Biological Conservation 310 (2025) 111406

Contents lists available at ScienceDirect

Biological Conservation

journal homepage: www.elsevier.com/locate/biocon

Review

The global threat of wire snare poaching: A comprehensive review of impacts and research priorities

Dylan E. Feldmeier[a,*], Oswald J. Schmitz[b], Amy J. Dickman[a,c], Herbert Kasozi[d], Robert A. Montgomery[e]

[a] Wildlife Conservation Research Unit, Department of Biology, University of Oxford, 11a Mansfield Road, Oxford OX1 3SZ, UK
[b] Yale School of the Environment, 195 Prospect Street, New Haven, CT 06511, USA
[c] Lion Landscapes, Highcliffe, New Road, Teignmouth, Devon, UK
[d] Department of Zoology, Entomology, and Fisheries Sciences, Makerere University, 7062 Kampala, Uganda
[e] Institute of Science and Environment, University of Cumbria, Ambleside, UK

ARTICLE INFO

Keywords:
Wire snare
Snaring
Bushmeat poaching
Mortality
Wildlife conservation
Socio-economic dimensions

ABSTRACT

Wire snare poaching is an indiscriminate and pervasive form of hunting that poses a significant threat to global biodiversity. However, research synthesizing the ecological and socio-economic dimensions of snaring remains limited. To address this gap, we systematically reviewed 304 studies published between January 1977 and May 2025 to: (1) assess the global distribution of wire snaring research, (2) examine spatio-temporal trends, (3) identify core research themes, and (4) determine key knowledge gaps. We found that snaring is a global issue, occurring across Africa, Australia, Asia, North America, and Europe. Despite the global nature and increasing magnitude of snaring research over the past three decades, most research attention was in sub-Saharan Africa and Southeast Asia. Through thematic analysis, we identified five core wire snare research themes: Direct Effects, Indirect Effects, Optimized Detection, Socio-economic Dimensions, and Management Interventions. While Direct Effects (mortality and injuries) are well-documented, Indirect Effects, such as altered predator prey dynamics and behavioral shifts, remain limited, underscoring the need for innovative methodologies to better capture non-consumptive impacts of snaring. Emerging research on Optimized Detection, including machine learning, shows promise but requires further validation to overcome low snare detectability. Addressing Socio-economic Dimensions, including poverty, bushmeat demand, and community perceptions, is critical for designing effective Management Interventions. Integrated approaches combining law enforcement with community-driven conservation strategies are gaining traction. However, further research is needed to assess effectiveness and adaptability. Expanding geographic representation, advancing interdisciplinary research, and refining intervention strategies is essential to mitigating the threat of snaring and informing conservation policies globally.

1. Introduction

Biodiversity loss is one of the most pressing conservation challenges globally, driven by anthropogenic factors such as habitat destruction, climate change, and overexploitation of wildlife (Dirzo et al., 2014; Habibullah et al., 2022; Maxwell et al., 2016). Among these drivers, unsustainable hunting has emerged as a particularly acute threat which can not only accelerate population declines but also disrupt ecosystem functions (Brodie et al., 2021; Ripple et al., 2016b). While unsustainable hunting can occur legally, such as when regulated harvest limits fail to reflect population dynamics (Minin et al., 2021), illegal hunting, including poaching for animal body parts and bushmeat, is an escalating threat that has been shown to rapidly accelerate declines in terrestrial wildlife populations (Ripple et al., 2016a; Wittemyer et al., 2014). Beyond reducing population sizes, such illegal hunting may have additional ecological impacts, including disrupting predator-prey dynamics, competitive dynamics, community food webs, and broader ecosystem resilience (Creel et al., 2024; Darimont et al., 2015; Figel et al., 2021).

Illegal hunting employs various capture methods that differ in selectivity for specific animal subjects (Montgomery et al., 2022). These methods range from targeted techniques, such as firearms and bows, to indiscriminate approaches, including traps and poisons, which impact

* Corresponding author at: Department of Biology, University of Oxford, 11a Mansfield Road, Oxford OX1 3SZ, UK.
E-mail address: dylan.feldmeier@magd.ox.ac.uk (D.E. Feldmeier).

https://doi.org/10.1016/j.biocon.2025.111406
Received 18 March 2025; Received in revised form 30 June 2025; Accepted 31 July 2025
Available online 2 August 2025

both target and non-target species (Lindsey et al., 2013; Ogada, 2014). Among the latter strategies, wire snaring is particularly concerning due to its widespread use and indiscriminate nature of the rudimentary technology (Becker et al., 2013; Gray et al., 2018; Montgomery et al., 2023).

Wire snaring is deeply rooted in social-economic challenges, motivated by subsistence needs in impoverished communities and the commercial demand for bushmeat and other animal products in local and regional markets (Akani et al., 2015; Fa et al., 2000; Lindsey et al., 2011a; Sawaki et al., 2022). Traditionally employed in biodiversity hotspots within sub-Saharan Africa and Southeast Asia, wire snares are constructed from readily available and low-cost materials, including wiring from vehicle tires, brake cables, fencing, or electrical wires (Gray et al., 2017; Gubbi et al., 2023; Haq et al., 2023; Mudumba et al., 2021). These lightweight materials are easily concealed for transport, silent in operation, and simple to set, making wire snares a preferred tool for poachers seeking to avoid detection, particularly in areas close to communities or where the sound of firearms would alert law enforcement (Dobson et al., 2019; Sethi, 2022). Poachers may strategically place snares along game trails, near water sources, and in other high-traffic wildlife areas, leveraging local ecological knowledge to maximize capture success (Nieman and Nieman, 2024; Watson et al., 2013). They may also employ landscape manipulation techniques to increase capture success, including the use of fire to stimulate the growth of palatable vegetation that attracts herbivores, and the construction of brush fences to direct animal movement toward snare lines (Lindsey & Bento, 2012; O'Kelly et al., 2018a). Snare placement may also be influenced by seasonal changes and the spatial distribution of law enforcement patrols, resulting in temporally dynamic and shifting patterns within landscapes (Becker et al., 2013).

Wire snares function through a self-operating mechanism that enables capture with minimal human effort. Depending on the habitat and target species, snares may be either passively or actively triggered, with a variety of designs that highlight the adaptability of poaching techniques (Becker et al., 2013). A typical passive snare consists of three primary components namely an anchor, a suspended loop, and a slip point. The anchor secures the snare by fastening it to strongly rooted vegetation, such as trees or shrubs in forested landscapes, or to fixed structures such as stakes or fence posts, preventing the wire from being dislodged when an ensnared animal struggles to escape (Becker et al., 2013; Kendon et al., 2022; Mudumba et al., 2021). The suspended loop, with the lower end positioned at the approximate height of the target species, is designed to capture the animal as it walks or runs through. The loop is often held at the approximate height using organic materials such as grass or reeds, ensuring it remains elevated and correctly positioned while easily breaking to release the snare when an animal is captured (Montgomery et al., 2023). The slip point functions as the tightening mechanism, allowing the loop to constrict in one direction. As an animal moves through the suspended loop, its forward motion pulls the running end of the wire through the slip point, causing the loop to tighten around its neck, torso, or limbs. Friction at the slip point ensures that the loop remains taut, making it nearly impossible for most animals to escape without external intervention or amputation. In contrast, actively triggered snares, such as foot- or whip- snares, use a bent branch or anchored pole held under tension which releases when an animal steps into a hidden loop and triggers the mechanism (Teutloff et al., 2021). Regardless of trigger type, if a snare breaks from its anchor, residual tension within the slip point can continue to constrict the wire over time, cutting deeply into tissue and exacerbating injury severity (Banda et al., 2023; Quiatt et al., 2002).

As wire snare traps are designed to be left unattended, poachers can deploy numerous snares simultaneously and in dense clusters, significantly increasing the spatial and temporal intensity of poaching (Groenenberg et al., 2023; Lindsey et al., 2011b). The precise locations of deployed snares are often left unchecked, which can result in undetected carcasses left along trap lines (Muchaal and Ngandjui, 1999). While the intended targets of wire snaring are often ungulates in forest and savanna ecosystems, as these species are highly valued for bushmeat, it frequently results in the incidental capture of non-target species, also known as by-catch (Gray et al., 2018; Rostro-García et al., 2023; Wiafe, 2021). Scavengers, for example are often caught while feeding on snared carcasses, and subordinate predators face heightened risk in poaching hotspots along protected area edges, where snaring pressure is often highest (Becker et al., 2024; Knopff et al., 2010; Watson et al., 2013). Thus, while ungulates are the primary targets, snaring can inadvertently disrupt their predators as well, amplifying the effect on overall predator-prey dynamics.

The risk of being snared also varies with animal life history traits. For example, adult males of some species exhibit higher snaring mortality rates, likely due to increased movement patterns associated with territoriality and mate-seeking behavior, and hence higher encounter with snaring sites (Holmern et al., 2006;Kasozi et al., 2023b). Dispersing individuals are often more vulnerable to snaring due to their wide-ranging movements through unfamiliar areas, increasing their likelihood of encountering snares (Becker et al., 2024). Juveniles may also be at heightened risk due to their exploratory behavior and inexperience in detecting snares, particularly among primates, where age-related vulnerability to snaring has been more commonly observed (Haggblade et al., 2019). Snare-related animal mortality may disrupt dispersal dynamics, reduce recruitment, and potentially skew population demographics, ultimately threatening population viability. While direct mortality is a significant consequence of snaring, animals that escape snares often sustain severe injuries, including lacerations, amputations, internal bleeding, and fractures, leading to long-term impairment of health or secondary mortality (Haggblade et al., 2019; Kasozi et al., , 2023b; King'ori et al., 2018; Turnbull et al., 2013; Waller and Reynolds, 2001; White and Van Valkenburgh, 2022; Yersin et al., 2017). The prolonged and cumulative removal of individuals, particularly among slow-reproducing, large-bodied species, can accelerate population declines, reduce recruitment rates, and heighten the risk of extirpation (Kasozi et al., 2023b; Loveridge et al., 2020; Montgomery et al., 2023).

In addition to injuries and fatalities, snaring may also disrupt species interactions, habitat use, and ecosystem dynamics. These indirect effects can be broadly categorized into two pathways. First, sublethal effects occur in injured individuals that escape snares but sustain injuries, leading to behavioral changes such as altered movement, reduced foraging efficiency, and disrupted social interactions (Kasozi et al., 2023a; Yersin et al., 2017). Beyond these behavioral shifts, sublethal effects can also impose long-term physiological costs, including chronic stress responses, weakened immune function, and diminished reproductive success, further compounding population declines (Benhaiem et al., 2023). Second, snaring can influence non-snared individuals by altering broader ecological dynamics. Predators, for example, may experience prey depletion and shifts in prey composition, as snaring disproportionately targets ungulates and other herbivores in heavily-poached landscapes (Creel et al., 2018; Basak et al., 2025; Vinks et al., 2020). These changes can result in dietary niche compression, prey base homogenization, and altered energetics, leading to smaller group sizes, increased interspecific competition among carnivores, and elevated levels of by-catch (Banda et al., 2023; Creel et al., 2025a, 2025b; Goodheart et al., 2021; Reyes de Merkle et al., 2024). The latter may occur as larger prey species, and the larger snares associated with them, become less commonly used, increasing the frequency of mid-sized snares that pose greater risk to carnivores. Collectively, these dynamics can have demographic consequences for predator populations, including reduced recruitment and the emergence of source-sink dynamics that inhibit long-term population viability and connectivity across landscapes (Becker et al., 2024; Creel et al., 2024). Importantly, such shifts may also extend to herbivore communities themselves, where altered species composition could disrupt competitive interactions, favoring species less susceptible to snaring and reshaping ecosystem structure and function. For instance, in Cambodia, snaring-driven declines in terrestrial ungulates contrasted with the persistence of arboreal primates, potentially restructuring trophic interactions in ways that remain poorly understood (Groenenberg et al., 2023). Additionally, similar to other forms of anthropogenic disturbance, snaring may alter wildlife habitat use, potentially causing some species to avoid high-risk areas despite resource availability, though such responses may not be universal and can be difficult to disentangle from general avoidance of human activity (Burak et al., 2023; Hayward, 2009; Suraci et al., 2019).

While research efforts have provided valuable insights, certain dimensions of snaring remain unexplored. Despite its widespread use and important conservation implications, many questions about wire snaring's extent and ecological consequences remain unanswered. We addressed this critical research gap by conducting a systematic review to synthesize existing knowledge on wire snaring and its socio-ecological impacts. Our specific study objectives were to: 1) assess the global distribution of wire snare research effort, 2) examine spatio-temporal patterns to evaluate how the field has developed over time and across different geographic regions, 3) identify the core research themes of wire snare research, and 4) determine key research gaps to highlight underexplored areas and inform future studies on wire snaring and its conservation implications. We derived a conceptual framework of core research themes that structure the current understanding of wire snaring and its broader implications for conservation science. Building on these insights, we propose novel methodologies to address identified research gaps, advancing future studies on the ecological and conservation challenges posed by wire snaring.

2. Methods

We conducted a systematic literature review in May 2025 to assess existing research on wire snare poaching. We implemented this search in two electronic databases, Scopus and Web of Science (WOS), due to their comprehensive coverage of the conservation science literature. To ensure robust retrieval of relevant studies, we developed a search strategy that combined keywords related to wire snaring, hunting, and bushmeat, along with terms capturing the ecological, behavioral, and socio-economic dimensions of snaring. Our primary search string was: ("snare" OR "snares" OR "snaring" OR "snared" OR "wire traps" OR "prey depletion") AND ("hunting" OR "poaching" OR "bushmeat" OR "wildlife" OR "subsistence" OR "by-catch" OR "mortality" OR "injury" OR "behavio*r" OR "population dynamics" OR "predator-prey" OR "detection" OR "mitigation" OR "social" OR "economic" OR "cultural"). We included multiple variations of the term "snare" and its derivatives to ensure that all relevant mentions in different contexts were retrieved. Additionally, terms such as "wire traps" were incorporated to account for alternate nomenclature. To ensure we captured the more complex indirect ecological effects associated with wire snare poaching, we also included the term "prey depletion" in our search string. This allowed us to identify studies that may have explored the broader consequences of snaring, such as altered predator-prey or competitive dynamics due to snared induced prey loss. The second half of our search string was designed to capture the broader contexts in which wire snaring occurs. These terms allowed us to identify studies addressing the ecological impacts of snaring (e.g., mortality, population dynamics), socio-economic drivers (e.g., bushmeat trade, subsistence use, cultural practices), and management responses (e.g., detection technologies, mitigation strategies, community engagement). The search was conducted across study titles, abstracts, and keywords in both databases to maintain consistency and relevance.

