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**Ecological Knowledge and Drivers of Tolerance for the Indian Grey Wolf and Striped
Hyena in Purulia District, West Bengal, India**

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Declaration

I, Chetan Ashok Iragar, hereby declare that this thesis entitled “Ecological Knowledge and Drivers of Tolerance for the Indian Grey Wolf and Striped Hyena in Purulia District, West Bengal, India” submitted to the Institute of Forest Sciences, Faculty of Environmental Sciences, Technische Universität Dresden, is the result of my original research. I further declare that no part of this thesis has previously been submitted for the award of any degree or diploma at this university or any other institution.

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Dedication

I dedicate this thesis to my mother Mrs. Manjula Ashok Iragar, whose compassion and kindness towards wildlife shaped my own connection with nature. Although her experiences with wildlife were limited, her habit of caring for animals and her deep empathy towards them inspired in me a love for the natural world. In many ways, her affection for wildlife found its continuation through my journey into forestry and wildlife conservation.

Abstract

Human–carnivore coexistence in human-dominated landscapes depends not only on ecological factors but also on the perceptions, knowledge, and tolerance of local communities. The present study investigated local ecological knowledge and tolerance towards the Indian grey wolf (*Canis lupus pallipes*) and striped hyena (*Hyaena hyaena*) in Purulia district, West Bengal, India. In addition, the study examined the influence of community-based conservation interventions implemented by the Human and Environment Alliance League (HEAL) on ecological knowledge and coexistence outcomes.

A mixed-methods approach was employed using semi-structured interviews with 86 respondents from eight villages, including four intervention villages and four non-intervention villages. In addition, six members of the seed goat bank committee were interviewed to obtain contextual information regarding conservation interventions. Local ecological knowledge related to species identification, morphology, diet, habitat, activity patterns, sociality, seasonality, and behavioral characteristics was documented and compared with scientific ecological knowledge. Tolerance towards both carnivores was assessed using conflict-related, impact, psychological, value-based, and demographic indicators. Quantitative data were analysed using statistical approaches, whereas qualitative responses were analysed through directed content analysis and thematic analysis using NVivo.

Respondents possessed considerable ecological knowledge regarding both species, and several observations corresponded closely with scientific ecological knowledge. Ecological knowledge regarding Indian grey wolves was generally higher in intervention villages, whereas knowledge regarding striped hyenas was broadly comparable between intervention and non-intervention villages. Direct conflict variables showed limited influence on tolerance. Instead, emotions, perceived risks, and perceived benefits emerged as important drivers of coexistence. Wolves were generally associated with higher perceived risks because of concerns regarding livestock depredation, whereas striped hyenas were increasingly recognized for their scavenging behavior and ecological role.

Most respondents exhibited passive coexistence, followed by stewardship behaviors, while intolerant responses were absent. Overall, the findings demonstrate that coexistence in Purulia is shaped by complex social and psychological factors rather than direct conflict alone. The study highlights the importance of integrating local ecological knowledge with scientific knowledge and emphasizes the role of sustained community-based conservation interventions in promoting long-term coexistence between people and carnivores in eastern India.

Keywords: Indian grey wolf, striped hyena, local ecological knowledge, tolerance, human–carnivore coexistence, community-based conservation, Purulia, West Bengal.

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Acronyms

Acronym & Definition

CBC: Community-Based Conservation

CMS COP15: Convention on the Conservation of Migratory Species (15th Meeting of the Conference of the Parties)

HEAL: Human and Environment Alliance League

HWC: Human-Wildlife Conflict

HWI: Human-Wildlife Interactions

IUCN: International Union for Conservation of Nature

LEK: Local Ecological Knowledge

OBC: Other Backward Classes

SC: Scheduled Caste

SEK: Scientific Ecological Knowledge

ST: Scheduled Tribe

TEK: Traditional Ecological Knowledge

WTM: Wildlife Tolerance Model

WWF: World Wide Fund for Nature / World Wildlife Fund

1 Introduction

Protected areas account for 16% of the global land mass but they fall short of conserving species that are wide-ranging and adaptable to several small and large-scale anthropogenic activities (Majgaonkar et al., 2026). In India, while 4% constitute protected areas, nearly 19% of the land area has unprotected forest cover, which along with many other non-forest habitats such as agroforests, scrublands, barrenlands, grasslands, etc. support populations of large carnivores outside the reserve network (Karanth et al., 2009; Srivathsa et al., 2019).

The semi-arid wildlands of West Bengal state of India are known to be a shared habitat for both Indian grey wolf (*Canis lupus pallipes*) and striped hyaena (*Hyaena hyaena*) (Mukherjee et al., 2021). Indian wolf represents an ancient lineage that has adapted to co-existing near human settlements for over 100,000 years, primarily occupying the grasslands, scrublands, and agro-pastoral ecosystems of semi-arid regions. Across India, their population patchily thrives outside of federally protected areas. In West Bengal specifically, their remaining distribution is highly fragmented and restricted to the human-dominated, semi-arid wildlands at the junction of the Chota Nagpur Plateau and the Lower Gangetic Plains (Mukherjee et al., 2021).

The striped hyena is one of the four extant hyena species and is distributed across Africa and Asia. Although historically widespread across northern and western West Bengal, due to pressures faced similar to wolves have driven them to near extinction in the state, restricting its last remaining relict population to the area south of the Damodar River (Akash et al., 2021). Their global population too is declining and occurs patchily at low densities, leading to its Near Threatened IUCN status (Akash et al., 2021).

Both species have fragmented and declining populations driven by escalating anthropogenic pressures. Forced to survive in human-dominated and industrial landscapes outside of traditional protected areas, they face severe, overlapping threats from habitat loss, human-wildlife conflict, and natural prey depletion, leading them to heavily rely on livestock for survival (Majgaonkar et al., 2026; Mukherjee et al., 2021). In India, both the wolf and the hyena receive the highest level of legal safeguard, as both are protected under Schedule I of the Wild Life (Protection) Act. While the Indian grey wolf is classified as Vulnerable by the IUCN, the striped hyena is listed as Near Threatened, with an estimated global population of fewer than 10,000 mature individuals and a declining population trend. Recognizing these conservation concerns, the striped hyena received

stronger international protection at the 15th Meeting of the Conference of the Parties to the Convention on the Conservation of Migratory Species (CMS COP15), where it was included in both Appendix I and Appendix II. This listing aims to strengthen transboundary cooperation and improve monitoring and conservation of the species across its range (CMS, 2026; Iqra Rabbani & Sharad Kumar, 2026; Mishra, 2026).

The Chota Nagpur Plateau region of West Bengal—encompassing the entire Purulia district and significant portions of Bankura and West Midnapore districts—is home to diverse tribal communities such as the Santals, Oraons, and Mundas, who have lived in close association with forests, wildlife, and the natural resources they provide for generations (Basu, 2020; Bhattacharya et al., 2016; D’Cruze et al., 2024; Sarkar & Modak, 2022). These groups have skillfully preserved their unique linguistic, religious, and cultural heritage amidst evolving socio-political landscapes, significantly enriching India's multidimensional sociocultural diversity (Basu, 2020; Sarkar & Modak, 2022). Their traditional practices, spanning agriculture, folk art, and religious rituals, are deeply intertwined with nature and natural resources (Dey et al., 2024; Kumar & Soni, 2023). Living alongside these communities, wolves and hyenas often utilize unconventional food resources, a pattern that may be associated with declining wild prey populations and the scavenging behavior of these species (Mukherjee et al., 2021).

Conservation research and practice have increasingly expanded beyond contiguous native habitats and now focus on the coexistence of large wildlife and humans in multi-use landscapes to better understand the ecology and distribution of adaptable species (Majgaonkar et al., 2026). A conservation intervention in wildlife ecology refers to a deliberate action designed to increase ecological knowledge, reduce human-induced threats to wildlife, and promote conservation outcomes (Bennett et al., 2017). Many conservation efforts still rely primarily on techno-administrative approaches, such as physical barriers and monetary compensation schemes, to reduce the material damages caused by carnivores (Mishra et al., 2026; Venumière-Lefebvre et al., 2022). In addition, organizations such as the Human and Environment Alliance League (HEAL), a non-governmental organization based in West Bengal, implement community-based conservation interventions, including awareness and outreach programmes, community engagement initiatives, livelihood-support mechanisms such as the Seed Goat Bank programme, and projects such as *Project Striped Hyena* and *Protecting Purulia's Carnivores*. Collectively, these initiatives aim to

strengthen ecological knowledge, dispel prevailing myths, and emphasize the ecosystem services provided by these carnivores, thereby promoting tolerance and supporting coexistence (HEAL, 2026).

While such interventions undoubtedly contribute to conservation, their effectiveness must be evaluated empirically, as understanding why specific initiatives succeed or fail is essential for designing and improving future conservation strategies (Baylis et al., 2016). Such approaches recognize that human interactions with carnivores extend beyond material losses and are strongly influenced by psychological and social factors, including personal values, social norms, attitudes, and emotions (Mishra et al., 2026; Vaske & Manfredo, 2012). For example, the recognition of wolves as protected species rather than pests contributed to a 40% increase in wolf populations across Europe, demonstrating how wildlife distribution can be shaped by human perceptions and behaviors (Capitain et al., 2025).

Despite increasing conservation attention towards large carnivores in India, limited research has examined how ecological knowledge and human tolerance towards the Indian grey wolf and striped hyena are influenced by conservation interventions in human-dominated landscapes. Furthermore, the effectiveness of community-based initiatives in shaping local perceptions and promoting coexistence remains poorly understood, particularly in eastern India. This knowledge gap limits the development of evidence-based conservation strategies for these species. Given the multiple threats faced by these carnivores and their potential for conflict with humans, such assessments can contribute not only to predator conservation but also to enhancing human well-being and fostering long-term coexistence (Srivathsa et al., 2019).

In the present study, conservation interventions refer to the community-based initiatives implemented by the Human and Environment Alliance League (HEAL) to enhance local ecological knowledge, promote coexistence, and reduce human-induced threats to the Indian grey wolf and striped hyena. Accordingly, villages where these initiatives have been implemented are referred to as *intervention villages*, whereas villages without such initiatives are referred to as *non-intervention villages*.

In this context, the present study investigates the complementarity between Local Ecological Knowledge (LEK) and Scientific Ecological Knowledge (SEK) and explores the drivers of human tolerance towards wolves and striped hyenas in the human-dominated landscapes of Purulia, West

Bengal. By examining variations in ecological knowledge and tolerance across intervention and non-intervention villages, the study aims to evaluate conservation outcomes and provide insights for designing more effective coexistence strategies. Such evidence can assist conservation practitioners, policymakers, and local communities in developing approaches that simultaneously support predator conservation and rural livelihoods.

1.1 General Objective

To assess ecological knowledge and human tolerance towards the Indian grey wolf and striped hyena in the human-dominated landscapes of Purulia, West Bengal, and to examine the influence of conservation interventions on these dimensions.

1.2 Research questions

1. Does ecological knowledge regarding the Indian grey wolf and striped hyena differ between villages with and without conservation interventions?
2. Does tolerance towards the Indian grey wolf and striped hyena vary between villages with and without conservation interventions, and what factors influence this variation?

1.3 Hypotheses

H₁: Respondents from villages with conservation interventions possess higher ecological knowledge regarding the Indian grey wolf and striped hyena than respondents from villages without interventions.

H₂: Tolerance towards the Indian grey wolf and striped hyena differs between intervention and non-intervention villages and is influenced by conflict-related, psychological, value-based, and demographic factors.

2. Literature Review

2.1 Ecological Knowledge

2.1.1 Local Ecological Knowledge (LEK)

Local ecological knowledge refers to experience-based ecological understanding acquired through direct interaction with the environment, typically within the lifetime of individuals, and informed by observation, practice, and learning (Berkes, 1999; Gilchrist et al., 2005). However, it is considered synonymous with “indigenous knowledge,” “community knowledge,” or “traditional ecological knowledge (TEK)” (Johannes, 1989). Although LEK, TEK, indigenous knowledge, and community knowledge are often used interchangeably in the literature, TEK specifically refers to ecological knowledge transmitted across generations. In contrast, the ecological knowledge documented in the present study was obtained through interviews and reflects respondents' current understanding of wildlife ecology acquired through direct experience within their own lifetime (Gilchrist et al., 2005). Therefore, the present study refers to this knowledge as local ecological knowledge.

LEK is mainly qualitative rather than quantitative and includes an intuitive component in addition to rational reasoning. It is holistic rather than reductionist and considers mind and matter together, without separating material ecological observations from perceptions and beliefs. Local ecological knowledge is not value-free; it is shaped by moral considerations and, in some contexts, by spiritual interpretations. It is based on empirical observation and the accumulation of facts through trial-and-error learning and is generated by local resource users themselves through their direct interaction with the environment (Berkes, 1993).

2.1.2 Scientific Ecological Knowledge (SEK)

Scientific ecological knowledge is “the set of ideas that agree or are consistent with the facts of nature” and is discovered through the application of scientific methods (Romesburg, 1981). SEK is generally characterized by formalized methods, abstraction, generalization, and institutional validation through standardized scientific practices (Berkes, 1999).

Scientific ecological knowledge is predominantly quantitative and emphasizes rational and analytical reasoning. It is reductionist in approach and is based on a separation of mind and matter. Scientific ecological knowledge aims for objectivity through standardized methods. It relies on experimentation and the systematic and deliberate accumulation of data, typically generated by a specialized group of trained researchers rather than by resource users (Berkes, 1993).

