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The need for a socioecological harm reduction approach to reduce illegal wildlife trade

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Abstract

The burgeoning illegal trade in succulents in southern Africa presents a critical conservation and social development challenge. Drawing parallels with the trajectory of the response to rhinoceros poaching, we considered the consequences of conservation law enforcement measures, particularly the militarization of antipoaching efforts. The response to rhinoceros poaching not only resulted in so-called green militarization, but also led to extrajudicial killings, human rights abuses, and the disproportionate targeting of low-level poachers. The nature of wildlife trade prohibition is complex and often contested, and many actors operating in illegal wildlife trades dispute the label of *illegal* for socioeconomic, cultural, historical, or political reasons. This contestation is crucial when considering Indigenous cultural and medicinal values of succulents, with Indigenous Peoples and local communities questioning the criminalization of traditional plant harvesting practices. As the illegal trade in succulents continues to grow, it is imperative for conservationists to consider a nuanced approach. We call for a socioecological harm reduction approach that emphasizes community engagement, sustainable use, and codesigned interventions. Such an approach could help balance the scales of ecological conservation and human dignity in the face of growing wildlife trade challenges.

KEYWORDS
community engagement, contested illegality, green militarization, rhinoceros poaching, social–ecological systems framework, socioecological harm reduction, succulents, sustainable use

INTRODUCTION

The illegal wildlife trade (IWT) in succulent plants for ornamental collection is global in scope and pervasive across dozens of taxonomic families, including Cactaceae, Cycadales, Aizoaceae, and Agavoideae (Margulies et al., 2019; Margulies et al., 2023). Pressure from illegal trade on specific species of wild succulents is closely tied to the vagaries of international consumer demands, which are geographically specific and prone to sudden shifts in fashion and consumer interests (Veríssimo et al., 2020). Illegal trade in a wide variety of South African succulents began to rise dramatically in 2019. Official reports suggest a strong correlation, and possibly indirect causation, between more frequent seizures of illegally harvested plants and the rise of the COVID-19 pandemic (SANBI, 2023).

Confiscations suggest the quantities of plants, affected locations, and the diversity of species being harvested continue to rise (SANBI, 2022). South Africa is not the only African country facing a growing problem with illegal trade in succulents—Namibian and Malagasy authorities are also concerned (Lavorgna et al., 2020; Ministry of Environment, Forestry and Tourism et al., 2023)—but the severity, scale, and scope of the problem are well-documented by South African officials and scientific authorities and affect a wide range of genera (SANBI & DFFE, 2022). This includes several species scientists now believe to be functionally extinct in the wild (SANBI, 2022). There are also several species that have been recorded for science for the first time, and species previously thought to be extinct in the wild have reemerged in confiscations (Interviews, 2023).

Concerned botanists, conservation nongovernmental organizations (NGOs), and government officials in South Africa and neighboring countries are hard pressed to develop responses and interventions to reduce illegal wild harvesting of succulent plants for an international consumer market (SANBI & DFFE, 2022). As conservation organizations, communities, and NGOs begin to roll out responses, they need evidence to inform what kinds of interventions might be most successful in reducing or eliminating these trades in a socially just and sustainable manner. Evidence to inform these responses is lacking, including on the structure and functioning of illicit supply networks as well as consumer preferences and culturally specific demand drivers.

The *succulent poaching crisis* is a phrase that is increasingly familiar in wildlife conservation circles in South Africa, but it is certainly not the first so-called conservation crisis in South Africa stemming from IWT. We believe there are important lessons to be learned from the rhinoceros poaching crisis in southern Africa, especially South Africa, and more specifically, how crisis responses have failed to protect rhinoceroses. We believe these lessons could be applied to succulent trade that threatens species conservation in a range of countries. It could also be extended to a wide range of taxa across different geographic contexts where the language of crisis management is used frequently in the conservation sector.