All retrieved studies were imported into Zotero for reference management. After removing duplicates, we implemented a two-stage screening process to determine eligibility. In the first stage, we screened study titles and abstracts, including studies that explicitly or implicitly examined wire snaring in the context of wildlife conservation. Studies were included if they discussed wire snares as a method of poaching or as a central cause of observed impacts, whether ecological, demographic, or socio-economic. This included studies that identified wire snaring as a driver of mortality, injury, behavior change, population, or community dynamics. We also included research where community reliance on bushmeat or poaching was linked specifically to the use of wire snares. Additionally, studies examining conservation interventions in landscapes explicitly affected by wire snaring were retained. Studies were excluded if they discussed poaching, bushmeat harvesting, or poaching induced prey depletion without mention of wire snares, as we could not assume snaring in the absence of specific reference. This approach was intended to strike a balance between comprehensive coverage and methodological rigor, while reducing the risk of misclassifying studies not directly focused on wire snaring.

Studies were removed if they focused on non-invasive hair snares for genetic sampling, archaeological research on historical snaring techniques, veterinary studies on pharmaceuticals for wildlife immobilization, or wildlife capture methods for scientific research or population management unrelated to illegal poaching. Additionally, we removed studies that referenced snare or snaring in relation to cell biology and medical techniques.

In the second stage, we conducted a full-text review of the remaining studies to confirm their relevance and adherence to our inclusion criteria. From each study, we recorded the year of publication to assess temporal trends in wire snare research and the geographic location to evaluate its global distribution. We then extracted key data from each study, including study objectives, methodologies, primary findings, and conservation implications, which we systematically analyzed to identify methodological patterns and recurring research foci. Using an inductive thematic analysis approach (Kiger and Varpio, 2020), we coded each study based on its primary area of investigation to identify convergent research questions and thematic trends across the literature. We subsequently aggregated these assigned themes by country to examine global thematic patterns of wire snare research effort.

To further increase analytical resolution and better capture the diversity of research within each theme, we conducted a second round of inductive coding to identify finer-scale research patterns. This iterative process led to the development of a nested classification structure that captured both broad thematic categories and more specific subcategories of inquiry. These subcategories reflect recurring methodological approaches, core results, or theoretical perspectives across studies. Articles were then assigned to a subcategory based on their primary content and contributions.

3. Results

Our database search yielded 4607 research studies from Scopus ($n = 2825$) and Web of Science ($n = 1782$). After removing duplicate records and applying our inclusion criteria, 4303 studies were excluded. This screening process resulted in a final dataset of 304 studies for analysis (See Supplemental A for full list of recognized studies).

The retained studies were published between January 1977 and May 2025, with wire snare research output increasing over time (Fig. 1.). Between 1977 and 2010, fewer than seven studies were published annually. Research activity began rising in the subsequent decade, peaking at 33 publications in 2021, with an overall Compound Annual Growth Rate (CAGR) of 6.34 %. The geographic distribution of wire snare research revealed a strong regional focus, with the highest concentration of studies conducted in Eastern and Southern Africa (Fig. 2). Nationally, Uganda had the highest number of studies ($n = 30$), followed by Zambia ($n = 21$), Zimbabwe ($n = 18$), South Africa ($n = 14$), and Tanzania (n = 14). In West Africa, notable research activity was recorded in Cameroon (n = 14), Equatorial Guinea ($n = 8$), and Ghana ($n = 7$). In Southeast Asia, research was well-represented in Cambodia ($n = 12$), Indonesia (n = 12), Vietnam ($n = 10$), Laos (n = 8), and Malaysia ($n = 4$). Beyond Africa and Southeast Asia, China (n = 12) and India (n = 14) had moderate research activity. North America also contributed a

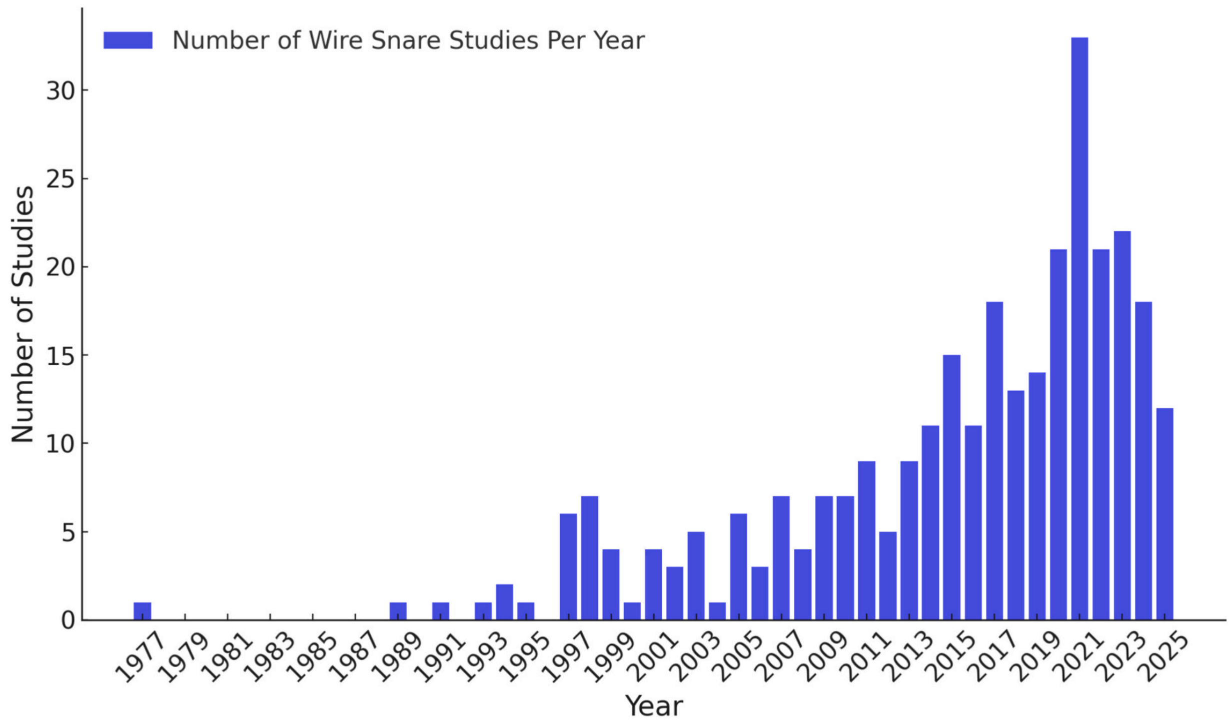

Fig. 1. The number of peer-reviewed studies published per year on wire snare poaching and its impacts on wildlife, from January 1977 to May 2025. The bar plot illustrates a gradual increase in research output over the decades, with notable growth from 2011 onward and a peak of 33 publications in 2021. All studies were sourced from Scopus and Web of Science.

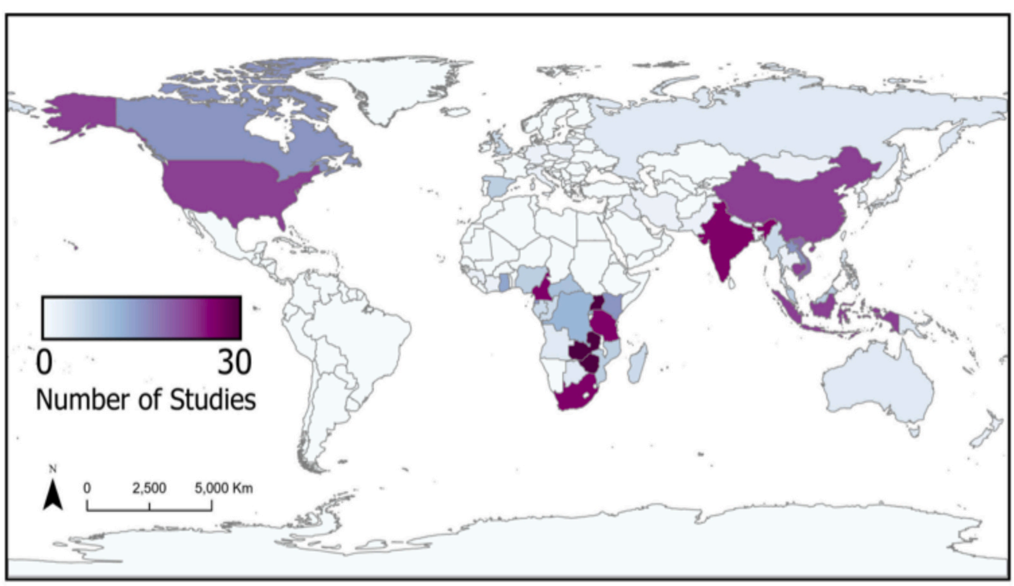

Fig. 2. Global distribution of wire snaring research effort categorized by the number of studies published per country. Darker shades represent a higher number of studies, with the highest concentrations observed in regions such as Southern and East Africa, Southeast Asia, China, and North America. Lighter shades indicate fewer studies, highlighting areas with lower research activity, including parts of Central and South America, Central Asia, Northern and Central Africa, and Europe.

significant number of studies ($n = 20$), primarily from the United States and Canada. Outside these regions, research on wire snaring was comparatively limited, with a few studies conducted in Europe, including Spain (n = 4), the United Kingdom (n = 3).

3.1. Wire snare research themes and subcategories

Our analysis identified five overarching themes that characterize the current landscape of wire snare research: **Direct Effects**, **Indirect Effects**, **Socio-economic Dimensions**, **Optimized Detection**, and **Management Interventions** (Fig. 3.). Direct Effects dominated globally, particularly across Southern and Eastern Africa, Europe, India, China, and Australia, while Indirect Effects were limited, emerging as the dominant theme only in Zambia and Japan (Fig. 4, Supplemental B). Socio-economic Dimensions were most prevalent in West Africa and Southeast Asia, including countries such as Ghana and Indonesia. Optimized Detection was primarily studied in Bangladesh and Guinea, while Management Interventions were the dominant focus in Canada, Russia, the Democratic Republic of Congo, Vietnam, and Laos. Within each theme, we developed 22 subcategories to capture distinct methodological approaches and conceptual emphases (Fig. 5., Supplemental C). All subcategory percentages reported below are calculated relative to the number of studies within each overarching theme.

The **Direct Effects** theme was the most represented in the literature, accounting for 39.8 % of all studies (n = 121). This body of work primarily focuses on the immediate consequences of snares on wildlife health and survival and was dominant globally, including most of South and East Africa, Europe, India, and China. Within this theme, *Snare-Related Mortality* was the most common subcategory (37.2 %, n = 45), documenting deaths caused by snares through carcass records, bushmeat market surveys, and ranger patrol data estimating snaring-related kills and species diversity. *Demographic Impacts* comprised 35.5 % (n = 43), assessing how snaring affects demographic patterns such as survival, recruitment, dispersal, source-sink dynamics, or local extirpation, often using GPS or camera trap data, transect sampling, long-term intensive studies, or population modeling. *Snare-Related Injury* accounted for 24.0 % (n = 29), with studies reporting wounds, limb loss, or other trauma from snares based on visual assessments, clinical records, or field monitoring. A smaller proportion (3.3 %, n = 4) addressed *Snare Design and Lethality*, examining how characteristics such as wire thickness, loop size, or anchor type influence capture success, lethality, and injury severity.

The **Indirect Effects** theme (12.5 %, n = 38) explored cascading ecological consequences of snaring beyond immediate injury or death. *Prey Depletion and Trophic Consequences* was the dominant subcategory (50.0 %, n = 19), documenting how snaring-driven declines in prey populations affect predator abundance, diet composition, interspecific competition, dietary niche compression, or broader trophic cascades. *Snare Injury–Driven Behavioral Change* (15.8 %, n = 6) focused on how injuries alter behavior in surviving animals, including reduced mobility, altered group dynamics, or long-term shifts in foraging and activity patterns. *Behavioral Responses to Snaring Risk* (15.8 %, n = 6) investigated avoidance behaviors, vigilance, or spatial and temporal movement changes in response to poaching pressure. A smaller set of studies examined *Physiological Stress and Energetics* (10.5 %, n = 4), assessing impacts of injury or human-induced predation risk on hormone levels, energy budgets, and reproductive physiology. *Scavenger and Predator Exploitation of Snared Wildlife* (7.9 %, n = 3) explored how carnivores and scavengers interact with snared animals, carcasses, or baited sites, interactions that can elevate by-catch risk, alter predation dynamics, or create ecological traps.

The **Socio-Economic Dimensions** theme accounted for 20.4 % of studies (n = 62) and focused on the human behaviors, motivations, and structural drivers that underlie snaring. *Bushmeat Market and Trade Drivers* (33.9 %, n = 21) examined how economic drivers, including bushmeat markets, trade networks, and consumer demand, drive snaring for economic gain. *Subsistence Hunting and Food Security* (16.1 %, n = 10) addressed snaring as a coping strategy for food insecurity, emphasizing its role in meeting subsistence needs where alternative protein sources are limited. *Hunting Practices and Demographics* (27.4 %, n = 17) explored who participates in snaring and how, including analysis of demographic predictors (e.g., age, gender, employment, education, and ethnicity), hunting techniques, and snaring frequency. *Community Perceptions, Awareness, and Attitudes* (22.6 %, n = 14) investigated how

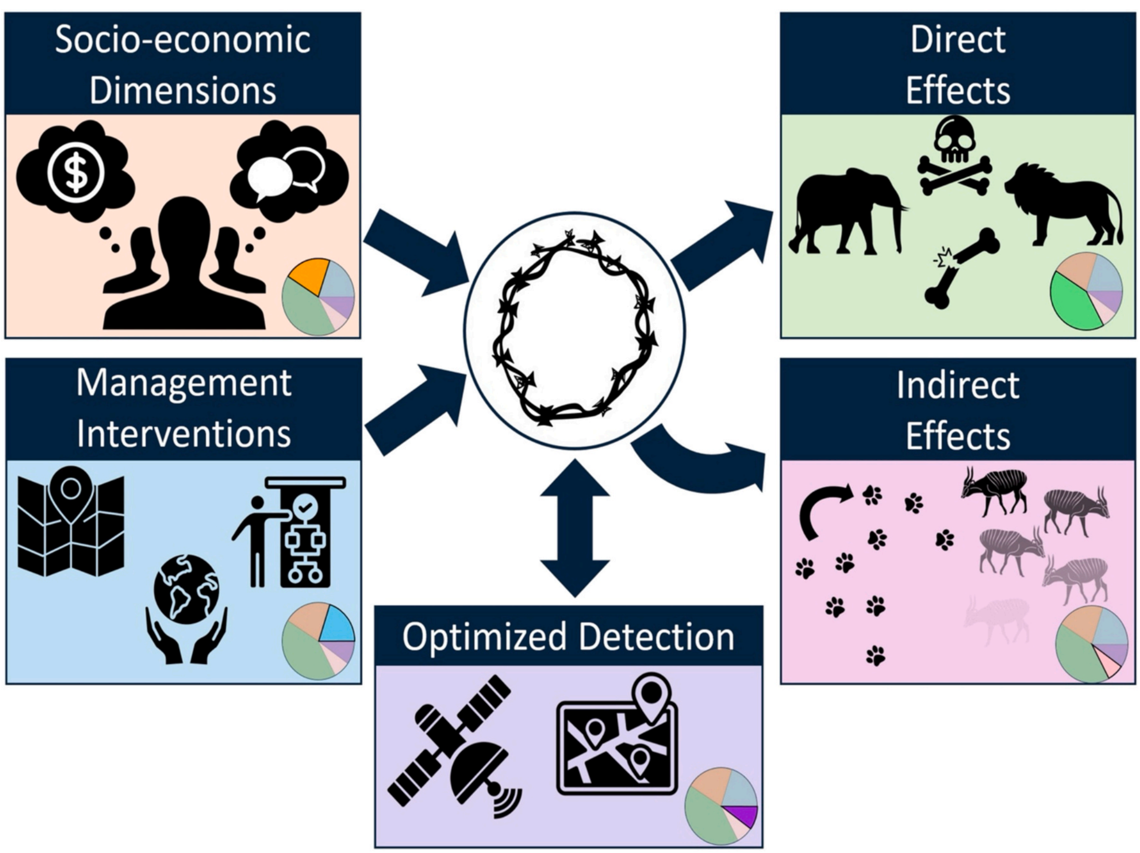

Fig. 3. Conceptual framework illustrating the key themes in research on wire snare poaching and its impacts. Arrows pointing into the central snare symbol represent themes driving snaring levels, including **Socio-economic Dimensions** (20.4 % of studies), which explore factors like poverty and cultural practices, and **Management Interventions** (18.7 %), which focus on strategies to mitigate poaching through policy, enforcement, and community engagement. Arrows pointing out of the snare symbolize the effects of snaring, including **Direct Effects** (39.8 %), such as injury and mortality of wildlife, and **Indirect Effects** (12.5 %), highlighting ecological consequences like altered predator-prey dynamics due to prey depletion, as well as behavioral changes. **Optimized Detection** (8.5 %) bridges both sides, focusing on technological advancements to detect and monitor snaring trends and deployment patterns, influencing both presence and impact of snares.

