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# Understanding South African private landowner decisions to manage rhinoceroses

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## ABSTRACT

With increased poaching pressures, rhinoceroses have become a financial liability due to expensive anti-poaching security costs required to protect this species. Nonetheless, approximately one-third of South Africa's rhinoceros population is protected on private lands. In a time when the future existence of rhinoceroses is uncertain, it is important to determine (a) the considerations included in private sector decisions to participate in rhinoceros conservation and (b) how increased conservation of rhinoceroses on private lands may be attained. We conducted semi-structured interviews with private wildlife ranchers and reserve managers in South Africa to answer these questions. Respondents cataloged financial (e.g., security costs, tourism revenues) and nonfinancial (e.g., psychological stresses, emotional attachment) factors that influence their decisions to keep rhinoceroses on their lands. Despite significant costs of rhinoceros ownership, rhinoceros owners were willing to engage in conservation efforts because of the nonfinancial benefits they derive from protecting rhinoceroses.



## KEYWORDS

financial and nonfinancial motivations; interviews; poaching; qualitative analysis; wildlife conservation

## Introduction

The continued existence of black (*Diceros bicornis*) and white (*Ceratotherium simum*) rhinoceroses (hereafter referred to as “rhinos”) in Africa is threatened by commercial poaching for their horns (Collins, Fraser, & Snowball, 2016). South Africa is critical to rhino conservation because it is home to over 80% of the world's rhino population (Saayman & Saayman, 2016). Although most rhino conservation takes place within national and provincial parks (Saayman & Saayman, 2016), only 5% of the land in South Africa is publicly protected (Cousins, Sadler, & Evans, 2008). By contrast, 80% of land is privately owned (Cousins et al., 2008), and these private lands are increasingly important to rhino conservation in South Africa. Recent estimates suggest that approximately 33% of the country's rhino population is privately owned (Rademeyer, 2016).

Rhino management by South African landowners occurs within the context of private ownership of wildlife – commonly referred to as the sustainable use approach to wildlife conservation (see Kabiri & Child, 2014). Private landowners in South Africa (hereafter referred to as “game ranchers” or “ranchers”) who comply with government regulations (e.g., fencing their property) own the wildlife on their land and may utilize this wildlife throughout the year to generate income, such as through hunting and photographic

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tourism (Pienaar, Rubino, Saayman, & Van Der Merwe, 2017). Private ownership of wildlife generates a direct financial incentive for ranchers to manage and conserve wildlife on their land, hence the designation of the South African approach to wildlife management as a sustainable use model. This market-based approach to wildlife management has been credited with increasing game populations and the amount of land allocated to wildlife management in South Africa (Child, 2012; Pienaar et al., 2017).

Prior to significant poaching pressures that began in 2008 (Rademeyer, 2016), income streams available from rhinos (photographic tourism, hunting, and live sales) were sufficient to generate profits for ranchers from owning rhinos, which in turn provided a clear financial incentive to own rhinos. However, escalating poaching efforts have increased the anti-poaching security (hereafter, “security”) costs associated with owning rhinos. Debut (2016) estimated that security costs have reached as high as \$170,000 per month for some ranchers. Without a commensurate increase in the revenues to be earned from rhinos, rising security costs will reduce or eliminate the financial returns from rhino ownership (Child, 2012). This poses a threat to rhino conservation because ranchers can remove rhinos from their lands if the costs of rhino ownership become excessive (Collins et al., 2016). Rhino conservation on public lands is expected to continue, despite relatively higher poaching pressures compared to private lands (Rademeyer, 2016), because conservation on these lands is government-mandated. However, the facts remain that (a) public lands only account for a small percentage of the total land area of South Africa and (b) private lands provide important habitat for the rhino.

Given that South Africa’s model of wildlife management is largely profit-driven, it would be reasonable to expect that the significant costs associated with rhino ownership would result in ranchers removing rhinos from their land. In fact, evidence suggests that the number of ranchers engaging in rhino conservation is declining (CITES Management Authority, 2016). As of 2016, it was estimated that 70 of 400 South African private rhino owners had removed rhinos from their lands. This represented a loss of approximately 200,000 ha of privately owned habitat (CITES Management Authority, 2016).

