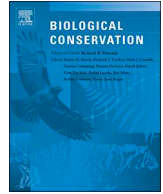




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What drives commercial poaching? From poverty to economic inequality

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ABSTRACT

Over the last decade, South Africa and its iconic Kruger National Park have experienced a steep increase in the killing of rhinoceros for its horn, which is reaching staggering prices largely in Asian markets. This is a key piece of the larger illegal wildlife trade (IWT). Drawing on fieldwork in the Mozambican borderlands adjacent to Kruger where many poaching recruits originate, we respond to calls for better understanding of the drivers of IWT and in particular links between poverty and poaching. Our analysis shows that economic factors including poverty are the most central drivers of rhino poaching on the ground-level and that, rather than mere poverty per se, they are better captured in the concept of *economic inequality*. We additionally provide methodological insights into conducting research in the sensitive context of IWT and enable readers to hear directly from members of communities involved in the trade as they offer socially-contextualized understandings of these drivers. Three IWT policy recommendations emerge from our findings: (1) Responses must be multifaceted and include reducing user-end demand. (2) Conservation practitioners should support community-based responses, including poverty reduction, especially over heavy-handed, increasingly militarized responses. And (3) community-based approaches must be part of broader efforts aimed at targeting economic inequality at a deeper structural level that include but extend beyond conservation and conservation-development frameworks.

1. Introduction

Over the last decade, South Africa and its Kruger National Park have become the global epicenter of the commercial illicit hunting, or poaching, of white and black rhinoceros (*Ceratotherium simum* & *Diceros bicornis*) for their horns. The trade is indeed concerning. It threatens the survival of rhino in the wild and has seen the death of hundreds of suspected poachers. More broadly, commercial rhino poaching is one piece in a broader upsurge in the global illegal wildlife trade (IWT) including the well-publicized trade in elephants and pangolin (Gao et al., 2016; Nash et al., 2016; UNODC, 2016). While estimates are both difficult to produce and controversial (UNODC, 2016), the most commonly cited figure has IWT generating revenues of USD\$7–23 billion annually (UNEP, 2016). Due to the dangerous and highly sensitive nature of IWT, we lack knowledge of what drives it especially on the ground level (Rogan et al., 2018; von Essen et al., 2018). And while there are routine claims poverty fuels IWT, these are largely speculative (Duffy et al., 2016). We address this gap by drawing on fieldwork in the Mozambican borderlands where many poaching recruits originate and ask what motivates young men to engage in illicit rhino hunting especially given the risks.

Speaking to the broader IWT literature, we show that economic

factors stand out as the primary drivers. Yet while poverty is a main driver of poaching, it does not adequately capture the complexity of economic motivations. In response, we turn to the concept of economic inequality. Unlike an undifferentiated notion of poverty, economic inequality draws together how such economic drivers are multilayered and even inconsistent, include more than material deprivation, and include the vast gap between poverty and wealth. This analysis supports three recommendations for addressing commercial rhino poaching and IWT more broadly: (1) a greater effort must target ending demand, (2) a greater focus should be placed on community engagement, including poverty reduction, as compared to top-down enforcement approaches, and (3) community-based approaches must be part of efforts aimed at targeting economic inequality at a deeper structural level that include but extend beyond conservation and conservation-development frameworks.

We begin by providing an overview of the research context and methodology, which provides insight into an effective way of gathering data in the challenging context of IWT. We then turn to literature on the drivers of IWT/commercial poaching across conservation biology and policy, green criminology, and political ecology followed by a discussion of economic inequality. Next, we examine the ground-level, supply-side drivers in the Mozambican borderlands where members of