We explored the multifaceted challenges and complexities affecting succulent conservation in the face of increased demand and bourgeoning illegal trade. We considered the consequences of militarized responses and the drawbacks of such an approach within the rhinoceros poaching crisis, including human rights abuses and the stigmatization of local communities, and explored the ramifications of trade bans and the categorization of wildlife trade offenses as serious crimes. We also critiqued the traditional prohibitionist approach to wildlife trade, proposing instead a socioecological harm reduction strategy.

IMPACT OF GREEN MILITARIZATION ON RESPONSES TO IWT

As social scientists with over 40 years of combined experience studying conservation conflicts, community-centered conservation, criminal networks, and the IWT, we are concerned about the consequences that might follow if the primary response to the illegal succulent harvesting problem mirrors the responses to rhinoceros poaching in southern Africa. These responses have not only failed to stop illegal rhinoceros hunting (IUCN Species Survival Commission et al., 2022), but also entrenched paramilitary and security responses (Annecke & Masubelele, 2016; Duffy et al., 2019), deepened us-versus-them mentalities (Hübschle, 2017a), and stigmatized rural communities as enablers and beneficiaries of illegal trade in rhinoceros horn (Hübschle & Shearing, 2018).

The dominant response to rhinoceros poaching has been the militarization of conservation law enforcement (McClanahan & Wall, 2016), also referred to as "green militarization" (Lunstrum, 2014). This set of responses relates to the implementation of military and security measures, including the use of military and security actors, strategies, and technologies (Duffy et al., 2019). It often involves a mutually beneficial partnership between conservation actors, the military, and private military or security companies (Dutta, 2020; Ybarra, 2018), leading to frequent and sometimes deadly encounters between conservation rangers and suspected poachers (Mogomotsi & Madigele, 2017), human and civil rights abuses during pursuit and interrogation (Hübschle & Jojo, 2021), and extralegal killings of poaching suspects (Smidt, 2022) and assassinations and murder of investigators and rangers (Rademeyer, 2023). Botswana, for instance, introduced an unwritten shoot-to-kill rule in 2013, targeting suspected poachers trespassing in protected areas (Mogomotsi & Madigele, 2017).

An emphasis on conservation through policing, militarization, and securitization also facilitated the discursive framing of "a war on poaching" (Hübschle & Faull, 2017). This framing legitimizes the increased use of military strategy, technologies, and tactics (Lunstrum, 2014); paramilitary training of field rangers (Massé et al., 2018); and private–public partnerships that promote lucrative deals with private security and military companies, defense corporations, and the military–industrial complex (Massé et al., 2018). It has also led to new dedicated laws, policies, and regulations (Craigie et al., 2009); more severe penalties and longer prison sentences (Anderson & Jooste, 2014); surveillance; and intelligence-led policing and information gathering (Büscher & Ramutsindela, 2016). The effects of the war on poaching narrative have further led to profiling and criminalizing of rural communities living close to rhinoceros poaching-affected conservation areas as "poaching villages" (Hübschle & Shearing, 2018) and have also promoted "softer" approaches based on counterinsurgency (COIN) doctrine that encourage community engagement and development with the implicit objective of "winning hearts and minds" (Massé et al., 2018).

Cost of the back-to-the-barriers movement through the green militarization of IWT

Although the tactics described above are seen by some in conservation as crucial (if unfortunate) for disrupting illicit supply chains and criminal networks and deter others from joining poaching gangs (Hübschle & Jooste, 2017; Humphreys & Smith, 2014), rhinoceros poaching in many parts of South Africa and other range states like Botswana, Namibia, and Zimbabwe persists (IUCN Species Survival Commission et al., 2022). This suggests the potential economic reward found in this illegal economy still outweighs its great risks (Barichievy et al., 2017; Hübschle, 2016a).

There is mounting evidence that green militarization undermines community–park relations by reigniting the image (and practice) of conservation as a racialized neocolonial endeavor (Jones, 2021; Kashwan et al., 2021). This includes promoting fortress conservation and forced resettlement in lieu of community-led conservation initiatives and broad-based socioeconomic upliftment of rural residents (Dlamini, 2020;

Neumann, 2004; Nixon, 2011). Research from southern Africa shows that militarization and the expansion of protected areas have led to diminished land and natural resource user rights of Indigenous Peoples and local communities (Duffy et al., 2019; Massé & Lunstrum, 2016). Specifically, Hitchcock (2020) found that these efforts resulted in a reduction in land and resources available to the indigenous San Peoples, higher levels of poverty, increased socioeconomic stratification, and lower levels of physical well-being in the Kavango–Zambezi Transfrontier Conservation Area.

