save rhinoceros. I then suggested a social learning approach as a useful means by which international, national, regional and local governance can recognize and promote solutions that may help empower local communities implement rhinoceros management

strategies that align individual values with the long-term health of rhinoceros populations (Chapter 2).

Although not specifically tested for causal linkages, preliminary evidence strongly suggests both formal and informal community enforcement is strengthened in these cases. For example, this was witnessed in December 2012 when a rhinoceros poacher was identified, apprehended, arrested and a firearm and horns confiscated within 24 hours following the discovery and immediate reporting of the carcass by a local farmer near the north-east boundary of the Palmwag Tourism Concession Area. More recently, all of the poached rhinoceros carcasses in one tourism area (not DRC) were found and reported within two – three weeks (some within 24 hours). This is a significant reduction from rhinoceros poached in non-tourism areas which ranged from months to years and resulted in very few arrests between 2012 and 2015. Consequently, every poaching case within the rhinoceros tourism area was followed by multiple arrests, most of which were driven by voluntary local intelligence (Tommy Hall, *pers. com.;* see Postscript). These results demonstrate that although rhinoceros tourism is unlikely to stop poaching on its own, its presence can improve on-the-ground detection and re-inforce law enforcement success which, over time, may lead to much lower poaching rates.

Following this large scale contextual proposition and brief overview on some successes from north-west Namibia, I narrowed my focus to describe and analyze key operational challenges associated with both design and delivery that could threaten the long-term sustainability of a rhinoceros conservation tourism enterprise. Specifically, I examined two technical problems and recommended alternative management solutions for improved rhinoceros conservation tourism

delivery, including minimizing both disturbances during individual rhinoceros – tourist encounters (Chapter 3) and group-level rhinoceros displacement due to required tourism infrastructure and activities (Chapter 4). I then investigated how procedural or design problems might be resolved by employing a policy sciences approach to characterize the decision context and appraising the decision process to highlight a series of prototypic elements for effective implementation (Chapter 5).

While tourism has been heralded as a highly effective conservation mechanism (Buckley, 2009; Griffith, 2012) numerous examples exist demonstrating how irresponsible, poorly conceived tourism activity uninformed by science can produce negative outcomes for species (Bejder *et al.*, 2006; Corkeron, 2004; Griffin *et al.*, 2007; Lott & Mccoy, 1995; Lusseau, 2004; Lusseau, 2003; Preisler *et al*., 2006; Trathan *et al*., 2008). While tourism, in some cases, has provided significant benefits for endangered species conservation (Buckley *et al.*, 2012; Morrison *et al.*, 2012), examples of impacts and costs to species protection also exist (Morrison *et al*., 2012) especially because increasing numbers of tourists seek opportunities to view and interact with threatened and endangered wildlife (e.g., Karanth & DeFries 2011). Further, evidence suggests that even benign exposure to tourism may induce negative impacts for some species that may be more susceptible to increased predation or poaching risk (Geffroy *et al.*, 2015) following the habituation-like processes that increase wildlife tolerance towards human activity (Knight, 2009). Black rhinoceros, may be especially susceptible to tourist-induced impacts due to their tendency to avoid human activities (Cunningham & Berger, 1997; Walpole *et al.*, 2003), low fecundity rates (Hearn, 2003) exacerbated by northwest Namibia's extremely arid environment (Mendelsohn *et al.*, 2003) and high poaching risk (Duffy *et al.*, 2013). Thus, despite the benefits

tourism may provide to rhinoceros conservation, irresponsible viewing practices can threaten the sustainability of both business and conservation initiatives.

In order to address this threat, I employed a statistical modeling approach to: (1) explore and identify human-rhinoceros encounter variables that led to rhinoceros disturbance; and (2) design sustainable rhinoceros-human encounter guidelines. Encounter variables and associated rhinoceros disturbance levels were captured during 123 rhinoceros viewing events. A model-averaging, information-theoretic approach (Anderson, 2008) identified closest approach distance, viewing time and individual encounter exposure as the most significant predictors of rhinoceros disturbance level. A suite of rhinoceros viewing scenarios were modeled for acceptable disturbance risks, and adopted as DRC's rhinoceros tourist viewing policy. Following implementation, rhinoceros displacements were reduced from 26 to 5% within two years (Chapter 3).

In addition to disturbances to rhinoceros during a tourist encounter, other indirect tourism activities such as lodge placement, airstrip activity and vehicle use intensity can affect, and in some cases completely displace, rhinoceros. Similar tourism-related results have been documented for other sensitive, high conservation value species such as wild reindeer *Rangifer tarandus tarandus* (Nellemann *et al.*, 2000) and mountain goats *Oreamnos americanus* (Richard & Côté, 2015), and can be extended to mountain woodland caribou *Rangifer tarandus caribou* (Polfus *et al.*, 2011), barren-ground caribou *Rangifer tarandus groelandicus*, brown bears *Ursus arctos*, and gray wolves *Canis lupus* (Johnson *et al.*, 2005) when mining activities are included. In other words, negative outcomes for species under tourism pressure are often a consequence of

poorly identified, understood and managed human impacts associated with various types and intensities of tourism activity beyond immediate encounters. Anecdotal evidence from DRC suggested the black rhinoceros persisting within the tourism operating area were being displaced from high quality habitat, threatening not only the security and health of the rhinoceros population but also the sustainability of the business enterprise. Minimizing such impacts, particularly for rare and endangered species like black rhinoceros, is critical to ensuring business and conservation enterprises can coexist for mutual benefit. I examined how required tourism infrastructure, namely an airstrip, lodge and vehicle tracks and their use, impact upon rhinoceros occupancy. I sought to characterize areas avoided by black rhinoceros to better understand how this free-ranging rhinoceros population responds to the various types and magnitudes of tourism development occurring at DRC while evaluating a series of alternative management scenarios. Again, I employed an information-theoretic approach (Anderson, 2008) to evaluate a suite of data-defined *a priori* cumulative zones of influence models, including various buffer widths for an airstrip, lodge and roads used daily. Evidence strongly supported a cumulative zone of influence model comprised of a six kilometer airstrip buffer merged with a one kilometer buffer around roads used daily. Quantitative comparisons of a suite of alternative management scenarios using the top cumulative zone of influence (ZOI) model informed a road use policy and re-location of an airstrip that reduced the total extent of habitat loss from 15.7% to 7.1% and high-value habitat loss from 32.8% to 20.7%. Conversely, the worst case scenario represented a total area and high value habitat loss to be 153% and 85% greater, respectively, than the selected management scenario. My findings provided a user-useful and user-friendly decision-support tool actively used to continually evaluate trade-offs in management that minimizes the inevitable costs and maximize benefits (Chapter 4).

While this analysis targeted technical problems in delivering a more sustainable rhinoceros tracking activity, acquiring a precise and accurate understanding of the entities, processes, activities and the interrelationships between these elements comprising the SES (in my case, a wildlife-based tourism enterprise) is essential for designing lasting solutions. Managing tourism that achieves rhinoceros conservation is fundamentally a human endeavor. One of the greatest challenges with designing and delivering a tourism experience that serves as an effective conservation mechanism is finding means to reconcile various disparate values and developing an effective decision process (Garen, 2000). Several approaches are available for developing a finely-tuned understanding of decision-making contexts such as behavior change (Akerlof & Kennedy, 2013), systems thinking (Cundill *et al.*, 2012; Jackson, 2003; Norberg & Cumming, 2008) including scenario planning (Carpenter *et al.*, 2006; Peterson *et al.*, 2003), appreciative inquiry (Cooperrider *et al.*, 2008), evaluation (Jenks *et al*., 2010; Kleiman *et al.*, 2000; Patton, 1990) and the policy sciences (Clark, 2002; Clark & Brunner, 2002). I employed the policy sciences approach, a well-respected discipline more than 50 years old (Lasswell, 1971), primarily because it provides both a theory and a practical framework for effective problem solving that includes a systematic, analytical process for integrating biophysical information with a rational theory for societal decision-making. This holistic process is critical to help clarify and secure solutions in the common interest and is particularly important for adequately addressing conservation challenges that are deeply embedded within complex SESs, although it has rarely been applied to a conservation tourism context.

I applied a policy sciences approach to describe how an understanding of social context embedded within a policy process can help lead to common interest solutions that ultimately

improve the sustainability of wildlife-based tourism. I demonstrated its utility by describing and analyzing the decision process at DRC and recommended prototypic elements or lessons learned from both success and failures, many of which are transferrable to other wildlife-based tourism enterprises, specifically rhinoceros tourism. While government, communities and traditional authorities were engaged at a high level, I chose to focus on the main institutions participating in the design and delivery of the operational model at DRC. I used a feature analysis to develop a more contextual understanding of the participant's values, perspectives and strategies to achieve their desired outcomes as a means to help identify common interests. My appraisal of the decision process identified strengths such as the inclusive nature and the participant's willingness and ability to reconcile different perspectives and objectives by finding a common interest solution based on shared values, such as human and rhinoceros well-being. The policy process could have been improved by mandating top management conduct more site visits with deeper interactions with site-level managers, guides and trackers, and more frequent and independent appraisals be compiled. Overall, I suggested a series of transferable prototypic elements, including the establishment of a shared decision-making arena, adopting a fully inclusive management-oriented research agenda, employing a strategic messaging approach as a means to motivate compliance and increase philanthropic behavior by tourists, and emphasizing a learning approach through role reversal opportunities that harness values for guides and trackers. In order to facilitate replication, attention should target establishing deeper engagements with conservancies who host emerging rhinoceros tourism enterprises, expanding the research agenda to include tourism's broader role towards influencing (or not) pro-rhinoceros behavior change in both tourists and neighboring communities (Chapter 5).

The rhinoceros tourism model this dissertation sought to help develop in northwest Namibia has evolved over time by learning through practice and quantitative analysis what approaches are effective, and operationalized through an inclusive and comprehensive decision making process. This work was instrumental towards developing a rhinoceros encounter protocol that minimized disturbance during tourist encounters (Chapter 3), formulating a rotational area use policy that reduced the overall tourism impacts on the rhinoceros group (Chapter 4), and charted an effective decision process that facilitated informed implementation of management options that enhanced the operational sustainability (Chapter 5). Lastly, this dissertation produced a series of prototypic elements (Chapter 5) that has helped craft a sustainable rhinoceros conservation tourism expansion strategy improving the long-term security of this unique and significantly important population of critically-endangered black rhinoceros. Despite not being explicitly tested for causal links to underlying characteristics described in this study, it is worth mentioning a few noteworthy outcomes. First, the prototype developed at DRC has maintained high levels of tourist satisfaction demonstrated by DRC's exceptionally high tourist evaluation feedback (L. Nortje, *pers.com.*). This is further demonstrated by 79 online ratings posted since 2006 with an average overall rating of 4.58 +/- 0.81 on a 5 point scale with 71% receiving an 'Excellent' (5) and 90% a 'Very Good' (4) posted on Trip Adviser (Wilderness Safaris Desert Rhino Camp, n.d.; see Appendix 4). Although only able to accommodate 16 tourists per night, DRC sustained sufficient profit to produce net conservation benefits, including fully funding SRT's tracking team based in camp since 2003, substantial annual cash payments to joint-venture partner conservancies averaging US$99,800 per annum and between 18-26 jobs for the surrounding local communities (Chapter 2, Muntifering *et al.* 2015). Lastly, again while it is not possible to prove direct causality, it is noteworthy that not a single rhinoceros has been poached in the DRC

operational area nor the areas immediately adjacent despite supporting the highest density of black rhinoceros in the region and accounting for 40% of the region's rhinoceros population (Beytell & Muntifering, 2009).