Nonetheless, despite the substantial costs associated with owning rhinos, approximately 83% of private landowners have retained their rhino herds (CITES Management Authority, 2016). In a system where wildlife conservation is driven by financial returns, this decision to keep rhinos appears irrational. The seeming irrationality of this decision is further highlighted when the nonfinancial costs of rhino ownership are factored into rancher decisions to keep rhinos. Recent research has demonstrated that the militarization of rhino conservation places park rangers in physical danger and also results in adverse psychological and social effects induced by war-like conditions (Annecke & Masubelele, 2016; Buscher & Ramutsindela, 2015; Duffy, 2014; Humphreys & Smith, 2014; Lunstrum, 2014; Neme, 2014). Rhino conservation may also force the reallocation of finances, labor, and resources from other important conservation activities (Annecke & Masubelele, 2016; Buscher & Ramutsindela, 2015; Humphreys & Smith, 2014), which may have long-term, detrimental impacts for both wildlife and habitat conservation on private and public lands. Why then do ranchers in South Africa continue to own rhinos?

One possible explanation is that ranchers anticipate future profits from the sale of rhino horn (i.e., ranchers may have speculated on the removal of CITES and domestic trade bans). Indeed, in April 2017, domestic commercial trade of rhino horn within South Africa was legalized for the first time since 2009. There are plans to establish a national

trading desk and depository to facilitate regulated horn trade (Jones, 2017). Although representatives for the game ranching community have been largely supportive of legalizing the trade in rhino horn, it is unclear to what degree domestic trade will benefit rhino owners. Given that Asian consumers chiefly drive demand for horn (Collins et al., 2016), legalizing only domestic horn trade may not provide sufficient revenue to offset security costs for rhino owners. With domestic trade in its infancy, rhinos are likely to remain a financial liability for the foreseeable future.

Given the uncertainties associated with rhino ownership, continued private ownership of rhinos suggests that South African game ranchers' decision-making is not purely financial. As part of the "Big 5," rhinos are often associated with tourist satisfaction (Maciejewski & Kerley, 2014), which should translate into tourism-based financial returns from owning rhinos. However, the environmental sociology and psychology literatures provide insights into important nonfinancial motivations that may be driving rhino ownership. For example, rancher decisions to keep rhinos on their land may be driven by their level of environmental knowledge or concern, the behavioral and physical characteristics of rhinos, their past and present interactions with rhinos (Kotchen & Reiling, 2000; Martin-Lopez, Montes, & Benayas, 2007; Schultz, 2000), or an emotional attachment to rhinos, such as in the theory of emotional affinity (Kals, Schumacher, & Montada, 1999) and attachment theory (Archer, 1997; Sable, 1995). Alternatively, ranchers may feel a moral obligation to contribute to rhino conservation, as posited by Schwartz's (1977) norm-activation model. Specifically, ranchers may recognize that action must be taken to conserve rhinos (awareness of need) or may consider themselves responsible for engaging in rhino conservation (awareness of responsibility).

Using the environmental economics, sociology, and psychology literatures, we sought to explore the financial and nonfinancial considerations that game ranchers include in their decisions to own rhinos. Using the economics constructs of utility (an individual's level of satisfaction from engaging in an action) and cost-benefit analysis, we framed rancher decisions to own rhinos as an example of utility maximization (Hanley & Shogren, 2005), rather than profit maximization. This framing allowed us to investigate both financial (e.g., security costs) and nonfinancial (e.g., emotional attachment) costs and benefits associated with rhino ownership. To investigate these considerations, we conducted semi-structured interviews with rhino owners and managers in South Africa in 2015 and 2016.

## Methods

### *Data collection*

Qualitative research methods were utilized because they allow researchers to capture experiences and perspectives, which are often too abstract to be measured quantitatively (Berg, 2001). Semi-structured interviews were used for eliciting information that respondents identified as important (Bryman, 2001). Semi-structured interviews use initial, predetermined questions to elicit information, but also allow respondents to introduce new material, providing further insights and encouraging the exploration of additional topics (Berg, 2001; Bryman, 2001).

We conducted 19 interviews in total. All interviews were conducted in English, audio recorded, and transcribed, with each interview averaging over 65 minutes. Fourteen respondents were owners of private game ranches, meaning that they own the wildlife on their land

and manage their properties to generate wildlife-based income. These ranchers primarily engaged in the game breeding, trophy hunting, and biltong (game meat) hunting of various species, although a subset of ranchers also engaged in ecotourism. The remaining five respondents were managers of privately owned reserves that border Kruger National Park. These reserves form part of the Associated Private Nature Reserves and, as such, are governed by certain rules regarding how wildlife and habitat are managed.