Instead of becoming integrated into rural development initiatives and conservation comanagement, some local communities near rhinoceros poaching hotspots have been evicted from private and public conservation lands and so-called conservation buffer zones as an antipoaching measure (Hübschle, 2021a; Massé & Lunstrum, 2016). Scholars have also demonstrated that communities accused of rhinoceros poaching merely by association bear tremendous costs (Witter & Satterfield, 2019) and, in some instances, screen and protect poachers from detection due to unhappiness and social protest against conservation enforcement (Hübschle, 2016a, 2021b).

The impact and consequences of militarized responses are far reaching. International and US investigations have uncovered a series of human rights abuses including rape, torture, and murder of local community members suspected of poaching at the hand of conservation rangers in the Democratic Republic of Congo, Cameroon, Nepal, and India (U.S. Deputy Secretary of the Interior, 2020; U.S. Government Accountability Office, 2020; Warren & Baker, 2019). Other than elevating poaching to a national security threat and a serious form of organized crime (see later section), there are long-term impacts on conservation practices, rhetoric, policy, and interactions between conservation actors and other stakeholders (Duffy et al., 2019).

However, there are also contexts where conservationists have hailed green militarization as effective and necessary (Shaw & Rademeyer, 2016). For instance, rhinoceros poaching in Kruger National Park has declined in recent years (DFFE, 2023), which some have attributed to successful conservation law enforcement. In the absence of a counterfactual, it is difficult to know what would have happened to rhinoceroses if the militarized response had not taken place. South Africa is not the only country that introduced military and security responses to deal with the escalation of rhinoceros poaching. Although rhinoceros poaching has decreased in the Kruger, rhinoceros populations have continued to decline. The number of white rhinoceroses declined by 75% between 2011 and 2020, and there was a black rhinoceros population decline of 51% between 2013 and 2020 (International Rhino Foundation, 2023). Diminished supply of rhinoceroses and increased law enforcement have led to the displacement of rhinoceros poaching (the so-called balloon effect) to private rhinoceros reserves and protected areas elsewhere in South Africa, especially KwaZulu-Natal (Phys.org, 2023), and in the wider region, particularly Namibia (Ministry of Environment, Forestry and Tourism et al., 2023). This geographic expansion is concerning because, in contrast to green militarization tactics, the examples of community-run conservancies, including the famed rhinoceros game guards program of turning poachers into protectors in Namibia, hold much promise, and an uptick in rhinoceros poaching might derail conservation successes and community benefits (Hübschle & Shearing, 2018).

Translating rhinoceros lessons for succulent conservation

A dynamic similar to that described above is beginning in the illegal succulent trade. For example, a farmer who fired 3 warning shots at 4 young men trespassing on his land and ordered 3 of them to strip naked was hailed as a "conservation hero" (Maron, 2022). According to a magazine article (Maron, 2022), the farmer transported the suspected illegal succulent harvesters naked on the back of a truck to a police station 90 min away. The farmer was later arrested for attempted murder. Earlier, at a meeting of botanists and conservationists in February 2020 attended by A.H., participants openly supported a presenter's call for shoot-to-kill orders to deal with succulent poachers.

There are power differentials at play in how actors engaged in illegal activities are framed and portrayed in both media articles and narratives told by conservation researchers and practitioners (Lunstrum, 2017). The conservation community often seeks simplicity over complexity in understanding the motivations of actors who are implicated in threatening succulent biodiversity and conservation (Margulies, 2020, 2023). However, attention to complexity, nuance, and seemingly contradictory positions and allegiances is crucial to understanding and trying to address so-called wicked problems like IWT. Although there is often a desire for a single solution to a specific problem (here illegal harvesting and trade in succulents), our research on both IWT in rhinoceros horn and succulents suggests this is rarely the case, and different kinds of actors may be motivated by a variety of reasons.