2.1.3 Complementarity of Local and Scientific Ecological Knowledge

Although LEK and SEK are independent sources of information, they exhibit strong complementarity. There is a continuous need for LEK to be cross-referenced with SEK, and vice versa, to strengthen the confidence of overall ecological knowledge (Huntington et al., 2004). Scientific knowledge typically seeks generalizations across broad spatial and temporal scales, whereas LEK provides highly detailed observations derived from long-term, direct experience within specific localities (Huntington et al., 2004). Comparing factual ecological observations collected at similar temporal and spatial scales makes it possible to identify the respective strengths and weaknesses of each knowledge source, thereby revealing gaps and indicating directions for future research (Huntington et al., 2004).

The two knowledge systems differ in their scale and emphasis. SEK generally seeks broad generalizations across space and time, whereas local ecological knowledge provides detailed observations derived from long-term experience within specific localities. Local ecological knowledge often draws upon the experiences of elders to interpret unusual or infrequent events, while scientific investigations frequently rely on historical records, unconventional data sources, or experimental simulations to understand rare phenomena (Huntington et al., 2004).

Local ecological knowledge encompasses multiple forms of experience-based understanding, and several characteristics are particularly relevant to ecological studies. First, LEK often emphasizes unusual or rare events that may have important ecological or social consequences despite occurring infrequently. Second, uncertainty, which is usually made explicit in scientific studies, tends to remain implicit in LEK, making it difficult to quantify the reliability or frequency of particular observations even though they are grounded in direct experience. Third, LEK is generally limited in spatial extent to specific localities but often reflects long-term temporal experience accumulated through repeated observations over many years, whereas scientific studies frequently cover broader spatial scales but may be constrained by shorter time frames (Huntington et al., 2004).

Despite their complementarity, direct comparisons between LEK and SEK are often more complex than initially assumed. Apparent agreements or disagreements between the two knowledge systems may be influenced by contextual factors and differences in interpretation (Huntington et al., 2004). For example, local residents may interpret increased sightings of wolves or hyenas near settlements as evidence of population growth. However, scientific studies suggest that increased sightings do not necessarily indicate demographic increases and may instead reflect changes in animal behavior, shifts in habitat use, or altered temporal activity in response to human disturbance (Carter et al., 2012; Mukherjee et al., 2021). Consequently, similar observations may lead to different interpretations within local and scientific knowledge systems.

Second, LEK often provides limited information regarding the precise location, timing, and magnitude of observed ecological changes. Conversely, comparable information from scientific research may only be available in obscure reports, books, or specialized publications, while readily accessible scientific literature frequently presents generalized conclusions. Therefore, limitations in documentation and accessibility affect both knowledge systems and highlight the need for improved information availability on both sides (Huntington et al., 2004).

Third, local ecological knowledge holders and scientists often approach the same ecological issue from different perspectives and rely on different indicators (Huntington et al., 2004). For example, local residents may assess wolf abundance based on the frequency of livestock depredation events or sightings near villages because these directly influence their daily lives (Srivathsa et al., 2019). In contrast, scientific studies may estimate abundance using camera-trap records, occupancy analyses, prey availability, or habitat characteristics (Mukherjee et al., 2021). Thus, although both knowledge systems address the same ecological phenomenon, they may emphasize different forms of evidence and operate at different scales.

Finally, the credibility of information derived from different knowledge systems requires careful evaluation. In scientific research, credibility is generally established through peer review and methodological transparency, whereas the credibility of LEK is often assessed through implicit community review based on the experience, consistency, and reputation of knowledge holders (Huntington et al., 2004). Nevertheless, not all locally derived interpretations can be accepted uncritically, particularly when they extend beyond direct observation. Likewise, scientific interpretations may sometimes fail to capture fine-scale ecological or social contexts recognized

by local communities. Therefore, neither knowledge system should be privileged uncritically, and both require careful evaluation.

To address these challenges and effectively utilize the complementarity between LEK and SEK, recent ethnozoological studies have increasingly moved beyond purely qualitative comparisons and have adopted quantitative approaches. Such studies assess local responses regarding species ecology, including diet, habitat, and behavior, by comparing them with established scientific knowledge (Gilchrist et al., 2005; Torrents-Ticó et al., 2021). By systematically identifying areas of convergence and divergence, researchers can detect ecological misconceptions and establish a baseline for designing targeted conservation education and locally appropriate awareness interventions (Gilchrist et al., 2005; Torrents-Ticó et al., 2021).

2.2 Tolerance and drivers of tolerance

2.2.1 Human–Wildlife Conflict and Coexistence

The conservation of mammalian carnivores is particularly challenging in human-dominated landscapes, where frequent interactions between people and carnivores are common (Chapron et al., 2014; Woodroffe et al., 2005). Such interactions often give rise to conflicts stemming from real or perceived threats to human safety, livelihoods, and property, which can reduce tolerance toward carnivore species (Kansky & Knight, 2014). WWF defines human-wildlife conflict (HWC) as “Any interaction between humans and wildlife that results in negative impacts of human social, economic or cultural life, on the conservation of wildlife populations, or on the environment” (WWF, 2005). While co-existence can be defined as a state involving the persistence of self-sustaining large carnivore populations in human-dominated landscapes whereby humans and wildlife co-adapt to living in shared areas through behavioral changes (Bruskotter et al., 2026; Carter & Linnell, 2016; Chapron & López-Bao, 2016).

In the context of human–wildlife interactions (HWI), coexistence represents a shift away from the traditional emphasis on HWC that has long dominated conservation practice (Fiasco & Massarella, 2022). Rather than focusing solely on mitigating conflicts or promoting market-driven conservation approaches, “meaningful coexistence” seeks to foster mutually adaptive relationships between humans and wildlife, moving beyond shallow and commodified forms of interaction (Fiasco & Massarella, 2022; Fletcher et al., 2020).

2.2.2 Human Dimensions in Conservation

Attitudes towards carnivores are not determined solely by the direct costs imposed by wildlife but are shaped by a complex interplay of individual, social, and cultural factors. Since humans constitute the common thread in the highly variable arena of human–wildlife conflict, and because the course and resolution of conflicts are ultimately determined by human thoughts and actions, understanding the human dimension has become a fundamental prerequisite for developing effective conservation and mitigation strategies (Dickman et al., 2012; Loveridge et al., 2010; Manfredo & Dayer, 2004)

The human dimension of wildlife conservation is inherently complex and has profound implications for carnivore conservation. Consequently, considerable research has focused on individual-level psychological constructs such as attitudes, motivations, subjective norms, perceived control, and values. These concepts are valuable for understanding and predicting human behavior and can be readily applied to conservation practice. In particular, understanding the cognitive foundations of the human dimensions of wildlife conservation can help design more effective prevention and mitigation measures, public participation and conflict-resolution processes, and conservation education programmes (Dickman et al., 2012; Manfredo & Dayer, 2004).

2.2.3 Attitudes and Tolerance

Since 1980s efforts have been made to scholarly conceptualize co-existence and tolerance (Bruskotter et al., 2026). One of the earliest concepts linking human attitudes to wildlife management was cultural carrying capacity, defined as the maximum number of animals that can compatibly coexist with a local human population, determined primarily by a specific group's willingness to tolerate those animals and their activities at a given place and time (Bruskotter et al., 2026; Ellingwood & Spignesi, 1986).

It is important to understand attitude before defining tolerance and upcoming other terms. In psychology, an individual's or group's attitude can be defined as the tendency to evaluate an object or entity with favor or disfavor, which may directly influence their behavior towards animals and

humans (Bruskotter et al., 2026; Eagly & Chaiken, 1993). Tolerance is described as a passive state in which individuals or groups are willing to accept wildlife and its associated impacts, including negative consequences arising from human–wildlife interactions (Bruskotter & Fulton, 2012; Lischka et al., 2019).

Attitudes have two dimensions. The first one is an evaluative component, where in an individual views attitude object as positive or negative. The second aspect is cognition, which is associated with belief. Beliefs are what we think are true but are not necessarily objective facts (Vaske & Manfredo, 2012). Although, both dimensions of attitudes play crucial role in predicting behavior, it must be noted that all tolerant attitudes do not necessarily turn out to be tolerant behaviors (Barmoen et al., 2024; Vaske & Manfredo, 2012). For instance, a person with intolerant attitudes may choose not to behave intolerantly if they believe their views are not supported by those around them (Bruskotter et al., 2026). The theory of planned behavior and the theory of reasoned action propose that human behaviors are determined by a combination of individual attitudes, social norms and the extent of perceived control over personal behavior (Dickman et al., 2012).

2.2.4 Emotions

Large carnivores elicit strong, conflicting emotions and people may simultaneously like, admire, fear and hate them (Dickman et al., 2012). There has been increasing recognition for importance of emotions deciding human actions and acceptance towards wildlife (Dheer et al., 2021; Dickman et al., 2012). Emotion can be defined as a “transient, discrete neurological state in an individual brought on by external or internal stimuli. Associated with behavioral responses, physiological conditions, and indicative of a degree of pleasure or displeasure” (Dheer et al., 2021; Ekman, 1999). Positive emotions can be happiness, cuteness, feeling culturally important etc. whereas negative emotions can be hatred, fear, anger etc.

2.2.5 Values and value orientation

Although attitudes are essential in predicting behaviors, they don't exist in isolation, indeed they are influenced by values- like honesty, self-respect etc., which are slow to form and are highly resistant to change (Dickman et al., 2012; Manfredo et al., 2009; Manfredo & Dayer, 2004). Values towards wildlife are dynamic and can be oriented towards certain standpoints along a continuum such as being utilitarian or mutualist; the prior endorses human domination of wildlife, the latter

one, believes animals have rights similar to those of humans (Dickman et al., 2012; Manfredi et al., 2009).

2.2.6 Risk, benefit and control perceptions

Risk and benefit perceptions refer to individuals' intuitive judgments about the likely outcomes associated with a potential hazard, with people generally exhibiting lower tolerance toward hazards perceived as risky and greater tolerance toward those viewed as beneficial (Bruskotter et al., 2026; Slovic, 1987). Similarly, tolerance is strongly associated with perceived control where in people predict their control over a hazard by inferring on its novelty and impacts; the more they perceive control, the more they are tolerant (Dickman et al., 2012; Starr, 1969).

2.2.7 Behavioral Continuum of Human Responses

Unlike tolerance, which is a passive concept, intolerance and stewardship are behaviors that imply action. Intolerance relates to behaviors that are carried out intentionally to harm an individual or a population (Bruskotter et al., 2015). Stewardship stands at the opposite side of the intolerance, it can be defined as the action oriented behavior undertaken to positively impact a wildlife population, species, or the habitat (Bruskotter & Fulton, 2012). Thus, tolerance occupies an intermediate position between active intolerance and active stewardship.

2.2.8 Wildlife Value Orientations and Cognitive Hierarchy

Although the role of values in influencing various aspects of human life had long been recognized (Rokeach, 1973), relatively few studies had attempted to understand the hierarchical relationships through which values influence attitudes and subsequent behaviors. Homer & Kahle (1988) were among the first to examine the hierarchical relationship between values, attitudes, and behavior in the context of nutrition and consumer choices. Subsequently, Fulton et al. (1996) adapted this framework to wildlife studies and developed the cognitive hierarchy model of human behavior, proposing that wildlife value orientations influence behavioral intentions and behaviors through a hierarchical chain in which higher-order attitudes largely mediate the effects of values.

By 2008, the same cognitive hierarchy framework had significantly expanded from a micro-level psychological model of individual behavior into a macro-level sociological tool. The primary development seen in the book was the integration of broad societal forces—such as urbanization, economic growth, and modernization—into the hierarchy. It demonstrates that these sweeping

societal shifts drive entire populations to transition from traditional "Domination" orientations (viewing wildlife as resources) to "Mutualism" orientations (viewing wildlife as companions or family). Consequently, the framework expanded from explaining individual behavior to providing insights into broader societal changes in human–wildlife relationships (Manfredo, 2008).

2.2.9 Evolution of Tolerance Frameworks

Bruskotter & Wilson (2014), rather than relying solely on attitudes, their behavioral continuum of tolerance framework integrates personal attitudes with *normative beliefs* (social expectations) to map human-wildlife interactions along a behavioral spectrum.

The Wildlife Tolerance Model (WTM), introduced by (Kansky et al., 2016), represents a major structural advancement by directly comparing the influence of tangible versus intangible factors on tolerance. Historically, conservationists assumed that tangible economic costs, like livestock depredation, were the primary drivers of human intolerance toward predators. However, the WTM suggested that intangible psychological variables—specifically a community's empathy for the species, their underlying beliefs, and their trust in managing institutions—are actually far stronger predictors of coexistence. This development highlighted the conflict management paradigm. It proved that simply reimbursing herders for financial losses will fail to foster long-term tolerance if conservation strategies ignore the community's emotional and institutional relationships.

Lischka et al., (2019) study advanced the field by empirically testing five competing *priori* models against one another to determine which framework best predicts human tolerance for carnivores. The five distinct models they compared were the Conflict Model, the Impacts Model, the Psychological Model, the Values Model, and the Demographic Model. By comparing these models, the researchers highlighted that traditional approaches relying primarily on demographic characteristics or tangible physical conflicts are relatively weak predictors of tolerance. Instead, their results indicated that the Psychological and Impacts models—which emphasize emotions, perceived risk, and institutional trust—performed better than the other models. This comparative evaluation further emphasized the importance of addressing psychological and perceptual factors, rather than focusing exclusively on physical conflicts or economic losses, in promoting human–carnivore coexistence.