It is also important to recognize the limitations of this study. First and foremost, I did not explicitly test whether the rhinoceros conservation tourism model at DRC in fact led to any direct measurable pro-rhinoceros behavior change within neighboring local communities. Regardless, I opted in this study to rather first develop an effective prototype fully operationalized before testing this critical assumption. This was important as I believe good ideas are often prematurely disregarded and deemed unsuitable when the failure was likely caused by poor implementation. Additionally, DRC was somewhat of an isolated operational system with a one-way relationship primarily running from the operator to the conservancy in the form cash payments, jobs and skills training. This one-way, passive relationship could be upgraded to become a two-way, active partnership by directly engaging partner conservancy staff in various aspects of the operation (i.e. decision-making, delivery – see Appendix 3). Learning how best to accomplish this will be especially critical as new rhinoceros tourism enterprises expand into more conservancy areas where they may increasingly come into conflict with other competing land uses, such as livestock grazing and small-scale mining, that are otherwise absent from government-administered tourism concession areas (such as Palmwag Concession).

Despite the monitoring and monetary benefits DRC has provided (via the tourism operator), another opportunity that has gone largely untapped is the potential to leverage additional

philanthropic behavior by visiting tourists. Evidence elsewhere, particularly with enterprises that cater for high-end tourism markets, such as the Galapagos Islands, suggests that targeted conservation messaging can indeed significantly improve pro-conservation behavior (Skibins *et al.*, 2013; McKenzie-Mohr 2000; French *et al.* 2012; Jenks *et al.* 2010) and specifically motivate conservation philanthropy (Powell & Ham, 2008). Like previous key decision points at DRC, addressing this gap would benefit from initiating applied social research on behavior change and social marketing (McKenzie-Mohr 2000; Wilhelm-Rechmann & Cowling 2010) with the goal to re-visit and revise the messaging strategy at DRC to optimize on pro-rhinoceros behavior such as increased philanthropy.

Finally, while increased monitoring and improved local value for rhinoceros certainly can help protect rhinoceros, there are clear limits to tourism's contributions towards combating poaching. For example, good monitoring and community support in the absence of sound law enforcement presence and effective prosecution outcomes may be unable to keep poaching at bay as witnessed in the Klip River case (see Post Script). Thus, rhinoceros tourism's value enhancements and monitoring activity that it directly supports should be viewed only as a partial solution embedded within a mix of policy instruments and incentives (Young & Gunningham, 1997) that will serve to deter poachers (Ferreira & Okita-Ouma, 2012). When strategically designed and delivered, rhinoceros-based tourism can provide a critical and necessary social foundation upon which other key protection strategies (i.e. law enforcement) can operate more effectively (Chapter2: Muntifering *et al.* 2015). My results demonstrated how an evidence-based, policy-oriented management approach can help improve tourism's contribution towards the conservation of an endangered species. The DRC experience has provided a unique case and

a clear, transferable set of prototypical elements that will help ensure the expansion of rhinoceros tourism is built upon solid foundations, enhancing prospects for securing a future for the world's last truly wild population of black rhinoceros and a model to advance our understanding and appreciation of wildlife-based tourism's role as a conservation tool.

Postscript: the good, the bad and a silver-lining

Since I began compiling this dissertation in 2013, rhinoceros tourism has advanced considerably in north-west Namibia. I felt it was thus worth noting some of the key successes and challenges in the wake of this body of work. First, aligned with the learning and skills transfer goals, I used this research to develop a new comprehensive training manual in Rhinoceros Conservation Tourism (Appendix 2). The training curricula included aspects of knowledge pertaining to rhinoceros threats and conservation strategies employed, managing both the rhinoceros tourism area and the encounter, and how to provide a sound, inspiring rhinoceros conservation message to tourists. It has been informally recognized by Namibian Association for Tourism and Hospitality training and approved by Ministry of Environment and Tourism (MET). In October 2013, specialists from SRT, Minnesota Zoo (including myself), conservancies and Ministry of Environment and Tourism officials co-developed the North-west Namibia Regional Rhinoceros Tourism Expansion Concept Plan (Appendix 3). This concept note included many of the prototypical elements described in Chapter 5 to ensure community-based rhinoceros monitoring is increased and made financially sustainable, security requirements are upheld, rhinoceros disturbance is minimized, and benefits to communities are maximized. It also outlined a full implementation plan (Appendix 3) describing how communities, through new or existing joint-venture tourism partnerships and their Rhino Rangers (Chapter 2), would be directly engaged and empowered to lead the activity. Subsequent to this concept note, eight Conservancy Rhino Rangers have been trained in Rhinoceros Conservation Tourism including numerous site visits to DRC to shadow SRT trackers. The first joint-venture community-based rhinoceros tourism activity was launched in September 2014 between the Torra Conservancy and Palmwag Lodge. The activity averaged 73 bookings and more than 40 rhinoceros sightings per month including a 99% sighting success rate during their first season. It also contributed approximately US$2,000

per month to the Torra Conservancy, more than enough income to support their Rhino Ranger team. Moreover, 95% of the rhinoceros in the areas used by the new tourism venture are being monitored each month. Not a single rhinoceros has been poached despite the area being in close proximity to a heavily used road. A second Conservancy-based rhinoceros tourism joint-venture was initiated in April 2016 between Ultimate Safaris and the Huab Conservancy. Finally, three planning meetings were held between 2015 and 2016 to help pave the way for a more complicated multi-Conservancy single operator enterprise contract negotiation. The activity is scheduled to be piloted in August 2016. Lastly, I received a request in February 2016 to assess and provide re-training to four local trackers employed by the Grootberg Lodge, a Conservancy-owned enterprise who have also been practicing rhinoceros tourism since 2006. This request was largely in response to a poaching outbreak that had occurred in the Grootberg Lodge's rhinoceros tourism area. Between December 2015 and January 2016, a number of rhinoceros were confirmed to have been poached (the precise number is confidential as cases are still under investigation). This was the first, and only, recorded poaching cases to have occurred in rhinoceros tourism areas in north-west Namibia. This was surprising, since the rhinoceros tourism activity based from the lodge provided some of the best monitoring coverage in the region and significant income to the local community (Chapter 2). However, a rapid assessment conducted by myself in February 2016 did reveal a handful of delivery improvements that urgently required strengthening.

However, the Grootberg Lodge also presented a silver lining. All the poached rhinoceros carcasses in the tourism area were found and reported within two – three weeks (some within 24 hours), a significant reduction from rhinoceros poached in non-tourism areas which ranged from

months to years and resulted in very few arrests between 2012 to the present. Consequently, every poaching case was followed by multiple arrests, many of which were aided by key local intelligence (Tommy Hall, *pers. com.*). These results demonstrate that although rhinoceros tourism is unlikely to stop poaching on its own, its presence can improve on-the-ground detection and re-inforce law enforcement success. Only time will tell if the justice system will play its part.

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Appendices

Appendix 1: Title page of published Chapter 2

Harnessing values to save the rhinoceros: insights from Namibia

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Abstract The rate at which the poaching of rhinoceroses has escalated since 2010 poses a threat to the long-term persistence of extant rhinoceros populations. The policy response has primarily called for increased investment in military-style enforcement strategies largely based upon simple economic models of rational crime. However, effective solutions will probably require a context-specific, stakeholder-driven mix of top-down and bottom-up mechanisms grounded in theory that represents human behaviour more realistically. Using a problem-oriented approach we illustrate in theory and practice how community-based strategies that explicitly incorporate local values and institutions are a foundation for combating rhinoceros poaching effectively in specific contexts. A case study from Namibia demonstrates how coupling a locally devised rhinoceros monitoring regime with joint-venture tourism partnerships as a legitimate land use can reconcile individual values represented within a diverse stakeholder group and manifests as both formal and informal community enforcement. We suggest a social learning approach as a means by which international, national and regional governance can recognize and promote solutions that may help empower local communities to implement rhinoceros management strategies that align individual values with the long-term health of rhinoceros populations.

Keywords Community-based conservation, conservation tourism, incentives, poaching, policy, rhinoceros, values

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Introduction

The rate at which the poaching of rhinoceroses has escalated (Knight, 2012) since 2010 poses a threat to the long-term persistence of extant rhinoceros populations (Duffy et al., 2013). Resurgent global trade and unprecedented black market prices for rhinoceros horn are implicated as the major drivers of the killing (Ferreira & Okita-Ouma, 2012; Biggs et al., 2013). Although rhinoceros conservation scientists and practitioners promote a variety of strategies to safeguard the rhinoceros (Duffy et al., 2013), military-style law enforcement and demand reduction (Ferreira & Okita-Ouma, 2012; Biggs, 2013; Challender & MacMillan, 2014; IUCN et al., 2015) have dominated the response to protect Africa's remaining 20,000 white rhinoceros *Ceratotherium simum* and 5,000 black rhinoceros *Diceros bicornis*. Despite courageous efforts to combat poaching, and some positive trends in end-user behaviour (Coghlan, 2014), rhinoceros poaching rates continue to rise, with a reported 184% increase across Africa during 2008–2012 (Standley & Emslie, 2013). We investigated what and how community-based strategies make military-style protection more effective but also provide innovative, longer-term solutions that are more resilient to the changing type and magnitude of threat. We use the Namibian experience to make a case for rhinoceroses and other wildlife as a legitimate land use that embodies both collective and individual values, creating the social foundation that enforcement-based strategies

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Appendix 2: Rhino Conservation Tourism training manual

RHINO CONSERVATION TOURISM

Training Course Outline: objectives & competencies

Objectives: People who receive training in this module will gain knowledge on:	1. The rhino conservation story: what threatens their survival and what can be done to help save them 2. The pros and cons of rhino tourism as a conservation tool 3. Rhino biology and behavior in a monitoring and tourism context 4. How to plan and execute linked rhino monitoring and tourism activities successfully
Competencies: People who receive training in this module will be able to:	1. Provide a short yet sound overview of the threats facing Africa's rhino and what strategies are being used to help protect them, with a special focus on the historical and present situation in Namibia 2. Communicate why and how a thorough understanding of rhino biology and behavior can help improve both rhino protection and the sustainability of the tourism enterprise(s) 3. Develop successful co-management practices for rhino-based tourism activities within your operating area / conservancy 4. Comprehend the critical factors that lead to a successful rhino tracking excursion including (a) the collection of good rhino monitoring data, (b) ensuring tourists are safe and satisfied, and (c) minimizing rhino disturbance 5. Accurately observe, record, secure and report on basic rhino monitoring information and security threats
This Module is intended for:	Conservancy Rhino Rangers, Tour Guides (especially those planning to conduct rhino tracking with conservancy rhino ranger teams)
Duration:	5 Days (2 days classroom), (3 days practical)

The training of this module will generally follow this schedule:

TOPIC 1	Key Issues in Rhino Conservation

TOPIC 2	Rhino tourism as a conservation tool
TOPIC 3	A primer on rhino biology and behavior in a linked monitoring and tourism context
TOPIC 4	Planning responsible rhino conservation tourism
TOPIC 5	Practicing responsible rhino conservation tourism
TOPIC 6	Capturing, securing and reporting rhino monitoring data and security threats

Prerequisites

- Either a Guiding Level x or BASIC Rhino Monitoring course (offered by Save the Rhino Trust in accordance with the IUCN SSC African Rhino Specialist Group's training course for field rangers).

Participants will be evaluated by:

- Completing a written/oral examination

- Completing a practical examination including scenarios

Course Instructor(s): if an instructor only has one of the two qualifications then a co-instructor must be appointed to cover both aspects

- Have at least 2-3 years working experience monitoring rhino and a minimum of 50 rhino sightings recorded using the internationally-recognized and Namibia Ministry of Environment and Tourism-approved IUCN African Rhino Specialist Group standard rhino monitoring system

- Have at least 2-3 years of experience leading at least 50 tour groups to view rhino in the wild

Note: the overall purpose of this course is to highlight the theory and practice of how rhino monitoring and tourism can be linked for the benefit of rhino conservation and indirectly lead to community empowerment and rural development through non-consumptive use of rhino. It is NOT in the scope of this course to train participants on rhino tracking, tourism hospitality / general guiding, or tourism enterprise development. Finally, although course content has largely been developed through roughly 10 years of research and experience in Namibia's northwest communal areas and the resident west Kunene rhinos, we feel many of the concepts and practices developed and promoted in this course is arguably transferable to different rhino locations in Namibia.