Alongside these enforcement responses and juridical responses (which are discussed later), we are also concerned about the emergence of new discursive responses to the illegal trade in succulents that mirror those of the illegal rhinoceros horn economy. Dominant conservation narratives demarcate clear lines between the heroes and villains in the rhinoceros horn economy, with poachers identified as the enemy in a conservation war in which rangers and park staff are the unambiguous and unsung heroes (Duffy, 2016). Often forgotten or ignored is the role of actors from legal or sublegal rhinoceros horn economies and how they have bridged frictions and flows between the source and the illegal market (Hübschle, 2016b; Hübschle & Gore, 2024). These "green collar" criminals (Iordăchescu et al., 2023) are frequently from privileged and wealthy backgrounds and collaborate with criminal actors and public officials (Hübschle, 2016a). A great deal of research shows how much more complex these dynamics are (McClanahan & Wall, 2016; Smidt, 2022), and the frequency with which people are shot dead through extrajudicial killings by park rangers in southern Africa is concerning. Such discursive maneuvers, which rely on racializing and dehumanizing actors engaged in poaching, can lead to the normalization of criminalization and lengthy incarceration in lieu of rehabilitation or restorative justice.

FROM SERIOUS CRIME TO CONTESTED ILLEGALITIES

A knee-jerk response when new kinds of IWTs emerge is for competent jurisdictions to seek elevating their status through new legislation to the status of more serious crime. In legal terms, a serious offense is an ambiguous yet ultimately impactful designation that can result in significant changes in how states respond to crimes, access international resources for mounting responses, and impose harsher penalties on perpetrators. Serious crime encompasses crimes that cause significant harm either to individuals or to society at large. Although definitions vary across jurisdictions, serious crimes often include murder, rape, armed robbery, serious assaults, kidnapping, and major drug offenses. What is considered a serious offense in one jurisdiction, however, might be considered a lesser crime elsewhere, thus complicating international legal proceedings including extradition. The United Nations Office on Drugs and Crime (UNODC) has attempted to standardize transnational organized crime as a serious offense due to its global implications.

However, local jurisdictions tend to prioritize locally pertinent crimes based on statutes, social norms, and crime trends. The United Nations Convention against Transnational Organised Crime refers to serious offenses as those offenses that might result in prison terms of at least 4 years (United Nations General Assembly, 2000). In the context of South Africa's colonial and apartheid past, criticisms have been raised about which crimes are treated as serious offenses (Pienaar, 2014). White-collar crimes with extensive social and economic implications may not be pursued with the same vigor as street crimes (Michel, 2015). This may lead to a perception that the law is biased in terms of race, ethnicity, gender, and class. In relation to rhinoceros crimes, many of the rhinoceros kingpins or organizers carry on with impunity, while low-level poachers have received long prison terms (Hübschle, 2019).

The labeling of certain crimes as serious reflects a punitive approach rather than an approach that may lead to rehabilitation or restorative justice. In the context of restorative justice, there are debates about whether the designation and the subsequent heavier sentencing help in reducing crime or exacerbate the cycle of criminality (Forsyth et al., 2021). Especially when it comes to wildlife crime offenses, scholars and practitioners have been promoting environmental restorative justice responses (Dore et al., 2022; Hübschle et al., 2021). However, as the rhinoceros horn economy has shown, elevating engagement in poaching economies to serious crime also comes with significant costs and fails to recognize that this status of serious crime is contested.