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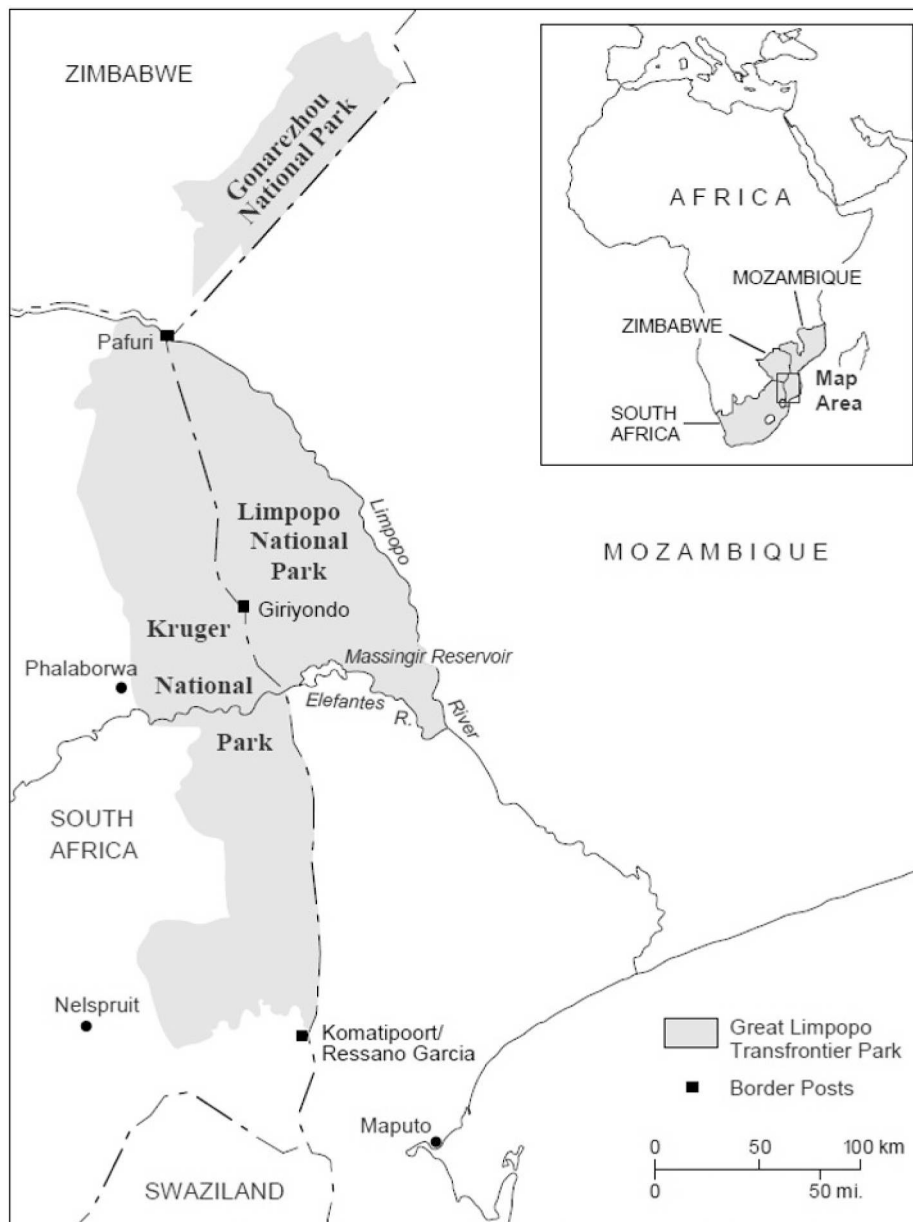


Fig. 1. Map of the study area. All interviews took place within communities located in the southern section of the Limpopo National Park (LNP). We have not indicated their exact location to protect anonymity.

communities involved in the trade offer socially-contextualized understandings of the drivers. We close with policy recommendations.

2. Background and methods

2.1. Research context and study area

Beginning in 2008, game rangers in South Africa began to encounter a growing number of rhinos that had been killed for their horns, with Kruger National Park as the epicenter (Fig. 1). This began to foretell a troubling trend with numbers rising from 13 in 2007 to over 1000 annually by 2013 and not falling below that until 2018 (Environmental Affairs, 2020). This reflects steady demand coming from increasingly affluent parts of Southeast and East Asia where rhino horn sells for up to USD\$60,000/kg (Haas and Ferreira, 2016). Given that less than 28,000 rhinos remain globally (UNODC, 2016), ecologists are concerned for their viability in the wild (Haas and Ferreira, 2016). South African security forces including the Department of Defence and the anti-

poaching arm of South African National Parks have also been concerned given the involvement of criminal syndicates and the fact that many of the young men hunting rhinos are well-armed and cross into South Africa from Mozambique. While initially most crossed into Kruger through or near the Limpopo National Park (LNP) (Fig. 1), today most enter Kruger through its western boundary given the intensive securitization of the international border (Interviews, 2013–2017; Lunstrum, 2014, Haas and Ferreira, 2016, UNEP, 2016, UNODC, 2016). Taken together, rhino and commercial poaching more generally are understood as joint ecological-security challenges (Interviews, 2013–2017; Lunstrum, 2014; Duffy et al., 2019). These concerns have prompted a multipronged approach ranging from high-tech interventions, including a DNA database and sophisticated surveillance technology, to binational negotiations with user-end countries to curb demand (Interviews, 2013, 2016, 2017; Environmental Affairs, 2018, Lunstrum, 2018). While there are nascent projects engaging local communities (Massé et al., 2017, Environmental Affairs 2018, Hübschle and Shearing, 2018, WWF, 2020), the primary community-level approach has been a heavy-

handed militarized response that has translated into the death of hundreds of suspected poachers in Kruger and across the region (Konopo et al., 2016; Lunstrum, 2014, 2018). Reflecting these dangers, hunting rhinos in the Mozambican borderlands is now commonly referred to as “playing with death” (Interviews, 2016, 2017).