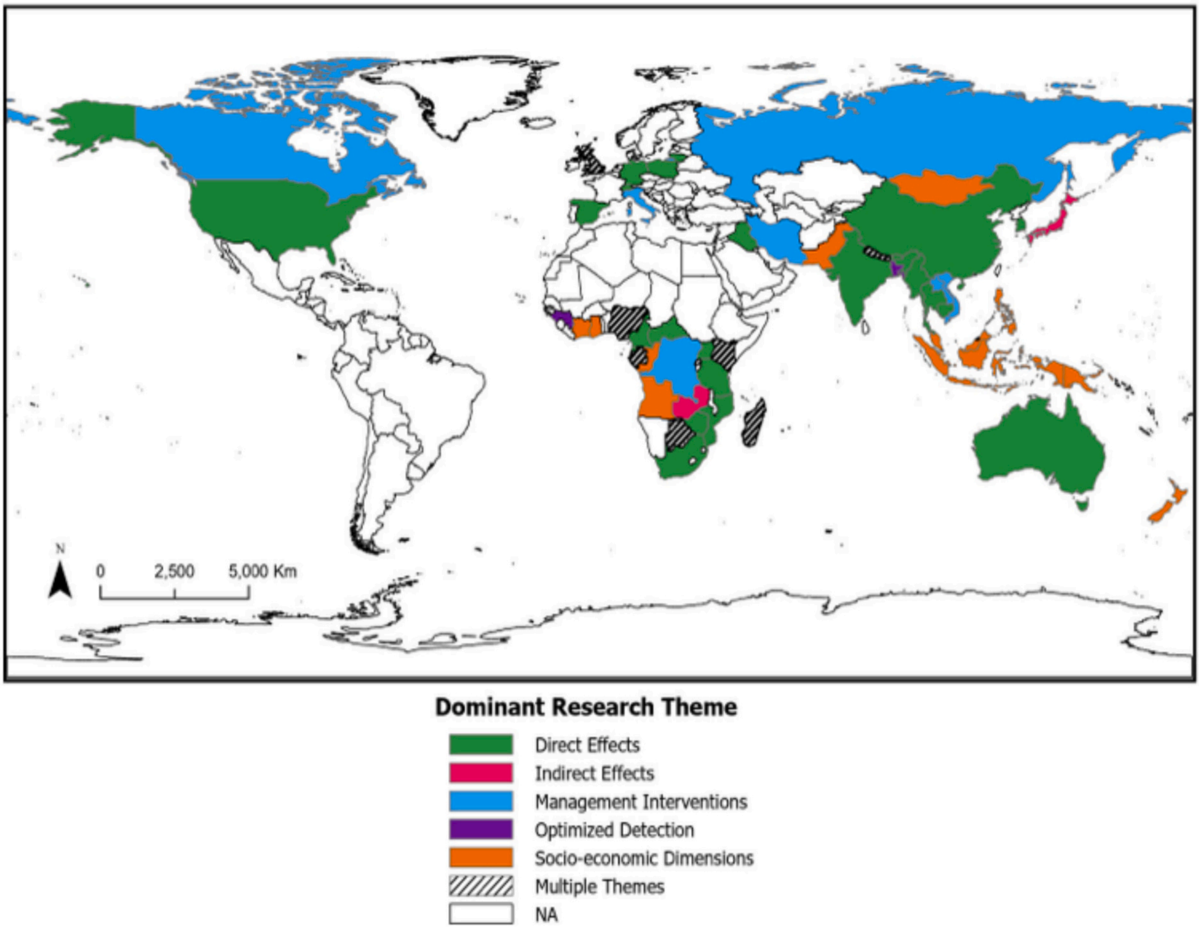

Fig. 4. Global distribution of dominant research themes in wire snaring studies. Countries are color-coded by the most frequently represented research theme in published studies: Direct Effects (green), Indirect Effects (red), Management Interventions (blue), Optimized Detection and Monitoring (purple), and Socio-Economic Dimensions (orange). Dominant theme refers to the research theme associated with the highest number of studies conducted in each country. Countries with black diagonal hatching indicate ties, where multiple themes were represented equally. Detailed theme distributions for these countries are provided in Supplemental B. (For interpretation of the references to color in this figure legend, the reader is referred to the web version of this article.)

communities perceive snaring in relation to wildlife populations, law enforcement strategies, and conservation efforts.

The **Management Interventions** theme (18.7 %, $n = 57$) focused on actions taken to reduce snaring through enforcement, governance, and community engagement. *Law Enforcement and Patrol Effectiveness* was the most represented subcategory (35.1 %, n = 20), analyzing snaring trends and assessing effectiveness of ranger patrols and other law enforcement strategies in deterring or reducing snaring incidents. *Protected Area Designation and Wildlife Monitoring* (21.1 %, n = 12) focused on how protected area designation (ex. protected area vs community area), combined with wildlife monitoring (e.g., camera traps, surveys, focal monitoring, field-based protection), affect snaring patterns and species persistence. An equal proportion of studies (21.1 %, n = 12) addressed *Snaring Legislation and Sustainable Use Policies*, focusing on legal frameworks banning or regulating snaring and bushmeat hunting, and promoting sustainable practices such as certified harvests, trap design standards, or quotas. *Community-Based Conservation and Livelihood Programs* (14.0 %, n = 8) evaluated interventions aimed at involving local communities in conservation through benefit-sharing, alternative livelihood strategies, or informal guardianship to reduce reliance on snaring. *Alternative Deterrence Strategies* (8.8 %, n = 5) investigated non-patrol interventions, such as researcher presence, signage, or voucher systems, designed to influence poacher decision-making through social or psychological cues.

The **Optimized Detection** theme (8.5 %, $n = 26$) reflects a growing focus on improving the detection, monitoring, and spatial understanding of wire snaring through technological and analytical advancements. *Spatial Risk Models for Snaring* (61.5 %, $n = 16$) dominated this theme, using spatial modeling and machine learning to snare deployment patterns based on environmental, topographic, or anthropogenic variables. *Patrol Optimization Strategies* (23.1 %, n = 6) focused on enhancing the efficiency and effectiveness of anti-poaching patrols by modeling patrol routes, assessing spatial coverage, and identifying effort gaps or biases. A smaller number of studies addressed *Imperfect Detection* (11.5 %, n = 3), explicitly accounting for the fact that snares are often missed during surveys or patrols. These studies employed methods such as N-mixture models, detection probability estimates, or experimental detection trials to correct for undercounting and improve the accuracy of monitoring data. Finally, only one study (3.8 %) focused on *Novel Detection Technology*, testing or developing innovative tools aimed at enhancing snare detection capacity in the field.

4. Discussion

4.1. Global distribution of wire snaring

Our review identified 304 peer-reviewed studies documenting wire snaring across a wide geographic range, with confirmed cases reported in Africa, Asia, Australia, Europe, and North America. While no studies from South America were identified in our dataset, this absence likely

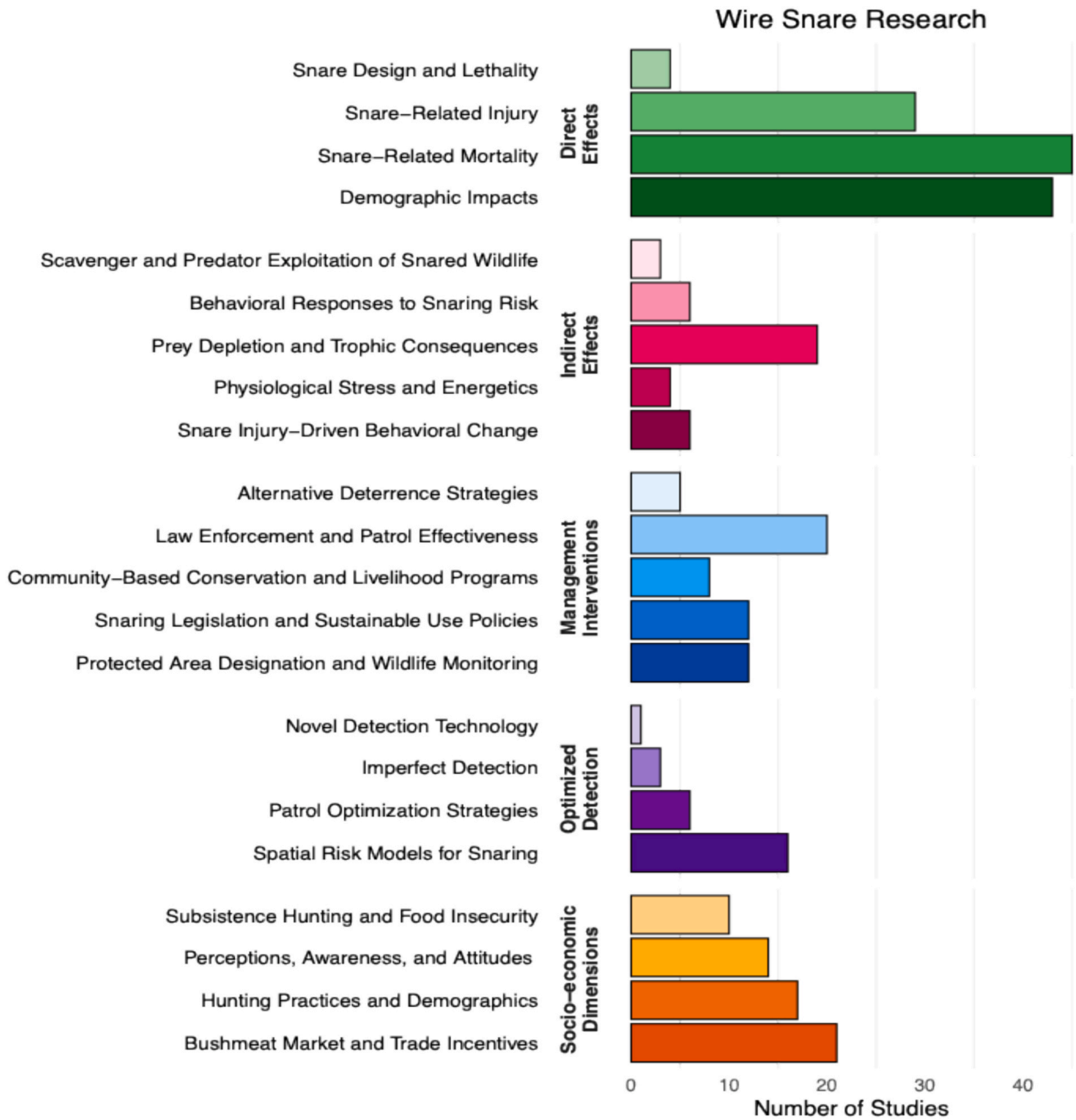

Fig. 5. Number of studies across 22 subcategories within the identified key research themes on wire snare research. Each bar represents the number of studies (out of $n = 304$) assigned to specific subcategories within broader themes: **Direct Effects** (e.g., mortality, injury, population impacts), **Indirect Effects** (e.g., prey depletion, physiological stress, behavioral responses), **Management Interventions** (e.g., patrol effectiveness, community programs, policy), **Optimized Detection** (e.g., spatial risk models, novel detection tools), and **Socio-economic Dimensions** (e.g., bushmeat trade, hunting practices, community perceptions, food insecurity).

reflects a gap in published research rather than a true absence of snaring in these regions. Given that snaring is widely used in similar ecological and socio-economic contexts elsewhere, it is reasonable to assume that snaring may also occur in South America but remains underreported. This underscores the global nature of snaring as a conservation threat and highlights the need for expanded research efforts to better understand its full extent and impact.

Sub-Saharan Africa and Southeast Asia remain critical hotspots for snaring, where its widespread use presents a major conservation challenge, particularly in illegal subsistence hunting and the wildlife trade (Gray et al., 2018; Lindsey et al., 2013). In Africa, snaring is especially prevalent in protected areas, with exceptionally high densities recorded in places like Murchison Falls National Park, Uganda, where up to 4.58 snares/km^2 have been documented, the highest reported in sub-Saharan Africa and possibly globally (Mudumba et al., 2021). In Zambia's Luangwa Valley, snaring by-catch has contributed to elevated elephant poaching rates and substantial impacts on large carnivores; Becker et al. (2013) documented a 32 % increase in elephant offtake and found that 67 % of wild dog packs were affected. More recent research from both Luangwa and the Greater Kafue ecosystem has revealed even more severe community-wide effects, where high snaring areas have driven significant prey depletion and, in turn, carnivore population declines for both dominant and subordinate predators (Creel et al., 2024; Creel et al., 2018; Reyes de Merkle et al., 2024). These effects appear especially pronounced in the Kafue ecosystem, which has historically received lower levels of funding and protection than Luangwa (Creel et al., 2025b). In Southeast Asia, wire snaring is widely used to supply the illegal wildlife trade, particularly for high-value species like the

Sumatran tiger (*Panthera tigris sumatrae*), but its indiscriminate nature results in extensive by-catch (Gray et al., 2018). Figel et al. (2023) identified 13 tiger snaring hotspots and 28 verified cases of snared tigers over a 15-year period in northern Sumatra. While Campbell et al. (2019) found that tiger snares in Sumatra, Indonesia's Kerinci Seblat National Park also caused high mortality in the endangered Malayan tapir (*Tapirus indicus*), highlighting the cascading ecological consequences of trade-driven snaring.