Lastly, the Synthetic Theory of Tolerance (Bruskotter et al., 2026) represents the most comprehensive framework currently available because it integrates individual psychology with broader sociological processes. It achieves this by synthesizing risk–benefit theory, modernization theory, and social identity theory into a single framework. Unlike previous approaches that primarily focused on individual perceptions and emotions, this theory suggests that risk perceptions are also influenced by social identities and group affiliations. Furthermore, it recognizes that broad societal changes occurring over generations may gradually alter people's emotional responses and attitudes towards wildlife. Ultimately, the framework provides a more holistic understanding of coexistence by incorporating individual, social, and cultural dimensions of tolerance.

2.3 Community-Based Conservation Interventions

Community-based conservation (CBC) has emerged over the past few decades as an important approach adopted by conservation organizations to protect biodiversity while simultaneously addressing the needs of local communities (Hackel, 1999). The approach is based on collaboration between conservation organizations and communities residing within conservation landscapes and seeks to integrate community interests with conservation objectives (Berkes, 2004).

The success of CBC depends primarily on two interrelated components: the incorporation of local community interests into conservation initiatives and the active participation of community members in conservation efforts (Berkes, 2004; Randrianasolo & Randrianasolo, 2025). Through this mutual exchange, conservation organizations support local development needs, while communities adopt behaviors that contribute to conservation (Randrianasolo & Randrianasolo, 2017).

CBC approaches have also been applied successfully in carnivore conservation. For example, in the Zaskar region of Ladakh, initiatives implemented in partnership with the Snow Leopard Conservancy India Trust have sought to reduce human–snow leopard conflict while supporting local livelihoods. Interventions such as predator-proof livestock corrals, livelihood diversification through ecotourism and handicrafts, community–government collaboration, and conservation awareness programmes have contributed to promoting coexistence between snow leopards and local communities. Such approaches demonstrate how simultaneously addressing conservation and socio-economic needs can enhance long-term support for wildlife conservation (Footprints, 2026).

Consequently, community-based conservation interventions are increasingly recognized as important tools for promoting coexistence, improving local attitudes, strengthening trust, and enhancing tolerance towards wildlife. However, their effectiveness can vary across contexts and therefore requires empirical evaluation.

2.3.1 Evaluation of Conservation Interventions

Conservation resources are often limited, requiring governments, donors, and conservation organizations to make strategic decisions regarding where and how investments should be allocated (Baylis et al., 2016). However, not all conservation interventions produce similar outcomes, and their effectiveness may vary across ecological and social contexts. Therefore, empirical evaluation is essential to determine whether interventions achieve their intended objectives and to understand the factors underlying their success or failure. Such evidence is critical for developing cost-effective conservation strategies and improving the livelihoods of natural resource users (Baylis et al., 2016).

Despite the increasing implementation of community-based conservation programmes, many interventions continue to be undertaken without rigorous empirical evaluation (Ferraro & Pattanayak, 2006). Consequently, conservation success is often assumed rather than systematically measured, making it difficult to determine whether observed outcomes are truly attributable to the interventions themselves (Stem et al., 2005; Ferraro & Pattanayak, 2006). This lack of evidence limits opportunities for adaptive learning and the improvement of future conservation practice (Brooks et al., 2013). Therefore, strengthening monitoring and evaluation has become a central component of evidence-based conservation and is increasingly recognized as essential for understanding the social and ecological outcomes of conservation initiatives (Brooks et al., 2013; Young et al., 2024).

Previous studies have reported several positive outcomes of community-based conservation interventions. Such approaches have been shown to improve local attitudes towards conservation initiatives, strengthen trust and legitimacy of conservation organizations, and foster stronger relationships between communities and conservation practitioners, thereby contributing to conflict management and coexistence (Lepp & Holland, 2006; Mehta & Heinen, 2001; Randrianasolo & Randrianasolo, 2025, 2017; Young et al., 2021).

2.4 Approaches for Assessing Ecological Knowledge and Human Dimensions

2.4.1 Quantification of Ecological Knowledge

Historically, the complementarity between LEK and SEK has been examined primarily through qualitative comparisons, where agreements and disagreements between the two knowledge systems were interpreted descriptively (Huntington et al., 2004). Although such approaches provide valuable insights, they are often influenced by subjective interpretation and make it difficult to identify specific misconceptions or statistically compare ecological knowledge across groups (Gilchrist et al., 2005).

Recent studies have increasingly adopted quantitative approaches to assess ecological knowledge by scoring local responses according to their agreement with established scientific information on species traits such as diet, habitat, activity patterns, and behavior (Gilchrist et al., 2005; Torrents-Ticó et al., 2021). Quantifying ecological knowledge enables statistical comparisons and facilitates the identification of areas of convergence and divergence between LEK and SEK. Such information can provide a valuable baseline for designing targeted awareness programmes and conservation interventions (Huntington et al., 2004; Mishra, 2026; Torrents-Ticó et al., 2021).

2.4.2 Mixed Methods in Human Dimensions Research

Human dimensions of wildlife conservation are inherently complex because factors such as attitudes, emotions, values, perceptions, and tolerance are shaped by multiple social and psychological processes that cannot be adequately understood through a single methodological approach (Creswell & Plano Clark, 2018). Consequently, mixed methods research has increasingly been adopted in conservation social sciences to provide a more comprehensive understanding of human–wildlife interactions.

Qualitative approaches are particularly useful for exploring local perceptions, meanings, experiences, and socio-cultural contexts, whereas quantitative methods enable the measurement of variables and the statistical examination of relationships among them (Creswell & Plano Clark, 2018). The integration of both approaches allows researchers to combine the depth and contextual

richness of qualitative data with the generalizability and analytical rigor of quantitative analyses (Drury et al., 2011).

The complementarity of qualitative and quantitative methods has become increasingly important in conservation research, where understanding both ecological and social dimensions is essential for promoting coexistence. Mixed methods approaches have therefore been widely recommended and increasingly applied in human dimensions studies to capture the complexity of conservation issues (Drury et al., 2011).

2.5 Previous Studies on Wolves and Hyenas in India

Research on Indian grey wolves and striped hyenas in India spans several decades and has progressively evolved from descriptive accounts to detailed ecological and conservation studies. Early information on striped hyenas was largely derived from natural history descriptions and distribution records provided by (Prater, 1948). Similarly, some of the earliest modern studies on Indian wolves focused on documenting their conservation status and declining populations. Shahi (1982) conducted a preliminary nationwide assessment and highlighted the effects of agricultural expansion and retaliatory killings on wolf populations.

During the 1990s, research increasingly focused on the ecology and conservation of wolves in human-dominated landscapes. Jhala & Giles (1991) provided important baseline information on wolf populations in Gujarat and Rajasthan states of India and documented their increasing reliance on livestock in degraded agro-pastoral systems. Jhala (1993) investigated wolf predation on blackbuck in Velavadar National Park and demonstrated the importance of natural prey availability.

Research on striped hyenas expanded during the 2000s and 2010s from descriptive studies to systematic investigations of population ecology, habitat use, and feeding behavior. Singh, (2008) and Singh et al., (2010) examined hyena population density and den-site selection, while Alam et al., (2015) documented the feeding ecology of striped hyenas and demonstrated their dependence on both wild prey and anthropogenic food resources. Studies have also highlighted the ecological role of hyenas as scavengers and their interactions with other carnivore species within shared landscapes (Panda et al., 2023).

Recent studies have increasingly recognized the importance of open natural ecosystems and human-dominated landscapes for the conservation of both species. Landscape-level investigations

have shown that wolves and hyenas persist extensively outside protected areas and are capable of adapting to agro-pastoral and semi-arid environments (Majgaonkar et al., 2019; Mukherjee et al., 2021; Srivathsa et al., 2019). In eastern India, studies have documented the occurrence and conservation importance of remnant populations in West Bengal and highlighted the need for landscape-scale conservation approaches. More recently, Mishra et al. (2026) employed a mixed-methods approach to investigate local ecological knowledge, cultural perceptions, and attitudes towards striped hyenas in West Bengal, emphasizing the importance of integrating social and ecological dimensions in carnivore conservation.

Despite these advances, most previous studies have concentrated on ecological aspects such as distribution, habitat use, diet, and population status. Comparatively fewer studies have examined local ecological knowledge, human tolerance, and the influence of conservation interventions on coexistence outcomes. Furthermore, despite the growing implementation of community-based conservation interventions, their influence on ecological knowledge and human tolerance has rarely been evaluated empirically. Comparative assessments between intervention and non-intervention communities are especially lacking.

In addition, most studies have examined either a single species or isolated aspects of human–carnivore relationships. Integrated assessments that simultaneously evaluate ecological knowledge, tolerance, and the underlying psychological, conflict-related, value-based, and demographic drivers of coexistence remain scarce.

Therefore, there is a need for studies that assess how conservation interventions influence ecological knowledge and tolerance towards multiple carnivore species in human-dominated landscapes. The present study addresses these gaps in the Purulia landscape of West Bengal by focusing on both the Indian grey wolf and the striped hyena.

Conceptual Framework

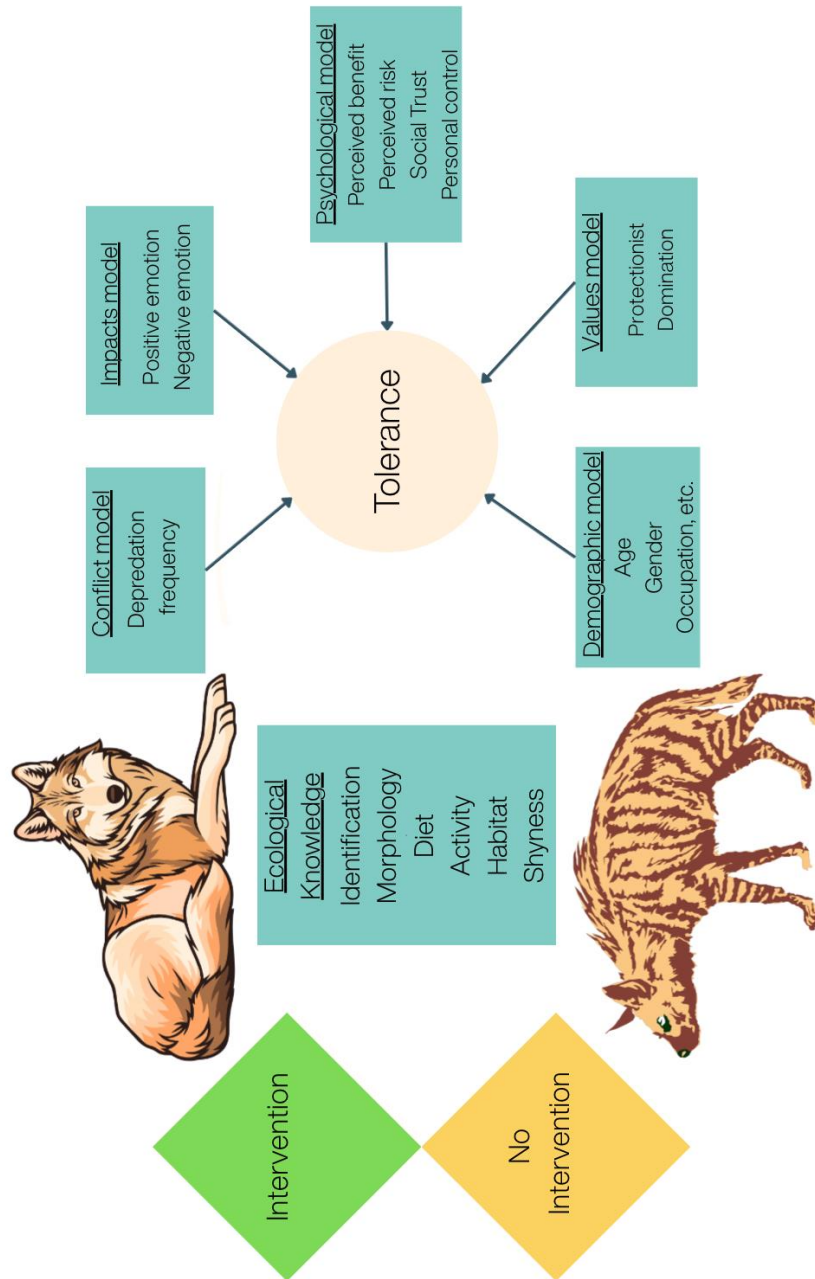


Figure 2.1 Conceptual framework illustrating ecological knowledge components and tolerance drivers examined among respondents from intervention and non-intervention villages (adapted from Lischka et al., 2019).