2.2. Methods

Scholars have routinely noted difficulties in gaining accurate IWT data given its illicit nature (Solomon et al., 2015; Rogan et al., 2018; von Essen et al., 2018). Commercial poaching stands out as particularly dangerous and sensitive, making it even more difficult to examine. In fact, researchers and journalists in the study area have been intimidated and experienced death threats and even kidnapping (Pers. comm., June 2015; Grill, 2015). In our case, we experienced unease given we were being watched and were warned to tread lightly. In addition, potential study participants at times refused to speak to us or showed distress during interviews, which required changing the line of questioning and/or reminding participants they could end the interview. This is a drastic change from research we conducted before commercial poaching took off.

Given the complexity and sensitive nature of IWT, it is necessary to reflectively and carefully develop methodologies that analyze different aspects of the trade (Nuno and John, 2015; Solomon et al., 2015; van Uhm, 2018). Reflecting the sensitive dynamics of the study site along with our specific research questions, we employed face-to-face semi-structured and open-ended interviews. Unlike indirect evidence from surveys and forensic and enforcement records (Solomon et al., 2015), interviews allowed us to examine drivers of behavior. The security context also prohibited a large sample size needed for specialized questioning techniques (Nuno and John, 2015), which also would have precluded a rich socially-contextualized understanding of drivers, which we were able to gain from interviews. We located informants through speaking with community leaders as gatekeepers and through purposive snowball sampling where informants, including several men involved in the rhino horn trade, had direct knowledge relevant to our research questions (Maxwell, 2013; van Uhm, 2018). As part of a broader ethical approach to conservation research (Sollund, 2017; Brittain et al., n.d.), we ensured anonymity and approached respondents with care, empathy, and non-judgment. This helped establish

rapport and trust, as did our prior work and reputation in the area and the fact our interviews were conversational in nature (Liamputtong, 2007; Titeca, 2019). Open-ended and semi-structured interviews additionally allowed flexibility, including asking about poaching in more indirect ways and changing the interview direction when necessary, and allowed participants to describe what they found to be the main drivers of poaching without researcher or study design interference (Liamputtong, 2007; Maxwell, 2013). Finally, the interview format allowed us to hear directly from members of communities most immediately impacted by poaching, both its benefits and costs, and share these with conservation scholars and practitioners in the pages below. In addition, it is important to cross-reference data especially given the illicit nature of IWT (van Uhm, 2018), which we did through semi-structured interviews with Limpopo and Kruger Park staff and other government, anti-poaching security, and NGO officials. Qualitative research is hence an important complement to quantitative approaches (e.g., Solomon et al., 2015) and may be more appropriate in highly-sensitive research contexts (e.g., Liamputtong, 2007).

In terms of data collection, the first author (from North America) worked with three research assistants/translators to conduct 30 interviews in June–July 2016. The second author (a Shangaan-speaking Mozambican) conducted 27 interviews in April and July 2017. This was complemented by our previous research in Mozambique and South Africa on rhino poaching beginning in 2009 and broader community-park relations beginning in 2003. The 2016 interviews focused largely on community relocation from the LNP, which is justified partially as an anti-poaching strategy, and were based in one of the most notorious poaching “feeder” communities. Engaging cautiously, we were able to glean insights into the drivers behind poaching. The 2017 interviews were spread across four other LNP communities and focused more explicitly on the rhino horn trade.

We coded and analyzed interview content using Nvivo10. This allowed us to locate the most (and least) powerful drivers of poaching and prevented researcher bias, for instance, in overly privileging drivers we might find more interesting or surprising. Our analysis generated a preliminary picture of the main drivers and how frequently they were referenced. Out of the interviews, there were 178 references to what motivated young men to hunt rhino, 91 of which (=51%) pointed to explicitly economic drivers. We list these and the extra-economic drivers below in Table 1.

Table 1
Economic and extra-economic ground-level supply-side drivers behind the rhino horn trade.