Contested illegality

Many actors—not only poachers but also elite actors—within rhinoceros poaching and other IWTs do not accept the label of illegality on account of socioeconomic, cultural, historic, or political reasons (Hübschle, 2017, 2022). So-called contested illegality is even more pronounced in the succulent economy where succulents carry Indigenous cultural and medicinal values. Local communities living in the Succulent Karoo region of South Africa say that it should not be a crime to pick a plant as "we cannot eat conservation" (Interview with botanist, 2023). Similarly, the US state of North Carolina classifies poaching the Venus flytrap (*Dionaea muscipula*), a plant native to the Carolinas, as a class H felony (similar to assault by strangulation and dog fighting) (North Carolina Gen Stat § 14–129.3 [2022]). Before this law, it was legal to collect Venus flytraps with permits, and even collecting them without permits was more socially accepted. Collecting Venus flytraps, both legally and illegally, has a long cultural history in the region (Outland, 2018). Paying attention to contestations by communities engaged in forms of IWT about the nature of these economies is valuable because ultimately community-led conservation and community responses to IWT are more just, equitable, and sustainable (Roe, 2015; Roe & Booker, 2019).

The contested legalities and illegalities of CITES-listed species

Alongside the response of elevating forms of IWT to more serious crimes is the frequent listing of species affected by new forms of IWT to one of the appendices of the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES). CITES stands as a cornerstone in the global effort to regulate wildlife trade and safeguard biodiversity. Established in the 1970s, CITES has played a pivotal role in ensuring that international trade in wild species of plant, wildlife, and fungi does not lead to overexploitation and, ultimately, extinction. This is achieved through its system of appendices, which categorize species based on their conservation status and the degree to which trade must be regulated or prohibited (Mackenzie et al., 2020).

However, recent critiques, notably by Cooney et al. (2022), highlight that CITES, although influential, is showing signs of its age in a rapidly evolving conservation landscape. Cooney et al. (2022) argue the treaty applies an oversimplistic and dated approach to listing species under its appendices—one developed prior to the advent of the internet and, consequently, online wildlife trade. The decision-making process within CITES largely overlooks the broader socioeconomic and ecological impacts of these listings (Challender et al., 2019). The current framework is grounded in a set of biological and trade criteria that fail to encompass the complex realities of wildlife trade and its implications. Furthermore, it fails to consider the interests of and impacts on IPLCs who live side by side with plant and wildlife species (Hübschle & Shearing, 2018).

Alongside these concerns, the misuse and misinterpretations of CITES trade data have led to poor analyses of the scale and scope of IWT, as well as the frequent conflation of legal and illegal trades (Challender et al., 2022). Challender et al. (2022) detail these misuses and warn that they may undermine the implementation of effective conservation policies and fuel contestations

over the meaning and significance of CITES listings. This problem is also reflected within the cactus and succulent collector community. Margulies et al. (2023) show that many collectors see CITES as important in intent but often flawed in its implementation, leading them to question CITES' ability to control IWT or reduce the illegal harvesting of plants. The delegitimizing of CITES within consumer groups trading in CITES-listed species is a concern because CITES is the only authority that determines the legal or illegal status of global wildlife trades.

FROM PROHIBITION TO SOCIOECOLOGICAL HARM REDUCTION

In the context of succulents, there is a lack of evidence that criminalization and elevation of offenses to serious crime lead to an overall reduction in plant poaching or improvement in conservation outcomes, and much more research is needed to evidence CITES' positive impacts on curtailing IWT in succulents (Margulies, 2023). Laws or new CITES listings targeting specific species or genera may also result in piecemeal responses, transferring pressure from one species or group of plants to another to circumvent new trade restrictions or greater law enforcement oversight. This represents what might be called a taxonomic balloon effect in IWT, something we have observed in our research in plant collector communities and in the commercial sector, where the listing of one species or genus to CITES may encourage demand to shift to a related, yet taxonomically distinct, group of plants. If one looks at other illegal trades where criminalization and prohibition responses remain the dominant approach, such as the United States' failed war on drugs, prohibition has introduced more serious and violent criminal actors into the illegal drug trade and expanded its geographical footprint of harms across a variety of social sectors, all while remaining ineffective at curtailing trade volume and economic value (McSweeney, 2023; Transform Drug Policy Foundation, 2011).