3 Research Methodology

3.1 Data collection

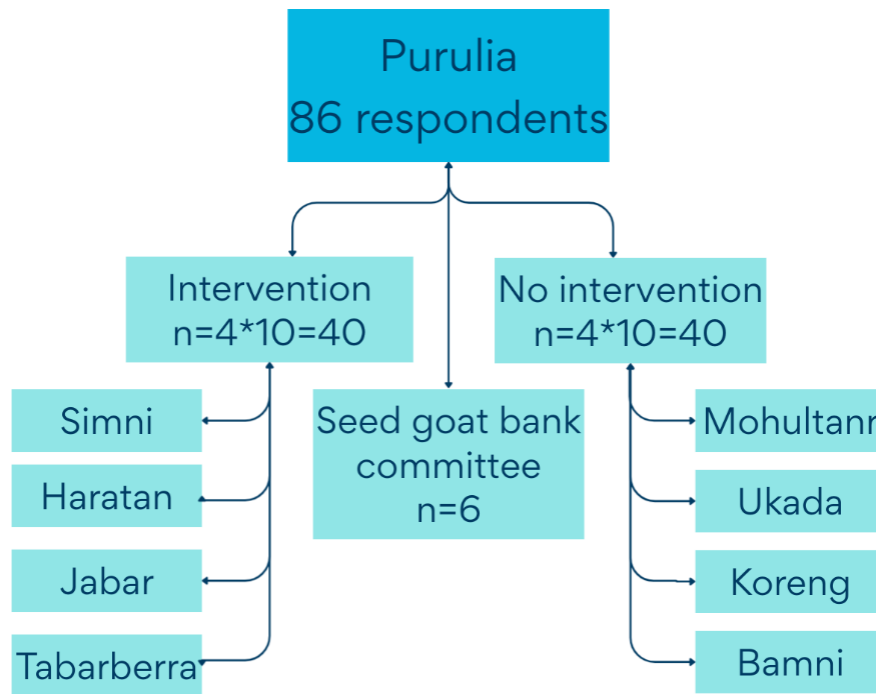


Figure 3.1 Sampling design

Data were collected in Purulia district, West Bengal, where conservation interventions are being implemented by the Human and Environment Alliance League (HEAL). A total of 86 respondents participated in the study. To enable comparison, both intervention and non-intervention villages were included in the sampling design. Eight villages were selected in total. Four villages—Simni, Haratan, Jabar, and Tabarberra—were categorized as intervention villages, where HEAL had implemented conservation-related activities. Four additional villages—Mohultanr, Ukada, Koreng, and Bamni—were selected as non-intervention villages, where no such activities had been conducted at the time of the study. Ten respondents were interviewed from each village, resulting in 40 respondents from intervention villages and 40 respondents from non-intervention villages (Fig. 3.1).

In addition, six members of the seed goat bank committee were interviewed to obtain deeper insights into the intervention process and community experiences. These included three committee members each from Simni and Haratan villages (Fig. 3.1). The Seed Goat Bank is a community-operated initiative established in 2024 in the Simni area by the HEAL with support from WWF India. The programme was developed as a community-based conservation approach that provides replacement goats to households affected by livestock depredation, thereby supporting local livelihoods while promoting carnivore conservation (Shrivastava & Guha, 2026).

Prior to data collection, the objectives of the study were explained to all participants and verbal informed consent was obtained before conducting interviews or audio-recording responses. Interviews were conducted opportunistically within the selected villages, with deliberate efforts made to ensure adequate representation of women participants. Field surveys were carried out between June and July 2025. All interviews were conducted in Bengali with the assistance of a local field assistant. Recorded responses were subsequently translated and transcribed into English in consultation with subject experts to preserve the social and contextual meaning of participants' narratives. Photographs documenting the interview process are presented in Appendix XI.

During the survey, clear photographs of the striped hyena and Indian grey wolf (Appendix IX) were shown sequentially to confirm species recognition. Only respondents who correctly identified at least one of the two focal species were included in the study. Data were collected using a semi-structured questionnaire administered in a structured sequence, with questions relating to the Indian grey wolf asked first, followed by those concerning the striped hyena.

3.2 Study area

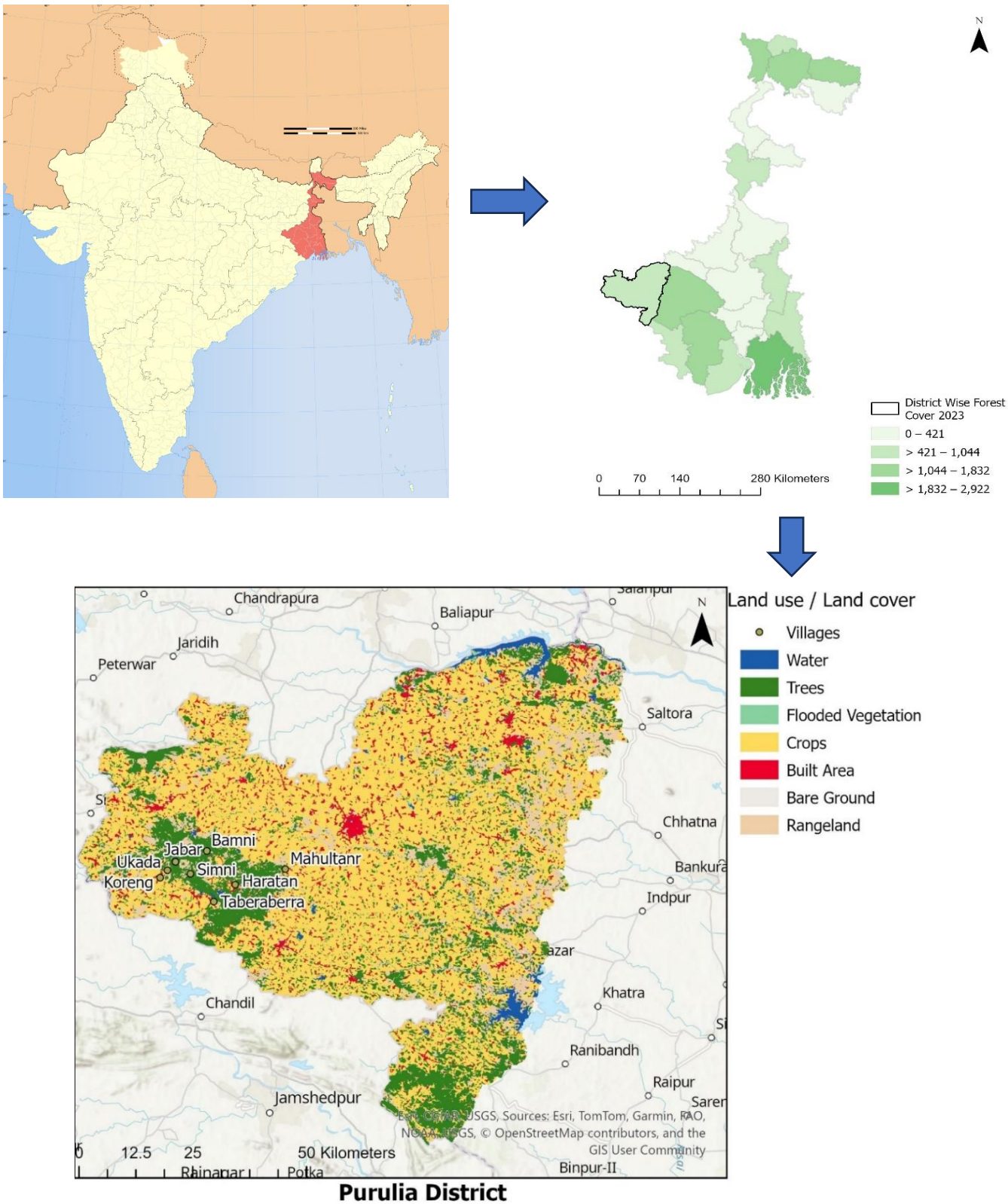


Figure 3.2 Map of India, West Bengal and Purulia district

Purulia is the westernmost district of West Bengal and is the fourth largest district of Bengal with latitudinal and longitudinal extensions of 22°43' N to 23°42' N and 85°49' E to 86°54' E, respectively, having a total area of 6259 sq. km (Fig. 3.2). Purulia district completely falls under the Chota Nagpur Plateau also known as India's oldest Precambrian hard rock terrain and it is characterized by the presence of undulating topography, steep hills and low-lying valleys (Bera & Das, 2021; Sarkar & Modak, 2022). The major carnivore species recorded in the study area include leopard (*Panthera pardus*), sloth bear (*Melursus ursinus*), golden jackal (*Canis aureus*), Bengal fox (*Vulpes bengalensis*), jungle cat (*Felis chaus*), Indian grey mongoose (*Herpestes edwardsii*), ruddy mongoose (*Herpestes smithi*), common palm civet (*Paradoxurus hermaphroditus*), and small Indian civet (*Viverricula indica*). The Indian grey wolf (*Canis lupus pallipes*) and the striped hyena (*Hyaena hyaena*), the focal species of this study, are also present in the region (Biswas et al., 2008). Photographs of the study landscape and the species encountered during the field survey are provided in Appendix X.

Recently, the camera-trap records and field observations confirmed the presence of lesser-studied carnivores such as the Indian grey wolf (*Canis lupus pallipes*) and the striped hyena (*Hyaena hyaena*), alongside other mammals. These species have been documented repeatedly in the forests of western Purulia over recent years, underscoring the region's biodiversity significance beyond more widely recognized protected areas (Mitra, 2025).

3.3 Ethical Considerations

Prior to conducting interviews, the objectives of the study were clearly explained to all potential participants. Participation in the study was entirely voluntary, and verbal informed consent was obtained before initiating interviews or audio-recording responses. Respondents were informed that they could decline to answer any question or withdraw from the interview at any stage without any consequences.

To protect privacy and confidentiality, no personally identifying information was included in the analysis or reporting of results. Respondents are therefore presented anonymously throughout the study. Interviews were conducted with respect for local customs, cultural practices, and community

sensitivities. Particular care was taken to ensure that respondents did not feel pressured to participate and that discussions involving wildlife, hunting traditions, and conflict experiences were approached respectfully.

Since the study focused on human perceptions and local ecological knowledge, no handling, capture, or disturbance of wildlife was involved. The research relied exclusively on interviews and observations. Translation and transcription of interviews from Bengali into English were carried out carefully to preserve the original meaning and socio-cultural context of respondents' statements.

3.4 Data Analysis

3.4.1 Ecological Knowledge

We analyzed respondents' local ecological knowledge of the focal carnivores by examining six key ecological traits: morphology, diet, activity pattern, habitat use, shyness, and sociality. In addition, reported encounters with each species within the last one year were assessed. The objective was to evaluate how LEK aligns with established scientific information and to compare patterns between the Indian grey wolf and the striped hyena.

Participants' responses for each ecological trait were classified into three categories: 'congruent with scientific facts', 'incongruent with scientific facts', or 'uncertain' ("not sure" or "don't know"). These were coded as 2, 1, and 0, respectively. To quantify alignment, we calculated the proportion of congruent responses for each trait, based only on the subset of interviews in which information on that particular trait was provided. These proportions were then compared between the two species to assess respondents' familiarity with their biological and ecological characteristics.

3.4.2 Tolerance

Table 3.1 Models, indicators, and coding scheme employed in the study

Model	Indicator	Wolf / Hyena
Conflict model	Depredation frequency	Frequently-3 Often-2 Not recently-1 I don't know/ Not sure-0
Impact model	Fear	Very much-2
	Joy	Somewhat-1
	Angry	No-0
	Hatred	
Psychological model	If you see hyena or Hyena in your village, what would you do? (Perceived risk)	High risk-1 Low risk-0
	Scavenging knowledge (Perceived benefit) (For Hyena only)	Good knowledge-1 No knowledge-0
	What is your reaction if you see a hyena or wolf attacks a livestock in your presence? (Personal control)	High control-1 Low control-0
	What is your response after a livestock gets killed (Social trust)	Inform authority-2 Inform villagers-1 Do nothing-0
Values model	What would you do, if a hunter/poacher comes to your village for catching/hunting animals or birds?	Protectionist-1 Domination-0
Demographic model	Gender	Male-1 Female-0
	Age	Continuous

	Occupation	Forest dependent-1 Forest independent-0
	Religion	Sarna-1 Others-0
	Caste	Scheduled Tribes-1 Others-0
	Education	Years of education
Tolerance	What would you do, if you find babies of hyena and wolf?	2 = Stewardship 1 = Passive Co-existence 0 = Intolerance

3.4.3 Qualitative analysis

Qualitative responses were translated and transcribed into English prior to analysis. Initial coding of all open-ended responses was carried out manually in Microsoft Excel using a directed content analysis approach. Since the study was guided by an existing conceptual framework, responses were assigned to pre-defined categories.

For ecological knowledge, responses were coded under categories including species identification, morphology, diet, habitat, activity patterns, sociality, and seasonality. In addition to this framework-based coding, transcripts were imported into NVivo and subjected to thematic analysis to identify recurring patterns and contextual nuances in respondents' ecological understanding.

Responses related to tolerance drivers were similarly coded in Microsoft Excel according to the pre-established conceptual models used in the study, namely the Conflict, Impact, Psychological, Values and Demographic models. Within each model, responses were further categorized according to the specific variables examined quantitatively. Representative quotations were retained to complement and contextualize the quantitative findings.

3.4.4 Statistical analysis

Descriptive statistics were used to summarize respondents' socio-demographic characteristics and response frequencies. Since several variables were ordinal and not normally distributed, non-parametric statistical tests were employed.

Differences in ecological knowledge between intervention and non-intervention villages were examined using the Wilcoxon rank-sum (Mann–Whitney U) test. Similarly, differences in tolerance drivers between respondents exhibiting passive coexistence and stewardship behaviors were analyzed using the Wilcoxon rank-sum test. To verify the robustness of the results, Kruskal–Wallis tests and Chi-square tests were additionally performed. All statistical analyses were conducted using MS-Excel and R statistical software.

3.5 Conservation Interventions in the Study Area

To promote human–carnivore coexistence in Purulia district, the HEAL has implemented several community-based conservation initiatives under programmes such as *Project Striped Hyena* and *Protecting Purulia's Carnivores*, the latter supported by WWF-India's Conservation Catalyst Program (HEAL, 2024). Recognizing that the semi-arid, human-dominated landscape of Purulia lacks formal protected areas, these interventions emphasize community stewardship and coexistence rather than exclusionary conservation approaches.