Economic driver of poaching referenced by study participants	Number of times referenced across the interviews
Young men hunt to enable a better life/address poverty	33
Young men hunt to earn money	30
Young men hunt because there are few other jobs available/existing jobs are not attractive	16
Young men continue hunting to maintain an extravagant lifestyle	10
Young men hunt because they are excluded from government financial assistance	2
Total	91
Extra-economic driver of poaching referenced by study participants	Number of times referenced across the interviews
Corruption, intimidation, and lack of legal will	27
Recruits are not scared of dying/see “death as destiny”	11
Recruits do not listen to the community/their elders/the government	10
Drought	8
Members of the community are used to a life of danger	6
Demand for rhino horn	5
Experience of/exclusion from conservation	5
Recruits lack education/lack other needed skills	4
New recruits are actively recruited by criminal syndicates	4
Miscellaneous extra-economic drivers	3
Community support for poaching	2
Poaching as a form of excitement/adventure	1
Recruits poach because they can get away with it/act with impunity	1
Total	87

2.3. Understanding the drivers of IWT/poaching: a review of the literature

We are beginning to gain a rich understanding of the main drivers of commercial poaching on the demand side, with these closely tied to growing affluence in parts of Asia. Here buyers are largely purchasing ivory and rhino horn as a conspicuous display of wealth or investment opportunity, similar to art, after the global financial crisis of 2007–2009 (Gao et al., 2016; UNODC, 2016). We nonetheless lack a comparable understanding of the supply-side drivers especially at the ground level (Beale et al., 2018) given the methodological difficulties outlined above. Furthermore, while there are repeated suggestions that poverty drives poaching in scholarly (e.g., Challender and MacMillan, 2014; Di Minin et al., 2015), policy (e.g., Milliken, 2014; UNODC, 2016) and popular sources (e.g., Ndlazi, 2016), these tend to be speculative (also see Duffy et al., 2016). Nonetheless, there is a rich literature spanning conservation biology and policy, green criminology, and political ecology that sheds light on ground-level supply-side drivers. Distilled into a ten-part typology by Muth and Bowe (1998), this includes: “(1) commercial gain, (2) household consumption, (3) recreational satisfactions, (4) trophy poaching, (5) thrill killing, (6) protection of self and property, (7) poaching as rebellion, (8) poaching as a traditional right, (9) disagreement with specific regulations, and (10) gamesmanship.”

Of these motivations, literature focusing on the illegal provision of bushmeat (Kahler and Gore, 2012; Knapp, 2012; von Essen et al., 2014; Knapp et al., 2017) and more recently elephant ivory (Hauenstein et al., 2019) shows that economic drivers – and mainly poverty – are some of the most powerful in predicting illicit hunting. The logic is that poor people hunt illegally to address basic needs through consuming what they hunt or through selling it. While some argue we need to also look at IWT’s non-economic motivations (Kahler and Gore, 2012; Hübschle, 2016), others contend we need a more comprehensive understanding of poverty itself as an instigator (Duffy et al., 2016; Knapp et al., 2017). These contributions also highlight the need to differentiate between different levels (from absolute to relative), experiences, and meanings of poverty (ibid). Moving beyond poverty, others have shown how economic drivers behind IWT include user-end affluence with user-end GDP being one of the greatest predictors (Di Minin et al., 2015; Hauenstein et al., 2019). These debates have moved into the Mozambican borderlands. Hübschle (2016; also see Hübschle and Shearing, 2018), for instance, chronicles the many layers of these drivers from poverty to resistance against expulsion from the LNP and green militarization. Rich in ethnographic detail and deftly upending assumptions that poverty fuels poaching in any simple sense, she does not however provide a sense of the relative weight of the different drivers. Witter and Satterfield (2019) add that eviction from the LNP and related restrictions have led to poverty and other forms of instability that have then encouraged poaching. While not their main focus, their work reinforces that poverty is at least one driver.

What we contribute is a deeper understanding of the economic drivers of IWT. Speaking back to these debates, we show that not all drivers are equal, with the majority in our study being explicitly economic. We are careful, however, not to reduce these to an unexplained concept of poverty given that the term suggests that drivers can largely be reducible to material deprivation and need to make ends meet. This fails to capture the complexity and even inconsistency of economic motivations along with the complex roots of poverty itself. In addition, poverty rarely stands on its own but rather emerges as a driver in relation to wealth. Here it is the substantial riches enabled by rhino poaching flowing from affluent buyers and investors that, in combination with poverty, drive the trade. We draw these complexities together in the concept of *economic inequality*. Turning from poverty to economic inequality also highlights that such inequality is a structural feature of the economic system and hence shapes life opportunities and behaviors. This analysis sheds light on how best to respond to IWT as we show in the conclusion.

