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Commentary

Address the root, not the fruit: Proactive measures outshine reactive ones in managing the human-wildlife conflict

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The complex challenges associated with human-wildlife conflict (HWC) require a thorough analysis and the careful adaptation of strategies to promote human-wildlife coexistence. Globally, strategies for addressing HWC are broadly categorized into preventive and mitigative approaches. While studies have investigated both approaches, a larger proportion of research focuses on preventive strategies. Mitigation strategies, although examined alongside prevention, are less frequently explored and offer comparatively fewer solutions. Within the preventive approach, key strategies identified in global studies include education and awareness campaigns, effective fencing, corridor management, habitat management, and livelihood incentives. Compensation and insurance schemes are common mitigation strategies, designed to alleviate socio-economic impacts and enhance human tolerance toward wildlife. Although integrated approaches that combine both preventive and mitigative measures are essential for achieving coexistence, most global studies concentrate on preventive measures, with particular emphasis on education and awareness, physical barriers, habitat restoration, and effective corridor management.

Key words: Human-wildlife conflict, prevention, proactive, mitigation, reactive.

INTRODUCTION

Human-wildlife conflict (HWC) arises from unresolved issues at the human-wildlife interface (Daszak et al., 2000). Encounters between humans and wildlife are intensified by rapid urbanization, agricultural expansion, and deforestation, which threaten biodiversity and pose risks to human livelihoods and health (Tilman et al., 2017). Habitat encroachment is a primary driver of increased HWC, manifesting as crop raiding by elephants and predation on livestock by large carnivores (Nyhus, 2016). Close contact between humans and wildlife also facilitates pathogen spillover, as seen in Ebola and COVID-19 outbreaks, which are believed to have originated from wildlife (Plowright et al., 2021). HWC is complex and multifaceted, threatening numerous wildlife species globally. It has prompted the post-2020 Global Biodiversity Framework to recognize HWC as a significant conservation challenge, leading many governments to incorporate HWC management into their national policies

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and strategies (International Union for Conservation of Nature [IUCN], 2022). The growing prevalence of HWC underscores the urgent need for humans and wildlife to coexist, motivating wildlife experts to design strategies that shift the focus from conflict to coexistence. In wildlife conservation, a substantial body of literature has documented various strategies aimed at mitigating HWC. Studies span diverse scenarios globally, including human-polar bear interactions in Canada (Lemelin et al., 2010; Clark et al., 2012; Heemskerk et al., 2020) and human-kangaroo conflicts in Australia (McLeod and Sharp, 2014; Chao, 2022; ABC News, 2023), illustrating the widespread nature of HWC. Strategies are often discussed in the context of mitigation measures (Dickman, 2010; Barua et al., 2013; Treves et al., 2016), ranging from preventive techniques such as fencing and deterrents to community-based conservation initiatives and policy interventions (Woodroffe et al., 2005; König et al., 2020). A comprehensive understanding of the global research landscape requires examining studies based on methodological approaches and proposed solutions (Dickman, 2010; Barua et al., 2013; König et al., 2021), as emphasized by Aishwarya (2024). This perspective aligns with the IUCN guidelines on HWC and coexistence, which outline distinct strategies for conflict prevention and mitigation (IUCN, 2023).

Conflict prevention, comprising primarily non-lethal methods (Meena et al., 2023), seeks to prevent conflicts by addressing their root causes (Hill, 2000). This approach differs fundamentally from conflict mitigation, which focuses on minimizing the negative impacts once conflicts have occurred. Understanding the balance between these approaches helps assess whether current strategies are proactive or reactive and whether they align with long-term sustainability goals. Evaluating which solutions are most studied and implemented, and their contextual appropriateness, can guide policy decisions and resource allocation, ensuring that HWC management is effective, efficient, and beneficial for both wildlife conservation and human well-being. This commentary highlights the types of HWC management approaches and solutions globally, including the proportion of studies focusing on prevention versus mitigation.