PART I: RHINO CONSERVATION TOURISM IN THEORY

TOPIC 1: Key Issues in Rhino Conservation (focus on black rhino)

Note: this section has been adapted from the IUCN African Rhino Specialist Group training module Rhino Conservation Background

Developing a basic understanding of the critical issues concerning rhino conservation, in particular their status and key threats, will enable individuals that deliver rhino tourism to add a new dimension to the experience for their tourists. Most tourists that visit Africa want to not only SEE a rhino but also LEARN something about them, the challenges they face and what Africans are doing to help save them. Further, if rhino tracking activity can clearly demonstrate that tourism dollars are going directly back into rhino conservation we believe tourist satisfaction will be greater and possibly result in the cultivation of a new constituency of global rhino ambassadors. Critical to achieving this outcome is how the tourism's contributions toward rhino conservation are communicated to tourists. First, however, it is vital to educate your tourists about why rhino are struggling in the first place and how your work is helping to secure their future.

Historical & present black rhino population status, trends, and key threats

Species	Continent	Main Range Country	Status	Current Population
Greater One-Horned Rhino	Asia	India & Nepal	Endangered	3,000
Javan Rhino	Asia	Indonesia	Critically Endangered	33-44

Sumatran Rhino	Asia	Indonesia	Critically Endangered	Less than 100
White Rhino	Africa	South Africa	Near Threatened	20,405
Black Rhino	Africa	Namibia & South Africa	Critically Endangered	5,000

- Rhinoceros have lived on earth for over 50 million years.
- There are five different species of rhinoceros, three in Asia and two native to Africa.
- Since 1960, the black rhino's population size has been reduced by over 95% (see below)
- Currently there are 4 sub-species of black rhino
- Other black rhino survive in: Botswana, Zimbabwe, Zambia, Tanzania and Kenya
- Poaching of rhino for the use of their horns in Traditional Asian Medicine is their main threat
- Although western science has proven rhino horn has no medicinal qualities, eastern medicine has been using rhino horn as an ingredient for more than 2,000 years
- Rhino horn is the same material as your fingernail (keratin)

1960s	**1970s**	**1980s**	**1990s**	**2000**	**2010**
About 100,000	65,000	15,000	2,500	3,000	5,000

Need to increase their numbers

- Due to the serious threat of poaching, it is critical to maintain large rhino population sizes to withstand the high mortality rates
- Rhino populations will typically breed at roughly 5% per year. Therefore, poaching pressure will have less impact on larger populations (see below)

Initial Population Size	20	100	500	1000	2000
Number of deaths the rhino population can absorb before it begins to decline	**1**	**5**	**25**	**50**	**100**

- Living rhino have great ecosystem service value such as job creation, economic development, their role in the ecosystem as a mega-herbivore and seed disperser, cultural/heritage and **TOURISM**

Role of the field ranger

- At the front lines of protecting rhino from poaching (armed or unarmed)
- The field ranger's physical presence in the rhino area acts as a poaching deterrent
- The field ranger carefully looks out for other information on suspicious or illegal activity in the area that may lead to rhino poaching (i.e. other signs of wildlife poaching, off-road driving, etc)
- The field rangers collect information on the rhinos they observe (monitoring) which can be used to improve their protection and conservation

Why rhino need to be monitored and why the information is useful

- It is important to monitor rhino so that managers can measure progress towards achieving conservation goals for example to demonstrate the population is growing or not, how the rhino behave around human activity

- It is critical to monitor the breeding performance and overall population health to understand if other threats are causing problems such as disease or human-induced disturbance

Why data quality is so critical

- Good rhino management requires that decisions are made using the best available knowledge and information.
- The most critical information is the population monitoring data that is collected by field rangers on a daily basis.
- If the data provided by the field rangers is collected poorly then the resulting rhino management decisions will likely also be poor.

General Knowledge

- Rhinoceros means ‘nose horn’ and refers to the horn that appears to stick out from the rhino’s nose
- All species of rhinoceros can weigh over 1000 kilograms (2000 pounds) and the white rhino can weigh nearly 4000 kilograms (8000 pounds - the size of a large bakkie)
- The longest rhino horn ever recorded measured about 1.5 meters (4 feet 9 inches) long but usually average less than 2 feet
- Rhinos can run faster than the fastest human sprinters and can cover 100 meters in less than 8 seconds.
- Rhinos do not have very good eyesight but can detect a human figure from roughly 100 meters / yards

- The white rhinoceros got its name from a mistranslation from the Afrikaan's word 'wyd' which sounds like white but actually means 'wide' and refers to its wide mouth for grazing.

Rhino Conservation in Namibia

- Namibia supports one third of the world's remaining black rhino
- The world's largest unfenced rhino population survives in the Kunene region and is also the largest rhino population to persist on formally unprotected land
- Save the Rhino Trust (www.savetherhinotrust.org) has been protecting Namibia's black rhino for over 30 years in the remote northwest Kunene region
- These rhino survive in an area that receives less than 6 inches of rainfall per year and are commonly known as the world's only desert-adapted rhinos
- Currently, in South Africa a rhino is killed by poachers every 7 hours
- In Namibia's remote northwest region, only 7 black rhino per year have been poached on average since 2013.
- Namibia's rhino are all owned by the State (government)
- Namibia's Ministry of Environment and Tourism has created the Rhino Custodianship Programme which provides local conservancies with the opportunity to become formally recognized as 'guardians or custodians' of the rhino that live on their land in exchange for assisting the government with monitoring and protection
- Local conservancies are then able to develop contracts with private tourism operators to benefit directly from rhino tourism activities
- In most African countries, benefits from tourism must go back to the state government

TOPIC 2: Rhino Tourism as a Conservation Tool

Conservation Tourism: a definition and local examples

Conservation tourism is a very small sub-sector of ecotourism, which is itself a small sub-sector of the multi-trillion dollar tourism industry. Conservation tourism is simply 'tourism which operates as a conservation tool.' More specifically, it can be defined as commercial tourism which makes a net positive contribution to the continuing survival of threatened plant or animal species. A number of different possible mechanisms exist that may produce positive contributions to conservation, but the key issue is that the end result is the positive contributions outweigh the negative. Many definitions of ecotourism do include contributions to conservation, but there are very few enterprises that can demonstrate their overall contribution is positive.

Methods are currently being developed to measure the indirect impacts that tourism may have on conservation but conservation tourism typically involves direct support for conservation efforts. Some of conservation tourism's direct positive impacts for rare and endangered species are:

- Funding the management of private reserves that protect rare and endangered species and secure their habitat
- Financing species management action such as translocations, veterinary care
- Supporting monitoring and law enforcement efforts
- Supporting research activities

- Providing benefits through jobs and monetary payments to local communities that sustain local support for their conservation

How can it help endangered species, particularly rhinos?

Most endangered species require urgent conservation attention and management that can be prohibitively costly. The majority of rhino (i.e. white rhino) are threatened but most species are critically endangered numbering only in the thousands. Since the threat of poaching will likely never cease, rhino require constant conservation attention including basic monitoring, law enforcement. In addition, their survival may be enhanced by targeted research efforts and exploring ways to increase local community support. Such intensive conservation needs rely upon heavy investment in financial resources, a major problem for most developing countries that sustain rhino populations. It is useful to consider the possible positive and negative impacts from conservation tourism on rhino populations:

POTENTIAL IMPACTS OF INTEGRATING TOURISM AND RHINO CONSERVATION	
Positive Outcomes	**Negative Outcomes**
Act as a deterrent to poachers (e.g. more eyes and ears on the ground)	Human-induced Disturbance (HID): (1) new infrastructure (camps and roads), (2) increased human activity (vehicles and viewing)
Support monitoring efforts by integrating patrols with rhino viewing activity	Poachers could disguise themselves as tourists to learn about rhino locations
Support research activities linked to the rhino tourism operation	Dishonest partnerships, especially broken financial agreements, could catalyze negative retaliation against the operator and/or the rhino
Employ local people	Less control and potential leakage of sensitive

	rhino information to the general public
Provide financial payments to neighboring communities (Rhino Royalty)	Any level of habituation may render rhino more at-risk to poachers
Provide financial payments to NGOs working to protect rhino	
Provide financial or in-kind support for rhino management activities	
Additional pro-rhino awareness and promotional material from marketing campaigns	
Enlightened tourists may act as rhino ambassadors	

TOPIC 3: Primer on rhino biology and behavior in a monitoring and tourism context

Rhino biology & behavior

- Rhino have very good sense of smell and hearing
- Although rhino do not see very well, they can detect movement and human figure from as far as 100 meters
- Rhino behavior varies from individual to individual so it is critical to know which rhinos are more vigilant (e.g. they seem to detect possible threats quickly) and the rhino which are more relaxed (e.g. seem to be less likely to detect possible threats)

What to expect if a rhino becomes aware of your presence:

- If a rhino becomes aware of your presence, it will quickly turn to face you with its ears locked in your direction. Stand absolutely still in this circumstance.

- After a few seconds the rhino may make a loud grunt or exhale.
- Sometimes, the rhino will slowly walk towards you to investigate the threat
- Normally, if you remain very still and the wind is blowing away from the rhino, the rhino will return to its normal behavior. Do not move until the rhino looks away from you.
- If the rhino becomes severely disturbed, they will typically run away but in some cases will run towards the group as they are curious to figure out what the possible threat is
- Rhino are more likely to charge on flat open ground so it is best to try and remain higher than the rhino when observing them (e.g. on a hill or river bank)
- Black rhino can run up to 55 kph (faster than an Olympic sprinter) and so it is impossible to out-run them (see BP 4 for what to do if I rhino charges)

Rhino monitoring

One of the main objectives of rhino conservation tourism is integrating monitoring work into the tourism activity. Obtaining quality monitoring data from each rhino sighting during the tourism activity is critical. Thus it is the priority of the trackers to focus on their rhino monitoring work when the rhino is spotted and the group approaches the rhino.

- Completing the Rhino Monitoring ID Forms for each rhino sighting during the tourism activity is absolutely critical
- When the rhino is spotted and safely approached on foot by the group, ensuring monitoring information is collected is the priority of the rhino trackers

- Experience has shown that it usually takes between 5 – 7 minutes to complete all rhino monitoring information
- This is also the maximum amount of time that the group should be observing the rhino from 100 meters.
- If the group would like to continue watching the rhino, the group must move back to a further distance

PART II: RHINO CONSERVATION TOURISM IN PRACTICE

TOPIC 4: Planning responsible rhino conservation tourism

Shared decision-making

Best Practice 1: encourage the development of a shared decision-making process within your Conservancy Management Committee

It is critical to ensure that the area used for rhino tracking tourism is not utilized for many other activities. Additional human-induced disturbance to the area, such as livestock grazing, regular hunting, or even regular tourism game drives, will make it more difficult to view rhino. Working with the conservancy's management committee closely will help make sure that when areas within the conservancy are zoned or re-zoned that rhino areas are given low human impact status. Thus clear definable boundaries for the rhino tracking area must be collectively chosen and enforced. If exceptions need to be made for emergency grazing or a trophy hunt then conservancy management committees should communicate this to the rhino tracking teams in advance.