Beyond these well-documented regions, snaring has also been recorded across North America and Europe, where it affects a diverse range of species, including wolves (*Canis lupus*), bears (*Ursus arctos*), cougars (*Puma concolor*), lynx (*Lynx lynx*), and wildcats (*Felis silvestris*). In North America, snaring primarily affects large carnivores as non-target by-catch in legal furbearer trapping for other species. In Canada it is illegal to snare cougars, however, they are frequently captured in snares set for wolves at carrion bait sites, illustrating the indiscriminate nature of snaring and its impacts on non-target scavenging species (Knopff et al., 2010). In New Mexico, USA, the endangered Mexican gray wolf (*Canis lupus baileyi*) has been documented in non-target snaring incidents, with some individuals sustaining severe injuries requiring limb amputations (Turnbull et al., 2013). Despite its legal use in some regions, the ecological and welfare impacts of snaring by-catch in North America remain underreported and urgently require systematic study and policy attention (Proulx and Rodtka, 2019; Proulx and Rodtka, 2015).

In Europe, illegal snaring is widely used for predator control and ungulate poaching, often affecting legally protected species (Barrull et al., 2011). In Poland alone, forest guards remove over 47,000 illegal snares annually (Central Statistical Office, 2019). Between 2002 and 2020, for example, 40.7 % of recorded wolf poaching cases ($n = 91$) were attributed to snaring (Nowak et al., 2021). Similarly, in Switzerland, illegal neck snares positioned along lynx dispersal corridors have been found to threaten reintroduced populations (Arlettaz et al., 2021). These findings challenge the perception that snaring is confined to the Global South and underscore the global severity of snaring as a wildlife conservation issue.

While research has traditionally focused on bushmeat-driven snaring in the Global South, specifically Sub-Saharan African and Southeast Asia, our findings indicate that alternative motivations for snaring, such as predator control and fur trapping by-catch, also drive snaring in the Global North and must be recognized as significant conservation challenges. These variations reflect diverse ecological and socio-economic contexts, where snaring occurs under different hunting traditions, economic pressures, and species assemblages. Addressing these regional differences is essential for developing effective mitigation strategies that are adaptable to variations in snaring practices, ecological impacts, and enforcement challenges.

4.2. Spatio-temporal trends in wire snare research

Over the past five decades, research on wire snaring has increased substantially, reflecting growing scientific attention on the conservation implications of this illegal activity. The sustained growth in research output is comparable to trends observed in human-wildlife conflict studies (Ridwan et al., 2023), suggesting that wire snaring is increasingly acknowledged as a major conservation challenge. However, despite the global breadth of wire snaring, our review identifies strong regional biases in snaring research, with the highest concentration of studies conducted in Eastern and Southern Africa, Southeast Asia, and China. This geographic focus, while aligned with regions where snaring is a major conservation threat, may also reinforce the false perception that snaring is exclusive to the Global South. South America, in particular, remains significantly underrepresented in the literature, despite the continent's high biodiversity and extensive tropical forests, which are ideal conditions for snaring to occur (Jarvis et al., 2010). One possible explanation for this research gap is language bias in publication databases, which prioritize English-language publications and may overlook studies published in Spanish or Portuguese. The lack of visibility for regional research limits global understanding of snaring prevalence and its ecological impacts. Expanding research efforts in South America and other underrepresented regions is critical for developing comprehensive, evidence-based snaring mitigation strategies. By synthesizing available studies, our review challenges the misconception that wire snaring is a regional issue and instead frames it as a severe global conservation crisis. However, the geographic concentration of research in Africa and Asia has led to an incomplete understanding of the full ecological impact of snaring, particularly in underrepresented regions like South America and parts of the Global North. The global footprint of snaring is likely far greater than current research suggests, and failure to address these knowledge gaps could limit the effectiveness of conservation interventions. Future studies should prioritize filling geographic research gaps by expanding monitoring efforts in understudied regions.

4.3. Conceptual framework of wire snare research

From our review, we present a conceptual framework (Fig. 3) that illustrates the interconnected themes of wire snare research, including the drivers, impacts, and mitigation strategies around snaring. **Socio-economic Dimensions** and **Management Interventions** act as key drivers, shaping where, why, and how snaring occurs, while **Direct** and **Indirect Effects** represent the ecological consequences of this practice. **Optimized Detection** serves as a crucial link, influencing both the extent of snaring and the success of mitigation efforts. Rather than implying that each study must address all of these components, the framework serves as a guiding structure for understanding how diverse research efforts relate to the broader dynamics of wire snaring. Researchers can use this framework to position their work, whether investigating how economic hardship and cultural practices drive snaring behavior, evaluating the impacts of snaring on wildlife populations and trophic dynamics, or developing and testing detection tools to enhance enforcement and monitoring. By explicitly considering these relationships, future studies can better inform conservation strategies that integrate ecological, technological, and socio-economic perspectives. Our two-tiered coding framework, encompassing both core themes and nested subcategories, allowed for a more granular characterization of wire snare literature. This approach not only clarified dominant methodological and conceptual trends within each theme, but also revealed significant research gaps, particularly in underexplored subcategories such as indirect physiological stress and energetic consequences of sublethal injury, the use of novel detection technologies, and the effects of snare design on lethality. By identifying both areas of concentrated effort and understudied topics, this framework aims to provide a roadmap for future research, helping to prioritize questions that address critical knowledge gaps in wire snaring science. Below, we examine each of the five core themes in detail, synthesizing key findings from the literature and highlighting emerging priorities for future work.

4.4. Direct effects

The direct effects of wire snaring on wildlife are the most studied aspect of snaring research, accounting for 39.8 % of studies., These studies primarily fall into subcategories focused on snare-related mortality, injury, and demographic impacts across a range of species. Ranger patrol records serve as a key source of data for *Snare-Related Mortality* studies, documenting carcasses found in snares and those recovered from apprehended poachers (Becker et al., 2013; Figel et al., 2021; Lindsey et al., 2011b). Snare mortality is also assessed through bushmeat market surveys and hunter accompaniments, estimating total kills, biomass removal, and snared species diversity (Fa and García Yuste, 2001; Noss, 1998; Willcox and Nambu, 2007). However, accurately quantifying the *Demographic Impacts* of snaring requires long-term species monitoring. Traditional methods in this subcategory include transect surveys, GPS collars and camera trap surveys, to assess demographic impacts, providing critical data on survival rates and snare-related mortality for both target and non-target species (Briers-Louw et al., 2024; Gubbi et al., 2023; Li and Jiang, 2014; Loveridge et al., 2020; Nowak et al., 2021). In combination with long-term monitoring data, population growth models and simulations have been used to assess how varying levels of snaring pressure influence survival rates, population dynamics, and the effectiveness of de-snaring interventions on population growth of non-target species (Banda et al., 2023; Montgomery et al., 2023).

Studies examining *Snare-Related Injury* have used direct observations and anatomical assessments to document injury patterns, identify affected tissues, and evaluate the broader impact of snares on limb function and survival (Emery Thompson et al., 2020; Haggblade et al., 2019; Jeong et al., 2021). For example, Waller and Reynolds (2001) used human forearm and muscle charts to assess the physiological effects of snare-induced deformities in chimpanzees. However, snare injuries can be difficult to quantify, as wounds may heal over time or affect highly cryptic species, making detection challenging (Loveridge et al., 2020). In some cases, forensic techniques have been applied to identify injuries that might otherwise go unnoticed. White and Van Valkenburgh (2022), for instance, used forensic examinations of lions and leopards to detect snare-related tooth damage caused by individuals pulling against constricted wire, demonstrating how snare injuries can persist undetected and underestimated in populations.

A smaller but important body of work has examined how *Snare Design and Lethality*. For example, Mudumba et al. (2021) investigated material properties such as suspended loop width, wire thickness, and anchor height, demonstrating that even minor differences in snare construction can significantly affect the likelihood of a fatal outcome. These findings suggest that poachers may tailor snare design to optimize lethality for specific species. Conversely, this research underscores the potential for modifying snare configurations to reduce mortality of non-target or threatened species in other settings such as predator control management or fur trapping (Barrull et al., 2011; Fleming et al., 1998; Proulx and Rodtka, 2017; Vantassel et al., 2010). These insights not only reveal the selective targeting enabled by trap design, but also highlight a promising, yet underexplored, avenue for mitigation through engineering or regulatory intervention. Despite its relevance to both poacher strategy and wildlife protection, this area remains significantly underrepresented compared to studies focused on injury and mortality detection.

4.5. Indirect effects

While the direct effects of snaring are well documented, the indirect impacts remain one of the least studied dimensions of the literature, comprising just 12.5 % of reviewed studies. This body of work highlights how wire snaring affects both snared and non-snared individuals beyond immediate harm, disrupting physiology, behavior, species interactions, and broader ecosystem dynamics.

Several studies have focused on sublethal effects among injured individuals, particularly those classified under *Physiological Stress and Energetics* and *Snare Injury-Driven Behavioral Change categories*. Benhaiem et al. (2023) found that snare-injured hyenas experienced delayed reproduction, smaller litter sizes, and reduced offspring survival, revealing the indirect population-level costs of snaring beyond immediate mortality. Similarly, Yersin et al. (2017) showed that snare-injured chimpanzees exhibited altered foraging behavior and increased stress levels, which contributed to a higher prevalence of intestinal parasites, highlighting how snaring can indirectly compromise immune function and increase disease susceptibility. Complementary findings from Stokes and Byrne (2001) showed that chimpanzees with hand injuries adapted their foraging techniques, but often at the cost of reduced feeding efficiency. In giraffes, Bernstein-Kurtycz et al. (2023) demonstrated that individuals with snare wounds exhibited shorter stride lengths and increased gait asymmetry, consistent with locomotor compensation for unilateral limb trauma. Collectively, these studies suggest that physiological and behavioral costs of snaring may persist well after initial injury. Future research could further examine these sublethal effects using an integrated framework that considers stress responses, altered movement patterns, and social disruptions, as these factors may scale to population-level consequences (Kasozi et al., 2023a).

Beyond sublethal effects, wire snaring also alters ecosystem structure through *Prey Depletion and Trophic Consequences*. This research highlights how snaring reduces populations of large-bodied herbivores, particularly high-value prey species, with cascading competitive effects for predator guilds (Becker et al., 2024; Creel et al., 2025a, 2025b; Creel et al., 2018; Rosenblatt et al., 2016). Reduced prey availability has been shown to shift dominant carnivores toward smaller prey, increasing dietary niche overlap with subordinate competitors and elevating energetic costs of hunting (Creel et al., 2025a, 2025b; Creel et al., 2018). These shifts have been associated with expanded home ranges, smaller group sizes, and reduced recruitment in predator populations (Creel et al., 2024; Goodheart et al., 2021; Reyes de Merkle et al., 2024). Importantly, the depletion of wild prey may force predators to shift toward livestock, exacerbating human-wildlife conflict (Soh et al., 2014). In contrast to prey-depletion research, studies in the *Scavenger and Predator Exploitation of Snared Wildlife* subcategory propose that wire snares may also act as unintentional food subsidies. Carcasses left undetected in snares can attract scavengers and opportunistic carnivores, creating localized resource pulses that modify scavenger behavior and potentially shift spatial food-web dynamics (Brand et al., 2014; Inagaki et al., 2024). While empirical work remains limited, this dynamic may artificially inflate scavenger populations or alter their movement patterns, especially in systems where snaring is spatially concentrated.

Another emerging research theme involves *Behavioral Responses to Snaring Risk* among non-snared individuals. Some wildlife populations have demonstrated adaptive responses to the threat of snares. Bonobos, for example, have exhibited stress responses to encountering other snared species, while some chimpanzee populations have developed the ability to recognize and deactivate snares, suggesting that repeated snare exposure can drive behavioral adaptations to mitigate risk (Brand et al., 2014; Hayashi et al., 2012; Ohashi and Matsuzawa, 2011). Although these studies are largely limited to primates, they raise broader questions about how the presence of snares may alter animal decision-making, movement, vigilance, and habitat use. Expanding such research to carnivores and ungulates is essential to understand whether snaring pressure elicits similar behavioral responses in other taxa.

To formally build upon these findings, we suggest framing wire snaring conceptually as a form of sit-and-wait predation (Montgomery et al., 2022), highlighting its role in generating non-consumptive effects (NCEs) that alter wildlife behavior, populations dynamics, and broader ecosystem processes. In this framework, snares act as fixed predatory devices that transform parts of the landscape into persistent risk zones, altering wildlife behavior, habitat use, and resource selection. Unlike mobile predators, snares may create localized but persistent risks of predation, triggering non-consumptive effects (NCEs) as wildlife alter habitat use, reduce foraging activity, or modify movement patterns to avoid high-risk areas (Montgomery et al., 2022; Schmitz et al., 2017). Such behavioral shifts have the potential to disrupt interspecific interactions, restructure food webs, and alter patterns of connectivity across landscapes with implications for gene flow, demographic stability, and the emergence of source-sink dynamics (Creel et al., 2024; Reyes de Merkle et al., 2024). Despite these theoretical insights, empirical evidence for snare-specific avoidance remains limited, in part because snares are often placed in high-resource areas that animals are reluctant to abandon (Vinks et al., 2020).

To test this hypothesis, future research should integrate behavioral ecology, spatial analysis, and experimental design. GPS tracking can assess whether animals avoid high-snaring zones, while camera trap networks can detect changes in occupancy, activity timing, or vigilance. Experimental manipulations, such as deploying non-lethal artificial snares or simulating human scent cues, could further isolate risk perception responses. Hormonal analyses, such as fecal glucocorticoid assays, could help quantify the physiological toll of living in snare-dense landscapes, as similarly demonstrated by Creel et al. (2013) in lion populations facing high anthropogenic pressure. Together, these approaches may help disentangle the behavioral and physiological costs of snaring beyond direct mortality, offering a more complete picture of human predation pressure and its impact on individuals, populations, and at the community scale.

4.6. Optimized detection

Research on snare detection remains limited (8.5 %), but has grown since 2013, driven by the increasing need for technology-based anti-poaching strategies. Over this period, research has increasingly explored machine learning and novel detection technologies to address the challenges of low snare detection rates, labor-intensive patrols, and spatial biases in predicted snare densities and occurrences.

A major focus within this theme is *Spatial Risk Models for Snaring*, particularly the use of machine learning to identify high-risk areas. Machine learning, an application of artificial intelligence (AI) that uses algorithms to detect patterns and improve predictions, has become a key tool for predicting snare placement based on ecological, anthropogenic, and socio-political variables linked to historic poaching activity. Studies across diverse landscapes have improved our understanding of the spatial drivers of snaring risk, demonstrating how machine learning can enhance targeted snare detection and removal (Denninger Snyder et al., 2019; Kendon et al., 2022; Kimanzi et al., 2015; Nieman and Nieman, 2024; Watson et al., 2013). Building on these efforts, research in *Patrol Optimization Strategies* have shifted from static risk mapping to active route optimization, improving efficiency and resource allocation in field tests across Uganda (Gholami et al., 2017; Xu et al., 2020), Rwanda (Moore et al., 2021), Cambodia (Xu et al., 2020), and China (Chen et al., 2021). Compared to traditional patrol planning, which often relies on local knowledge and perception, these data-driven approaches optimize patrol routes in high-risk areas in order to improve resource allocation. (Chen et al., 2021). Some models have even demonstrated adaptability across different landscapes, demonstrating the potential for scaling up AI-assisted strategies globally (Xu et al., 2020). However, high computational demands remain a challenge, especially in remote areas with limited access to advanced computing.