3. Results and discussion

At the most general level, our data illustrate that the supply-side drivers of rhino poaching are multilayered and reflect the interests of a complex network of actors including government and park corruption, lack of political will, the greed of criminal syndicates orchestrating the trade, and the motivations of the young men procuring the horn (see Table 1; also see Hübschle, 2016). Focusing on the latter, we ask: what motivates these men to join small hunting teams where they risk their lives to obtain rhino horn? Even for this group, their motivations are multifaceted and include intimidation by kingpins, drought, quest for excitement, and understandings of conservation as exclusionary (ibid). While not ignoring these factors, our analysis shows they are overshadowed by a combined set of *economic* drivers. In fact, even apparently non- or extra-economic motivations influence young men to hunt only in the context of larger economic inequality.

3.1. Historical-economic outline of the Mozambican borderlands

To understand the existing endemic poverty of the region, let us first briefly sketch the economic context of the Mozambican-South African borderlands. Mozambique is one of the world’s poorest countries, consistently scoring low on human-development indexes (e.g., UNDP, 2020). While the borderlands in particular are dry, which makes farming difficult, the existing poverty is not a “natural” feature of the landscape. The region experienced decades of labor and natural resource exploitation along with minimal investment in human development by colonial officials (Interviews, 2004–2005; Newitt, 1995). After independence in 1975, Mozambique experienced a brutal civil war (1977–1992), orchestrated in part by Apartheid South Africa, that left over one million dead and one-third of the country displaced including much of the borderlands (ibid). This has been paralleled by the loss of relatively well-paying jobs for Mozambicans in the South African mining sector (Interviews, 2009, 2017; Cunguara et al., 2012). More recently, the country’s rapid economic growth tied to natural resource extraction and economic liberalization has not been directed at poverty reduction (Castel-Branco, 2014). Finally, poverty for communities living inside the core of the LNP has intensified due to a protracted displacement from the park, which began in 2003 and in some instances is still not complete (Witter and Satterfield, 2019). In short, commercial rhino poaching has emerged within a context of already-entrenched poverty and limited economic opportunities. We now turn to the more current factors driving the rhino horn trade, showing how these come together in the concept of economic inequality.

3.2. Lack of jobs and means of earning money

A common explanation among those interviewed as to why young men have turned to illicit hunting is the lack of decent jobs (also see Hübschle, 2016). Explained by several community members, over the past decades opportunities in the South African mines have been largely replaced with predominantly informal, insecure, and relatively low-paying work in South Africa as street vendors, domestic help, and seasonal agricultural laborers (Interviews, 2009, 2017). A common sentiment is that these earnings do not go far and are not enough to support a family (Interviews, 2009, 2017). Employment possibilities in Mozambique are even worse and are limited to construction and tourism along with farming and cattle rearing, which are increasingly risky due to drought (Interviews, 2016, 2017). This creates an environment in which entering the poaching economy is attractive. In the words of a former community leader, poaching has become popular because:

[m]ost of our people are unemployed and life is difficult. Jobs in South Africa, which used to be what we resorted to, also became scarce, and farming became difficult due to drought. So there were young people hanging around who easily get caught by the poaching network (Interview, 2017).

Rhino poaching, moreover, offers not only paid employment but employment that brings extraordinary wealth. In the words of one respondent,

People go poaching because it gives lots of money... Even those who have worked their whole lives in South Africa [in the mines] have never seen such money or experienced the subsequent opportunities to build houses, buy cars, and also show off money in 50 kg bags (Interview, 2017).

In fact, ground-level recruits (the poorest members of the poaching hierarchy) can each see USD\$2500 to \$5000 for a successful hunting trip (Interview, 2017; also see Haas and Ferreira, 2016). There is hence a common saying that with rhino poaching young men “go to bed poor and wake up rich” (Interviews, 2016, 2017).

3.3. Addressing material deprivation, caring for family and community

While it is likely intuitive that economic motivations drive poaching on the ground-level, these are multifaceted and speak to inconsistent motivations and are therefore not easily reflected in a simple understanding of poverty. These motivations range from addressing poverty as material deprivation and caring for others to more self-interested drivers. Beginning with the former, many recruits are motivated by earning money to care for families and communities. These earnings buy basic foodstuff and household goods including furniture and clothes. As a local development worker succinctly put it, “when the child makes money from poaching, family conditions change for the better” (Interview, 2017). This explains why some, but certainly not all, family members encourage their loved ones to engage in poaching. We see this in the words of a young man who explains why so many of his cohort enter the trade:

This increase is motivated by hunger and lack of money. A person who does not provide for his family is going to have problems with his wife. The wife will leave you if you do not provide. A wife does not stick around if there is no food. A wife will even go so far as to say, “What are you doing only trying to procure food close to home like a chicken does? There are those who go further out in the bush [where the rhinos are] to get food and provide for their family. Why don't you?” (Interview, 2016).