A major component of these initiatives involves awareness and outreach programmes conducted in forest-fringe villages through visual aids, documentary screenings, and community engagement activities. These efforts aim to strengthen ecological awareness, dispel prevailing myths, and highlight the ecological importance of carnivores, including the scavenging role of striped hyenas in maintaining ecosystem health (Fig. 3.3a) (HEAL, 2022). HEAL also works to reduce ritualistic and retaliatory hunting by facilitating the formation of Humane Committees and conducting sensitization campaigns during annual hunting festivals, with support from local volunteers (HEAL, 2025).

To address the economic consequences of livestock depredation, HEAL piloted a community-managed Seed Goat Bank in 2024 in Simni village with support from WWF-India (HEAL, 2024). Under this mechanism, a village-level management committee oversees the distribution and

maintenance of breeding goats. Livestock losses resulting from verified carnivore attacks are compensated through replacement animals from the goat bank, thereby reducing immediate economic hardship and the likelihood of retaliatory killing (Fig. 3.3b). The programme is complemented by community-led conservation activities, including the involvement of local youth in monitoring carnivore presence and protecting important denning habitats, as well as assistance to livestock owners in accessing formal compensation schemes (HEAL, 2024). Through this integrated socio-ecological approach, these interventions seek to strengthen local participation and foster long-term coexistence between communities and carnivores in the Purulia landscape.

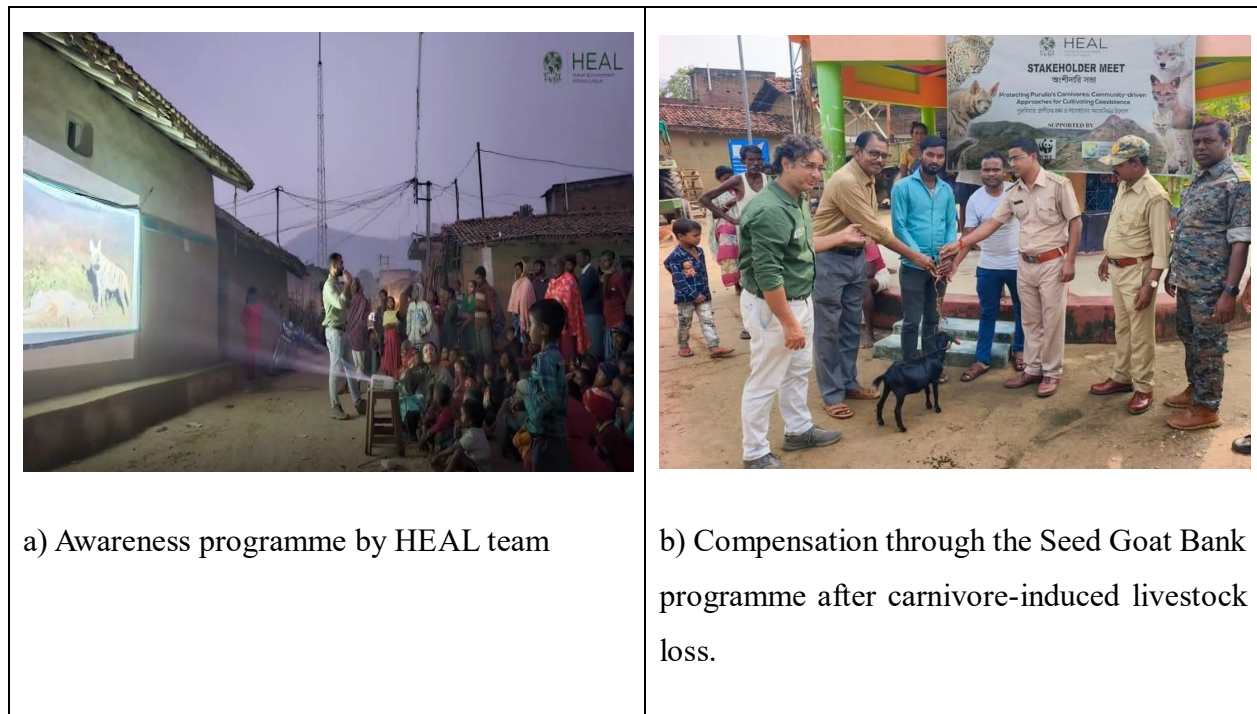


Figure 3.3 Community-based conservation interventions implemented by HEAL in Purulia district, West Bengal.

4 Results

A total of 86 villagers were interviewed for this study, with sessions lasting approximately 20 minutes each. The majority (n=59) were conducted as individual interviews. Additionally, 22 were classified as household interviews as one or more family members joined the primary respondent during the session. The remaining five were categorized as group interviews, which occurred when non-family members joined the ongoing discussion.

4.1 Socio-demographic Profile

To establish the socio-demographic profile of the respondents, a descriptive analysis was conducted comparing the intervention and non-intervention groups. Key findings regarding their demographic characteristics are summarized below:

Table 4.1 Socio-Demographic profile of respondents in intervention and non-Intervention groups

Particular and unit of measurement	Category	Value
Gender (%)	Male	76.74
	Female	23.26
Age (Average)	-	44.56
Education (%)	Illiterate	33.72
	Primary (1-5)	26.74
	Middle (6-8)	12.79
	Secondary (9-10)	16.28
	Higher secondary (11-12)	2.33
	Graduate	6.98
	Other	1.16
Religion (%)	Hindu	46.51

	Sarna	51.16
	Sari	2.33
Caste (%)	ST	67.44
	OBC	23.26
	SC	6.98
	General	1.16
	Others	1.16
Language (%)	Bengali	46.51
	Kudamali	4.65
	Santali	36.05
	Bhomuz	3.49
	Kudmi	1.16
	Mundari	8.14
Primary occupation (%)	Agriculture	73.26
	Animal husbandry	12.79
	Selling woods	6.98
	Others	6.98
Secondary occupation (%)	Agriculture	4.65
	Animal husbandry	53.49
	Selling woods	13.95
	Others	19.77

To establish the socio-demographic profile of the respondents, a descriptive analysis was conducted across the entire sampled population (N = 86), encompassing both intervention and non-intervention villages as well as committee members.

The overall average age was 44.56 years, and most of the respondents interviewed were male (Table 4.1). More than half of the respondents belonged to indigenous animistic religion called Sarna or Sari, followed by Hindu. However, their caste was majorly scheduled tribe (ST). Linguistically, six languages were of use in and around their livelihoods, however Bengali was found to be commonly understood and spoken by all. More than half of the respondents had received education up to the secondary level, whereas approximately one-third were illiterate and only a small proportion had completed education beyond secondary school (Table 4.1).

Economically, agriculture or animal husbandry were predominant occupations (either primary or secondary) followed in the study area which were followed by fuelwood collection and sale in nearby markets and several locally relevant jobs like beedi making, traditional dance performing etc.

4.2 Species identification based on morphology

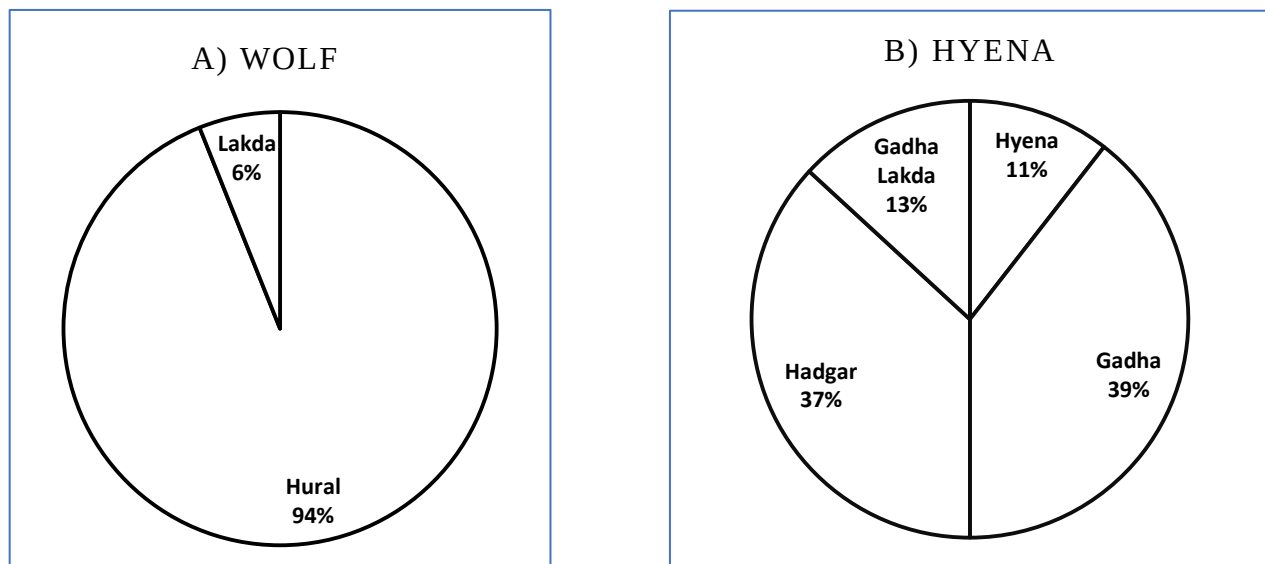


Figure 4.1 Diversity in local names of wolf and hyena

Both villages with and without interventions exhibited high levels of wolf identification accuracy, with 90.00% and 75.00% of respondents, respectively, correctly identifying wolves based on their morphological traits (Fig. 4.2). Among those who correctly identified the species, the local name

Hural was used most frequently, followed by *Lakda* (Fig. 4.1A). Similarly, striped hyenas were correctly identified by 55.00% and 57.50% of respondents from villages with and without interventions, respectively (Fig. 4.3). Among the four local names recorded for striped hyenas, *Gadha* and *Hadgar* were more commonly used than *Gadhalakda* and *Hyena* (Fig. 4.1B).

4.3 Local Ecological Knowledge of the Indian Grey Wolf and Striped Hyena

Local ecological knowledge (LEK) was evaluated using six traits: morphology, diet, activity, habitat, sociality, and shyness. Only respondents who correctly identified the species based on morphology were included in the analysis of the remaining traits. Differences between intervention and non-intervention villages were tested using the Wilcoxon rank sum test, a non-parametric method suitable for comparing two independent groups.

4.3.1 Indian Grey Wolf

4.2 Statistical Significance of Ecological Knowledge Differences

Ecological Trait	Wolf		Hyena	
	W-Statistic	P-Value	W-Statistic	P-Value
Morphology	540	NA	253	NA
Diet	537.5	0.9309	264.5	0.3281
Prey	520	0.4866	243	0.7570
Habitat	534	0.8639	243	0.6920
Activity	567	0.4090	244.5	0.7731
Sociality	376	0.0141*	274.5	0.5846
Shyness	598	0.2849	208	NA

*Note: * indicates statistical significance at $p < 0.05$ and Morphology was used to identify respondents for further analysis; therefore, no p-value was calculated for this trait (NA)*

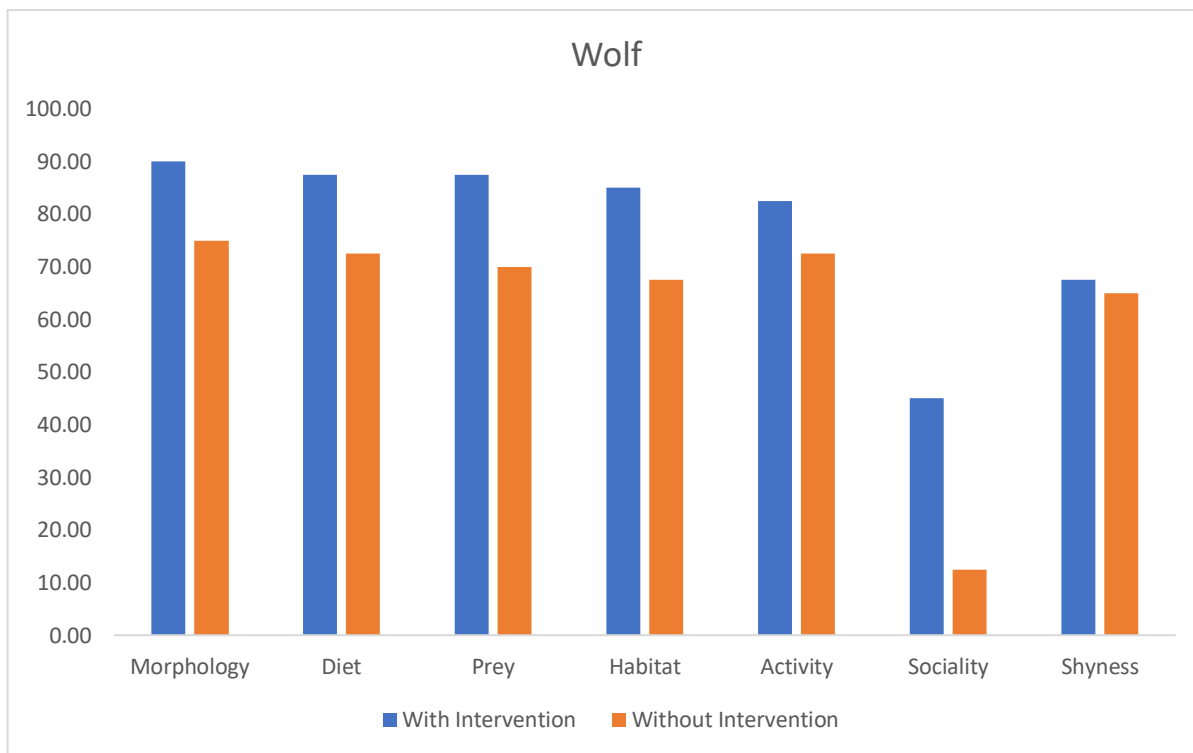


Figure 4.2 Comparison of local ecological knowledge on wolf between with and without intervention villages

Overall, conservation interventions did not significantly influence LEK regarding most ecological traits of the Indian grey wolf. Nevertheless, respondents from intervention villages demonstrated significantly better knowledge regarding the sociality of wolves.