Establishing your area of operation & rotating activity zones

Best Practice 2: Always minimize chronic use of any one area by rotating activity zones or allowing

Research has clearly demonstrated that Kunene's free-ranging rhino will not tolerate daily vehicle activity and will move out of good habitat due to frequent vehicle activity. This outcome will only make the tracking and viewing of rhino more difficult and may result in angry tourists – not to mention the possible impacts on the rhino. Therefore, when the tracking activities are planned (usually the night before) try to avoid patrolling the same area. It is best to develop 3-4 areas within the designated rhino area and only use 1-2 of the areas per day. Each area should thus be large enough to occupy at least a half day of patrolling activity.

TOPIC 5: Practicing responsible rhino conservation tourism

Principles and Best Practices

Best Practice 3: Guide(s) must always provide a full safety briefing before you leave the vehicle to approach the rhino

The safety of the group is the number one priority on any rhino tracking activity. Rhino can be very dangerous animals and must be treated with respect at all times while maintaining the golden goal of completing the rhino tourism activity without the rhino ever becoming aware of the group. Therefore a comprehensive safety briefing conducted **just before the group departs**

from the vehicle to view the rhino (to ensure everyone remembers the rules) is absolutely critical.

The briefing should emphasize:

- There will be no talking during the approach.
- The group should try to minimize sound while walking such as avoiding stepping on dry sticks, leaves and/or loose stones.
- The group will approach the rhino in a single file with at least one guide/tracker in the front and one guide/tracker in the back.
- The group will remain together and maintain the speed of the slowest moving person. If there are more than two guide/tracker present, it is possible for one guide/tracker to stay with one or two less fit guest(s) while the rest of the group pushes ahead. A certified guide/tracker must ALWAYS be present with guests.
- Should the rhino become aware of the group, the guests are to watch and listen very closely to the guide/tracker instructions given by hand signals. Hand signals (stop, go, crouch down) should be clearly explained.
- Should the rhino charge (which is very unlikely) the guests should remain in a tight group with the specified guide/tracker while the other guide/tracker(s) will attempt to divert the rhino in a different direction. Guests should NOT scatter under any circumstance. (see Best Practice 4 below)
- Remind guests about the viewing policy and address any final questions or concerns

- Double-check to make sure everyone has sufficient water. Remind guests that the hike may be long and challenging, and point out which guide/tracker will carry additional water plus a medical first aid kit should they be required.

Best Practice 4: In the unlikely event of a charging rhino, TRACKERS distract the rhino and GUIDES remain together with guests

- A charging rhino is a very rare event, especially if you are careful to always approach with the wind blowing in your face and keep your distance (closest distance 100 meters)
- If the wind is swirling, your scent may confuse the rhino and instead of running away from you they may actually run in your direction by mistake. This may be confused with an actual charging rhino. Thus, if the wind is swirling (e.g. not blowing in one consistent direction) you must be extremely careful with your approach and should keep to a safer distance greater than 100 meters.
- If the rhino does charge, it is the TRACKER(S) responsibility to try and distract the rhino away from the group of tourists by running at a 90 degree angle from the rhino's path
- The GUIDE(S) should ensure that the tourists remain together with them and to NOT FOLLOW THE TRACKER(S)
- Tourists should not run under any circumstance and must remain with the GUIDE(S)
- If the TRACKER(S) cannot find a tree or rock to hide behind and the rhino is still charging them, it is best to lay flat on the ground to avoid the horn

Best Practice 5: Try to reach the rhino area at first light

Rhino are very active in the early morning as they move from their water source to feed along dry riverbeds and small drainage lines through the mountains. Locating and viewing rhino in the early morning, just after sunrise, is the best time because:

- Rhino normally drink early in the morning and the earlier the group reaches the springs where rhino typically visit the better chance of encountering a fresh rhino spoor or spotting them from the vehicle / viewpoint.

- An active rhino's horns and ears are normally easily visible and thus produces better photographic opportunities for both monitoring and tourism purposes

- The temperature is typically nice and cool making it comfortable to hike and less stress on the rhino should they become disturbed

- The wind is typically more consistent. As the day progresses, the wind usually begins to change direction much more frequently thus increasing the chances that a rhino may smell the group

- The light is much better for tracking and photographic quality

- The earlier the group starts the more time they will have to search for the elusive rhino before mid-day – when rhino tracking should be discouraged

Best Practice 6: Avoid driving past springs known to be visited by rhino and tracking activities 2 hours before sunset

Access to water is one of the most critical factors for a rhino and any human activity that may impair the ability of a rhino to drink should be absolutely minimized or eliminated. Rhino

typically begin moving towards their desired water source 2-3 hours before sunset. Disturbing a rhino during this period has a much greater impact than any other time of the day since it may cause them to abandon their drink for the day. If this continues to occur it could cause permanent abandonment of the water source and potentially even death, if other drinking options are limited.

This also applies to sundowner activities (should they form a part of your activity). Do not have your sundowner at or even within 1 kilometer of a spring known to be visited by rhino.
In addition to possibly causing significant impacts on the rhino, such activity would certainly make the tourism and monitoring activity much more difficult. The end result would be angry tourists, empty-handed rhino rangers and stressed rhino.

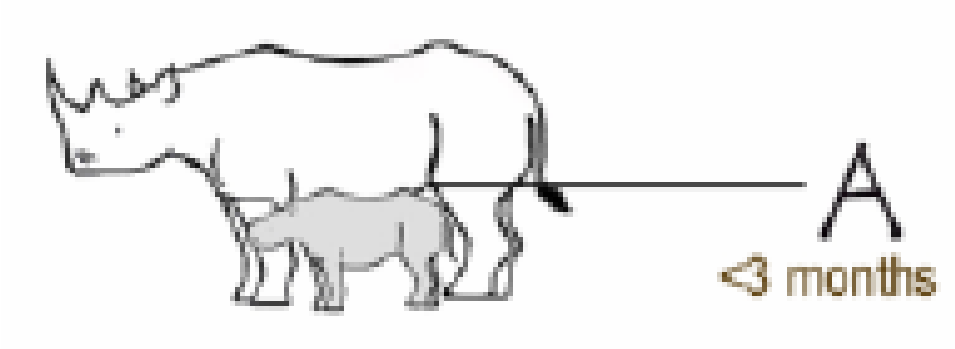
Best Practice 7: Always approach a rhino from downwind (e.g. the wind is blowing in your face as you approach the rhino)

As discussed earlier, rhino have very acute sense of smell and rely on the wind (and associated airborne smells) to alert them to possible danger. Rhino have been known to detect human scent from more than 1 kilometer away typically resulting in a running rhino and a spoiled tourist activity. Tourists become very frustrated and disappointed when their rhino sighting consists of a very short glimpse of a running rhino.

Best Practice 8: Do not approach rhino cows with a small (A size) calf

Female rhinos with a calf are especially sensitive to disturbance. Disturbing a mother may result in the calf becoming separated from its mother and killed by lions or hyaenas. Cows with calves younger than 3 months (the calves back is not yet up to its mother's belly) should not be

approached under any circumstance, and extra cautions should be applied when approaching any female with a calf.



Best Practice 9: Establish and communicate a clear rhino viewing policy BEFORE conducting any rhino viewing

Besides indirect disturbance caused by chronic vehicle activity in a rhino area, additional adverse impacts from rhino tourism may occur at the actual rhino sighting. Rhino disturbance, as defined above, happens when the rhino becomes either aware of the group and/or is displaced resulting in unwanted stress on the rhino, an unacceptable rhino sighting for the guests and possibly a very unsafe situation if the rhino charges the group. It is also generally assumed that the energetic costs incurred by a displaced rhino, and particularly rhino that are displaced frequently or rhino with young calves, would experience some degree of stress-induced behavior which may, over time, result in lower breeding performance and/or permanent site displacement. This result would be directly opposed to the goals set forth in **Namibia's Black Rhino Conservation Strategy which states *'any form of human-induced disturbance which can negatively impact on rhino behavior, condition and breeding performance need to be eliminated, or kept at an absolute minimum'.*** Consequently, such impacts would not only negatively affect rhino population viability but also the tourism enterprise that we all depend upon. Thus, an ideal rhino

sighting should aim to minimize the likelihood of a rhino disturbance event. At a minimum, a rhino disturbance event should be defined as a 'displacement' but a more responsible goal would consider even an 'awareness' behavior unsatisfactory.

A few important issues should be highlighted regarding the rhino viewing policy:

1. The policy should be communicated to guests BEFORE the group begins their viewing approach, preferably during the safety briefing or the night before around the campfire. In addition, the message must contain an explanation WHY this policy is necessary. A standard policy that is based on focused research between 2004 – 2007 that aimed to (1) identify the critical factors that drive rhino disturbance (defined as 'awareness', i.e. the rhino becomes aware of the viewing group), and (2) develop a suite of viewing scenarios that minimized the likelihood of a rhino disturbance event. **The research resulted in the development and implementation of a rhino viewing policy with specific guidelines for guides/trackers on approach distances and viewing times under various sighting conditions summarized on Rhino Viewing Cards as illustrated above.**

2. The Rhino Viewing Card presents multiple viewing scenarios that minimize the likelihood of a rhino becoming aware of the group. There is a trade-off between time and distance, for example, the closer the group approaches the less time they should spend at that distance. The vast majority of tourists were found to be perfectly happy with NOT approaching closer than 100 meters for 5-10 minutes. However, should the group wish to

stay longer they must simply move back farther to account for the longer time and increased chances of someone making a noise or the wind shifting.

FRONT

RHINO VIEWING CARD

Closest **DISTANCE**	Maximum **TIME**
100 *meters*	**5** *minutes*
150 *meters*	**15** *minutes*
200 *meters*	**25** *minutes*
250 *meters*	**45** *minutes*

REVERSE

Using the Rhino Viewing Card

What is the Rhino Viewing Card?

✓ The Rhino Viewing Card is Desert Rhino Camp's (DRC) rhino viewing policy.
✓ It provides rhino viewing guidelines under different conditions that minimize the chances of a rhino viewing event resulting in a disturbed rhino.
✓ This card is based upon research jointly conducted at DRC since 2003.

Why do we need a Rhino Viewing Card?

✓ Research has also confirmed that our rhino are very sensitive to human disturbance and will move into areas that are less safe (higher risk of being poached), lower quality habitat, and more difficult for tourists to see.
✓ Our ideal rhino sighting is achieved when we observe our rhinos completely unaware of our presence – providing guests with an authentic experience with wild rhino and Save the Rhino Trust with the ability to monitor them.
✓ The Rhino Viewing Card is thus a means to both illustrate our genuine intent to ***practice responsible rhino tourism*** to our guests while providing our guides with a ***simple tool*** for attaining a respectable number of ideal rhino sightings.

Where did the numbers come from?

✓ Our rhino viewing policy is the result of research designed specifically to help understand how to approach our wild rhino without disturbing them.
✓ Based upon detailed information collected during hundreds of rhino viewing events over many years, we now understand:

1. ***The main factors that drive rhino disturbance***: wind direction, whether the rhino is sleeping or active, the approach distance, and the viewing time;
2. ***Associated viewing times and approach distances that result in only a small number of rhino disturbance events***

✓ The research findings were then translated into a set of 'rhino viewing scenarios' displayed on this card to help guide each rhino viewing event.

Desert Rhino Camp is the only place on earth where guests may go on foot with Save the Rhino Trust trackers to observe the last population of truly wild black rhino living in their natural environment. You can help us sustain our responsible tourism business and rhino conservation project by respecting these simple guidelines so our success may endure for generations to come.

Best Practice 10: Clearly define the differing roles between the Guide(s) and the Tracker(s) BEFORE approaching the rhino

One of the most critical aspects of the actual rhino viewing event is the communication between the Guides and Trackers. Before the group approaches the rhino, ensure that the division of roles (ensuring guest safety and minimal rhino disturbance) is clearly established. In general, ensure that at least one Tracker is responsible for all decisions related to the approach and viewing of

the rhino, including early withdrawal from the viewing site if the animal is unduly disturbed or to ensure safety, and one Guide is responsible for guest safety and who guests should direct attention towards under all circumstances. Below is a tried and tested communication protocol that works quite well.