Given the likelihood of arrest or death, this also underscores the dire economic reality behind such family pressure.

In addition to providing basic provisions, rhino poaching has allowed recruits to build sturdy masonry houses to replace mud and thatched-roof huts and purchase 4 × 4 vehicles, with the latter making it easier to move from place to place and even get to the hospital and access water (Interviews, 2017). Although far from common, several recruits have invested their new-found wealth in community development, for instance improving roads, supporting schools, providing watering holes for cattle, and investing in stores and cattle operations, which have provided jobs for others (Interviews, 2017). These insights show that poverty as material deprivation is indeed a core driver of rhino poaching and that the money earned from a successful hunt enables recruits' families and at times broader communities to lead more economically comfortable lives and build less vulnerable futures.

3.4. Self-interested economic motivations

Rhino poaching is not a response to poverty in any simple sense. We can see this in what can be roughly classified as self-interested economic motivations. One of the main community-level criticisms of rhino poaching (beyond the overwhelming concern for the loss of life) is that many of the young men involved act irresponsibly, spending the money as quickly as they earn it and doing so often in culturally inappropriate ways (also see Hübschle, 2016). As explained by a former community leader when asked if he thought poaching improved well-being:

Yes, some of them who have rational minds build houses, put money in the bank, buy cattle, and start businesses. But others just spend money on cars, beers, and women. And once the money is finished, they are stuck living in the same poor condition (Interview, 2017).

While some attribute this to immaturity and showing off, others see recruits as responding to previously unattainable wealth and the fact that recruits see the next batch of riches as just a quick, albeit extraordinarily risky, trip into Kruger. In addition, such wealth improves one's social standing as much as economic status (Interviews, 2016–2017).

The continuing cycle of entering Kruger is also explained by the fact that poaching's exorbitant riches lead to unsustainable consumptive lifestyles. When asked how he thought poaching had changed communities, a Mozambican conservation security official elaborated: “It has created a big problem. There is now pressure, especially for the youth, to experience a kind of a lifestyle they cannot afford... they want to maintain the addictions they have created” (Interview, 2017). In short, rhino poaching is driven by inconsistent economic drivers, both altruistic and self-interested.

3.5. Economic motivations between and beyond altruism and self-interest

There are also economic motivations that fall between or beyond altruism and self-interest and hence that cannot be easily captured in a concept like poverty. First, some young men enter the rhino trade out of economic intimidation and mockery by established poachers and at times family members. As a regional leader explained,

The young guys entering the bush are being trapped because they sit unoccupied in the villages. Established poachers attract them by teasing them, saying that they are still poor because they are lazy and afraid, they are not true men. And these words are also repeated by their wives or relatives encouraging them to join a poaching network (Interview, 2017).

Second, others earn money from illicit hunting with the aim of upward mobility, namely of becoming *patrões* (bosses) rather than *çadores* (hunters), who rent out weapons to others and act as middlemen (Interviews, 2016, 2017). Moving up the ranks is more lucrative and less dangerous and speaks to securing longer-term economic interests.

Still other young men are motivated by a desire to not live the poverty of their parents. For instance, when asked if the community leaders and elders talk to them about how their friends are being killed in Kruger, one community leader lamented,

In the funerals we do talk about it. We tell them that we are running out of young men. We say we will not be able to develop our villages if we don't have strong men left. There are more than 10 households [here in our village] without men, men who were killed engaging in poaching. Young men seem not to listen. But some do react, saying that we old guys are used to suffering and want to die in a state of disgrace [i.e., to die poor and without social status]. In contrast, they say they have dreams and want to have cars and other assets (Interview, 2017).

Here poaching is motivated by a desire to attain a sense of freedom, economic and otherwise, elusive to previous generations (also see Hübschle, 2016).¹

Understanding how poaching profits are directed at self-interested ends, providing for family and community, or whether they fall somewhere between shows that the motivations behind rhino poaching are complex, multilayered, and even inconsistent. Furthermore, these economic drivers emerge from a history and regional geography of structural economic deprivation and exploitation along with a current illicit wildlife economy that is characterized by an intricate relation of

¹ This reflects Sen's (2001) more complex understanding of poverty as unfreedom or capability deprivation.

poverty and wealth. Here the economic precarity of ground-level recruits contrasts starkly with the wealth of consumers paying exorbitant prices. In fact, the economic drivers behind poaching emerge not from either end of this spectrum (e.g., Duffy et al., 2016) but the *vast gap* between them. The wealth in question also includes the economic interests of kingpins and criminal syndicates who organize the trade and hence profit jointly from the wealth of consumers and poverty and aspirations of ground-level recruits (Interviews, 2016, 2017; also see Milliken, 2014, Hübschle, 2016). Poverty alone cannot make sense of these complex economic dynamics. These motivations are better reflected in a broader understanding of economic inequality. And while not every young man chooses to hunt rhino, the larger context of economic inequality – the experience of economic scarcity and vulnerability combined with the possibility of substantial economic gain – makes rhino poaching an attractive option, ensuring it is easy to find recruits.