The interviews were conducted in two distinct sets: 9 interviews were completed in July and August of 2015, and 10 interviews were completed in October and November of 2016. Data from both sets of interviews were used in our analysis. The first set of interviews (2015), which were conducted by both authors, was part of a larger study on management activities by South African game ranchers. The interviews were guided by broad questions regarding ranchers' wildlife and land management activities (e.g., do you have a management plan for any of the species on your ranch?). These interviews were not specific to rhino ownership, but respondents organically raised the issue of rhinos, including different ways rhino ownership affected their ranch management, finances, and families. These respondents were derived from a random sample of Wildlife Ranching South Africa members.

Respondents for our second set of interviews (2016), conducted by the first author, were identified using referral-based (i.e., snowball) sampling from the first set of respondents. Referral-based sampling utilizes personal connections to reach new respondents, and is well suited to researching sensitive topics (Biernacki & Waldorf, 1981). This method was appropriate because ranchers may be reluctant to share that they have rhinos with unknown researchers for fear of poachers gaining this information (Wright, Cundill, & Biggs, 2016). These interviews were guided by questions specific to the challenges and motivations of rhino ownership (e.g., why do you continue to keep rhinos on your property?).

### **Data analysis**

We independently analyzed transcripts from the first set of interviews. We both independently identified themes and categories (e.g., “dehorning,” “poaching problems”) that emerged and checked how we reached these findings as a form of verification (Berg, 2001). We then compared and discussed these initial findings to confirm that they were consistent, an intercoder reliability check suggested by Berg (2001).

After this initial data analysis, we refined our interview questions for the second set of interviews. These questions were specific to rhino ownership and were meant to further investigate key concepts that arose during the first set of interviews. The same coding scheme from the first set of interviews was applied to the second set of interviews, although additions were made as necessary to account for new information. Data collection ended after 19 interviews when saturation of concepts that arose from both sets of interviews was reached, which is consistent with findings that the frequency of new concepts and results diminish after approximately 20 interviews (Tashakkori & Teddlie, 2003).

### **Results**

Respondents confirmed that they factor both financial and nonfinancial costs and benefits into their decision to own rhinos. All respondents noted that, although the financial costs

of rhino ownership exceeded financial returns, the sum of all (financial and nonfinancial) benefits from owning rhinos were sufficient to offset the various costs of rhino ownership. Direct quotes from respondents are used for supporting important findings.

### **Financial costs: Security costs**

Our interviews with rhino owners and reserve managers suggest that security costs vary across ranches and reserves, depending on the size of the property and how much owners are willing or able to invest in security measures. Most private ranchers who were interviewed estimated their monthly security costs to be between ZAR 20,000 and ZAR 50,000 (2017 USD \$1500–3700), with one large rhino breeder spending ZAR 3 million (~\$227,000) per month on security. Reserve managers in our study were not willing to share exact amounts, but they all indicated that security costs account for 30–60% of their budgets. As one respondent noted, “There is no wildlife reserve in the world where the amount of money spent on rhino protection is financially sustainable.”

Nearly all respondents indicated their main security expense was paying for the salaries and accommodations of around-the-clock security teams with the appropriate training and firearms experience to prevent poaching. According to respondents, rhino security is almost exclusively conducted by armed guards with extensive firearms training who are expensive to employ. Some ranchers in our study contracted with external security companies because it simplified the process for them. Others preferred internal security teams because they trust their own employees and believe that hiring external companies leads to information leaks and increased threats of poaching. Other respondents used a combination of internal and external security teams as a way of “one jackal watching the other.” Liability insurance associated with having armed personnel on the property (e.g., in the case of firearm fights with poachers) was a related security expense. Ranchers with internal security teams paid their own insurance fees, whereas those with external teams stated that these fees are built into the security contracts.

Most respondents also noted that fencing costs may be extremely expensive if the perimeter of the ranch is very long or if fences are electrified (which is more effective at deterring poachers from entering the ranch). All respondents checked their fences at least daily because fences are the first line of defense against poachers. Respondents used cameras to monitor their fences, and they stated that high-tech equipment was a major expense of rhino ownership. Respondents also paid for the following equipment as part of their security expenses: vehicles and fuel, firearms, cameras and spotlights for in the bush and on roads, radio collars and GPS tags for rhinos, and night vision goggles and night sights for rifles. Many respondents paid for verifiable intelligence about potential poaching threats. It was noted this can be expensive, depending on how often they were contacted by informants.

However, as respondents noted, the one benefit of such intensive security efforts is that snare poaching, or poaching by locals for bush meat, is virtually eliminated. As one respondent said, “If someone claims they are protecting rhinos on their land, but they are having a problem with snare poaching, then they definitely have a problem.”