Despite these advancements, further research is needed to refine these snare risk models, particularly given the highly spatially and temporally dynamic nature of snaring. Poachers frequently adjust their strategies in response to law enforcement pressure and environmental changes, making it critical that snare risk models are continuously tested, validated, and adapted over time (Gholami et al., 2017). Emergent studies have begun integrating these models into real-time monitoring systems like SMART and EarthRanger, which is crucial for enabling them to learn from patrol data and improve predictive accuracy in real-time (Wall et al., 2024; Wich and Piel, 2021; Xu et al., 2020). Ensuring that these models remain flexible to changing poacher behavior is critical to maintaining their effectiveness and informing responsive conservation strategies.

Even with advancements in machine learning, snare detection in the field remains inherently challenging due to imperfect detection rates, spatial biases in patrol data, and the cryptic nature of snares, which are often concealed in dense vegetation and occur at low densities across vast landscapes (Mudumba et al., 2021; O'Kelly et al., 2018a). Studies in the *Imperfect Detection* category are addressing these practical limitations by incorporating systematic survey approaches and occupancy models to correct for detection biases, improving the accuracy of snare risk assessments (Van Doormaal et al., 2022; Ibbett et al., 2020; O'Kelly et al., 2018b). Complementing these methods, *Novel Detection Technology* such as ground-penetrating radar systems have shown promise in identifying snares in difficult-to-access terrains (Borrion et al., 2019). These on-the-ground tools, alongside advancements in AI-assisted monitoring, offer future opportunities to increase snare detection rates and reduce reliance on traditional, labor-intensive patrol efforts. Meanwhile, low-tech detection tools such as snare-detecting dogs have been used effectively in high-density snaring areas, providing a valuable complement to technology-based detection methods (Matungwa and Wawa, 2021). However, while detection dogs can be highly effective at locating individual snares once in a snare-dense area, their landscape-level search efficiency may be limited if not guided by prior knowledge or targeted deployment strategies. As detection methods continue to evolve, integrating both high-tech and low-tech solutions may further enhance the efficiency and effectiveness of anti-snaring efforts.

4.7. Socio-economic dimensions

Snare removal is essential for conservation but remains costly and labor-intensive. In Southeast Asia alone, an estimated 13 million snares are present in protected areas (Belecky and Gray, 2020), and annual removal costs have reached up to $220,000 per site (Tilker et al., 2024). Given the scale of the challenge, reactive snare removal strategies are unlikely to succeed in isolation. Roughly 20 % of reviewed studies has shifted attention toward the socio-economic drivers of snaring, providing insight into the cultural, economic, and livelihood factors that sustain this practice (Nieman et al., 2019; Plumptre et al., 1997; Tanalgo, 2017; Teutloff et al., 2021).

Studies examining the socio-economic drivers of snaring often focus on two overlapping but distinct motivations: *Subsistence Hunting and Food Insecurity* and *Bushmeat Market and Trade Drivers*. Research in these subcategories have used spatial analyses, semi-structured questionnaires, and market surveys to reveal how economic hardship and limited access to alternative protein sources can directly increase reliance on snaring (Damania et al., 2005; Gandiwa et al., 2013; Hennessey and Rogers, 2008; Ibbett et al., 2021). In Uganda, for example, Bortolamiol et al. (2023) found that snaring activity was concentrated near remote villages where households faced high levels of crop raiding and lacked access to markets selling domestic meat, creating food shortages and in turn driving wild meat consumption. Using a combination of market surveys and hunter offtake diaries, Allebone-Webb et al. (2011) assessed how economic and logistical factors influence which species reach urban bushmeat markets, showing that decisions about which snared animals are sold versus consumed locally depend on trader profits, hunter income per carcass, and market access. These studies are vital for understanding the local and regional market dynamics that drive snaring. Importantly, these motivations are rarely dichotomous, subsistence and trade often co-occur, particularly in areas where food insecurity and economic vulnerability intersect (Dounias, 2016; Lindsey et al., 2011a). Future research and interventions must therefore account for both immediate livelihood needs and the broader market forces that shape snaring incentives in dynamic socio-ecological systems.

Research on *Hunting practices and Demographics* has sought to understand who participates in snaring, as well as deployment techniques and traditional knowledge. Studies typically employ qualitative and participatory methods, such as interviews, ethnographic observation, and community mapping, to document hunting behavior across diverse cultural contexts (Bartholomew et al., 2021; Gubbi and Linkie, 2012; Pattiselanno et al., 2023). This body of work emphasizes that demographic drivers of snaring, including age, gender, household composition, and cultural norms are highly context-dependent. For instance, while Sawaki et al. (2022) found snaring in West Papua, Indonesia to be strictly practiced by adult men and teenage boys to strengthen male bonds, Ohmagari and Berkes (1997) documented the transmission of snaring and bush skills among Cree women in Canada, highlighting the importance of intergenerational knowledge and gendered roles in snaring practices. These findings challenge generalized assumptions about poacher profiles and underscore the importance of culturally grounded research to inform effective conservation strategies.

Another key area of research explores *Perceptions, Awareness, and Attitudes* of communities toward conservation, wildlife population trends, and enforcement policies in relation to snaring (Afriyie et al., 2021; Kamgaing et al., 2019; Mudumba et al., 2022; Sethi, 2022). Understanding local attitudes toward snaring, including its perceived necessity, cultural significance, and economic role, helps inform the design of interventions that align with community needs, making conservation efforts more sustainable and effective while promoting alternative livelihood strategies (Montgomery et al., 2020; Mudumba et al., 2021). While some studies have examined these socio-cultural factors, further research is needed to assess how shifting community perceptions, policy effectiveness, and enforcement dynamics influence snaring behavior over time. Expanding this research will be critical for developing adaptive, community-centered strategies that reduce reliance on snaring while ensuring long-term conservation success.

4.8. Management interventions

Efforts to mitigate wire snaring have increasingly focused on management interventions, with 18.7 % of reviewed studies assessing the effectiveness of different strategies. Research in this area has explored a range of approaches, from community-based conservation initiatives and alternative livelihoods to enforcement strategies and behavioral deterrents, highlighting the need for multi-faceted solutions tailored to specific socio-ecological contexts. However, studies also emphasize that the success of these interventions depends on long-term sustainability, economic viability, and adaptability to local conditions.

In the *Community-Based Conservation and Livelihood Programs* subcategory, researchers have evaluated whether economic incentives can reduce reliance on snaring. Studies on *Community-Based Conservation and Livelihood Programs* such as the Community Markets for Conservation (COMACO) in Zambia and the Snares to Wares Initiative in Uganda have documented reductions in snaring where conservation compliance is linked to alternative livelihoods, such as agricultural training and artisanal crafts (Lewis and Wilkie, 2020; Mudumba et al., 2021; *but see* Becker et al., 2013). However, research indicates that the long-term effectiveness of such initiatives is contingent on ensuring that economic returns remain stable and competitive with poaching profits (Sarkar et al., 2022). Research also highlights that some beneficiaries continue to snare, underscoring the need to clarify links between participation and conservation outcomes (Lindsey et al., 2013). Beyond financial incentives, studies have examined the role of social norms and community enforcement in deterring poaching (Kragt et al., 2016). Informal guardianship mechanisms, where local social pressures discourage snaring, have shown promise in enhancing anti-snaring efforts (Viollaz et al., 2022). Participatory conservation programs, such as engaging hunters in sustainable-use modeling exercises, have been evaluated for their effectiveness in fostering conservation ownership and shifting perspectives on hunting practices (Le Page et al., 2015). However, these approaches remain highly context-dependent, with studies identifying trust in authorities, enforcement consistency, and the availability of alternative livelihoods as key determinants of success (Lewis and Phiri, 1998; Viollaz et al., 2022).

Other studies have assessed *Law Enforcement and Patrol Effectiveness* as well as *Alternative Deterrence Strategies*. Ranger patrols and law enforcement interventions remain critical, with studies evaluating their effectiveness in reducing poaching pressure, deterring illegal hunting, and increasing snare removal rates (Harmsen et al., 2021; Holmern et al., 2007; Lam et al., 2023; Moore et al., 2018). Additionally, studies have found that intelligence-led patrols incorporating community informants can increase snare detection rates by over 40 %, underscoring the importance of integrating local knowledge into enforcement efforts (Linkie et al., 2015). Beyond direct enforcement, research has also examined deterrence-based approaches. Experimental studies on warning signage indicate that explicitly communicating conservation regulations can reduce snaring activity by altering poacher decision-making (Fedurek et al., 2022). Similarly, studies on researcher presence in protected areas suggest that increased human activity, even in the absence of direct enforcement, may contribute to lower snaring rates through perceived oversight effects (Campera et al., 2019; Piel et al., 2015). In the Democratic Republic of Congo, a voucher-based monitoring system was evaluated for its ability to reinforce local hunting legislation by tracking the transport of bushmeat and ensuring legal compliance (Hart et al., 2022). While these studies highlight the potential of various intervention strategies, research continues to emphasize the need for integrated, adaptive management approaches that combine economic, social, and enforcement-based mechanisms to effectively address snaring.

Studies in the *Protected Area Designation and Wildlife Monitoring* subcategory have used comparative designs to evaluate how protected area status and monitoring capacity influence snaring occurrence and wildlife outcomes. For example, Jones et al. (2019) found higher species richness and mammal encounter rates in Tanzanian national parks compared to lesser-protected reserves, with snaring levels and proximity to ranger posts emerging as key predictors. Similarly, Rosenblatt et al. (2019) and Creel et al. (2024) demonstrated that lion and herbivore populations in Zambia were more stable in intensively protected zones, whereas prey depletion and elevated snaring were more common in loosely managed areas. Complementary research highlights the importance of sustained presence and systematic monitoring in reducing snaring impacts. For example, Robbins et al. (2011) documented the recovery of Virunga mountain gorillas through strict protection and continuous ranger-led surveillance, while Becker et al. (2024) demonstrated the utility of GPS collars in detecting snared individuals and enabling timely intervention.

Finally, studies in the *Snaring Legislation and Sustainable Use Policies* subcategory have assessed how regulatory frameworks and technological standards shape snaring outcomes. In North America, researchers have evaluated cable-snaring and trap technologies under evolving welfare legislation, finding that science-based guidelines have improved trap specificity, reduced non-target bycatch, and increased public acceptability (Vantassel et al., 2010). In Central African logging concessions, hybrid management models incorporating regulated community hunting with fauna management policies are being studied as a means of aligning conservation goals with local resource use (Vermeulen et al., 2009). These studies underscore how policy grounded in empirical research can enhance both ecological and social outcomes in snare-prone systems.

5. Conclusion

This review synthesized current knowledge on the distribution of wire snare research and its drivers, highlighted key trends in research, and identified critical gaps in understanding its ecological and socio-economic impacts. Our findings make clear that wire snaring is a severe global conservation threat with far-reaching ecological and socio-economic consequences for biodiversity and human communities. Spatio-temporal analysis of wire snaring research revealed an uneven geographic distribution, underscoring the need for broader research effort beyond Africa and Southeast Asia to fully understand snaring's global impact. While substantial research has documented the direct impacts of snaring on wildlife mortality and injury, the indirect ecological effects, including altered predator-prey dynamics and non-consumptive behavioral changes, require further investigation. Emerging frameworks that recontextualize snaring as a form of sit-and-wait predation offer new directions for investigating its broader ecological consequences. Research on snare detection and management interventions has expanded, yet further studies are needed to assess the long-term effectiveness of enforcement strategies, technological innovations, and community-driven conservation models. To effectively mitigate snaring, integrating ecological studies with socio-economic analyses will be essential for understanding the drivers of snaring and designing context-specific interventions. Furthermore, increased collaboration between conservation practitioners, policymakers, and local communities can enhance the implementation of sustainable, adaptive management approaches. Addressing these gaps will not only improve wildlife conservation outcomes but also support broader socio-ecological resilience in regions affected by snaring.

Supplementary data to this article can be found online at https://doi.org/10.1016/j.biocon.2025.111406.

CRediT authorship contribution statement

Dylan E. Feldmeier: Writing – review & editing, Writing – original draft, Visualization, Methodology, Investigation, Funding acquisition, Formal analysis, Data curation, Conceptualization. **Oswald J. Schmitz:** Writing – review & editing, Writing – original draft, Supervision, Conceptualization. **Amy J. Dickman:** Writing – review & editing, Writing – original draft, Supervision, Conceptualization. **Herbert Kasozi:** Writing – review & editing, Writing – original draft. **Robert A. Montgomery:** Writing – review & editing, Writing – original draft, Supervision, Project administration, Methodology, Conceptualization.

Funding information

This research was supported by UKRI National Environmental Research Council NERC Award NE/S007474/1. Funding sources were not involved in the study design, collection, analysis, interpretation of data, or the writing the report.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Acknowledgements

We thank Gabriella Dodd, Sandy Slovikosky, and WildCru members for their invaluable support and contributions to this research. We are grateful to the global researchers and conservation practitioners whose work informed this review. Special thanks to UKRI NERC for financial support. We also acknowledge the reviewers whose insights helped shape this study.

Data availability

Data will be made available on request.

References

Afriyie, J., Asare, M., Hejcmanova, P., 2021. Exploring the knowledge and perceptions of local communities on illegal hunting: Long-term trends in a west African protected area. FORESTS 12. https://doi.org/10.3390/f12111454.

Akani, G.C., Petrozzi, F., Ebere, N., Dendi, D., Phil-Eze, P., Nioking, A., Luiselli, L., 2015. Correlates of indigenous hunting techniques with wildlife trade in bushmeat markets of the Niger delta (Nigeria). Vie Et Milieu - Life and Environment 65 (3), 169–174.

Allebone-Webb, S.M., Kümpel, N.F., Rist, J., Cowlishaw, G., Rowcliffe, J.M., Milner-Gulland, E.J., 2011. Use of market data to assess Bushmeat hunting sustainability in Equatorial Guinea. Conserv. Biol. 25, 597–606. https://doi.org/10.1111/j.1523-1739.2011.01681.x.

Arlettaz, R., Chapron, G., Kéry, M., Klaus, E., Mettaz, S., Roder, S., Vignali, S., Zimmermann, F., Braunisch, V., 2021. Poaching threatens the establishment of a Lynx population, highlighting the need for a centralized judiciary approach. Front. Conserv. Sci. 2. https://doi.org/10.3389/fcosc.2021.665000.

Banda, K., Creel, S., Sichande, M., Mweetwa, T., Mwape, H., De Merkle, J.R., Bwalya, L. M., Simpamba, T., McRobb, R., Becker, M.S., 2023. Effects of de-snaring on the demography and population dynamics of African lions. Biol. Conserv. 286, 110273. https://doi.org/10.1016/j.biocon.2023.110273.