3.6. Economic inequality and extra-economic drivers of poaching: Drought and climate change

The examples above illustrate how poaching is driven by economic inequality at the ground-level of the trade. Our data additionally indicate how non- or extra-economic drivers only influence young men into the trade in the context of broader economic inequality. While several examples emerge from our data,² given space constraints we examine the most straightforward: drought and climate change.

A series of devastating droughts tied to larger climatic changes hit the region in 2009–2011 and 2014–2016 resulting in a substantial loss of crops and livestock, both important sources of food and economic security (Givá and Raitio, 2017). Cattle rearing in particular has been a means of amassing wealth and prestige and has been especially important for communities with little access to or interest in modern banking systems (Interviews, 2003–2017). In light of this, the droughts have wreaked havoc on the already-stressed agricultural and cattle safety net of the region making it difficult for families to meet basic caloric and financial needs and further limiting job opportunities. In addition, over the longer-term, the droughts are leaving agriculture and cattle rearing less attractive livelihood options. We see this in the words of one woman: “Agriculture depends on rain, and it's not always possible to grow crops. Like now, there is nothing in the fields. It doesn't rain so young men are just hanging around without an occupation” (Interview, 2017).

The crux is that given the reality of existing poverty, a contemporary lack of employment, and the money available from procuring rhino horn, the impacts of drought further spur interest in the poaching economy. As a community leader described:

With lack of employment anyone is attracted to poaching. Our young guys have no occupation, and they sit long hours in the *barracas* [cantinas] drinking... Also, the reality of drought leads them to poaching because the conditions for farming are so poor and cattle are dying. So there aren't many options left (Interview, 2017).

It would be too strong to say that drought is an outright driver of poaching. Moreover, even without such environmental stressors, poaching would still be extraordinarily attractive. But the reality is that drought exacerbates problems of already profound economic inequality by further limiting other livelihood and employment options.³ More broadly, we see here that even some of the extra-economic drivers behind poaching become drivers only within a larger context of economic inequality.

² Other examples include a culture of risk taking and the exclusionary value created by the legal wildlife economy.

³ The experience in the Mozambican borderlands shows that climate change threatens biodiversity indirectly by making poaching more attractive and thereby more common.

4. Conclusion and policy relevance

Based on fieldwork in the Mozambican borderlands, we have offered insight into the ground-level supply-side drivers of commercial rhino poaching as a key piece of IWT. Our analysis has shown that economic drivers are the primary factors influencing young men to enter the rhino horn trade. Rather than ascribing these to poverty, we have shown these drivers are more accurately attributed to broader economic inequality. This highlights how these economic motivations are complex, even contradictory, include more than material deprivation, and encompass an intricate relation between poverty and wealth. This more comprehensive knowledge of the drivers of commercial poaching is key to understanding how best to address it (Kuhl et al., 2009; Nuno and John, 2015; Solomon et al., 2015; Knapp et al., 2017). We draw from these findings and the broader IWT policy literature to outline three recommendations regarding how best to address commercial poaching and IWT more broadly.

First, our data reinforce the importance of taking a multi-pronged approach as the problem of IWT is too complex for a singular response (Roe and Booker, 2019). This begins with the need to address demand. Given the existing poverty of the Mozambican borderlands combined with lack of employment options and strong demand backed up by high prices, it has not been difficult to find hunting recruits even in the face of a substantial loss of human life. This points to the fact that it is not merely poverty but economic inequality – in the form of vast economic differences between the supply and demand ends of the trade – that fuels the trade (also see Hauenstein et al., 2019). Ending demand will not erase this differential, but it will take money out of the supply chain (also see Challender and MacMillan, 2014, UNEP, 2016). Without this money, there is simply no incentive to hunt, regardless of the economic reality of potential poaching recruits, their families, and their communities. While difficult to realize in practice, demand reduction strategies are proving effective, especially ones that are culturally sensitive and organized within user-end countries rather than imposed externally (Dang Vu and Nielsen, 2018; Zhou et al., 2018).