1. The TRACKERS will manage the viewing policy and shall lead the group toward the viewing point, in single file, and is expected to use the viewing guidelines provided by the Rhino Viewing Cards to choose an appropriate viewing distance and time. It is possible for the group to remain viewing the rhino for an extended period given the group retreats to a further distance to minimize the chances of rhino becoming aware. Again, Rhino Viewing Cards may also be used to provide guidelines for appropriate distances under a requested time frame.

2. Once the group reaches the desired distance, the TRACKER(S) will began completing the sighting records for monitoring purposes immediately while GUIDE(S) will ensure everyone remains together, preferably behind an object such as a tree or bush for cover, when taking photographs.

3. Once either the maximum time has been reached or guests prefer to move further back, the TRACKER(S) will indicate to the GUIDE(S) that it is time to withdraw using the appropriate hand signal. The GUIDE(S) will then immediately indicate with a hand signal for the guests to withdraw from the sighting behind him/her while the TRACKER(S) will follow behind periodically checking on the rhino.

4. Once the rhino is out of sight, the guests may talk using a soft voice but should continuing moving away from the rhino.

5. Once the group reaches the vehicle(s), the GUIDE(S) will ensure everyone is safely loaded in the vehicle and that the vehicles will proceed in different direction from where the rhino sighting took place.

TOPIC 5: Providing the rhino conservation message

A primer on Public Speaking

Practicing HOW to provide a good public speech

Be sure to practice and use good public speaking techniques to improve the impact of your message (based upon NACSO Institutional Training Module 1.6: Public Speaking and Presentation)

Techniques	GOOD	BAD
EYE CONTACT	• Make brief eye contact with each person in your audience throughout your talk	• Do not stare at certain individuals for more than a couple seconds. • Do not look off in the distance while you speak
HAND GESTURES	• Make modest amounts of hand movements when you want to show extra importance • If you are explaining information on a display or poster, point it out with your hands	• Do not wave your hands around excessively as it distracts your audience from what you are saying • Try not to scratch or fidget while you talk
POSTURE	• Keep an upright, settled posture while you talk • Taking a few steps sideways or	• Do not slouch or look down at the ground • Do not lean against

	forward/backward is ok	objects • Do not stamp your feet or be shifting your body posture to different positions
FACIAL EXPRESSIONS	• Give a positive, energetic face to your audience • Smile but not too much	• Do not look sad or unhappy • Do not express anger at your audience at any time
VOICE	• Speak with a strong, steady volume that reaches all your audience (ask in your introduction if everyone can hear you) • Speak slow and clear	• Do not shout or whisper • Do not mumble your words
HYGIENE & CLEANINESS	• Be sure your uniform is reasonable clean • Tuck in your shirt • Make sure you brush your teeth or carry breath mints • Make sure your hands are clean	• Do not wear clothing that is too dirty or smelly • Do not spit • Cover your mouth if you need to cough • Use a cloth or serviette if you need to blow your nose
USING PROPS	• Be sure that everyone in your audience can clearly see what you are displaying • Make sure your presentation materials are neatly organized and attractive	• Do not leave your materials sitting in the dirt • Do not leave your materials free to bounce around in the vehicle

Preparing WHAT to say

Ensure that your message clearly explains how their choice to participate in the rhino tourism activity is helping you and your community value and thus protect the rhino.

Presentation Phase	Example Description
1. Introduce	Hello, my name is _____ and this is my colleague _____. Together, we work for _____ to look after our rhino. We have recently decided to combine our rhino monitoring work with tourism as a creative way to provide tourists a better chance of seeing our amazing desert rhino while also helping to fund our important work. We would like to take a few moments to share with you some of our knowledge and passion for our rhinos.
2. Explain	Here in Namibia, we are very proud of our rhinos and want to see them survive and continue growing. However, as you may know, rhinos are very rare and are being hunted by humans everyday across Africa to sell their horns to the black market for use in Asian Medicine. We want to see our rhinos alive but it costs money to protect rhino and make sure that the rest of the local community members see value in keeping rhino alive and safe.
3. Discuss	Thus, an important part of our approach to rhino conservation is strengthening local community support to help protect rhino. By finding ways to increase the value that we place on our rhinos is critical because we need to find the resources to help protect them

	and ensure that the land we set aside for rhino is earning income. We see tourism as a good way to sustain our monitoring work and help increase the value we locals place on our rhino.
4. Details	When we monitor our rhinos, we first begin our patrol and look for signs of rhino, for example footprints, dung or actually spotting them from the vehicle. We then approach them carefully on foot being careful not to disturb them to complete our ID Forms and record a photo for our long-term database. Today, we saw ____ . He/she is ___ years old. (explain some more information about the rhino – calves).
5. Wrap Up	So it has really been our pleasure to share our land and love for rhinos with you. We thank you for your support and wish you a safe and fulfilling rest of your journey in Namibia. We welcome you back and hope you will help share our story with your friends and family.
6. Q & A	Any questions?

TOPIC 6: Capturing, securing and reporting key information

Rhino monitoring data, security threats and rhino tourist profiles

Each day the rhino tracking activity occurs provides an opportunity to collect information on three key aspects of rhino conservation: (1) monitoring the rhinos, (2) monitoring human activity

in the area that might be suspicious or possible security threats, and (3) monitoring the background of the rhino tourists.

It is vital that this information is only provided to trusted individuals in MET, SRT or the Rhino Ranger Support Group

1. All rhino monitoring data will be collected by SRT or a senior member of the Rhino Ranger Support Group every 3 months (or possibly sooner). Never share your rhino ID book with anyone. How to collect this information should have been provided in the BASIC rhino monitoring training program.

2. Recording and reporting possibly security threats are also absolutely critical. Pay attention for signs of off-road driving, campfires in strange places especially near springs, any wire snares or drum-lid traps, and of course look out for any sign of carcasses (smell and circling vultures). Any rhino carcass should be reported immediately to MET or SRT.

3. Lastly, each rhino tracking team will be responsible for ensuring that tourists complete a rhino tourism indemnity form. This form will help release them/conservancy from any accident, should it occur, and will capture all the key bits of personal information for each tourist. This information will be collated by MET and recorded into a database as an archive of outside visitors, which may be useful should a rhino poaching event take place.

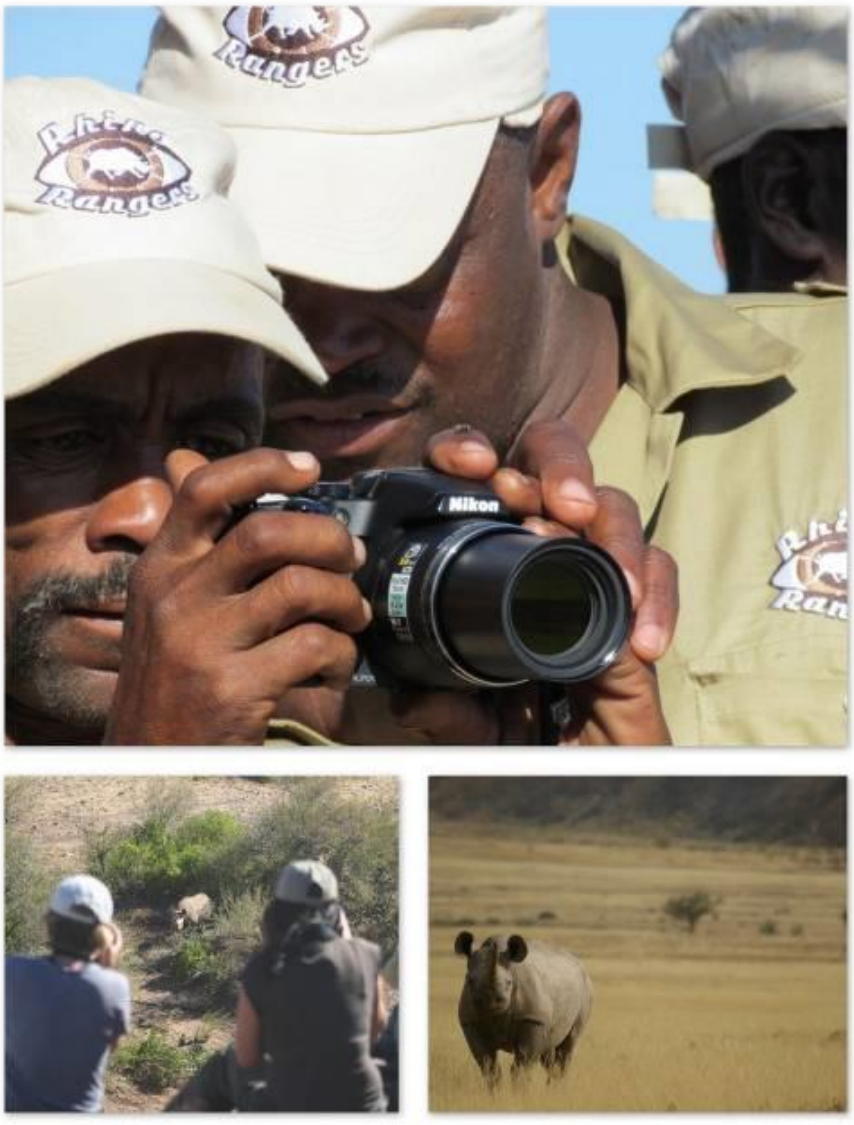
Appendix 3: Regional Rhino Tourism Expansion Concept Plan

Northwest Rhino Tourism Expansion Concept Plan

Ministry of Environment and Tourism (MET), Kunene

In partnership with
Communal Rhino Custodians, Save the Rhino Trust and the
Communal Rhino Custodian Support Group

DRAFT -- NOVEMBER 2014



Compiled by: Jeff Muntifering
with support by Minnesota Zoo (USA) & WWF-Namibia / MCA-Namibia

Background

The conservancies in the Kunene region have seen impressive recoveries of their wildlife populations over the past decade. With support from MET, NGOs and development partners there has also been increase in black rhino range in conservancies through the innovative Rhino Custodianship Programme.

Custodianship of black rhino brings costs for conservancies including increased protection measures and reduced or limited grazing access. To ensure that the current and future rhino rangelands are secure it is imperative that rhino should provide income-generating opportunities to off-set costs against management and other opportunity costs. There is an increasing demand from operators and tourists for rhino-based tourism products and there are a number of initiatives which are uncoordinated and which are not linked to the conservancy custodians.

This working document is the product of two consultative workshops between MET Kunene and Erongo regional staff and SRT senior staff held in Khorixas and Outjo in 2013. Comments were also received from MET Kunene Regional Office, MET chief scientist (national rhino coordinator) and the Rhino Custodianship Programme coordinator, and three Communal Rhino Custodian Chairmen (Sesfontein, Anabeb and Torra).

GOAL: To design and implement a rhino tourism expansion programme that supports the ecological, social and economic objectives set forth by Namibia's National Black Rhino Conservation Strategy that ensures quality rhino monitoring and security measures are sustained or improved, regulations are

in place that minimize disturbance, and new revenue streams from rhino reach the rhino custodians.

Opportunities

- Nature-based tourism in Kunene region remains stable or increasing
- Tourists are very willing to pay reasonable amounts to increase their chances of viewing a desert rhino under conservative viewing policies –accompanied by a trained local rhino tracker
- A new constituency of Rhino Custodian Rhino Rangers have been equipped, trained and motivated to conduct quality patrols in their respective areas (13 Communal Custodians / 26 local rangers)
- Linking the conservancy-based rhino ranger teams with tour operators that seek better opportunities to provide a desert rhino sighting to their clients on foot may provide a mechanism to (1) improve security by having more trained and equipped 'boots on the ground', (2) regulate tourism in key rhino areas thereby reducing poaching risks, (3) fund conservancy-level rhino monitoring to help fulfill custodian contracts with government, (4) create new revenue streams from rhino at the local-level
- Supporting local rhino custodians with expanded rhino tourism opportunities will help ensure rhino are secure and local community support for rhino conservation is maintained or enhanced.