To understand the depth and nature of the community's ecological knowledge, qualitative responses from all surveyed villages and committee members were merged and coded across specific ecological parameters. This thematic analysis revealed a diverse range of observational or shared knowledge, highlighting how local communities perceive the Indian grey wolf and striped hyena through distinct behavioral, morphological, and temporal lenses.

4.3.1.1 Qualitative Dimensions of Local Ecological Knowledge on Wolves

Morphologically, wolves' resemblance with dog or golden jackal and size being bigger than both were prevalent in the study region and it was considered congruent with scientific knowledge. Among the various prey mentioned domestic prey such as goat, sheep, pig, cattle (only calves) and

chicken; wild prey such as deer, hare, peacock and other smaller prey were congruent with scientific knowledge. Whereas dog and aquatic prey such as fish and crab were incongruent with scientific knowledge. In scientific knowledge wolves are considered as highly adaptable in changing their activity pattern in response to human presence and activity. Hence, diurnal, nocturnal, crepuscular were all considered as congruent. Broadly forest and specific mention of cave or den as wolf's habitat was considered congruent. For wolf's sociality, either pair or pack was considered as congruent and lastly wolf's were considered as shy or elusive creatures.

4.3.1.2 Local Ecological Knowledge of the Indian Wolf

The qualitative coding revealed that wolves were deeply intertwined with the community's daily agro-pastoral routines. Morphologically wolf was almost exclusively described by comparing either with golden jackal or dog (n=72) (Appendix IV and VI). In terms of diet, all the respondents associated wolf with the active livestock predator. The code "Only goat and sheep" dominated the dietary responses (n=47), the rest mentioned various other wild and domestic prey along with goat and sheep. Wolf also was perceived to be feeding on dead animals (n=7).

Ecologically wolves were perceived to be a forest dwelling carnivore (n=68), some specifically noted their home as cave or den (n=15). Interestingly, wolves were perceived to be diurnal (n=47) and the rest perceived as nocturnal, crepuscular or all the mentioned. Activity of wolf was perceived mostly as either single or in pair (n=59) compared to being in pack (n=19) (Appendix IV and VI). Perception on the shyness of wolves towards humans was nearly same in both sets of villages (Fig. 4.2).

4.3.2 Striped Hyena

No significant differences in local ecological knowledge of striped hyenas were observed between intervention and non-intervention villages (Table 4.2). Knowledge levels for all evaluated traits were generally comparable between the two groups. Although respondents from non-intervention villages showed slightly better knowledge of morphological traits, respondents from intervention villages demonstrated better knowledge regarding the shyness of striped hyenas (Fig. 4.3).

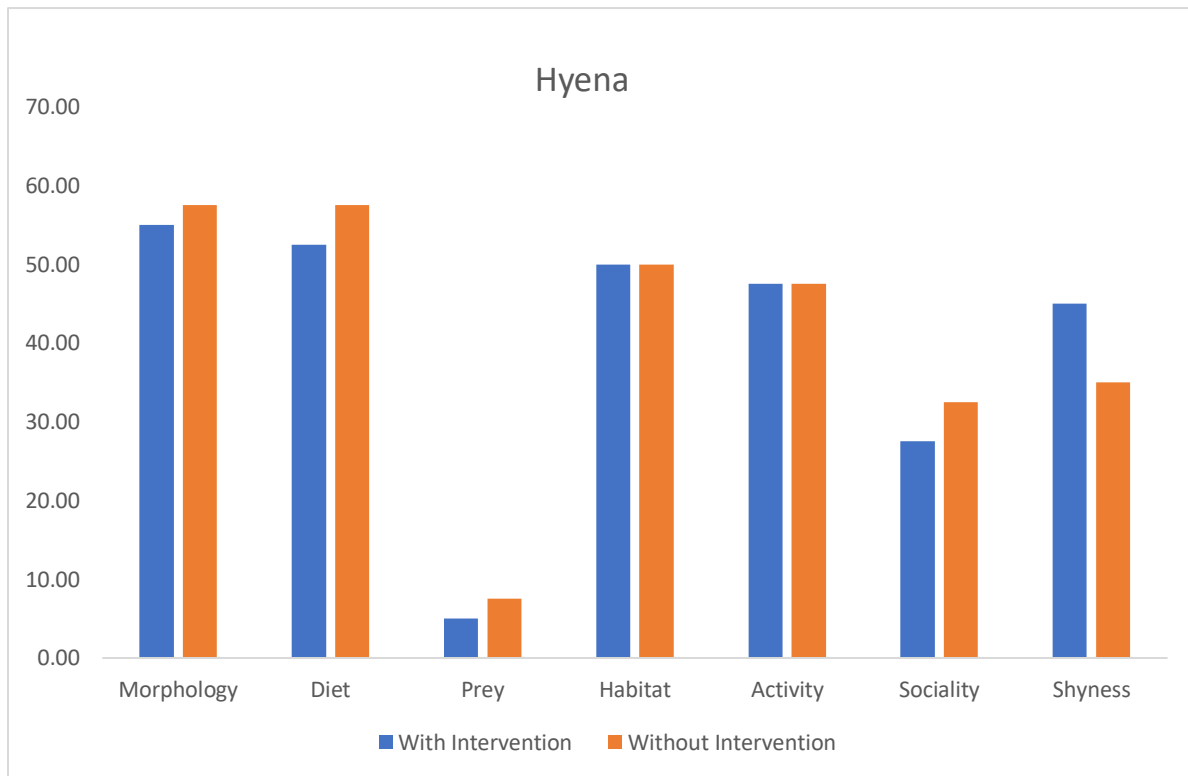


Figure 4.3 Comparison of local ecological knowledge on hyena between with and without intervention villages

4.3.2.1 Qualitative Dimensions of Local Ecological Knowledge on Hyenas

Morphologically hyena's big head, resemblance with dog or golden jackal and size being bigger than both, stripes on the body, long hair along the backbone, front legs taller than the hind legs were all considered as in congruent with the scientific knowledge. Hyena's diet as dead animals (including human dead body) were considered congruent. Hyena was considered as opportunistic in hunting, while duck, chicken, goat, sheep and calf mentioned by respondents were considered congruent; dog, fish and crab were considered incongruent with scientific knowledge. Nocturnal

activity of hyena, being shy or elusive and its solitary sociality were all considered as in congruent with scientific knowledge.

4.3.2.2 Local Ecological Knowledge of the Striped Hyena

Apart from mentioning morphological traits two respondents, one from Koreng and one from Simni mentioned the unique smell of hyena. Respondent from Koreng said “*Before seeing a hyena, its unique smell comes. It is longer and taller than a dog but smaller than a tiger. It is striped*”. All the respondents understood hyena as scavenger; while majority knew it as a scavenger (n=43), It was known for hunting livestock (n=7) as well. Activity wise hyena was mostly correctly perceived as a nocturnal (n=38) (Appendix V and VII). Although some (n=4) mentioned its activeness both during day and night, none of the respondents mentioned it as exclusively diurnal. Hyena’s habitat was broadly considered as forest (n=41), among them many (n=27) associated with its living in cave. About sociality of hyena, although correct perception as exclusively solitary (n=22) existed, single or pair or pack were mentioned in combination as well (n=23) (Appendix V and VII). Comparatively more respondents perceived hyenas as shy or elusive than those who mentioned they are not afraid of humans (Fig. 4.3).

Seasonality of wolves and hyenas

Perceptions regarding seasonal occurrence differed between wolves and striped hyenas. Most respondents associated wolf presence with the rainy season (n = 24), followed by summer (n = 13) and winter (n = 9), while some believed wolves could be encountered throughout the year (n = 8) (Appendix IV, V, VI and VII). A few respondents mentioned other seasonal patterns (n = 5). In contrast, striped hyenas were predominantly perceived as occurring throughout the year (n = 27), although some respondents associated their occurrence with winter (n = 8), rainy season (n = 7), or summer (n = 6). Overall, these responses suggest that perceived seasonality is influenced more by local patterns of agricultural activities, livestock grazing, and opportunities for human–carnivore encounters than by any clearly defined biological seasonality. Compared to wolves, hyenas were viewed as more consistently present in the landscape, reflecting their role as resident scavengers that are encountered across seasons.

Treemaps have been created for both wolf and hyena to visualize these results (Appendix VI and VII).

4.4 Variation in Tolerance Toward the Indian Grey Wolf and Striped Hyena

To identify the conflict, impact, psychological, value, and demographic drivers of tolerance towards wolves and hyenas, the Wilcoxon Rank-Sum (Mann–Whitney U) test was used (Table 4.3). This test was chosen because many variables were ordinal and non-normally distributed. Since no respondents exhibited absolute intolerance, the analysis compared two tolerance levels (Passive Co-existence and Stewardship) separately for intervention and non-intervention villages. The results were further verified using the Kruskal–Wallis and Chi-square tests, which yielded similar outcomes (Appendix III).

In intervention villages, the transition from passive coexistence to active stewardship was primarily driven by emotional factors. Specifically, negative emotions towards wolves ($p = 0.0008$) and hyenas ($p < 0.0001$) emerged as the main determinants of respondents' tolerance levels. This suggests that in areas with active conservation efforts, progression towards stewardship is closely associated with overcoming negative emotions such as fear, anger, and hatred (Table 4.3).

In contrast, stewardship in non-intervention villages was influenced more strongly by perceived risk and demographic factors (occupation). Although negative emotions towards hyenas remained a significant driver ($p = 0.002$), negative emotions towards wolves were not significant ($p = 0.1085$). Instead, perceived risk from wolves significantly influenced tolerance levels ($p = 0.0134$). In addition, occupation emerged as a significant demographic driver ($p = 0.0027$), indicating the importance of livelihood dependence in shaping tolerance in the absence of conservation interventions (Table 4.3).

Table 4.3 Drivers of tolerance in villages with and without interventions

Model	Variable	W (Intervention)	p-value (Intervention)	W (No- intervention)	p-value (No- Intervention)
Conflict	Depredation frequency	185.5	0.0661	75.0	0.3929
Impact	Positive emotion (Wolf)	144.5	0.7975	74.0	0.3883

	Negative emotion (Wolf)	44.0	0.0008*	57.5	0.1085
	Positive emotion (Hyena)	145.0	0.7857	61.0	0.1107
	Negative emotion (Hyena)	8.0	< 0.0001*	25.5	0.0020*
Psychological	Perceived risk (Wolf)	104.5	0.0839	130.0	0.0134*
	Perceived risk (Hyena)	113.0	0.3018	98.5	0.7381
	Personal control	132.0	0.5465	84.0	0.4264
	Social trust	99.5	0.1411	90.0	0.9296
	Perceived scavenging benefits (Hyena)	151.5	0.3946	94.5	0.9133
Value	Value orientation	133.5	0.8253	94.0	0.9377
Demographic	Gender	128.0	0.6060	83.5	0.5978
	Occupation	133.5	0.8253	126.5	0.0027*
	Age	161.5	0.4182	76.5	0.4977
	Education	96.0	0.1495	83.5	0.7106

	Religion	120.0	0.4830	109.5	0.3755
	Caste	120.0	0.4830	95.0	0.8762

*Note: * indicates statistical significance at $p < 0.05$*

4.4.1 Qualitative results

4.4.1.1 Conflict model

Livestock depredation frequency was mostly perceived to be happening often or not occurring recently (n=77) across both sets of villages (Appendix I). Residents consistently noted that wolves and hyenas are rarely seen nowadays and are no longer actively hunting livestock. For instance, two respondents from the village of Tabarberra specifically mentioned that livestock depredation is currently being caused by stray dogs and golden jackals, not by wolves. Similarly, in the village of Koreng, two respondents highlighted that while wolves and hyenas used to be common, they are now largely absent, and stray dogs have instead become the primary problem, actively hunting their sheep and goats. Furthermore, two respondents from Bamni and one respondent from Jabar pointed out that golden jackals along with foxes are the ones predating on livestock more frequently these days.

4.4.1.2 Impact model

The emotional impact of the target species on the local communities was evaluated under the impact model. Responses were classified across four continuous emotional variables fear, anger, hatred, and joy to understand the underlying psychological disposition of the respondents toward both the wolf and the hyena (Appendix II). Fear was found to be the most prominent negative emotion expressed by the respondents and it was quite prominent towards hyena compared to wolf. Yet, respondents from villages without intervention exhibited slightly higher extreme fear (“very much”) toward the wolf than those in intervention villages. Anger and Hatred emotion toward both species was found to be exceptionally low across the surveyed landscape. Joy as a positive emotion was also recorded, but less than half of the respondents felt it for both wolf and hyena (Appendix II).