Second, our data indicate there needs to be a greater focus on community engagement including poverty alleviation as opposed to top-down enforcement approaches. Over the last decade, these have been the two primary supply-end approaches to addressing IWT, with top-down enforcement receiving the lion's share of government and NGO attention and resources (Biggs et al., 2017; Roe and Booker, 2019). While increased enforcement often includes greater ranger presence, more surveillance and patrol technology, and stiffer penalties, more extreme measures amount to the militarization of conservation practice, or green militarization, including the paramilitarization of ranger forces, deployment of armies, partnerships with military corporations, and more acceptance of killing suspected poachers (Lunstrum, 2014, 2018; Duffy et al., 2019). These heavy-handed approaches have been exercised in the Mozambican borderlands, with several hundred suspected poachers shot and killed in Kruger over the last decade (ibid). The preference for these approaches stems in part from a sense they can more immediately “stop the bleeding” and a sense that earlier community-based projects have failed to meet their conservation goals (Interviews, 2015, 2016; Knapp et al., 2017).

In contrast, our data strongly endorse calls to better support communities and community-based conservation. First, top-down approaches are likely to back-fire over the long-run as they alienate communities, denying a needed ally in realizing long-term conservation goals (Lunstrum, 2014; Biggs et al., 2017; Cooney et al., 2017; Duffy et al., 2019). Additionally, and speaking directly to the core insights of our study, these heavy-handed approaches cannot address problems of economic inequality. They cannot address the market dynamics of economic inequality (Challender and MacMillan, 2014), and they actually lead to *more poverty* as recruits are jailed for lengthy sentences and are killed as we saw routinely during fieldwork. Repeating a quote from above and reflecting a common sentiment, because of poaching,

“... we are running out of young men... we will not be able to develop our villages if we don't have strong men left” (Interview, 2017). Given that economic inequality is a main driver of poaching, these heavy-handed approaches make this inequality worse and in turn can incite increasing rounds of poaching in the future, which is a dynamic recognized explicitly by South African National Parks (Pers. comm., 2017). We agree that enforcement must take place, but this must work in tandem with community engagement (Di Minin et al., 2015; UNEP, 2016; Massé et al., 2017; Rogan et al., 2018) and not overshadow it (Cooney et al., 2017). It should work to protect communities, not further alienate them nor exacerbate economic inequality.

Our third recommendation is that global poverty and wider inequality must be addressed. This is too broad to be a straightforward policy prescription, and, of the three, it is the least concrete and most difficult to realize in practice. It must, however, be part of a long-term strategy to address IWT. To elaborate, we strongly support expanding community-engagement, which is currently quite limited, including developing alternative enterprises and expanding economic incentives for protecting wildlife (Biggs et al., 2017; Cooney et al., 2017, *Environmental Affairs*, 2018, Hübschle and Shearing, 2018, Roe and Booker, 2019, WWF, 2020). Scholars and practitioners are beginning to outline innovative design principles and methods aimed at incorporating communities into conservation on such grounds (ibid). Such support for community-based engagement emerges from a broader recognition that we must approach poaching and IWT as problems of development and not just conservation (Duffy et al., 2016). While we endorse these efforts, addressing poaching will require more than this and related integrated conservation development projects (ICDPs), as necessary as these are. This is because the incentives to poach are substantial (reflecting the economic inequality defining IWT) and dwarf the economic benefits made available from even more lucrative ICDPs.⁴

In some sense, this is somber news for conservationists, as it is a reminder that conservation and ICDPs cannot solve the problem of poverty and inequality alone and hence cannot confront commercial poaching/IWT alone. This is even more challenging as the global income gap continues to grow (World Inequality Lab, 2018). In other words, poaching is a problem of global economic inequality and must be addressed as such. While we can only be suggestive, this requires a long-term plan and commitment spanning a range of global partners working within and beyond conservation. This plan must ensure international funds are directed at the poor including communities in biologically rich areas. More broadly, it must ensure that global wealth is more evenly distributed to put an end to poverty as material deprivation and to promote broader long-term economic wellbeing and security. From a human wellbeing perspective, the IWT crisis sheds light on the problem of global inequality and provides more impetus to address it. Taking up this challenge may also provide the best hope for wildlife.

CRediT authorship contribution statement

Elizabeth Lunstrum: Conceptualization, Methodology, Investigation, Resources, Writing - original draft, Writing - review & editing, Project administration, Funding acquisition. **Nícia Givá:** Conceptualization, Methodology, Investigation, Resources, Writing - original draft, Writing - review & editing, Project administration, Funding acquisition.

⁴ Speaking to a parallel debate, our data strongly support the position that, if the trade in rhino horn and ivory is legalized, profits must support community development and poverty alleviation for this to be an effective strategy in combatting IWT (also see Di Minin et al., 2015).

Declaration of competing interest

The authors have no conflict of interest.

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