Despite these anti-poaching efforts, nearly every respondent had at least one of their rhinos poached since 2008. Respondents who did not experience significant poaching attributed it to the fact that their property is isolated from major roads, there are minimal access points to the property, and/or that the property is surrounded by other ranches. One rancher explained his poaching problems are because his property is adjacent to a main highway and there is a cell tower on the property, which provides easy access to his property and communication by poachers when on his ranch.

### ***Financial costs: Managing rhinos***

At the time of the second set of interviews, South Africa was suffering from a drought, so supplemental feed costs were substantial for all respondents except for the managers of a few large reserves. Even in non-drought years, many ranchers in our study said that they engage in supplemental feeding because they keep their rhinos in smaller camps,<sup>1</sup> rather than letting them roam across the ranch. The choice to keep rhinos in these smaller camps was motivated by the fact that high-level security is more cost-effective for a single camp than for the entire property. However, smaller camps may not provide sufficient feed to support the rhinos, and so supplemental feeding is necessary to maintain the rhinos and habitat in the camps.

There was no clear consensus regarding dehorning costs. All respondents with smaller ranches (<1000 ha) considered dehorning costs to be substantial, but most respondents with larger operations (>2000 ha) considered dehorning costs insignificant compared to security and supplemental feed costs. Based on information provided by respondents, there are economies of scale associated with dehorning, such that dehorning more rhinos per event reduces the cost per rhino. According to respondents, the two major dehorning expenses are (a) the cost of the veterinarian and (b) the cost of hiring a helicopter and pilot, to locate the rhinos in the bush so the veterinarian can tranquilize the animals using a dart gun. Both veterinarians and helicopter pilots are paid by the hour. Respondents also pointed out that they must pay for the indefinite storage of the horn offsite because the sale of horn was not legal. Many respondents used banks to store horns, although one respondent noted that fewer banks are willing to take on this responsibility because of the security risks involved. Most ranchers and managers we interviewed engaged in dehorning, although a few respondents admitted they do not like the practice for aesthetic reasons. One rancher explained that before he began dehorning, he was able to offer rhino hunting, but because hunters do not want a rhino without a horn, he is no longer able to benefit from that income stream.

Purchasing insurance on individual rhinos is an available option for owners. However, only one rancher we interviewed bought annual insurance for his individual animals, and another rancher buys insurance for when he transports rhinos. Several respondents indicated that rather than paying high insurance premiums, they choose not to insure their rhinos and instead allocate that money to security costs. Given these multiple costs of rhino ownership, respondents frequently described their rhinos as a “financial liability” or

the cause of “economic strain.” For example, “[Expenses are] always in the back of my mind because if I sell [my rhinos] the farm won’t have all these problems, we can go on profitably ... Rhinos are crippling us.”

### ***Tradeoffs and opportunity costs***

Nearly all respondents said that they routinely sacrifice funding for other land management and business activities to pay for their rhino-related costs. Examples included less spending on burning programs, fence maintenance, and marketing for their businesses, as well as monitoring and research programs on larger reserves. Example quotes included:

On a financial side, having rhinos ... I’ve never been in such a bad financial situation as I am now because every single cent that I have goes to the rhinos. And if I have a few extra bucks at the end of the month, I buy a [trail] camera.

I was supposed to start growing lucerne. I just haven’t had enough money to buy the seeds. We had to redo the piping in one section of the farm. There hasn’t been enough money to do it.

A few ranchers in our study stated they have made financial sacrifices in their personal lives to pay the costs of rhino ownership, including working a second job and selling their car. Only two ranchers noted that, although rhino-related expenditures do not reduce funds available for other ranching activities, their profits have decreased in line with rising costs of rhino ownership.

Three reserve managers we interviewed estimated that habitat management previously accounted for 40% of their total budgets, but due to the costs of security, only 5–10% of their budgets are currently being allocated to habitat management. One reserve manager expressed concern about rhinos receiving such a disproportionate amount of funding, worrying that that the conservation of other species and ecosystem services is being neglected:

[Reserves and parks are] skewing their budget to rhino protection and things as unglamorous as pollinators, bees, or dung beetles, whatever, are just not getting the due that they should be. Or eradication of alien vegetation, those sorts of unsexy things are tending to go by the wayside.

Many ranchers and managers in our study agreed that private operations are currently facing tradeoffs between hiring ecologists or game managers and recruiting security experts because most operations cannot afford both.