4.4.1.3 Psychological model

Perceived risk

Respondents' perceived risk of a wolf entering their village was higher (80.23%) compared to a hyena (60.47%) (Appendix I). Perception of wolves and hyenas as a high risk to their livestock was prevalent in the study area. One of the respondents from Jabar village said *“We will make noise and scare wolf away to the jungle. It can attack our goats and sheep, if it enters our village.”* The phrase *“Halla karke bhagayenge”* which translates to “We will make noise and scare it away” was commonly used phrase. Similarly, about hyena, one respondent from Koreng village mentioned *“They come looking for dead animals during nighttime, if they don't get, they go back, not a problem. If it comes during daytime, I gather people and scare it away.”* Respondent knew about scavenging behavior of hyena and yet would be unhappy to see it in the daytime. Rest of the respondents who perceived wolf or hyena as high risk mentioned of scaring them away by either gathering people or by using whatever objects were available like stick, stone and axe or using their pets.

Hyena was comparatively perceived as a low-risk species than wolf if it entered their village (Appendix I). One respondent from Koreng village who perceived hyena as low risk said *“I feel very happy, if it comes back because village will be clean as it will scavenge”*. Another respondent from the same village expressed his happiness seeing hyena by mentioning *“I just watch them; there's nothing else to do. They are rarely seen, and I feel happy to have them around”*. A respondent from Bamni village who perceived wolf as low risk mentioned *“No need to anything. It roams around village at will and goes back.”*

Some respondents expressed themselves about their special relationships with wild animals. A respondent from Haratan village mentioned about wolf as *“It lives with us. We share common space in this area. I won't harm it. I will try to save it as Bhagawan Kishan resides in all animals”*. Another respondent from Koreng village stated that *“I gather people and we catch it. If it stays calm, I keep it at home in a cage and feed it. But if it doesn't like being in a cage, I release it back into the jungle”* which showed his enthusiasm to help and protect the wolf but lacked knowledge about what is exactly right thing to do. Committee members too shared the mixed perception on the level of risk if wolf or hyena entered their village.

Perceived benefit

Awareness and knowledge about benefit of hyena as a scavenger was studied under perceived benefit under psychological model. The knowledge about hyena's scavenging and its benefits were good among 69.77% of all the respondents (Appendix I). According to a respondent from Jabar village *"Eating dead animals is scavenging. Flies multiply when dead animals are nearby, leading to the spread of diseases. If hyenas are present, they help keep the village clean and reduce such diseases"*. Another respondent from Bamni village stated *"Eating dead animals is scavenging. The environment around us will stay clean and free of bad smells. It makes the village, pollution-free and prevents the spread of disease-causing organisms"*. Among those who didn't have a good knowledge, a respondent from Koreng village mentioned *"Scavenging is bad for environment. Not sure how"*.

Some respondents who had good knowledge about hyena's scavenging, were happy with its consumption of dead animals but were not happy if it fed on dead humans. One respondent from Jabar stated *"Eating dead animals is good because it helps clean the environment, but scavenging on human dead bodies is bad as it can hurt the feelings of the family"*. All the committee members had good knowledge about scavenging of hyena.

Personal control

Reaction if a wolf or hyena attacked livestock of respondents under the presence of them was studied as personal control under psychological model.

About 96.51% of the herders mentioned their high control over the situation if a wolf or hyena attacked their livestock in their presence (Appendix I). About 82.56% of the respondents mentioned scaring the livestock depredator away either by making noise, by gathering neighbors, using any objects available nearby (stick, stone, axe), firecrackers or by using dog. The primary concerns of the respondents were to protect their family and livestock as one respondent from the Ukada village mentioned *"I will scare it away as soon as possible. If I make some delay, it will hunt and take away my animal"*. Few mentioned scaring them away in a gentle manner so that they won't get hurt and also their livestock would be saved.

All the committee members expressed their high personal control over wolf or hyena attack. One of the member from Simni village mentioned *"I will not harm or scare away the wild animal. If I*

have my phone with me, I will capture pictures or videos of the carnivore that is attacking and I will use it as proof in future.”

Social trust

Social trust was analyzed based on how the respondents respond when their livestock get killed by a wolf or hyena. The respondents were classified into 3 categories.

Most of the respondents preferred to inform no one if their livestock get killed by wolf or hyena (Appendix I). A respondent from Haratan village mentioned *“I will accept and move on. It is a wild animal, and hunting is its natural behavior.”* Another respondent from Simni village said *“I don’t know what to do or whom to contact”* despite being in a village having a seed goat bank committee. As a next option, respondents thought of informing authorities like forest department, seed goat bank or HEAL organization and the proportion of them was higher in villages with intervention (Appendix I). There was nearly equal amount of trust and distrust towards forest department. Those who trusted told, they will seek compensation from forest department. Among those who showed distrust a respondent from Simni village said *“So far, the forest department hasn’t helped me get compensation. What’s the use of telling them?”*. As a result, in the villages with intervention, several respondents expressed their trust towards seed goat bank committee or the organization. A respondent from Tabarberra village mentioned *“In the recent days, the seed goat bank is active, I will inform them”*.

Few respondents relied on informing their fellow villagers. A respondent from Koreng village mentioned *“I go along with villagers to find my goat. If we find my goat with the wolf, we kill the wolf. I will not inform any authority or organization about the lost goat”*. Another respondent from Haratan village mentioned *“I don’t have enough knowledge to go to the forest department. I inform villagers about the hunt”*. All the committee members expressed their trust over seed goat bank committee, HEAL organization and forest department. One of the member mentioned *“I will search for the dead goat or sheep and inform HEAL”*. And another member of the same village mentioned *“I will submit the collected evidence or witness statements to the seed goat bank committee so that I can receive compensation for the killed goat”*, which is exactly they should do according to seed goat bank committee to get the compensation.

4.4.1.4 Values model

The response to entry of a hunter or poacher to hunt or catch the wild animals into their village of the respondents was studied under values model. Broadly the respondents were categorized into protectionist and domination. The ones who showed concerns over protecting wild animals from hunters or poachers were classified as protectionists whereas the ones who either actively or passively restrained away from protecting the wild animals were classified under utilitarian.

About 68.60% of the total respondents were found to be protectionist and they were comparatively more in the villages with intervention than the villages without intervention (Appendix I). Among the respondents who said they would stop hunters or poachers mentioned several approaches to do so. One approach was to gently convince them by explaining importance of having wildlife around as one of the respondents from Haratan village mentioned *“We villagers will stop him. I live with wild animals like family and do not allow tree cutting or hunting in our forest. If the hunter doesn’t stop, we inform the forest department”*. Some respondents said they would scare him away either by gathering villagers or by informing the forest department and another respondent was also a forest volunteer and he mentioned *“If I see a hunter, I will tell them not to hunt. Before the hunting season, we make announcements about the ban on hunting and its negative impact on biodiversity. During the hunting season, when hunters are in the forest, we hide and follow them. We create loud noises using ‘sound-making bombs’ to scare wild animals and birds away, preventing the hunters from catching them”*.

Among the respondents who were utilitarian, one respondent from Ukada village mentioned *“I feel happy seeing hunting, as they are hunters and it is their nature. Some villagers and outsiders often hunt in the jungle”*. Another respondent from Haratan village mentioned *“We do nothing if a hunter or poacher comes. We do our job, and they do theirs. Two years ago, hunting was more common, but the forest department worked on it. Now, hunting takes place only one day a year, on the 7th day of Ashadh. When a hunter makes a kill, we know by the sound and go to the forest. The hunter gives us a share of the animal. This happened when a hunter killed a wild boar and a deer”*. All the committee members were found to be protectionists and gave responsible answers.

4.4.1.5 Demographic model

Explanation about demographic model can be seen in socio-demographic profile (Table 4.1)

4.4.1.6 Tolerance

The response when they encounter babies of wolf or hyena was considered to study the tolerance level of them. Stewardship, passive co-existence and intolerance were the three levels of tolerance considered.

About 70.93% of the total respondents were found to be in passive co-existence with the wolf and hyena and their proportion was slightly higher in villages without intervention (Appendix I). Among them, some of the respondents expressed happiness and did not stay involved with the babies either it could be due to their respect towards wildlife or due to fear of mothers of babies roaming around nearby. A respondent from Mohultanr village mentions *“I feel happy. They have a life like us. I don’t disturb them”*. Another respondent from Ukada village mentioned *“I feel afraid and run away because the mother of the babies might attack me”*.

Comparatively higher respondents were stewards in villages with intervention and among them some, along with mentioning their happiness, also mentioned what they would do to ensure safety of the babies. A respondent from Simni village mentioned *“I feel happy but don’t disturb them. I have dogs, and I will stop them if they start to attack the babies. I will make sure wolf or hyena babies stay with their mother. If not, I will take them back to her”*, Another respondent from Koreng village mentioned *“We just watch them and their activities and feel happy. We can’t afford to feed them if they are orphans, so we leave them in the jungle”*. Other respondents who showed stewardship behavior too mentioned that they would observe whether mother of the babies is around them, If mother doesn’t show up for long time they would either gently scare them towards jungle as they don’t know what else to do and some mentioned they would take care of the babies as long as babies like or inform forest department. No intolerance was observed in the study area. Tolerance level of seed goat bank committee members varied between passive co-existence and stewardship.

4.5 Conservation interventions

The frequency, impact, and community reception of conservation programs were evaluated to understand the efficacy of ongoing interventions. Across the total population, nearly half of the respondents noted that interventions had 'not happened since a long time', a sentiment heavily seen in the non-intervention group (n=33) (Appendix VIII).

Although more than half of the respondents did not know about the details about the interventions, those who knew mentioned they were organized by forest department and NGO and few with joint efforts. All the committee members recognized the collaborative efforts of organizations and the forest department. One of the members from Simni village stated, *“The forest department announces if any wild carnivore, like a leopard, enters the village or shares other important information. HEAL conducted two programs—one on wild animals and birds, and another on snakebite awareness.”* To the question of what they had learned from the conservation interventions, two kinds of learnings were seen. The first was related to ecological interdependence & co-existence, comparatively higher number of respondents mentioned this. The rest recalled practical knowledge regarding the Seed Goat Bank compensation scheme. A respondent from Simni village expressed their learning by stating, *“Wild animals and birds are important. It is good to have them around. The seed goat bank is a great initiative, benefiting both the donors and receivers of goats”*. All the committee members cited practical compensation knowledge alongside ecological benefits, reflecting their active administrative role in the program. A committee member from Simni village mentioned, *“I did not know much about wildlife before, but I learned from HEAL’s awareness programs. If wild animals hunt livestock, HEAL provides compensation. Wild animals contribute a lot to the environment, and their benefits outweigh the harm they cause to livestock”*.

In the future, the respondents looked forward to their direct conservation and forest education programs (44.19%) (Appendix VIII), indicating a widespread community desire for structured, ongoing wildlife awareness. There was also a notable demand for skill development and livelihood training to reduce forest dependency. A respondent from Simni village highlighted this by mentioning, *“How to plant fruit trees? I also want a motor pump so that I can work on the farm and not have to go to the forest for firewood”*. Committee members echoed this dual need for both conservation education and livelihood training. One member from Simni village explained, *“It would be good if more programs on wildlife conservation take place here. Agricultural programs are also needed, as farmers here follow conventional, old farming methods. It would be great if small booklets on wildlife awareness were published and distributed to villagers”*.

Lastly, there was overwhelming enthusiasm for continued engagement across the entire study area, with 90.70% of all respondents expressing a strong willingness to participate in future initiatives (Appendix VIII).

5 Discussion

This study, using both quantitative and qualitative methods, provides insights into local ecological knowledge and its complementarity with scientific ecological knowledge. It also examines the tolerance levels of villagers towards the Indian grey wolf and striped hyena, along with the drivers influencing such behavior. Our findings reveal the complexity of local perceptions, offering deeper insights into human–carnivore coexistence and highlighting the importance of conservation interventions for mitigating human–wildlife conflict.

5.1 Ecological knowledge about wolf and hyena

The local names used to identify the wolf aligned well with the concept of ‘folk generic taxa’ within traditional taxonomic classification (Fig. 4.1a) (Berlin et al., 1973; Mishra et al., 2026). Mishra et al. (2026) note that folk generic names often extend beyond simple morphological descriptions to incorporate a species' perceived behaviors and functional roles within the environment. This is reflected in the use of *Hural* and *Lakda* as synonyms for *Nekre*, the Bangla term for the wolf.

Among the three local names recorded for the hyena (Fig. 4.1b), *Gadhalakda* deviates from this pattern; unlike the simple primary lexemes *Gadha* and *Hadgar*, it is a linguistically analyzable compound name. Because our methodology did not explicitly test synonymity or semantic overlap among these local names, the exact cognitive categorization of this term remained ambiguous. Consequently, further research is required to cross-check whether *Gadhalakda* functions purely as a regional synonym for the hyena, or if it conceptually represents a specific, subordinate classification of *Lakda* (Berlin et al., 1973).