GLOBAL PREFERENCE FOR CONFLICT PREVENTION OVER MITIGATION

Global studies contribute to a growing body of knowledge essential for balancing biodiversity conservation with human well-being (Treves and Karanth, 2003; Dickman, 2010; Barua et al., 2013; Redpath et al., 2015; Nyhus, 2016). Most research emphasizes conflict prevention as the primary strategy for addressing HWC (Treves and Karanth, 2003; Goodrich, 2010; Miller et al., 2016; Eklund et al., 2017; Kansky et al., 2021), evidenced by the greater number of studies and solutions under this approach. Preventive measures address the root causes of conflicts, reducing the likelihood of recurrence and associated risks. By fostering stable, long-term solutions, these strategies are often more effective and less harmful to wildlife, making them popular due to their humane and sustainable nature (Treves and Karanth, 2003). Preventive approaches align with sustainability principles and conservation goals, explaining their prioritization in conservation policies and by funding bodies (Woodroffe et al., 2005). They are also consistent with ecosystem management objectives that aim to balance human and wildlife needs (Dickman, 2010). In contrast, mitigation strategies focus on conflicts after they occur, often perpetuating challenges and increasing long-term costs (Treves et al., 2009). Methods such as compensation and insurance require ongoing financial commitments and extensive resource allocation (Dickman et al., 2011). Some mitigation approaches, including culling or relocating animals, encounter community resistance due to animal welfare concerns or cultural attachments (Nyhus, 2016). By addressing only the immediate impacts without tackling root causes, mitigation offers no guarantee that conflicts will not recur, potentially causing ongoing frustration (Woodroffe et al., 2005). For instance, in the Eastern Himalayas, communities reported dissatisfaction with compensation schemes due to lengthy claims procedures and inadequate financial remuneration (Wangchuk et al., 2024).

TYPES OF PREVENTIVE AND MITIGATION SOLUTIONS

Among the various fencing solutions for mitigating HWC, the Aberdare fence in Kenya stands out as a successful example. Its implementation not only reduced conflicts but also improved local livelihoods, increased land value, and enhanced biodiversity conservation (States News Service, 2011). However, Osipova et al. (2018) caution that while fencing may resolve HWC locally, it can displace problems to other areas. Additionally, combining deterrents, such as corridor management and livelihood incentives, represents a multifaceted approach, acknowledging the need for diverse strategies to address the complex dynamics of HWC. These trends highlight the importance of holistic solutions that integrate compensation, education, and fencing. Through such comprehensive approaches, global studies aim to foster sustainable and harmonious relationships between humans and wildlife, creating shared landscapes that accommodate the needs of both. Recognizing the transformative power of knowledge dissemination, global studies particularly from India emphasize the critical role of community awareness programs in mitigating conflicts and promoting coexistence (Madhusudan and Mishra, 2003; Karanth et al., 2013).

These findings align with broader global perspectives suggesting that informed communities are crucial for

biodiversity conservation and reducing instances of HWC (McKinney, 2002; Ogra and Badola, 2008). Improved wildlife literacy can lessen hostility toward wildlife, reduce resentment, and enable communities to respond appropriately during wildlife encounters (Chikezie et al., 2023). Education and outreach activities empower residents with the knowledge and skills to minimize conflicts and make informed decisions in support of sustainable wildlife management (Jacobson et al., 2006).

The dual emphasis on education and fencing illustrates a comprehensive, proactive approach to managing HWC. Within the prevention framework, many global studies have explored corridor management, livelihood incentives, and habitat management. These strategies underscore the multifaceted nature of conflict prevention, recognizing that ecosystem protection and socio-economic considerations are essential components of sustainable solutions. This thematic framework reflects an understanding of the complex interplay of factors driving HWC, illuminating pathways toward proactive management and long-term coexistence.

In contrast, the mitigation approaches, representing less than a quarter of global studies, addresses conflicts after they occur. Compensation, a common mitigation strategy, involves monetary payments by governments or conservation organizations to individuals affected by wildlife, such as those experiencing injury, death, or property loss. The primary goal is to support affected communities and promote tolerance toward wildlife (Madhusudan, 2003). Effective compensation fosters equity and reassurance, increasing community acceptance of wildlife and facilitating peaceful co-existence (Maclennan et al., 2009; Karanth et al., 2018). Innovative financial instruments, including insurance schemes, provide additional safety nets for communities vulnerable to the unpredictable impacts of HWC. The dual focus on compensation and insurance demonstrates the need for diverse, adaptive strategies in mitigating the consequences of wildlife conflicts.

CONCLUSIONS

This commentary highlights the complexity of HWC and underscores essential strategies for its management and the promotion of coexistence. Although global studies address both prevention and mitigation, a larger proportion focuses on preventive measures. Rather than relying on a single approach, a combination of preventive strategies both traditional and modern is necessary, tailored to the specific context of each conflict. Key preventive solutions include fencing, corridor management, habitat management, and livelihood incentives, which together provide a promising framework for sustainable human-wildlife coexistence, particularly in ecologically diverse regions. In mitigation, compensation remains the most widely recognized approach, reducing socio-economic impacts and fostering greater tolerance toward wildlife. These findings emphasize the importance of adaptive, species-specific strategies that consider the unique behaviors and ecological roles of key species, offering a comprehensive approach to addressing HWC across diverse ecosystems.

CONFLICT OF INTERESTS

The author has not declared any conflict of interests.

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