### ***The costs of securing human safety***

Nearly all respondents stated that their security staff risk their lives on the job, but were of the opinion that their guests and clients are not in danger from poachers, although one rancher stated his guests seem wary of staying on his ranch due to perceived risks. Another rancher noted that he no longer offers ecotourism on the part of the ranch with rhinos because clients were uneasy about seeing armed guards. Many respondents were most concerned about the potential safety risks to their families, particularly when loved ones help with ranch activities (e.g., helping to patrol the fences at night). For example:



The biggest impact is on my family. I put my whole family's lives at risk by bringing these animals onto the farm.

I've noticed my son ... he used to be very comfortable wandering anywhere around the ranch. Now there are certain parts where he won't go without me. He used to be just fine.

Dehorning was mentioned by respondents as a strategy to protect both rhinos and humans because it may discourage poachers from targeting properties with dehorned animals, provided that poachers did not believe there is still horn available on the property. However, many respondents also believed that applying for dehorning permits increases the risk of poaching because it creates the opportunity for government officials to pass information about the location of rhinos and dehorning events to poaching syndicates. As a safety precaution, all respondents who dehorn said they immediately transport horn to an external storage facility after the dehorning event so no horn is kept on the ranch overnight. One rancher recalled having poachers break into his house searching for horn, whereas another said a similar situation happened to a friend. Some respondents also post signs throughout their properties displaying that they do not keep horn on the premises.

Many respondents also engage in other measures to protect staff who may be targeted by poachers. Although cleaning and custodial staff are unlikely to be put at risk from poaching, one reserve manager noted that senior management and their families were being repeatedly targeted at his reserve, where poachers would try to locate and break into their homes to find stored rhino horn. He now posts security guards around their houses and has installed panic buttons in their homes. Another rancher employs night-time security guards outside her house. The majority of respondents also said they carry firearms and provide their families and other at-risk employees with firearms. For example:

I have now applied for three new firearms because I don't feel safe walking on the farm on my own. One of them is an AK-47. It's not a normal thing for anybody, let alone a woman, to go and buy an AK-47.

Every single family member of mine who is above 18 [years old] has a firearm that is carried on them all the time, ready for trouble at all times.

### ***Psychological stress***

Continuous stress due to concerns about the safety of rhinos, family members, and employees was repeatedly mentioned by respondents as one of the important challenges of rhino ownership. Respondents characterized their daily life as "war-like" with "no break." Most respondents also stated that rhino ownership creates strain on their families, with multiple respondents citing an increase in divorce rates among their colleagues as evidence of this strain. Some of the statements made by respondents included:

Every aspect of my life has changed. From being a normal civilian ... Your whole mindset has changed. You have to think in militaristic ways.

We're in a war, that's one way you can describe it.

We're up all hours, watching the ranch for any poaching activity.

Respondents also indicated that there are other, more subtle strains associated with rhino ownership. Most respondents stated that their job as a rancher or land manager has changed since rhino poaching escalated. These respondents pointed out that they entered game ranching to be outside in nature, but now they spend most of their time dealing with issues of security and related administrative work. For example:

In the days before [poaching] was a really big problem, we had a lot more time to spend out in the bush, which is of course what our passion is for.

We are conservationists who are now being forced into the role of securing and protecting a species. It creates quite a bit of problems.

As a result of this shift in job duties and the stress associated with anti-poaching efforts, many respondents stated that their former colleagues have exited the game industry.

### ***Lack of external financial support***

Although both public and private lands are being targeted by poachers, ranchers we interviewed expressed a strong sense of isolation because they do not receive financial or in-kind support from the government and conservation-related nongovernmental organizations (NGOs). All respondents noted that their financial costs are paid entirely out-of-pocket. In contrast, the government and NGOs subsidize anti-poaching enforcement on public lands. Respondents pointed out that they pay twice (i.e., double-billing) for anti-poaching enforcement, first as a taxpayer and second as a rhino owner. Most respondents argued that government and NGO funding should also be available to the private sector because they are performing the same conservation service as public parks: “We don’t see a single penny of that [NGO donation]. I guess it goes to Kruger (i.e., the largest national park in the country). But what people don’t get is that we’re fighting the same battle.” One respondent specifically suggested government rebates per animal or lower tax rates to assist private rhino owners.

### ***Ideological conflicts***

Most ranchers in our study were also frustrated by the anti-horn trade sentiments of NGOs. These ranchers claimed that anti-trade NGOs are perpetuating poaching by lobbying against trade legalization, which ranchers perceive as simultaneously exacerbating their poaching problems and preventing them from earning additional income from rhinos that could be used to offset security costs. They argued that these organizations exploit public emotions, using graphic images and stories of poaching to raise funds, but then do little for on-the-ground conservation. Respondents stated that as long as rhino poaching continues NGOs will benefit from increased donations, which support NGO staff salaries rather than financing conservation efforts like their own. Example quotes included:

It’s a multi-billion dollar business – being an anti-trader and getting all [these] “save the rhino” [donations and merchandise] ... They’re making the money, these guys running campaigns against us.