There is growing recognition (though not without heated debate) in the context of IWTs that total prohibition responses (including the banning of legal trades through the use of CITES Appendix I) for many species and trades are ineffective at stopping trade and may even accelerate or cause greater harm to species conservation efforts by introducing more criminal actors or increasing, rather than decreasing, the value of desired products in the marketplace (Roe & Lee, 2021; Zhu, 2022). Too often, trade regulations are debated and developed by trained conservation biologists rather than lawyers, economists, and social scientists who study illicit markets and consumer behavior and are equipped to study or model the effectiveness of proposed regulatory responses (Sas-Rolfes et al., 2019).

The problems in succulent conservation, exacerbated by international demand and illegal trade, would benefit from a more nuanced approach. For instance, rather than outright bans or militarized enforcement, a revised international regulatory framework that takes into account the socioeconomic realities of IPLCs, alongside ecological needs, could lead to more sustainable conservation strategies. This should also involve a more inclusive decision-making process at the global level that considers not just biological imperilment but also the livelihoods of local communities and the potential unintended consequences of trade restrictions.

Socioecological harm reduction

We propose, contra prohibition, for what we call a *socioecological harm reduction* approach to the IWT. In advocating for a socioecological harm reduction approach, we draw inspiration from Elinor Ostrom's vital work on managing social–ecological systems. Ostrom's (2009) principles emphasize the interconnectedness of human communities and natural ecosystems. She advocated for collaborative, multistakeholder governance systems that respect local knowledge and contexts. This perspective is crucial in rethinking strategies for IWT because it recognizes that ecological issues cannot be divorced from their social dimensions. A socioecological harm reduction approach would involve participatory decision-making processes in which IPLCs have a significant voice in shaping conservation strategies, ensuring that these are not only ecologically sound but also socially equitable and economically viable.

A socioecological harm reduction approach to the IWT is informed by harm reduction approaches emergent in the public health sector in response to drug use and addiction (Transform Drug Policy Foundation, 2011). In brief, harm reduction "…is a set of practical strategies and ideas aimed at reducing negative consequences associated with drug use. Harm Reduction is also a movement for social justice built on a belief in, and respect for, the rights of people who use drugs" (National Harm Reduction Coalition, 2023). The approach focuses on recognizing that both illegal and legal drug use hold significant personal, social, and public health harms for drug users and societies affected by drug use, but it equally recognizes that such harm exists and works to minimize these harms through practical interventions rather than attempting to wholly eliminate or ignore them and their attendant effects.

Understanding the complexities of harm minimization

There is a growing sector of scientists and policy makers who argue that it is better for the conservation of species to regulate and permit rather than ban forms of wildlife trade (Di Minin et al., 2022; Parlee et al., 2018). However, in naming socioecological harm reduction, we recognize that, in contrast with drug use, there are at least 2 important subjects, rather than only one, that we seek to focus on in relation to harm minimization. We acknowledge this also leaves many important questions about species welfare open for discussion because a key area of conflict in sustainable use versus prohibition debates (especially around animals) centers on whether the primary subject of concern is the species or individual organism (Natusch et al., 2021).

Ecology is about relations, and here we seek to minimize the harms that emerge in IWTs through the relations held between those directly engaged in illegal wildlife economies (e.g., poachers, harvesters, intermediaries), the communities living near or in areas where desirable wildlife is located, and the species and ecosystems affected by these trades. In addition, we are also concerned about responses to IWT, which often carry with them unexpected social and ecological consequences, affecting not only human communities, but individual organisms and populations, species, and ecosystems as a whole.

Socioecological harm reduction is therefore focused on both the persons benefitting, harmed by, enrolled, or engaged in IWTs as well as affected species, species populations, and the ecosystems they help compose. We recognize that some forms of harm to species, specific populations, and individual organisms will be inevitable through the continuance of IWTs. However, we advocate for their minimization rather than total mitigation through practices, responses, and activities that can foster meaningful sustainable use and livelihood opportunities through regulated, promoted, and transparent legal trades in wildlife. This approach aims to minimize the power, criminalization, and human and socioecological harms that so often emerge in heavily criminalized forms of IWT. Ecological harms to species that some people value will persist, and socioecological harm reduction should focus on how the greatest social and ecological harms can be minimized through practical attention to people's immediate and longer term needs and the needs of affected nonhuman species.