Key Challenges

1. Ensure quality rhino monitoring is sustained
2. Ensure activities are regulated and disturbance is minimized
3. Ensure rhino security requirements are upheld
4. Ensure new revenue streams from rhino reach the local conservancy

Proposed Implementation Approach

Tourism is a double-edged sword and needs to be carefully planned, executed and regulated to maximize the positive gains and minimize the negative. In the absence of incentives and institutions to regulate activities, tourism could quickly become more harmful than helpful. Therefore, we seek to develop a regional rhino tourism strategy that aims to:

a. Establish guiding principles and protocols to address the Challenges (Annex 1)
b. Identify priority areas for rhino tourism expansion (Annex 2)
c. Develop a new Community-based Rhino Conservation Tourism model (Annex 3 and 4)
d. Promote a novel financial mechanism that effectively stores and distributes the new rhino revenue (Annex 5)
e. Identify the Conservancy Rhino Rangers and Support Group members (Annex 6)
f. Develop tools (e.g. profiling methods) to ensure tourist activity occurs within a security management system (Annex7)
g. Develop and provide accredited training in responsible Rhino Conservation Tourism (Annex 8)
h. Devise an Action Plan for Implementation (Annex 9)

ANNEX 1: Proposed Guiding Principles

1. Ensure quality rhino monitoring is sustained

a) All rhino tracking activities on foot will require that at least two trained (see below) local conservancy rhino rangers be present.

b) Any conservancy rhino rangers conducting rhino tourism should have received and passed, at a minimum, BASIC rhino monitoring training course

c) All tracking activities will be expected to produce a completed Rhino ID Form and photograph which will be presented to SRT for quality control and passed on to MET.

2. Ensure activities are regulated and disturbance is minimized

a) All tour guides and rhino trackers conducting rhino tourism should have received and passed a Rhino Conservation Tourism course

b) Only designated access points into rhino areas are to be used

c) Each new rhino tracking enterprise/activity will select ONE central booking agent to handle all bookings and payments (income from tourists and royalty payments to respective conservancy(s).

d) Only registered tourism operator vehicles will be allowed in the rhino area for tracking activities. All self-drive tourists will be required to book with registered booking agent.

e) Rotating the areas exposed to rhino tracking pressure will be encouraged to minimize disturbance while maximizing monitoring coverage.

f) Strict viewing protocols are adhered to that promote safety and minimal disturbance on rhino.

g) No permanent tourism infrastructure should be constructed within the rhino area(s)

3. Ensure security requirements are upheld

a) All tourism operators that sign agreements to participate in rhino tourism with rhino custodians will be encouraged to register with MET

b) All Guides and Trackers involved will be required by SRT to complete a confidentiality form.

c) All tourists participating in the rhino tourism activity will be required to complete an 'indemnity' form which will contain all relevant personal information.

d) A Rhino ID form and photograph must be completed and provided to SRT for each sighting for quality control before being passed on to MET

e) The management of all booking records, including the completion and provision of tourist indemnity forms to each respective rhino custodian, will be the responsibility of the designated booking agent(s)

f) All tourist indemnity forms will be entered into an electronic database by SRT/Rhino Ranger Support Group and forwarded to MET as per security requirements.

4. Ensure new revenue streams from rhino reach the local conservancy

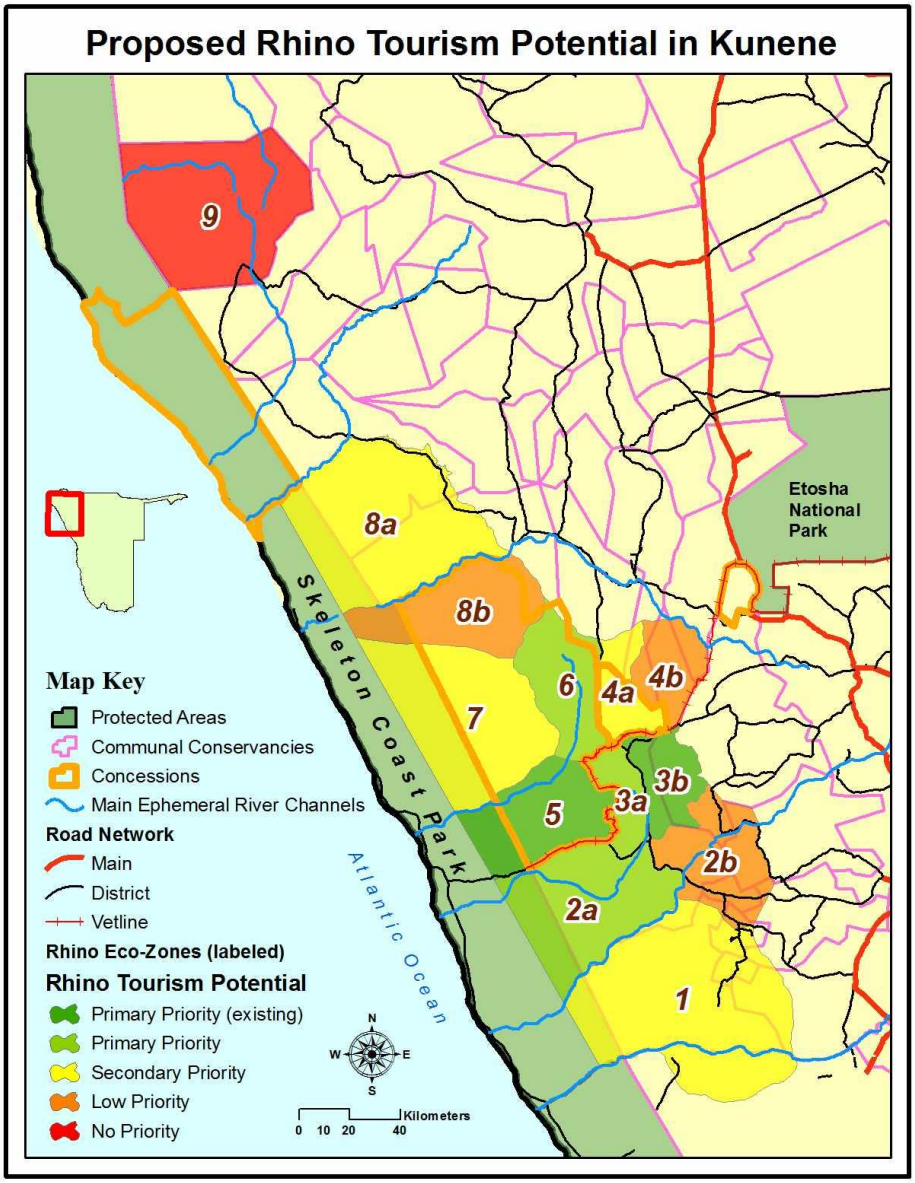
a) Each participating conservancy / rhino custodian (or cluster) shall select a business partner(s).

b) Each Communal Rhino Custodian wishing to conduct rhino tourism should approach a member of the CRCSG for assistance with facilitating a business plan and negotiating benefit sharing agreements with selected private sector operators

c) A fixed amount per tour/guest will be deposited by the booking agent into the conservancy's rhino royalty account for provision of the rhino tracking service.

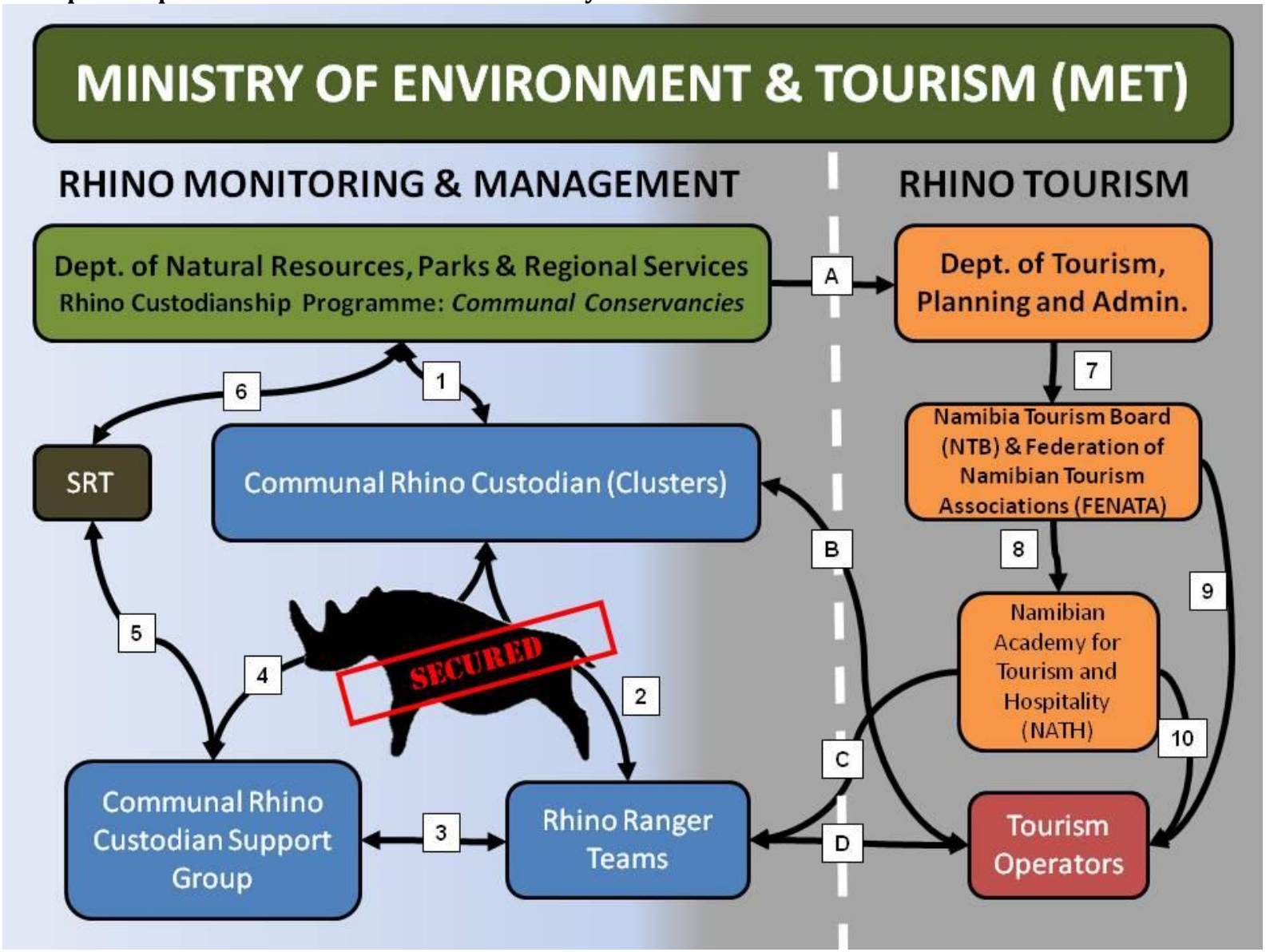
d) All bookings must be made through a single designated booking agent for each rhino tracking activity specified by the conservancy(s).

ANNEX 2: Priority Eco-Zones for Rhino Tourism Expansion. Specific areas within selected eco-zones will be demarcated and specified in Custodian Rhino Tourism Plans.