The problem is that as soon as rhino can start paying for themselves, the funding and the sensationalism behind the “save the rhino” organizations is going to disappear. So they will no longer make a profit.

Some ranchers we interviewed also expressed feelings of resentment and anger because they had been labeled as “greedy” and maligned on social media for being in favor of legalizing horn trade. These ranchers said that rather than being applauded for their self-funded conservation efforts, the international public (mainly Americans) shames them for earning income from wildlife. Ranchers in our study described this characterization of their business as “unfair criticism” because it is inconsistent with the sustainable use model of South Africa. These ranchers voiced frustration that the tangible conservation benefits they provide are disregarded by people on social media, most of whom “have never set foot in Africa.” Most of these ranchers were also of the opinion that the international public needs to recognize the significant contributions that the private sector makes to rhino conservation.

### ***Financial benefits of rhino ownership***

Many owners of hunting and tourism-based ranches and all reserve managers who we interviewed noted that having rhinos on the property (especially as part of the Big 5) helps differentiate an operation from competitors’ ranches, thereby attracting tourists and increasing revenues. Four ranchers originally bought rhinos for breeding to generate revenues from live sales, although these ranchers have since sold most of their herd and keep only a few rhinos they can more easily protect. Only one rancher mentioned offering rhino hunting in the past. In all cases, respondents stated that additional revenues generated from rhinos were insufficient to cover security costs.

All ranchers in our sample indicated that if horn trade were legalized they would be eager to participate, in large part because it would provide an additional source of income that could be used for covering security costs. One rancher noted that he originally did not think trade legalization was a prudent idea, but has since decided it is the only way to conserve rhinos. All other ranchers were strongly in favor of a well-regulated horn trade, as demonstrated by the following quotes:

If you encourage it to be bred commercially and it pays, it will stay. The rhino is not currently paying its way and therefore it will not stay.

[Income from horn trade] would just go back to rhinos. And then it wouldn’t be such a cost to people. They might actually want rhinos again.

Most reserve managers we interviewed were pro-trade, although they noted that the decision to participate in horn trade would not be made by them. One reserve manager noted that, as an individual, he was against legalizing trade, but as a reserve manager, he saw merit in participating and acknowledged that trade legalization would provide an additional income stream for the reserve that could be used for security costs.

At the time of the interviews, the domestic trade moratorium was still in place and respondents were undecided about the potential effect of domestic legalization. One rancher we interviewed was confident that domestic trade would be helpful. He cited the sizeable Chinese population in South Africa and he was of the opinion that if he could sell horns to the domestic Chinese population then he could afford to protect his rhinos.

Several other ranchers in our sample were more skeptical. These respondents were of the opinion that there would only be significant demand if the horn that is traded domestically is smuggled out of the country to Asia.

### ***The responsibility to conserve rhinos***

All reserve managers in our study mentioned that they felt a responsibility to nature and the environment to conserve rhinos because rhinos are imperiled. These managers cited the directives of their reserves which mandate: (a) the reintroduction of all species that are native to the area and (b) the maintenance of well-functioning ecosystems. Most managers sampled noted that white rhinos fill an ecological niche as productive grazers.

Nearly all ranchers we interviewed tended to focus more on their responsibility to their children and grandchildren. For these ranchers, doing their part to conserve rhinos was their way of doing “the right thing” for future generations, as demonstrated by the following quotes:

[I keep rhinos] because I feel that it is my responsibility so that my grandchildren can one day see rhinos. I have taken on this responsibility and I have made the choice and I have to do it.

You want your grandchildren and everyone else to see a rhino. So we've got to keep the rhinos alive.

### ***Emotional attachment to rhinos***

Most ranchers in our study spoke about a strong emotional attachment to rhinos, stating that rhinos have “the best personalities” and characterizing rhinos as “majestic” and “gentle.” One respondent used the term “underdog” to describe rhinos, and many owners stated their relationship with rhinos is unique because rhinos need the protection of landowners to survive. This attachment to the rhino is epitomized by the following quotes:

But rhino is a passion of ours. And we believe that we have to protect them.

You know these things need your help more than anything else. You know you need to protect them.

Given that they viewed rhinos as persecuted and in need of special care, many respondents mentioned they have a strong attachment to their rhinos that they do not have with other species on the land. Rhinos were often referred to as “part of the family.” For example:

My rhinos have names. I've seen them born. I know their characters. I know their personalities.