We believe that a socioecological harm reduction approach to IWT shares close affinities with sustainable use and livelihood approaches. However, there is a more explicit recognition of harm to species, ecosystems, and persons alike, as well as a pragmatic orientation toward reducing harm wherever possible while supporting people's rights to livelihoods that depend on other species. A holistic orientation toward harm minimization within a broader socioecological context should be developed through community-led and supported initiatives responding to IWT leading ultimately to state devolution of rights in favor of meaningful citizen control (Abensperg-Traun, 2009; Arnstein, 1969). In recognizing there are a multiplicity of philosophical and ethical underpinnings that drive conservation interventions (Natusch et al., 2021), a socioecological harm reduction approach should holistically consider social and ecological harms across scales of organisms, populations, species, and ecosystems. Further, it recognizes that sustainable use approaches can, when managed correctly, lead to species population increases while recognizing this entails harm to individual organisms (Abensperg-Traun, 2009).

IWT INTERVENTIONS MUST FLOW FROM EVIDENCE

Pragmatic interventions to respond to IWTs focusing on sustainable use and livelihoods should be emphasized over criminalization, prosecution, and vilification of historically dispossessed and marginalized peoples, especially Indigenous and Black communities (Hübschle & Shearing, forthcoming). Further, although the importance of codesign approaches to IWT interventions is well-recognized in the literature, there has been much less focus on codesign at the consumer end of trades. How does one design interventions at the demand end that are codesigned from the ground up as well? The problems and many failures of demand reduction campaigns are now well-known in IWT circles (Margulies et al., 2019; Thomas-Walters et al., 2020; Vu, 2023), yet the same codesign principles that focus on supply-side actors could be incorporated into consumer research and intervention activities as well.

In the realm of research on IWT with the aim of practically informing socioecological outcomes, it is insufficient for conservation social scientists to concern themselves with the social costs or wildlife trades, whereas the species conservation and ecological costs of IWT remain the purview and focus of conservation biologists, land managers, and ecologists. A socioecological harm reduction approach demands meaningful collaboration and expanding the definitions of harms wrought through wildlife trade with regard to how responses to minimize harms are conceived, researched, and enacted.

Many people who become engaged in forms of IWT are already intergenerational knowledge keepers of traditional and Indigenous knowledge systems that include important knowledge about affected species. As we have seen in the case of succulent trades, harvesters are often aware of population locations and their statuses more than scientists (Interview with botanist, 2023), yet this knowledge rarely informs International Union for Conservation of Nature (IUCN) field monitoring exercises for the IUCN Red List or conservation management plans. There is an opportunity to economically value this knowledge for conservation's benefit while providing economic opportunities that may serve as alternatives to illegal harvesting practices.

At the same time, other kinds of evidence are also still sorely lacking in other forms of IWT. The globally interconnected and patchworked networks that convey illicit flows move and communicate through fiber optic cables, satellites, bus routes, taxis, hiking boots, and international mail couriers. Research must respond in kind. There is a strong need for funding agencies to streamline and facilitate multinodal, international, and collaborative research codesigned in close concert with affected communities at both supply and consumer ends to enable researchers to fully envision and execute evidence-gathering research that can respond to these globally connected trades.

In envisioning a more effective approach to succulent trade regulation, we propose a macro-level strategy that transcends the shortcomings of the rhinoceros experience. Central to this strategy is the recognition and protection of local use rights, which ensures community participation and benefits from conservation efforts. Strengthening governance structures is crucial, particularly in enhancing harvester and management capacity, ideally leading in time to citizen control. This, in turn, facilitates communities' access to legitimate and well-paying value chains, fostering sustainable livelihoods. A key component of this approach is the implementation of traceability systems that ensure transparency and accountability in

the trade of succulents. Additionally, enforcement mechanisms should be redesigned to support, rather than undermine, community resources, interests, and rights. Such a holistic approach not only addresses conservation needs but also aligns with the socioeconomic realities of those most affected by trade regulations.

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