ECO-ZONE	PRIORITY LEVEL	CONSERVANCY(s)
2a, 3a, 6	Primary	Big 3 (Torra, Anabeb and Sesfontein)
1	Secondary	Puros
8a	Secondary	Doro !Nawas, Uibasen
4a	Secondary	Etendeka Concession, Omatendeka
7	Secondary	Palmwag Concession

ANNEX 3: Proposed operational framework for community-based rhino conservation tourism model

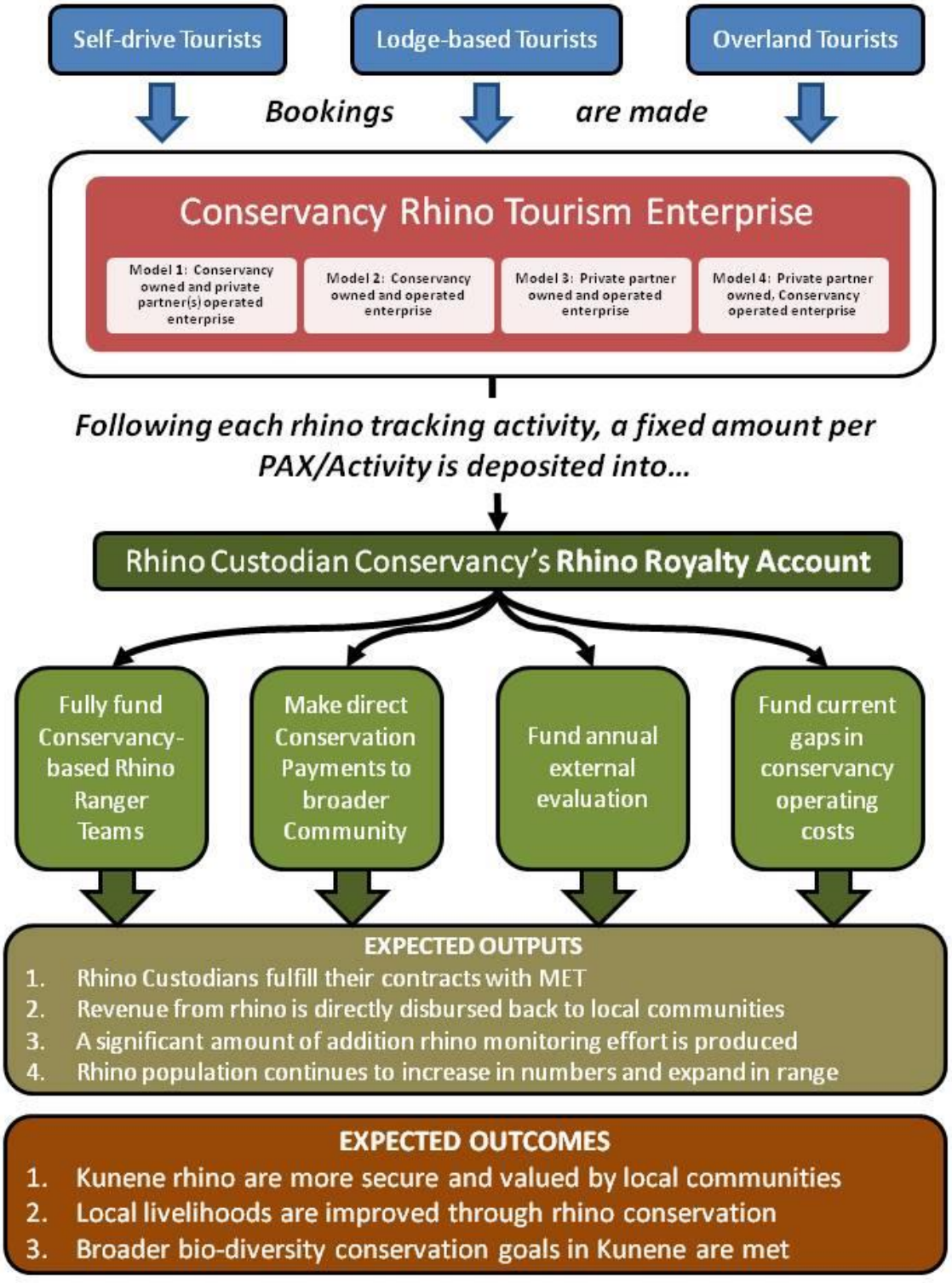


ANNEX 4: Community-based Rhino Conservation Tourism Operational Framework -- description

Map ID		Engagement	Description
1	RHINO MONITORING AND MANAGEMENT	MET Rhino Custodianship Programme - Communal Rhino Custodians	MET's Rhino Custdodianship Programme maintain contracts with Communal Conservancies that have chosen to become registered as 'Rhino Custodians'
2		Communal Rhino Custodians – Rhino Ranger Teams	Registered Communal Rhino Custodians maintain teams of 2-3 trained and equipped staff (see Appendix 5 – Rhino Ranger Contact Card) to serve as 'Rhino Rangers' – situated within the conservancy system as Conservancy Game Guards with 'specialist' skills
3		Rhino Ranger Teams – Communal Rhino Custodian Support Group (CRCSG)	Rhino Ranger Teams continue to receive support from the Communal Rhino Custodian Support Group (CRCSG) – a consortium of local organizations/agencies/companies that provide logistical, financial and training support aligned with and accountable to MET's Rhino Custodianship Programme. The CRCSG also ensures all rhino monitoring information collected by Rhino Ranger Teams is collated, secured and managed properly.
4		CRCSG – Communal Rhino Custodians	CRCSG continue to provide institutional support to Rhino Custodians including technical assistance in rhino tourism development and ensuring that Rhino Ranger results are being communicated effectively.
5		CRCSG – Save the Rhino Trust (SRT)	CRCSG deliver Rhino Ranger monitoring data to Save the Rhino Trust for quality control and bonus scoring as per SRT's MoU with MET.
6		SRT – MET / Rhino Custodianship Programme	SRT deliver Rhino Ranger monitoring information to MET as per data management protocol and MoU with MET

			including Quarterly Summary Reports for each Communal Rhino Custodian to Rhino Custodianship Manager.
7	**RHINO TOURISM**	MET Directorate of Tourism – Namibian Tourism Board (NTB) & Federation of Namibian Tourism Association (FENATA)	MET Directorate of Tourism discuss possible accreditation and/or endorsement for registered JV Rhino Tourism Enterprises/Activities that exhibit willingness to comply with new Community-based Rhino Tourism enterprises with NTB & FENATA
8		NTB – Namibian Academy for Tourism and Hospitality (NATH)	NTB & FENATA endorse new Rhino Conservation Tourism training curricula that NATH may accredit
9		NTB/FENATA – Tourism Operators	NTB & FENATA endorse JV Rhino Tourism Enterprises/Activities that demonstrate a willingness to comply with new responsible rhino tourism regulations and register with MET.
10 & D	**LINKED RHINO MONITORING & TOURISM**	NATH – Rhino Ranger Teams & Tour Guides	NATH endorse training courses to Rhino Ranger teams and Tour Guides in Rhino Conservation Tourism
A		MET Rhino Custodianship Programme – Directorate of Tourism	MET Rhino Custodianship Programme discuss principles of 'responsible rhino tourism' and compliance mechanisms for expanded rhino tourism with Directorate of Tourism
B		Tourism Operators – Communal Rhino Custodians	Communal Rhino Custodians develop business plans with selected private sector partners (using CRCSG to assist with facilitation and negoatiation).
C		Tourism Operators – Rhino Ranger Teams	Tourism operators begin working directly with partner Rhino Ranger teams through their respective Booking Agent.

ANNEX 5: A proposed Rhino Royalty Institution for ensuring new revenue from rhino tourism is appropriately channeled back into conservancy operations that support rhino monitoring and broader community development projects



ANNEX 6: RHINO RANGER CONTACT CARD

RHINO RANGER INCENTIVE PROGRAM			
COMMUNAL RHINO CUSTODIAN SUPPORT GROUP			
Name	**Affiliation**	**Town/Village**	**Cell**
Simson Uri-Khob	SRT	Khorixas / Palmwag	081-230-4052
Lesley Karutjaiva	SRT	Palmwag	081-315-1117
Sebulon Hoeb	SRT	Wereldsend	081-691-1672
Boas Hambo	CRCSG	Swakopmund / Wereldsend	081-627-0982
Jeff Muntifering	MN Zoo / SRT	Swakopmund / Wereldsend	081-312-2738
RHINO RANGERS			
Karl So-orbeb	Doro !Nawas	Morewag Pos	081-4343758
Piet Oeamseb	Doro !Nawas	Oas Pos	
Titus Hango	Uibasen	Twyfelfontein Louw Inn	081-3193117
Ellias Tourib	Uibasen	Twyfelfontein Louw Inn	081-7269315
August Areseb	Huab	Hart Pos	081-7821639
Hans !Haoseb	Huab	Hart Pos	
Albertus Simon	Torra	Vrede	
Ricky Beukes	Torra	Bergsig	081-8022485
Wanted Musaso	Anabeb	Warmquelle	
Christo Ganuseb	Anabeb	Khowarib	081-8085234
Theo Hawachab	Sesfontein	Sesfontein	081-8533984
Bethuel Kasaona	Sesfontein	Ganamub	081-8533984
Sandika Ngakuzevi	Omatendeka	Ondevete	
Kangombe Ngeripurue	Omatendeka	Omuramba	081-8292596
Sackey Utjavari	Ehirovipuka	Otjokavare	081-4357022
Kavatu Matarakuani	Ehirovipuka	Ombaweyeyo	
Chips Tjambiru	Puros	Puros	081-8046918
Ruddy Kasaona	Puros	Puros	081-6964401

ANNEX 7: Draft tourist indemnity form that may be incorporated into a security profiling system

CONSERVANCY RHINO TOURISM INDEMNITY FORM

Please complete the information requested below and be sure to sign and date the bottom. Your information will remain confidential

FULL NAME
CITIZENSHIP
PASSPORT NUMBER
DATE OF BIRTH
COUNTRY OF CURRENT RESIDENCE
CONTACT PHONE NUMBER / EMERGENCY PHONE NUMBER
EMAIL (OPTIONAL)

In seeking to participate on a RHINO TRACKING tour conducted in partnership with _____ Conservancy, I hereby warrant and acknowledge;

- that my general health is good and there is nothing which renders me unfit to undertake a tour
- that I understand and appreciate fully the fact that there may well be risks, hazards and dangers involved to which I would be subjected, more particularly;
    - that there will not always be protection in the form of fences, buildings and vehicles in which to take cover, and that exposure to one or more of the following potentially dangerous animals, such as lion, elephant, hyena, rhinoceros, leopard, as well as poisonous snakes, scorpions, spiders, insects and plants and other natural hazards may occur whilst on tour;
    - that I am aware of the potential dangers of exposure to the sun - directly or indirectly - and that serious sunburn may result from unprotected exposure
    - that I am aware of the potential hazards of the rough, rocky terrain in which we may be hiking across
    - I accept your 'standard conditions of contract' and I voluntarily assume the risk inherent in taking part in such a tour and I, together with my heirs, executors and administrators hereby release the above said Conservancy, its officers, servants, agents and representatives, from any duty or care towards me, in connection with my participation in any tour, and from liability from all or any claims that could accrue to me or my heirs, executors and administrators arising out of my participation in the tour or in any related activities irrespective of whether such claim or claims arose through the negligence of any person, or from any of the risks, dangers or hazards inherent in an African tour, or of any loss of, or damage to, any property from any cause whatsoever and I further indemnify and hold harmless associated persons against any claims howsoever the same may arise.