Losing a rhino – it's like losing a family member. I'm 73 years old and I cried more than 10 days when I had a loss from rhino poaching. It's very emotional.

Multiple ranchers in our sample commented that they believe that if rhinos are able to be saved from extinction it will be due to the efforts of the private sector.

## **Discussion**

Our intention in conducting this study was to identify the financial and nonfinancial considerations that drive private landowner decision-making with regards to rhino

ownership. To date, our respondents have kept rhinos on their lands, largely due to nonfinancial considerations, in particular a sense of responsibility for the protection of rhinos, concerns about the continued existence of rhinos, the desire to protect rhinos for future generations, and an emotional affinity for rhinos. However, all respondents also stressed the need for additional financial returns from rhinos to finance the continued protection of these species on their lands. Respondents placed particular emphasis on the need for legalized trade in rhino horn, which would provide considerable revenues and would not harm rhinos, according to those interviewed.

Child (2012) previously documented the limited financial benefits currently available to rhino owners, which include: trophy hunting, live sales, and ecotourism. None of our respondents currently offered rhino hunting and those who invested in rhinos for live sales purposes had reduced their rhino herds (given the significant costs of protecting them). Although rhino ecotourism was not considered profitable, many ranchers and all reserve managers believed the presence of rhinos, particularly as part of the Big 5, attracted additional tourism to their operations. This finding is consistent with Maciejewski and Kerley (2014), although they cautioned against the introduction of species outside of their natural ranges for tourism purposes.

Respondents' protection of rhinos is consistent with findings that conservation behavior can be motivated by feelings of personal and moral responsibility to protect a species or the environment (Hines, Hungerford, & Tomera, 1987; Kaiser & Shimoda, 1999). Based on our findings, there were multiple nonfinancial motivations for respondents' protection of rhinos, including (a) their level of environmental concern (which was particularly apparent during interviews with reserve managers who were typically trained ecologists), (b) the behavioral and physical characteristics of rhinos (which was apparent in how respondents described the characteristics of rhinos), (c) an emotional attachment to rhinos (which manifested itself in statements that rhinos are like members of the family), and (d) an awareness of the need and responsibility for protecting the rhino (which tended to be expressed as the need to protect the rhino because it is an underdog). Furthermore, ranchers in our study stated that it was important to them to protect rhinos for their children and grandchildren, which is consistent with the economic concept of bequest value, the value of ensuring rhinos will be protected for future generations (Laurila-Pant, Lehtikoinen, Uusitalo, & Venesjärvi, 2015).

During interviews, respondents stressed the multiple costs of rhino ownership. We infer that this was an attempt to demonstrate the level of commitment respondents have made in owning and conserving rhinos (i.e., they were trying to emphasize how much value they place on the continued existence of rhinos). These costs are both financial and nonfinancial in nature, and the safety threats associated with rhino ownership were emphasized by respondents.

Although the financial costs of rhino ownership in terms of anti-poaching enforcement have been previously established (Collins et al., 2016; Ferreira, Pfab, & Knight, 2014), ranch-scale estimates of security costs are typically missing from the literature. Our respondents estimated that they spend between ZAR 20,000 and ZAR 50,000 (2017 USD \$1500–3700) per month on security costs, although one larger rancher estimated his costs considerably higher at ZAR 3 million per month. Payments for security personnel, firearms, cameras, fences, and other equipment form a large part of these security expenses (see also Collins et al., 2016), but respondents also pay for intelligence about poaching

threats, a strategy that has also been adopted by Kruger National Park officials (Buscher & Ramutsindela, 2015). The costs of dehorning rhinos and securing horns off-site were also raised by respondents. As noted by Lindsay and Taylor (2011), dehorning costs can range from \$125 to \$1600 per event, depending on the scale of the operation. Despite multiple measures to protect rhinos on their lands, all respondents had experienced at least one rhino poaching event, and they characterized these events as traumatic precisely because they have such a strong attachment to their rhino herds.

Consistent with Wright et al. (2016), we found that respondents were also concerned about safety threats to their families from the presence of rhinos on their property. This psychological stress is exacerbated by the physical dangers that both ranchers and reserve managers bear when protecting rhinos from poaching threats (see also Buscher & Ramutsindela, 2015; Duffy, 2014; Humphreys & Smith, 2014; Lunstrum, 2014). Annecke and Masubelele (2016) and Neme (2014) have previously documented the psychological trauma associated with protecting rhinos from poaching threats on public lands, and the majority of our respondents described similar stresses, noting that these psychological and emotional stresses have resulted in divorce or exit from the game ranching industry.