Barrull, J., Mate, I., Casanovas, J., Salicrú, M., Gosàlbez, J., 2011. Selectivity of mammalian predator control in managed hunting areas: an example in a Mediterranean environment. MAMMALIA 75, 363–369. https://doi.org/10.1515/MAMM.2011.052.

Bartholomew, C.V., Zainir, M.I., Zalipah, M.N., Husin, M.H., Abdullah, M.T., 2021. Wildlife hunting practices by the indigenous people of Terengganu, peninsular Malaysia. In: Res. Use and Sustainability of Orang Asli: Indigenous Commun. In Peninsular Malaysia. Springer International Publishing, pp. 137–153. https://doi.org/10.1007/978-3-030-64961-6_10.

Basak, Krishnendu, Chiranjib Chaudhuri, M., Suraj, Moiz Ahmed, 2025. Trophic cascades and habitat suitability in Udanti Sitanadi Tiger Reserve: impacts of prey depletion and climate change on predator-prey dynamics. Zoological Studies 無. https://doi.org/10.6620/ZS.2025.64-07.

Becker, M., McRobb, R., Watson, F., Droge, E., Kanyembo, B., Murdoch, J., Kakumbi, C., 2013. Evaluating wire-snare poaching trends and the impacts of by-catch on elephants and large carnivores. Biol. Conserv. 158, 26–36. https://doi.org/10.1016/j.biocon.2012.08.017.

Becker, M.S., Creel, S., Sichande, M., De Merkle, J.R., Goodheart, B., Mweetwa, T., Mwape, H., Smit, D., Kusler, A., Banda, K., Musalo, B., Bwalya, L.M., McRobb, R., 2024. Wire-snare bushmeat poaching and the large African carnivore guild: impacts, knowledge gaps, and field-based mitigation. Biol. Conserv. 289, 110376. https://doi.org/10.1016/j.biocon.2023.110376.

Belecky, M., Gray, T.N.E., 2020. Silence of the snares: Southeast Asia's snaring crisis. WWF International.

Benhaiem, S., Kaidatzi, S., Hofer, H., East, M., 2023. Long-term reproductive costs of snare injuries in a keystone terrestrial by-catch species. Anim. Conserv. 26, 61–71. https://doi.org/10.1111/acv.12798.

Bernstein-Kurtycz, 2023. Evaluating the effects of giraffe skin disease and wire snare wounds on the gaits of free-ranging Nubian giraffe [WWW Document]. URL https://www.nature.com/articles/s41598-023-28677-y (accessed 6.6.25).

Borrion, H., Amiri, A., Delpech, D., Lemieux, A.M., 2019. Experimental assessment of the viability of using ground penetrating radar for metal wire-snare detection. Crime Sci. 8. https://doi.org/10.1186/s40163-019-0105-0.

Bortolamiol, S., Feuillet, T., Kagoro, W., Namirembe, R., Asalu, E., Krief, S., 2023. Illegal harvesting within a protected area: spatial distribution of activities, social drivers of wild meat consumption, and wildlife conservation. ANIMALS 13. https://doi.org/10.3390/ani13050771.

Brand, C., Eguma, R., Zuberbühler, K., Hobaiter, C., 2014. First report of prey capture from human laid snare-traps by wild chimpanzees. Primates 55, 437–440. https://doi.org/10.1007/s10329-014-0419-1.

Briers-Louw, W.D., Kendon, T., Rogan, M.S., Leslie, A.J., Almeida, J., Gaynor, D., Naude, V.N., 2024. Anthropogenic pressure limits the recovery of a postwar leopard population in Central Mozambique. Conserv. Sci. Pract. 6. https://doi.org/10.1111/csp2.13122.

Brodie, J., Williams, S., Garner, B., 2021. The decline of mammal functional and evolutionary diversity worldwide. Proc. Natl. Acad. Sci. USA 118. https://doi.org/10.1073/pnas.1921849118.

Burak, M.K., Broekhuis, F., Dickman, A., Ekwanga, S., Elliot, N., Frank, L., Oriol-Cotterill, A., Williams, T.M., Wilmers, C.C., Schmitz, O., 2023. Spatiotemporal patterns of lion (Panthera leo) space use in a human–wildlife system. Ecological Solutions and Evidence 4, e12276. https://doi.org/10.1002/2688-8319.12276.

Campbell, K., Martyr, D., Risdianto, D., Clemente, C.J., 2019. Two species, one snare: Analysing snare usage and the impacts of tiger poaching on a non-target species, the Malayan tapir. Biol. Conserv. 231, 161–166. https://doi.org/10.1016/j.biocon.2019.01.009.

Campera, M., Phelps, M., Besnard, F., Balestri, M., Eppley, T.M., Nijman, V., Donati, G., 2019. Does forest management and researchers' presence reduce hunting and forest exploitation by local communities in Tsitongambarika, south-East Madagascar? ORYX 53, 677–686. https://doi.org/10.1017/S0030605317001211.

Central Statistical Office, 2019 [WWW Document]. stat.gov.pl. URL https://stat.gov.pl/obszary-tematyczne/roczniki-statystyczne/roczniki-statystyczne/rocznik-statystyczny-lesnictwa-2019,13,2.html (accessed 5.13.25).

Chen, W., Zhang, W., Liu, D., Li, W., Shi, X., Fang, F., Intelligence, Assoc Advancement Artificial, 2021. Data-driven multimodal patrol planning for anti-poaching. In: Shanghai Jiao Tong University. Presented at the THIRTY-FIFTH AAAI CONFERENCE ON ARTIFICIAL INTELLIGENCE, THIRTY-THIRD CONFERENCE ON INNOVATIVE APPLICATIONS OF ARTIFICIAL INTELLIGENCE AND THE ELEVENTH SYMPOSIUM ON EDUCATIONAL ADVANCES IN ARTIFICIAL INTELLIGENCE, pp. 15270–15277.

Creel, S., Becker, M.S., Goodheart, B., Kusler, A., Banda, Kachama, Banda, Kambwiri, Vinks, M., Sun, C., Dart, C., Matsushima, S., Kabwe, R., Donald, W., Zyambo, L., Indala, P., Kaluka, A., Chifunte, C., Reid, C., 2025a. Changes in African lion demography and population growth with increased protection in a large, prey-depleted ecosystem. Conservation Science and Practice 7, e13256. https://doi.org/10.1111/csp2.13256.

Creel, S., Christianson, D., Schuette, P., 2013. Glucocorticoid stress responses of lions in relationship to group composition, human land use, and proximity to people. Conservation. Physiology 1, cot021. https://doi.org/10.1093/conphys/cot021.

Creel, S., Matandiko, W., Schuette, P., Rosenblatt, E., Sanguinetti, C., Banda, K., Vinks, M., Becker, M., 2018. Changes in African large carnivore diets over the past half-century reveal the loss of large prey. J. Appl. Ecol. 55, 2908–2916. https://doi.org/10.1111/1365-2664.13227.

Creel, S., Redcliffe, J., Goodheart, B., Reyes de Merkle, J., Mwape, H., Matsushima, S., Dart, C., Banda, K., Mayani, B., Njobvu, J., Kabungo, R., Mungolo, M., Kabwe, R., Kaseketi, E., Donald, W., Kaluka, A., Chifunte, C., Maimbo, H., Plankenhorn, L.,

Christianson, D., Becker, M.S., Wilson, R.P., 2025b. Prey depletion, interspecific competition, and the energetics of hunting in endangered African wild dogs, Lycaon pictus. Proc. Natl. Acad. Sci. 122, e2414772122. https://doi.org/10.1073/pnas.2414772122.
Creel, S., Reyes de Merkle, J., Goodheart, B., Mweetwa, T., Mwape, H., Simpamba, T., Becker, M.S., 2024. An integrated population model reveals source-sink dynamics for competitively subordinate African wild dogs linked to anthropogenic prey depletion. J. Anim. Ecol. 93, 417–427. https://doi.org/10.1111/1365-2656.14052.
Damania, R., Milner-Gulland, E., Crookes, D., 2005. A bioeconomic analysis of bushmeat hunting. PROCEEDINGS OF THE ROYAL SOCIETY B-BIOLOGICAL SCIENCES 272, 259–266. https://doi.org/10.1098/rspb.2004.2945.
Darimont, C.T., Fox, C.H., Bryan, H.M., Reimchen, T.E., 2015. The unique ecology of human predators. Science 349, 858–860. https://doi.org/10.1126/science.aac4249.
Denninger Snyder, K., Mneney, P.B., Wittemyer, G., 2019. Predicting the risk of illegal activity and evaluating law enforcement interventions in the western Serengeti. Conserv. Sci. Pract. 1. https://doi.org/10.1111/csp2.81.
Dirzo, R., Young, H.S., Galetti, M., Ceballos, G., Isaac, N.J.B., Collen, B., 2014. Defaunation in the Anthropocene. Science 345, 401–406. https://doi.org/10.1126/science.1251817.
Dobson, A., Milner-Gulland, E., Ingram, D., Keane, A., 2019. A framework for assessing impacts of wild meat hunting practices in the tropics. Hum. Ecol. 47, 449–464. https://doi.org/10.1007/s10745-019-0075-6.
Dounias, E., 2016. From subsistence to commercial hunting: technical shift in cynegetic practices among southern Cameroon forest dwellers during the 20th century. Ecol. Soc. 21. https://doi.org/10.5751/ES-07946-210123.
Emery Thompson, M., Muller, M.N., Machanda, Z.P., Otali, E., Wrangham, R.W., 2020. The Kibale chimpanzee project: over thirty years of research, conservation, and change. Biol. Conserv. 252. https://doi.org/10.1016/j.biocon.2020.108857.
Fa, J., Yuste, J., Castelo, R., 2000. Bushmeat markets on Bioko Island as a measure of hunting pressure. Conserv. Biol. 14, 1602–1613. https://doi.org/10.1046/j.1523-1739.2000.99067.x.
Fa, J.E., García Yuste, J.E., 2001. Commercial bushmeat hunting in the Monte Mitra forests, Equatorial Guinea: extent and impact. Anim. Biodivers. Conserv. 24, 31–52.
Fedurek, P., Akankwasa, J.W., Danel, D.P., Fensome, S., Zuberbühler, K., Muhanguzi, G., Crockford, C., Asiimwe, C., 2022. The effect of warning signs on the presence of snare traps in a Ugandan rainforest. Biotropica 54, 721–728. https://doi.org/10.1111/btp.13088.
Figel, J., Hambal, M., Krisna, I., Putra, R., Yansyah, D., 2021. Malignant snare traps threaten an irreplaceable megafauna community. TROPICAL CONSERVATION SCIENCE 14. https://doi.org/10.1177/1940082921989187.
Figel, J.J., Safriansyah, R., Baabud, S.F., Herman, Z., 2023. Snaring in a stronghold: poaching and bycatch of critically endangered tigers in northern Sumatra. Indonesia. Biological Conservation 286, 110274. https://doi.org/10.1016/j.biocon.2023.110274.
Fleming, P., Allen, L., Berghout, M., Meek, P., Pavlov, P., Stevens, P., Strong, K., Thompson, J., Thomson, P., 1998. The performance of wild-canid traps in Australia: efficiency, selectivity and trap-related injuries. Wildl. Res. 25, 327–338. https://doi.org/10.1071/WR95066.
Gandiwa, E., Heitkönig, I., Lokhorst, A., Prins, H., Leeuwis, C., 2013. Illegal hunting and law enforcement during a period of economic decline in Zimbabwe: a case study of northern Gonarezhou National Park and adjacent areas. J. Nat. Conserv. 21, 133–142. https://doi.org/10.1016/j.jnc.2012.11.009.
Gholami, S., Ford, B., Fang, F., Plumptre, A., Tambe, M., Driciru, M., Wanyama, F., Rwetsiba, A., Nsubaga, M., Mabonga, J., 2017. Taking it for a test drive: A hybrid Spatio-temporal model for wildlife poaching prediction evaluated through a controlled field test. In: Altun, Y., Das, K., Mielikäinen, T., Malerba, D., Stefanowski, J., Read, J., Žitnik, M., Ceci, M., Džeroski, S. (Eds.), Machine Learning and Knowledge Discovery in Databases. Springer International Publishing, Cham, pp. 292–304. https://doi.org/10.1007/978-3-319-71273-4_24.
Goodheart, B., Creel, S., Becker, M.S., Vinks, M., Schuette, P., Banda, K., Sanguinetti, C., Rosenblatt, E., Dart, C., Kusler, A., Young-Overton, K., Stevens, X., Mwanza, A., Simukonda, C., 2021. Low apex carnivore density does not release a subordinate competitor when driven by prey depletion. Biol. Conserv. 261, 109273. https://doi.org/10.1016/j.biocon.2021.109273.
Gray, T., Lynam, A., Seng, T., Laurance, W., Long, B., Scotson, L., Ripple, W., 2017. Wildlife-snaring crisis in Asian forests. SCIENCE 355, 255–256. https://doi.org/10.1126/science.aal4463.
Gray, T.N.E., Hughes, A.C., Laurance, W.F., Long, B., Lynam, A.J., O'Kelly, H., Ripple, W. J., Seng, T., Scotson, L., Wilkinson, N.M., 2018. The wildlife snaring crisis: an insidious and pervasive threat to biodiversity in Southeast Asia. Biodivers. Conserv. 27, 1031–1037. https://doi.org/10.1007/s10531-017-1450-5.
Groenenberg, M., Crouthers, R., Yoganand, K., Banet-Eugene, S., Bun, S., Muth, S., Kim, M., Mang, T., Panha, M., Pheaktra, P., Pin, T., Sopheak, K., Sovanna, P., Vibolratanak, P., Wyatt, A.G., Gray, T.N.E., 2023. Snaring devastates terrestrial ungulates whilst sparing arboreal primates in Cambodia's Eastern Plains landscape. Biol. Conserv. 284, 110195. https://doi.org/10.1016/j.biocon.2023.110195.
Gubbi, S., Linkie, M., 2012. Wildlife hunting patterns, techniques, and profile of hunters in and around Periyar Tiger Reserve. J. Bombay Nat. Hist. Soc. 109, 165–172.
Gubbi, S., Prabhu, K., Suthar, S., Poornesha, H.C., Deschamps, J., 2023. Quantifying the threat of wire snares using camera trapping data in India. Biol. Conserv. 286, 110303. https://doi.org/10.1016/j.biocon.2023.110303.
Habibullah, M.S., Din, B.H., Tan, S.-H., Zahid, H., 2022. Impact of climate change on biodiversity loss: global evidence. Environ. Sci. Pollut. Res. 29, 1073–1086. https://doi.org/10.1007/s11356-021-15702-8.
Haggblade, M.K., Smith, W.A., Noheri, J.B., Usanase, C., Mudakikwa, A., Cranfield, M.R., Gilardi, K.V.K., 2019. Outcomes of snare-related injuries to endangered mountain gorillas (Gorilla beringei beringei) in Rwanda. J. Wildl. Dis. 55, 298–303. https://doi.org/10.7589/2018-01-008.
Haq, S.M., Sircar, D., Louies, J., Sinha, S.K., Menon, V., 2023. Tracking snares to mitigate the threat to wildlife: quantification of hunting methods along the fringes of Valmiki Tiger Reserve. India. Biological Conservation 284, 110196. https://doi.org/10.1016/j.biocon.2023.110196.
Harmsen, H., Mbau, J.S., Muthama, J.N., Wang'ondu, V.W., 2021. Comparing law enforcement monitoring data and research data suggests an underestimation of bushmeat poaching through snaring in a Kenyan world heritage site. Afr. J. Ecol. 59, 912–923. https://doi.org/10.1111/aje.12879.
Hart, J.A., Omene, O., Hart, T.B., 2022. Vouchers control for illegal bushmeat transport and reveal dynamics of authorised wild meat trade in central Democratic Republic of Congo (DRC). Afr. J. Ecol. 60, 222–228. https://doi.org/10.1111/aje.12965.
Hayashi, M., Ohashi, G., Ryu, H.J., 2012. Responses toward a trapped animal by wild bonobos at Wamba. Anim. Cogn. 15, 731–735. https://doi.org/10.1007/s10071-012-0478-x.
Hayward, M., 2009. Bushmeat hunting in Dwesa and Cwebe nature reserves, eastern cape, South Africa. S. Afr. J. Wildl. Res. 39, 70–84. https://doi.org/10.3957/056.039.0108.
Hennessey, A.B., Rogers, J., 2008. A study of the bushmeat trade in Ouesso, republic of Congo. Conserv. Soc. 6, 179–184. https://doi.org/10.4103/0972-4923.49211.
Holmern, T., Mkama, S., Muya, J., Roskaft, E., 2006. Intraspecific prey choice of bushmeat hunters outside the Serengeti National Park, Tanzania: a preliminary analysis. Afr. Zool. 41, 81–87. https://doi.org/10.3377/1562-7020(2006)41[81:IPCOBH]2.0.CO;2.
Holmern, T., Muya, J., Roskaft, E., 2007. Local law enforcement and illegal bushmeat hunting outside the Serengeti National Park, Tanzania. Environ. Conserv. 34, 55–63. https://doi.org/10.1017/S0376892907003712.
Ibbett, H., Keane, A., Dobson, A., Griffin, O., Travers, H., Milner-Gulland, E., 2021. Estimating hunting prevalence and reliance on wild meat in Cambodia's Eastern Plains. ORYX 55, 878–888. https://doi.org/10.1017/S0030605319001455.
Ibbett, H., Milner-Gulland, E.J., Beale, C., Dobson, A.D.M., Griffin, O., O'Kelly, H., Keane, A., 2020. Experimentally assessing the effect of search effort on snare detectability. Biol. Conserv. 247. https://doi.org/10.1016/j.biocon.2020.108581.
Inagaki, A., Sugimoto, Y., Allen, M.L., Koike, S., 2024. Documentation of an Asiatic black bear preying on a living sika deer caught in a leg-hold snare trap. Ursu 2024 1–8. https://doi.org/10.2192/URSUS-D-24-00013R1.
Jarvis, A., Touval, J.L., Schmitz, M.C., Sotomayor, L., Hyman, G.G., 2010. Assessment of threats to ecosystems in South America. J. Nat. Conserv. 18, 180–188. https://doi.org/10.1016/j.jnc.2009.08.003.
Jeong, D., Jang, K., Yang, J., Choi, J., Lim, S., Yeon, S., Shim, K., Kim, S., Kang, S., 2021. Treatment of two Asiatic black bears (Ursus thibetanus) with severe injuries and their subsequent release into the wild: a case report. BMC Vet. Res. 17. https://doi.org/10.1186/s12917-021-02834-9.
Jones, T., Hawes, J.E., Norton, G.W., Hawkins, D.M., 2019. Effect of protection status on mammal richness and abundance in Afromontane forests of the Udzungwa Mountains, Tanzania. Biol. Conserv. 229, 78–84. https://doi.org/10.1016/j.biocon.2018.11.015.
Kamgaing, T.O.W., Dzefack, Z.C.B., Yasuoka, H., 2019. Declining ungulate populations in an African rainforest: evidence from local knowledge, ecological surveys, and Bushmeat records. Front. Ecol. Evol. 7. https://doi.org/10.3389/fevo.2019.00249.
Kasozi, H., Linden, D., Roloff, G., Montgomery, R., 2023b. Evaluating the prevalence and spatial distribution of giraffes injured by non-target poaching. J. Zool. 319, 152–162. https://doi.org/10.1111/jzo.13033.
Kasozi, Herbert, Kakuru, A., Montgomery, R.A., 2023a. A framework for assessing animal behavioural responses to wire snare poaching. Biol. Conserv. 284, 110192. https://doi.org/10.1016/j.biocon.2023.110192.
Kendon, T.A., Comley, J., Wilkinson, A., Grobler, M.J., Nieman, W.A., Leslie, A.J., Justin O'Riain, M., Naude, V.N., 2022. Evaluating determinants of wire-snare poaching risk in the Boland Mountain complex of South Africa. J. Nat. Conserv. 70, 126295. https://doi.org/10.1016/j.jnc.2022.126295.
Kiger, M.E., Varpio, L., 2020. Thematic analysis of qualitative data: AMEE guide no. 131. Med. Teach. 42, 846–854. https://doi.org/10.1080/0142159X.2020.1755030.
Kimanzi, J.K., Sanderson, R.A., Rushton, S.P., Mugo, M.J., 2015. Spatial distribution of snares in Ruma National Park, Kenya, with implications for management of the roan antelope *Hippotragus equinus langheldi* and other wildlife. Oryx 49, 295–302. https://doi.org/10.1017/S0030605313000689.
King'ori, E., Obanda, V., Ndambiri, E., Runo, S., Chiyo, P., 2018. Adding injury to infection: the relationship between injury status and genetic diversity of Theileria infecting plains zebra, Equus quagga. INFECTION GENETICS AND EVOLUTION 58, 269–278. https://doi.org/10.1016/j.meegid.2018.01.010.
Knopff, K., Knopff, A., Boyce, M., 2010. Scavenging makes cougars susceptible to snaring at Wolf bait stations. J. Wildl. Manag. 74, 644–653. https://doi.org/10.2193/2009-252.
Kragt, M.E., Hay, E.J., Renton, M., 2016. Supporting wildlife conservation by modelling the effectiveness of community-led poacher mitigation. In: Simeoni-Sauvage, S., Sanchez-Perez, J.M., Rizzoli, A.-E. (Eds.), Environ. Model. Softw. Supporting Sustain. Future, Proc. - Int. Congr. Environ. Model. Softw., iEMSs. Presented at the Environmental Modelling and Software for Supporting a Sustainable Future, Proceedings - 8th International Congress on Environmental Modelling and Software, iEMSs 2016, International Environmental Modelling and Software Society (iEMSs), Eds., pp. 1245–1252.
Lam, W.Y., Phung, C.-C., Mat, Z.A., Jamaluddin, H., Sivayogam, C.P., Zainal Abidin, F.A., Sulaiman, A., Cheok, M.K.Y., Osama, N.A.W., Sabaan, S., Abu Hashim, A.K., Booton, M.D., Harihar, A., Clements, G.R., Pickles, R.S.A., 2023. Using a crime