SIGNATURE DATE

ANNEX 8: Draft outline for Rhino Conservation Tourism training course

RHINO CONSERVATION TOURISM

Training Course Outline: objectives & competencies

Objectives: People who receive training in this module will gain knowledge on:	1. The rhino conservation story: what threatens their survival and what can be done to help save them 2. The pros and cons of rhino tourism as a conservation tool 3. Rhino biology and behavior in a monitoring and tourism context 4. How to plan and execute linked rhino monitoring and tourism activities successfully 5. (Optional) How to provide a professional oral presentation to a tourist group
Competencies: People who receive training in this module will be able to:	6. Provide a short yet sound overview of the threats facing Africa's rhino and what strategies are being used to help protect them, with a special focus on the historical and present situation in Namibia 7. Communicate why and how a thorough understanding of rhino biology and behavior can help improve both rhino protection and the sustainability of the tourism enterprise(s) 8. Develop successful co-management practices for rhino-based tourism activities within your operating area / conservancy 9. Comprehend the critical factors that lead to a successful rhino tracking excursion including (a) the collection of good rhino monitoring data, (b) ensuring tourists are safe and satisfied, and (c) minimizing rhino disturbance 10. Accurately observe, record, secure and report on basic rhino monitoring information and security threats 11. Provide a professional, accurate and informative speech concerning rhino conservation issues and the importance of tourism as a conservation tool.
This Module is intended for:	Conservancy Rhino Rangers, Tour Guides (especially those planning to conduct rhino tracking with conservancy rhino ranger teams)
Duration:	5 Days (2 days classroom), (3 days practical)

The training of this module will generally follow this schedule:

TOPIC 1	Key Issues in Rhino Conservation
TOPIC 2	Rhino tourism as a conservation tool

TOPIC 3	A primer on rhino biology and behavior in a linked monitoring and tourism context
TOPIC 4	Planning responsible rhino conservation tourism
TOPIC 5	Practicing responsible rhino conservation tourism
TOPIC 6	Capturing, securing and reporting rhino monitoring data, security threats and tourism figures
TOPIC 7 (optional)	Providing the Conservation Message: a primer in public speaking

Prerequisites

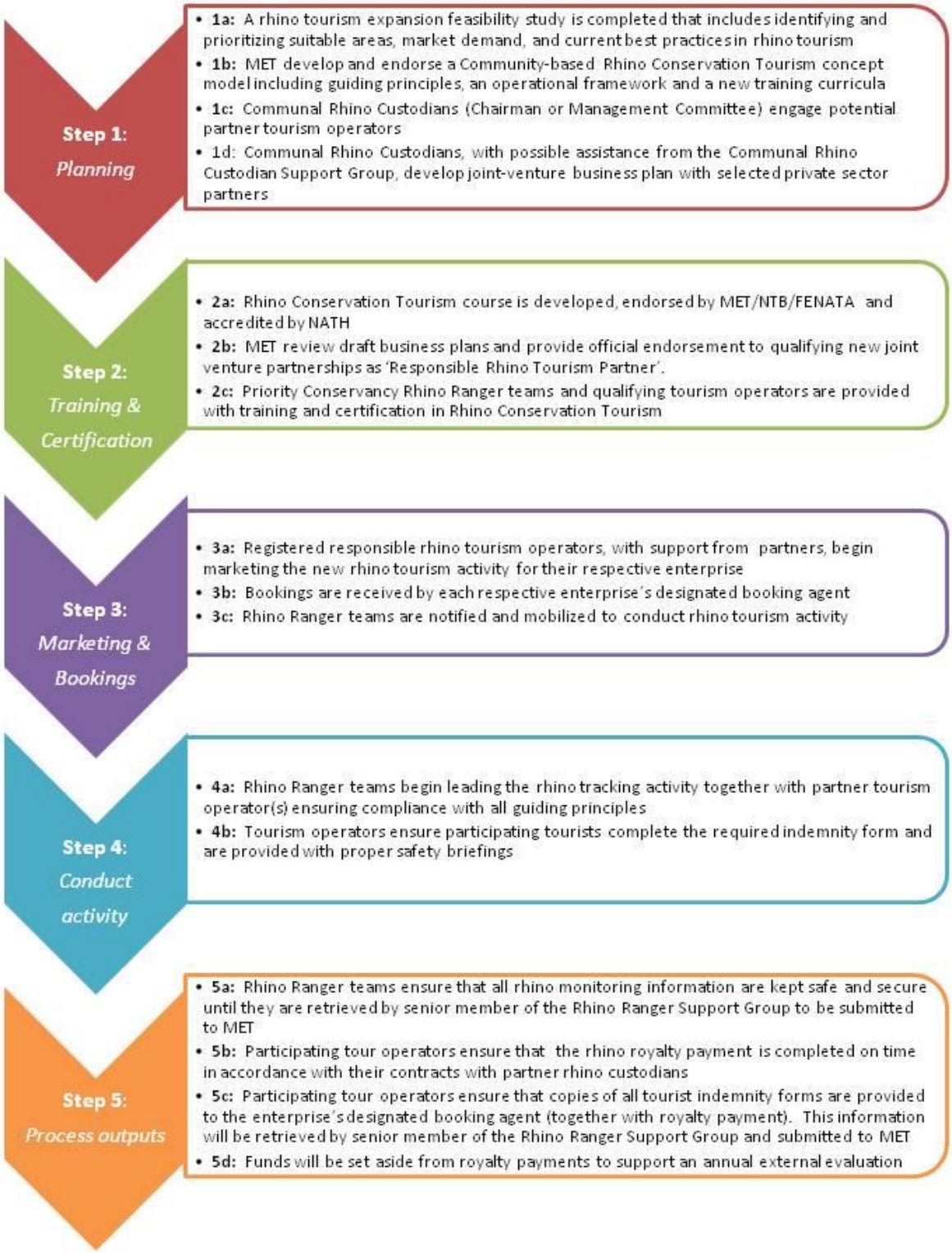
- Either a BASIC Rhino Monitoring course (offered by Save the Rhino Trust in accordance with the IUCN SSC African Rhino Specialist Group's training course for field rangers).
- Or a minimum of the following National Unit standards:
  - 170 Health and Safety
  - 171 Work with Colleagues
  - 174 Customer care
  - 1202 Prepare for short tours
  - 1205 Conduct Short tours
  - 2017 Awareness of Environment

Participants will be evaluated by:

- Completing a written/oral examination
- The oral delivery of both a rhino conservation message and safety issues
- Completing a practical examination including a number of scenarios that include demonstrating proficiency in comprehending and performing the 'best practice' guidelines

Note: the overall purpose of this course is to highlight the theory and practice of how rhino monitoring and tourism can be linked for the benefit of rhino conservation and indirectly lead to community empowerment and rural development through non-consumptive use of rhino. It is NOT in the scope of this course to train participants on rhino tracking, tourism hospitality / general guiding, or tourism enterprise development. Finally, although course content has largely been developed through roughly 10 years of research and experience in Namibia's northwest communal areas and the resident west Kunene rhinos, we feel many of the concepts and practices developed and promoted in this course is arguably transferable to different rhino locations in Namibia.

ANNEX 9: Action Plan for Implementation



Appendix 4: Recent anonymous tourist review of DRC posted on Trip Adviser [6]

"No.1 on our Bucket List"

Reviewed April 29, 2016

Everything about our 3 night stay at Desert Rhino Camp was wonderful and far exceeded our expectations. As we were arriving by road, we had arranged to leave our 2-wheel-drive vehicle at Palmwag and were collected by Jeff (who was to be our guide for the duration of our stay) in a Lodge 4x4. We were then treated to an entertaining and informative 2 hour drive in to the Lodge itself, with some game-viewing en-route and, on arrival at our destination were met with a song of welcome to the camp by the Desert Rhino staff and moist towels to refresh ourselves after the drive. Whilst we were 'checked-in' by Future (who is both charming & efficient) Jeff delivered the luggage to our luxury tent (the ultimate in 'glamping') and then checked through all the facilities with us to make sure that everything was in working order.

With an hour to freshen up we were raring to go on our first official game-drive - following a sumptuous afternoon tea in the main tent. A party of 6 American tourists were in the care of Boris - the other guide on duty - and between Boris & Jeff, who interacted and shared sightings for both parties/vehicles, our three day stay was in expert hands.

Our return to the camp after our afternoon/evening game drive (including sundowner drinks) was again met with moist towels to freshen up, followed by pre-dinner drinks and a sumptuous dinner set up around a campfire ..... with a party of hyaena observing proceedings from a safe distance. We were also briefed on the rules and safety regulations of rhino tracking ahead of the next morning's adventure, and reassured that our guide and the trackers would keep us safe.

Rhino tracking requires an early start ... woken by Jeff at 04h30, collected for breakfast at 05h00 and departing in search of Rhino at 05h30. The trackers are absolutely incredible - they set out an hour or so ahead of the guides & guests in the pitch dark of pre-dawn on their daily quest to track, find and monitor the rhino population in their area. The concession is divided up into 4 zones and a different zone is visited/checked each day in order to minimise human impact on their environment. The ideal is to see/monitor and record sightings of rhino in the selected zone without the rhino being aware of human presence - so strict adherence to the guide's safety instructions is

[6] Retrieved August 7, 2016 at https://www.tripadvisor.com/ShowUserReviews-g479220-d531265-r368687179-Wilderness_Safaris_Desert_Rhino_Camp-Damaraland_Otjozondjupa_Region.html#CHECK_RATES_CONT

imperative.

As we had a 3 night stay we were privileged to experience 2 mornings of rhino tracking - finding no less than 5 on our first morning and 1 on the second. Both days' sightings, in different zones, were, in equal measure, thrilling and exhilarating and, happily, our combined group managed to view, photograph and safely exit our sightings without the rhino having been alerted to our presence.

The morning's rhino tracking (which can involve a lengthy 'appetite-building' walk) is followed by a game drive and delicious bush lunch - set up by the trackers - after which the trackers give an interesting interactive presentation explaining the conservation and data recording procedures. In addition to the rhino, the trackers found us 4 lions early in the morning of day 2 - en route to our 'rhino of the day'. We didn't find any desert elephants on this visit as they had followed the rains and left the area in search of better food & water resources, so we have a good excuse to return to find them on a future visit.

It was extremely hot at the time of our visit (with temperatures well in excess of 40 degrees celsius) and Chambers - in his role as Camp Manager & Master of Ceremonies - was conscientious about ensuring that everyone kept well hydrated (even when the freezer couldn't cope with the searing heat and was unable to form ice). Chambers also does a fine job of orchestrating catering (which is of a very high calibre - especially when you consider how remotely located this camp is).

Everything about Desert Rhino Camp - the well-trained and top quality staff, the cuisine, extremely comfortable accommodations, spectacular environment and, of course, their obvious passion for the endangered rhino entrusted to their care & protection - is of the highest calibre.

We were sad to leave – with the notes of a farewell song to send us on our way – and hope to return soon.

Photographic Illustrations from DRC

Photo 1: The on-the-ground partnership and teamwork is key to deliver sustainable and effective rhinoceros conservation tourism (photo credit: David John Webber). [7]

[7] Pictured (from left to right): SRT lead tracker, Martin Nawaseb; SRT tracker Abner Nosob; WS Guide Nestor Nghuuduka; Minnesota Zoo Conservation Biologist and SRT Science Adviser Jeff Muntifering; SRT Tracker Pehi Nduimeua.

Photo 2: Tourists photograph a wild black rhinoceros while the SRT tracking team alongside WS guide completes their monitoring work (photo credit: Minnesota Zoo / SRT)

Photo 3: An SRT tracker provides a lunchtime presentation on the threats facing rhinoceros and their efforts to combat poach at DRC (photo credit: Minnesota Zoo / SRT)

Photo 4: Five Conservancy Rhino Rangers in-training watch and learn about rhinoceros conservation tourism from the SRT team at DRC. Over the past year, two new Rhino Ranger-led tourism activities have been initiated based on the model developed at DRC (photo credit: Minnesota Zoo / SRT)

Photo 5: A desert-adapted black rhinoceros photographed by the team at DRC (photo credit: SRT)