Based on our interviews, it would appear that these stresses are further compounded by ranchers' frustration with how the legalized trade in horn and their support for this trade is characterized by the international public. Similar to legalizing the trade in drugs (see Miron, 2003), legalizing the trade in rhino horn is heavily debated (see Biggs, Courchamp, Martin, & Possingham, 2013; Di Minin et al., 2014; Ferreira & Okita-Ouma, 2012). Ranchers in our sample viewed opposition to the legal trade in horn as emotive and based on inaccurate and misleading information. In particular, they expressed frustration and anger with international NGOs that they perceive to be financially exploiting the poaching crisis rather than promoting pragmatic approaches to conservation (see also Wright et al., 2016). Respondents were further frustrated by the fact that although they are helping to conserve rhinos they receive no financial assistance with anti-poaching enforcement and are vilified on social media. Respondents viewed the legalization of rhino horn trade as a means to earn sustainable revenue streams that could be used to finance security costs (Biggs et al., 2013; Child, 2012), not as a means for exploiting rhinos.

As noted by our respondents, the considerable costs of managing and protecting rhinos not only directly affect the financial viability of game ranches and reserves, but these costs also indirectly affect other wildlife and habitat. According to one reserve manager, allocating such a large share of financial resources to rhinos siphons both funding and time away from alternative conservation actions (see also Buscher & Ramutsindela, 2015; Humphreys & Smith, 2014). As documented by Annecke and Masubelele (2016), Kruger National Park rangers spend up to 90% of their time on security, leaving only 10% for conservation activities, which may have a long-term impact on habitat, biodiversity, and ecosystem services.

## Limitations

Although our findings help to extend the existing literature by providing additional insights into private rhino owners' decision-making, we recognize several limitations of our study. For example, the long timeframe of data collection may have influenced our results from the different sets of interviews. Additionally, similar to many exploratory

qualitative studies, our small sample size means that we must caution against using our findings to make inferences for the larger population of game ranchers in South Africa as our results may not be generalizable (Berg, 2001). Larger-scale, quantitative research is required to understand the motivations and decision-making by private game ranchers in South Africa specific to rhinos.

We also recognize the potential for bias in the data collection and data analysis processes. Our interview questions were pretested with methodological experts and our study population, which is a strategy to reduce bias in questions and ensure the validity of the interview instrument (Berg, 2001). Nonetheless, there is potential for bias in qualitative analysis, which we attempted to minimize through comparisons of findings to test for intercoder reliability (Berg, 2001).

## Conclusion

South Africa's sustainable use paradigm is a prime example of market-based conservation (i.e., wildlife remains on private lands if it is profitable). But, explaining rhino ownership as merely a financial cost-benefit analysis is clearly an oversimplification. Ranchers continue to keep rhinos on their land, despite the considerable costs and risks associated with rhino ownership. According to a purely financial analysis, this decision is irrational and should not occur. Yet, our findings show that the decision to own rhinos is not irrational. In economics parlance, rhino owners are utility-maximizing in that they have considered all of the financial and nonfinancial costs and benefits associated with rhino ownership, and they continue to engage in rhino conservation because they derive net benefits from rhino ownership. Our findings suggest that the benefits of rhino ownership are primarily nonfinancial and are strongly grounded in an emotional attachment to rhinos and a sense of responsibility for the continued existence of rhinos. Although we acknowledge that ranchers may also own rhinos because they anticipate considerable earnings from the legalization of the rhino horn trade (i.e., rhino owners may be speculating on future returns from selling rhino horn), our research was conducted prior to the legalization of the domestic trade in rhino horn. At the time that we conducted this research, the potential financial returns from rhino ownership were insufficient to cover the costs of rhino ownership (see also Child, 2012).

Understanding private rhino owners' motivations for owning rhinos, and the financial and nonfinancial constraints and obstacles they face is important for designing appropriate policies and programs to support rhino conservation in South Africa. As already discussed, private lands are critical to continued rhino conservation. Although our results are not generalizable to the larger population of game ranchers in South Africa, our findings suggest that rhino owners would value financial assistance with anti-poaching efforts. Furthermore, our results indicate that rhino owners would value recognition of the role they play in rhino conservation efforts, and that these individuals and their families may require support to address the psychological and emotional stresses of protecting rhinos.

## Note

1. The term "camp" may be misleading to individuals who are not familiar with South Africa's game ranching system. These camps may be sufficiently large to allow for dense bush and may not allow for the darting of rhinos using motor vehicles.

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