prevention framework to evaluate tiger counter-poaching in a southeast Asian rainforest. Front. Conserv. Sci. 4. https://doi.org/10.3389/fcosc.2023.1213552.
Le Page, C., Bobo, K.S., Kamgaing, T.O.W., Ngahane, B.F., Waltert, M., 2015. Interactive simulations with a stylized scale model to Codesign with villagers an agent-based model of Bushmeat hunting in the periphery of Korup National Park (Cameroon). JASSS 18, 8. https://doi.org/10.18564/jasss.2550.
Lewis, D., Phiri, A., 1998. Wildlife snaring - an indicator of community response to a community-based conservation project. ORYX 32, 111–121. https://doi.org/10.1046/j.1365-3008.1998.d01-21.x.
Lewis, D., Wilkie, D.S., 2020. COMACO, from snares to plowshares: a conservation and human wellbeing success story. Conserv. Sci. Pract. 2. https://doi.org/10.1111/csp2.263.
Li, X., Jiang, X., 2014. Implication of musk deer (Moschus spp.) depletion from hunter reports and dung transect data in Northwest Yunnan. China. J. Nat. Conserv. 22, 474–478. https://doi.org/10.1016/j.jnc.2014.05.004.
Lindsey, P., Bento, C., 2012. Illegal Hunting and Bushmeat Trade in Central Mozambique: Coutada 9 Case Study.
Lindsey, P., Romañach, S., Matema, S., Matema, C., Mupamhadzi, I., Muvengwi, J., 2011a. Dynamics and underlying causes of illegal bushmeat trade in Zimbabwe. ORYX 45, 84–95. https://doi.org/10.1017/S0030605310001274.
Lindsey, P., Romañach, S., Tambling, C., Chartier, K., Groom, R., 2011b. Ecological and financial impacts of illegal bushmeat trade in Zimbabwe. ORYX 45, 96–111. https://doi.org/10.1017/S0030605311000153.
Lindsey, P.A., Balme, G., Becker, M., Begg, C., Bento, C., Bocchino, C., Dickman, A., Diggle, R.W., Eves, H., Henschel, P., Lewis, D., Marnewick, K., Mattheus, J., Weldon McNutt, J., McRobb, R., Midlane, N., Milanzi, J., Morley, R., Murphree, M., Opyene, V., Phadima, J., Purchase, G., Rentsch, D., Roche, C., Shaw, J., Westhuizen, H.V.D., Vliet, N.V., Zisadza-Gandiwa, P., 2013. The bushmeat trade in African savannas: impacts, drivers, and possible solutions. Biol. Conserv. 160, 80–96. https://doi.org/10.1016/j.biocon.2012.12.020.
Linkie, M., Martyr, D., Harihar, A., Risdianto, D., Nugraha, R., Maryati, M., Leader-Williams, N., Wong, W.-M., 2015. Safeguarding Sumatran tigers: evaluating effectiveness of law enforcement patrols and local informant networks. J. Appl. Ecol. https://doi.org/10.1111/1365-2664.12461.
Loveridge, A.J., Sousa, L.L., Seymour-Smith, J., Hunt, J., Coals, P., O'Donnell, H., Lindsey, P.A., Mandisodza-Chikerema, R., Macdonald, D.W., 2020. Evaluating the spatial intensity and demographic impacts of wire-snare bush-meat poaching on large carnivores. Biol. Conserv. 244, 108504. https://doi.org/10.1016/j.biocon.2020.108504.
Matungwa, L.M., Wawa, A.I., 2021. The effectiveness of anti-poaching techniques in combating wildebeest poaching in Serengeti National Park. Tanzania Journal of Forestry and Nature Conservation 90, 24–39.
Maxwell, S.L., Fuller, R.A., Brooks, T.M., Watson, J.E.M., 2016. Biodiversity: the ravages of guns, nets and bulldozers. Nature 536, 143–145. https://doi.org/10.1038/536143a.
Minin, E.D., Clements, H.S., Correia, R.A., Cortés-Capano, G., Fink, C., Haukka, A., Hausmann, A., Kulkarni, R., Bradshaw, C.J.A., 2021. Consequences of recreational hunting for biodiversity conservation and livelihoods. One Earth 4, 238–253. https://doi.org/10.1016/j.oneear.2021.01.014.
Montgomery, R.A., Borona, K., Kasozi, H., Mudumba, T., Ogada, M., 2020. Positioning human heritage at the center of conservation practice. Conserv. Biol. 34, 1122–1130. https://doi.org/10.1111/cobi.13483.
Montgomery, R.A., Mudumba, T., Wijers, M., Boudinot, L.A., Loveridge, A., Chapron, G., Macdonald, D.W., 2023. Predicting the consequences of subsistence poaching on the population persistence of a non-target species of conservation concern. Biol. Conserv. 284, 110147. https://doi.org/10.1016/j.biocon.2023.110147.
Montgomery, R.A., Raupp, J., Miller, S.A., Wijers, M., Lisowsky, R., Comar, A., Bugir, C. K., Hayward, M.W., 2022. The hunting modes of human predation and potential nonconsumptive effects on animal populations. Biol. Conserv. 265, 109398. https://doi.org/10.1016/j.biocon.2021.109398.
Moore, J.F., Mulindahabi, F., Masozera, M.K., Nichols, J.D., Hines, J.E., Turikunkiko, E., Oli, M.K., 2018. Are ranger patrols effective in reducing poaching-related threats within protected areas? J. Appl. Ecol. 55, 99–107. https://doi.org/10.1111/1365-2664.12965.
Moore, J.F., Udell, B.J., Martin, J., Turikunkiko, E., Masozera, M.K., 2021. Optimal allocation of law enforcement patrol effort to mitigate poaching activities. Ecol. Appl. 31. https://doi.org/10.1002/eap.2337.
Muchaal, P., Ngandjui, G., 1999. Impact of village hunting on wildlife populations in the western Dia reserve, Cameroon. Conserv. Biol. 13, 385–396. https://doi.org/10.1046/j.1523-1739.1999.013002385.x.
Mudumba, T., Jingo, S., Heit, D., Montgomery, R.A., 2021. The landscape configuration and lethality of snare poaching of sympatric guilds of large carnivores and ungulates. Afr. J. Ecol. 59, 51–62. https://doi.org/10.1111/aje.12781.
Mudumba, T., Moll, R., Jingo, S., Riley, S., Macdonald, D., Astaras, C., Montgomery, R., 2022. Influence of social status and industrial development on poaching acceptability. GLOBAL ECOLOGY AND CONSERVATION 38. https://doi.org/10.1016/j.gecco.2022.e02271.
Nieman, W.A., Leslie, A.J., Wilkinson, A., Wossler, T.C., 2019. Socioeconomic and biophysical determinants of wire-snare poaching incidence and behaviour in the Boland region of South Africa. J. Nat. Conserv. 52. https://doi.org/10.1016/j.jnc.2019.125738.
Nieman, W.A., Nieman, K., 2024. Unveiling poaching patterns and threat sources for informed conservation in Southeast Angola. J. Nat. Conserv. 77, 126532. https://doi.org/10.1016/j.jnc.2023.126532.
Noss, A., 1998. Cable snares and bushmeat markets in a central African forest. Environ. Conserv. 25, 228–233. https://doi.org/10.1017/S0376892998000289.
Nowak, S., Żmihorski, M., Figura, M., Stachyra, P., Mysłajek, R.W., 2021. The illegal shooting and snaring of legally protected wolves in Poland. Biol. Conserv. 264. https://doi.org/10.1016/j.biocon.2021.109367.
Ogada, D.L., 2014. The power of poison: pesticide poisoning of Africa's wildlife. Ann. N. Y. Acad. Sci. 1322, 1–20. https://doi.org/10.1111/nyas.12405.
Ohashi, G., Matsuzawa, T., 2011. Deactivation of snares by wild chimpanzees. Primates 52, 1–5. https://doi.org/10.1007/s10329-010-0212-8.
Ohmagari, K., Berkes, F., 1997. Transmission of indigenous knowledge and bush skills among the Western James Bay Cree women of subarctic Canada. Hum. Ecol. 25, 197–222. https://doi.org/10.1023/A:1021922105740.
O'Kelly, H.J., Rowcliffe, J.M., Durant, S., Milner-Gulland, E.J., 2018a. Experimental estimation of snare detectability for robust threat monitoring. Ecol. Evol. 8, 1778–1785. https://doi.org/10.1002/ece3.3655.
O'Kelly, H.J., Rowcliffe, J.M., Durant, S.M., Milner-Gulland, E.J., 2018b. Robust estimation of snare prevalence within a tropical forest context using N-mixture models. Biol. Conserv. 217, 75–82. https://doi.org/10.1016/j.biocon.2017.10.007.
Pattiselanno, F., Lloyd, J., Krockenberger, A., Arobaya, A., Sheil, D., 2023. Hunting in Indonesian New Guinea: dogs, conservation and culture. ETHNOBIOLOGY AND CONSERVATION 12. https://doi.org/10.15451/ec2023-09-12.20-1-11.
Piel, A.K., Lenoel, A., Johnson, C., Stewart, F.A., 2015. Deterring poaching in western Tanzania: the presence of wildlife researchers. Glob. Ecol. Conserv. 3, 188–199. https://doi.org/10.1016/j.gecco.2014.11.014.
Plumptre, A., Bizumuremyi, J., Uwimana, F., Ndaruhebeye, J., 1997. The effects of the Rwandan civil war on poaching of ungulates in the Parc national des Volcans. ORYX 31, 265–273. https://doi.org/10.1046/j.1365-3008.1997.d01-15.x.
Proulx, G., Rodtka, D., 2015. Predator bounties in Western Canada cause animal suffering and compromise wildlife conservation efforts. ANIMALS 5, 1034–1046. https://doi.org/10.3390/ani5040397.
Proulx, G., Rodtka, D., 2017. Steel-jawed Leghold traps and killing neck snares: similar injuries command change to agreement on International humane trapping standards. J. Appl. Anim. Welf. Sci. 20, 198–203. https://doi.org/10.1080/10888705.2017.1286989.
Proulx, G., Rodtka, D., 2019. Killing traps and snares in North America: the need for stricter checking time periods. ANIMALS 9. https://doi.org/10.3390/ani9080570.
Quiatt, D., Reynolds, V., Stokes, E.J., 2002. Snare injuries to chimpanzees (*Pan troglodytes*) at 10 study sites in east and West Africa. Afr. J. Ecol. 40, 303–305. https://doi.org/10.1046/j.1365-2028.2002.00356.x.
Reyes de Merkle, J., Creel, S., Becker, M.S., Goodheart, B., Mweetwa, T., Mwape, H., Dröge, E., Simpamba, T., 2024. Long-term data reveal fitness costs of anthropogenic prey depletion for a subordinate competitor, the African wild dog (Lycaon pictus). Ecol. Evol. 14, e11402. https://doi.org/10.1002/ece3.11402.
Ridwan, Q., Wani, Z.A., Anjum, N., Bhat, J.A., Hanief, M., Pant, S., 2023. Human-wildlife conflict: a bibliometric analysis during 1991–2023. Regional Sustainability 4, 309–321. https://doi.org/10.1016/j.regsus.2023.08.008.
Ripple, W.J., Abernethy, K., Betts, M.G., Chapron, G., Dirzo, R., Galetti, M., Levi, T., Lindsey, P.A., Macdonald, D.W., Machovina, B., Newsome, T.M., Peres, C.A., Wallach, A.D., Wolf, C., Young, H., 2016a. Bushmeat hunting and extinction risk to the world's mammals. R. Soc. Open Sci. 3, 160498. https://doi.org/10.1098/rsos.160498.
Ripple, W.J., Chapron, G., López-Bao, J.V., Durant, S.M., Macdonald, D.W., Lindsey, P. A., Bennett, E.L., Beschta, R.L., Bruskotter, J.T., Campos-Arceiz, A., Corlett, R.T., Darimont, C.T., Dickman, A.J., Dirzo, R., Dublin, H.T., Estes, J.A., Everatt, K.T., Galetti, M., Goswami, V.R., Hayward, M.W., Hedges, S., Hoffmann, M., Hunter, L.T. B., Kerley, G.I.H., Letnic, M., Levi, T., Maisels, F., Morrison, J.C., Nelson, M.P., Newsome, T.M., Painter, L., Pringle, R.M., Sandom, C.J., Terborgh, J., Treves, A., Van Valkenburgh, B., Vucetich, J.A., Wirsing, A.J., Wallach, A.D., Wolf, C., Woodroffe, R., Young, H., Zhang, L., 2016b. Saving the world's terrestrial megafauna. BioScience 66, 807–812. https://doi.org/10.1093/biosci/biw092.
Robbins, M.M., Gray, M., Fawcett, K.A., Nutter, F.B., Uwingeli, P., Mburanumwe, I., Kagoda, E., Basabose, A., Stoinski, T.S., Cranfield, M.R., Byamukama, J., Spelman, L. H., Robbins, A.M., 2011. Extreme conservation leads to recovery of the Virunga Mountain gorillas. PLoS One 6, e19788. https://doi.org/10.1371/journal.pone.0019788.
Rosenblatt, E., Creel, S., Becker, M., Merkle, J., Mwape, H., Schuette, P., Simpamba, T., 2016. Effects of a protection gradient on carnivore density and survival: an example with leopards in the Luangwa valley, Zambia. Ecol. Evol. 6, 3772–3785. https://doi.org/10.1002/ece3.2155.
Rosenblatt, E., Creel, S., Schuette, P., Becker, M.S., Christianson, D., Dröge, E., Mweetwa, T., Mwape, H., Merkle, J., M'soka, J., Masonde, J., Simpamba, T., 2019. Do protection gradients explain patterns in herbivore densities? An example with ungulates in Zambia's Luangwa Valley. PLoS One 14, e0224438. https://doi.org/10.1371/journal.pone.0224438.
Rostro-García, S., Kamler, J., Sollmann, R., Balme, G., Augustine, B., Kéry, M., Crouthers, R., Gray, T., Groenenberg, M., Prum, S., Macdonald, D., 2023. Population dynamics of the last leopard population of eastern Indochina in the context of improved law enforcement. Biol. Conserv. 283. https://doi.org/10.1016/j.biocon.2023.110080.
Sarkar, D., Bortolamiol, S., Gogarten, J.F., Hartter, J., Hou, R., Kagoro, W., Omeja, P., Tumwesigye, C., Chapman, C.A., 2022. Exploring multiple dimensions of conservation success: Long-term wildlife trends, anti-poaching efforts and revenue sharing in Kibale National Park. Uganda. Anim. Conserv. 25, 532–549. https://doi.org/10.1111/acv.12765.
Sawaki, S., Taran, D., Taran, F., Bomoi, R., Rumateray, M., 2022. Hunting of wild animals by Saubeba Community in Manokwari, West Papua, Indonesia. Biodiversitas 23, 2411–2416. https://doi.org/10.13057/biodiv/d230519.

Schmitz, O.J., Miller, J.R.B., Trainor, A.M., Abrahms, B., 2017. Toward a community ecology of landscapes: predicting multiple predator–prey interactions across geographic space. Ecology 98, 2281–2292. https://doi.org/10.1002/ecy.1916.

Sethi, S., 2022. Insights into illegal wildlife hunting by forest guards of selected tiger reserves in Central India. Eur. J. Wildl. Res. 68. https://doi.org/10.1007/s10344-021-01553-8.

Soh, Y.H., Carrasco, L.R., Miquelle, D.G., Jiang, J., Yang, J., Stokes, E.J., Tang, J., Kang, A., Liu, P., Rao, M., 2014. Spatial correlates of livestock depredation by Amur tigers in Hunchun, China: relevance of prey density and implications for protected area management. Biol. Conserv. 169, 117–127. https://doi.org/10.1016/j.biocon.2013.10.011.

Stokes, E., Byrne, R., 2001. Cognitive capacities for behavioural flexibility in wild chimpanzees (Pan troglodytes): the effect of snare injury on complex manual food processing. Anim. Cogn. 4, 11–28. https://doi.org/10.1007/s100710100082.

Suraci, J.P., Frank, L.G., Oriol-Cotterill, A., Ekwanga, S., Williams, T.M., Wilmers, C.C., 2019. Behavior-specific habitat selection by African lions may promote their persistence in a human-dominated landscape. Ecology 100. https://doi.org/10.1002/ecy.2644.

Tanalgo, K.C., 2017. Wildlife hunting by indigenous people in a Philippine protected area: a perspective from MT. Apo National Park. Mindanao Island. J. Threat. Taxa 9, 10307–10313. https://doi.org/10.11609/jot.2967.9.6.10307-10313.

Teutloff, N., Meller, P., Finckh, M., Cabalo, A., Ramiro, G., Neinhuis, C., Lautenschläger, T., 2021. Hunting techniques and their harvest as indicators of mammal diversity and threat in northern Angola. Eur. J. Wildl. Res. 67. https://doi.org/10.1007/s10344-021-01541-y.

Tilker, A., Niedballa, J., Viet, H.L., Abrams, J.F., Marescot, L., Wilkinson, N., Rawson, B. M., Sollmann, R., Wilting, A., 2024. Addressing the Southeast Asian snaring crisis: impact of 11 years of snare removal in a biodiversity hotspot. Conserv. Lett. 17, e13021. https://doi.org/10.1111/conl.13021.

Turnbull, T., Cain, J., Roemer, G., 2013. Anthropogenic impacts to the recovery of the Mexican Gray Wolf with a focus on trapping-related incidents. Wildl. Soc. Bull. 37, 311–318. https://doi.org/10.1002/wsb.247.

Doormaal, N., Van Lemieux, A.M., Ruiter, S., Allin, P.M.R.R., Spencer, C.R., 2022. Detecting wildlife poaching: a rigorous method for comparing patrol strategies using an experimental design. Oryx 56, 572–580. https://doi.org/10.1017/S0030605320001301.

Vantassel, S.M., Hiller, T.L., Powell, K.D.J., Hygnstrom, S.E., 2010. Using advancements in cable-trapping to overcome barriers to furbearer management in the United States. J. Wildl. Manag. 74, 934–939. https://doi.org/10.2193/2009-298.

Vermeulen, C., Julve, C., Doucet, J.-L., Monticelli, D., 2009. Community hunting in logging concessions: towards a management model for Cameroon's dense forests. Biodivers. Conserv. 18, 2705–2718. https://doi.org/10.1007/s10531-009-9614-6.

Vinks, M.A., Creel, S., Schuette, P., Rosenblatt, E., Matandiko, W., Sanguinetti, C., Banda, K., Goodheart, B., Becker, M., Chifunte, C., Simukonda, C., 2020. Testing the effects of anthropogenic pressures on a diverse African herbivore community. Ecosphere 11, e03067. https://doi.org/10.1002/ecs2.3067.

Viollaz, J., Rizzolo, J.B., Long, B., Trung, C.T., Kempinski, J., Rawson, B.M., Reynald, D., Quang, H.X., Hien, N.N., Dung, C.T., Huyen, H.T., Dung, N.T.T., Gore, M.L., 2022. Potential for informal guardianship in community-based wildlife crime prevention: insights from Vietnam. Nat. Conserv. 48, 123–147. https://doi.org/10.3897/natureconservation.48.81635.

Wall, J., Lefcourt, J., Jones, C., Doehring, C., O'Neill, D., Schneider, D., Steward, J., Krautwurst, J., Wong, T., Jones, B., Goodfellow, K., Schmitt, T., Gobush, K., Douglas-Hamilton, I., Pope, F., Schmidt, E., Palmer, J., Stokes, E., Reid, A., Elbroch, L.M., Kulits, P., Villeneuve, C., Matsanza, V., Clinning, G., van Oort, J., Denninger Snyder, K., Peter Daati, A., Gold, W., Cunliffe, S., Craig, B., Cork, B., Burden, G., Goss, M., Hahn, N., Carroll, S., Gitonga, E., Rao, R., Stabach, J.A., Dulude-de Broin, F., Omondi, P., Wittemyer, G., 2024. EarthRanger: An Open-Source Platform for Ecosystem Monitoring, Research and Management. Evol, Methods Ecol. https://doi.org/10.1111/2041-210X.14399.

Waller, J.C., Reynolds, V., 2001. Limb injuries resulting from snares and traps in chimpanzees (Pan troglodytes schweinfurthii) of the Budongo Forest, Uganda. Primates 42, 135–139. https://doi.org/10.1007/BF02558140.

Watson, F., Becker, M.S., McRobb, R., Kanyembo, B., 2013. Spatial patterns of wire-snare poaching: implications for community conservation in buffer zones around National Parks. Biol. Conserv. 168, 1–9. https://doi.org/10.1016/j.biocon.2013.09.003.

White, P.A., Van Valkenburgh, B., 2022. Low-cost forensics reveal high rates of non-lethal snaring and shotgun injuries in Zambia's large carnivores. Front. Conserv. Sci. 3, 803381. https://doi.org/10.3389/fcosc.2022.803381.

Wiafe, E., 2021. Distribution and population density of endangered primate species in Ghana's Forest reserves. FORESTIST 71, 238–247. https://doi.org/10.5152/forestist.2021.20040.

Wich, S.A., Piel, A.K., 2021. Conservation Technology. Oxford University Press.

Willcox, A.S., Nambu, D.M., 2007. Wildlife hunting practices and bushmeat dynamics of the Banyangi and Mbo people of southwestern Cameroon. Biol. Conserv. 134, 251–261. https://doi.org/10.1016/j.biocon.2006.08.016.

Wittemyer, G., Northrup, J.M., Blanc, J., Douglas-Hamilton, I., Omondi, P., Burnham, K. P., 2014. Illegal killing for ivory drives global decline in African elephants. Proc. Natl. Acad. Sci. 111, 13117–13121. https://doi.org/10.1073/pnas.1403984111.

Xu, L., Gholami, S., McCarthy, S., Dilkina, B., Plumptre, A., Tambe, M., Singh, R., Nsubuga, M., Mabonga, J., Driciru, M., Wanyama, F., Rwetsiba, A., Okello, T., Enyel, E., IEEE, 2020. Stay Ahead of Poachers: Illegal Wildlife Poaching Prediction and Patrol Planning Under Uncertainty with Field Test Evaluations (Short Version), in: Harvard University. Presented at the 2020 IEEE 36TH INTERNATIONAL CONFERENCE ON DATA ENGINEERING (ICDE 2020), pp. 1898–1901.doi:https://doi.org/10.1109/ICDE48307.2020.00198.

Yersin, H., Asiimwe, C., Voordouw, M., Zuberbühler, K., 2017. Impact of snare injuries on parasite prevalence in wild chimpanzees (Pan troglodytes). Int. J. Primatol. 38, 21–30. https://doi.org/10.1007/s10764-016-9941-x.