The morphological traits mentioned by our respondents about both wolf and hyena were in alignment with the scientifically identified morphological traits (Houssaye et al., 2025; WII, 2018). Two respondents displayed a nuanced olfactory understanding of the species, noting that '*Before seeing a hyena, its unique smell comes.*' This observation directly mirrors the chemical ecology of the species; empirical research confirms that striped hyenas deposit an incredibly resilient, volatile fatty-acid secretion (volatile paste) from their subcaudal pouch that acts as a long-lasting territorial marker (Theis et al., 2013). This volatile 'paste' creates a highly distinct olfactory signature described by biologists as a pungent, sour 'fermenting mulch' odor that remains continuously detectable by the human nose for up to a month in the wild, explaining why villagers frequently

detect the predator's presence via scent before a physical sighting occurs (Theis et al., 2013). Previous studies show that wolves are nocturnal animals (Ciucci et al., 1997; Khan et al., 2022; Kumar, S, 1998; Theuerkauf et al., 2007). In contrast, in our study, although majority of the respondents reported wolf's activity as diurnal, there were instances where respondents mentioned about their nocturnal and crepuscular activity. As most large carnivores in human-use landscapes do modify their activity patterns and also several studies across the world on wolf have shown that activity patterns also get changed based on intrinsic factor such as sex, age, physiological, and social status, external factors like prey availability, weather and moon phases (Ferreiro-Arias et al., 2024), our findings considered all activity timings as congruent with the scientific knowledge. Unlike varied LEK on wolf activity, hyena was perceived fully as a nocturnal animal, none called it a diurnal. This was in alignment with the past studies (Mishra et al., 2026; Prater et al., 1971; Singh, 2008).

Except dog, crab and fish, all the prey or diet of wolf mentioned were considered as congruent with scientific knowledge. Khan et al., (2022), after reviewing seven studies on Indian grey wolf diet mentions that 17 different prey species are preferred by them and among them all medium-sized constituted more than smaller and large sized prey. Many studies suggest livestock animals as the more preferred prey for wolf (Khan et al., 2022; Mukherjee et al., 2021; Saren et al., 2019); also scavenging of wolf can be true (Jethva & Jhala, 2004).

Hyena's scavenging behavior, like observed in scientific studies also perceived in our findings (Mills, 1988; Panda et al., 2023). The perception of hyena as a predator of goat and sheep in the study area although may be true, it is an opportunistic and limited hunter preying on mostly small-size wild and domestic prey, less on medium size prey (Panda et al., 2023). The perception of hyena's scavenging on human body although is true (Horwitz & Smith, 1988), while feeding on superficially buried bodies or unburnt bodies could have attracted attention of the people and which may have been persisting all along in the study area. Both wolf and hyena are known to be distributed in varied habitat type, especially the grasslands and scrublands of semi-arid regions and agroforestry landscapes (Khan et al., 2024; Mukherjee et al., 2021). In addition, as perceived in our study, both wolves and hyenas do live in dens, caves and burrows. Dens serve as the central hubs within a wolf's home range. Apart from their importance as feeding and breeding spot, the activities surrounding them contribute towards the reproductive success of the wolf's packs as pup

mortality is highest during initial six months of their lives (Doncaster & Woodroffe, 1993; Eberhardt et al., 1982; Hofer & Mills, 1998; Iqbal et al., 2025; Khan et al., 2024; Kuhn, 2005; Mandal et al., 2018), In addition hyena also prefers available rock refugia on steep slopes (Ashish et al., 2022).

When it comes to social behavior, in contrast to our finding, wolves live in packs (WII, 2018). The word “wolf” itself has been paired with the word “pack” in many children stories such as “the jungle book” and scientific papers (Khan et al., 2024; Van Belkom, 2004). According to Sustain Team (2026), Indian wolf packs have an alpha pair, some younger wolves from the previous litter, and pups from the current litter. When it comes to hunting, in addition to stalking, chasing and rushing, hunting in a pack too is a technique followed by wolves (Khan et al., 2022; Saren et al., 2019). Whereas, striped hyena are considered historically and in the scientific studies as solitary (Mishra et al., 2026; Panda et al., 2022; Tichon et al., 2020), the same has been perceived in our findings. However, sociality of them is in fact more complex and variable than generally assumed and a revision of striped hyena social structure is required (Califf et al., 2020; Tichon et al., 2020).

The elusive behavior of both wolf and hyena which can be seen in our findings is in alignment with the past scientific studies (Chakraborty, 2023; Prater et al., 1971; Singh, 2008; Wang et al., 2022).

5.2 Drivers of tolerance

Understanding tolerance and its drivers is essential. By becoming an useful tool they help in guiding conservation actions (Lischka et al., 2019). By adapting different drivers from experts and previous studies (*a priori* models), we analyzed how each of the drivers within the models influence tolerance.

5.2.1 Conflict model

Depredation frequency within the conflict model did not significantly influence tolerance towards either wolves or striped hyenas in intervention or non-intervention villages (Table 4.3). Similar findings have been reported by Lischka et al. (2019) and Johnson et al. (2018), who showed that reductions in direct conflict do not necessarily translate into increased tolerance.

Residents across the study area generally perceived wolves and hyenas to be less frequently encountered than in the past and no longer regarded them as major livestock predators. A continuous decline in Indian grey wolf populations across their distribution range has been reported

previously (Jhala et al., 2022; Wang et al., 2022), and a similar trend has also been documented in West Bengal (Saren et al., 2019). Although livestock depredation has been reported from the study area and nearby regions of West Bengal (Saren et al., 2019; Shrivastava & Guha, 2026), it was not perceived as a major problem by our respondents. Instead, several respondents reported that domestic dogs have increasingly become responsible for livestock losses, while a few also attributed depredations to golden jackals and foxes.

Relatively, little research has focused on livestock depredation by stray or feral domestic dogs (Kalandarishvili et al., 2024). However, previous studies have documented livestock depredation by feral dogs and have shown that their impacts on wolves and other predators may further exacerbate human–wildlife conflict (Home et al., 2018; Suryawanshi et al., 2013). Feral dogs are also recognized as a significant threat to wildlife in rural landscapes and protected area buffers worldwide (Adhya, 2025). Therefore, respondents' perceptions that dogs are increasingly responsible for livestock losses in the study area warrant further attention (Adhya, 2025). Although a few respondents attributed livestock losses to golden jackals and foxes, these perceptions should be interpreted with caution because both species primarily rely on smaller prey, although golden jackals may occasionally prey on small livestock depending on local conditions (Kalandarishvili et al., 2024; Kumara & Singh, 2012).

5.2.2 Impact model

Negative emotions significantly influenced variation in tolerance towards wolves in both intervention and non-intervention villages, whereas for striped hyenas their effect was observed only in villages without interventions (Table 4.3). Similar species-specific emotional responses have been reported elsewhere, suggesting that communities form distinct emotional relationships with different carnivores and that conservation interventions may therefore vary in effectiveness across species (Dheer et al., 2021).

Fear was reported more frequently towards striped hyenas than towards wolves, whereas anger was more pronounced towards wolves (Appendix II). Similar patterns have been observed elsewhere, where large carnivores and other potentially dangerous animals evoke strong emotional responses among local communities (Zeller et al., 2025).

The greater fear associated with hyenas may partly reflect local beliefs surrounding the species, particularly perceptions regarding the scavenging of human corpses. Such beliefs appeared to generate ambivalent attitudes towards hyenas despite their relatively low involvement in livestock depredation. In contrast, greater anger towards wolves may be associated with their long-standing reputation as livestock predators in the study area.

Recent studies increasingly demonstrate that emotions and other intangible factors are among the strongest predictors of human tolerance towards wildlife (Kansky & Kidd, 2024). Consequently, conservation interventions should not focus solely on reducing material losses but should also address the emotional and cultural dimensions underlying human–carnivore relationships.

5.2.3 Psychological model

Within the psychological model, perceived benefits associated with hyena scavenging significantly influenced tolerance (Table 4.3). In contrast, perceived risk towards wolves emerged as an important driver of tolerance in non-intervention villages. These findings are consistent with hazard-acceptance theories, which suggest that tolerance is largely shaped by individuals' evaluation of perceived risks and benefits (Bruskotter et al., 2026; Slagle et al., 2022). Similarly, St John et al. (2020) demonstrated that heightened perceived risk from wolves is associated with negative emotions that subsequently reduce tolerance.

Striped hyenas are generally regarded as relatively low-risk carnivores worldwide (Tal, 2024), and a similar pattern emerged in the present study. Although some respondents perceived hyenas as potential livestock predators, many recognized their scavenging behavior and valued their role in removing carcasses and maintaining environmental cleanliness. Such perceived benefits may have contributed to lower risk perceptions and greater acceptance of hyenas.

In contrast, wolves were perceived as a greater threat because of their association with livestock depredation. Since livestock constitute an important livelihood asset for economically vulnerable rural communities in Purulia (Sarkar & Modak, 2022), the potential for livestock losses may explain the higher levels of perceived risk associated with wolves.

Respondents generally reported that locally available protection measures provided them with a sense of control over livestock depredation. Similar findings have been reported elsewhere, where

the availability of protective measures increases perceived control irrespective of their actual effectiveness (Pineda Guerrero, 2023).

More than half of the respondents preferred not to report livestock losses to government authorities. Previous studies have shown that delays, lack of transparency, and high transaction costs frequently discourage victims from engaging with formal compensation mechanisms (Barua et al., 2013; Karanth & Vanamamalai, 2020). These challenges may partly explain why some respondents expressed greater trust in HEAL than in the Forest Department. Through the Seed Goat Bank initiative and continuous awareness programmes, HEAL has attempted to provide a more accessible support mechanism, which may have contributed to strengthening institutional trust within the study area.

5.2.4 Value model

Within the value model, respondents' attitudes towards hunters and poachers did not significantly influence tolerance (Table 4.3). However, the proportion of protectionists in the study area was considerably higher than that of utilitarians (Appendix I).

Most respondents belonged to the Santhali community, among whom hunting has historically formed part of cultural traditions, and previous studies have documented ritualistic hunting festivals in the region (Chatterjee et al., 2022; D'Cruze et al., 2024). Although hunting has been prohibited in India since the enactment of the Wildlife (Protection) Act, 1972, hunting pressure in Purulia has reportedly declined in recent years, coinciding with legal enforcement and awareness initiatives undertaken by HEAL in collaboration with state agencies (Guha, 2025).

The predominance of protectionist orientations observed in the present study may indicate increasing acceptance of wildlife and a gradual transition towards more conservation-oriented values within the region.

5.2.5 Demographic model

Lastly, from the demographic model, occupation of the respondent was found to be significant driver in making difference in tolerance amongst without intervention respondents (Table 4.3). Being climate-sensitive and forest-dependent, these occupation holders possess more negative attitudes towards carnivores compared to those who do other jobs like business, or other employment (Khan et al., 2019; Khattak et al., 2022; Mahajan et al., 2022).

5.3 Tolerance

Most respondents were categorized within the passive coexistence level of tolerance, followed by stewardship, while none were classified as intolerant (Appendix I). This pattern may be explained by the fact that stewardship and intolerance represent action-oriented behavioral responses, whereas passive coexistence does not necessarily require active engagement (Bruskotter et al., 2015). Consequently, respondents were less likely to express either active stewardship or overt intolerance.

Nevertheless, the absence of intolerance and the presence of stewardship behaviors among some respondents represent encouraging signs for the long-term coexistence and conservation of wolves and striped hyenas in the study area (Berkes, 1993, 2012; Kikvidze & Tevzadze, 2015; Mishra et al., 2026). Overall, these findings suggest that coexistence between local communities and carnivores in Purulia is currently characterized by acceptance rather than conflict.

5.4 Evaluation of Hypotheses

Overall, the findings of the present study partially supported the proposed hypotheses. H_1 was partially supported, as respondents from intervention villages generally demonstrated higher ecological knowledge regarding Indian grey wolves. However, differences in ecological knowledge regarding striped hyenas were less pronounced, with knowledge levels remaining broadly comparable between intervention and non-intervention villages.

Hypothesis H_2 was also partially supported. Tolerance varied between intervention and non-intervention villages and was influenced by conflict-related, psychological, value-based, and demographic factors, although the relative importance of these factors differed across species and contexts.

These findings highlight the multidimensional nature of human–carnivore coexistence and emphasize the importance of integrating both social and ecological perspectives in conservation planning. Furthermore, behavioral change is often a gradual process, and sustained long-term conservation interventions may progressively reinforce positive values, beliefs, attitudes, and emotions, thereby promoting long-term coexistence between local communities and carnivores.

6 Summary and Conclusion

6.1 Summary

The present study investigated local ecological knowledge and tolerance towards the Indian grey wolf (*Canis lupus pallipes*) and striped hyena (*Hyaena hyaena*) in Purulia district, West Bengal, using a mixed-methods approach. By comparing villages with and without conservation interventions, the study examined species-specific ecological knowledge and explored the influence of conflict-related, psychological, value-based, and demographic factors on tolerance towards carnivores.

The findings demonstrated that local communities possessed considerable ecological knowledge regarding both species and that many aspects of local ecological knowledge corresponded with existing scientific ecological knowledge. Ecological knowledge regarding Indian grey wolves was generally higher in intervention villages, whereas knowledge regarding striped hyenas was broadly comparable between intervention and non-intervention villages.

Tolerance towards wolves and striped hyenas was shaped by multiple interacting factors. Direct conflict variables alone did not explain variations in tolerance. Instead, psychological dimensions, particularly emotions, perceived risks, and perceived benefits, emerged as important drivers of coexistence. Wolves were generally associated with higher perceived risks because of their reputation as livestock predators, whereas striped hyenas were more frequently recognized for their scavenging role and associated ecosystem services.

Most respondents exhibited passive coexistence, followed by stewardship behaviors, while no respondents expressed intolerant behavioral responses. Overall, the findings suggest that coexistence between people and carnivores in Purulia is presently characterized more by adaptation and acceptance than by active conflict.

The study also highlighted the importance of integrating local ecological knowledge with scientific understanding to better comprehend human–carnivore relationships and to design conservation strategies that are socially acceptable and locally relevant.

6.2 Conclusion

The present study demonstrates that human–carnivore coexistence in Purulia is influenced by much more than direct livestock losses. Emotions, perceptions, cultural beliefs, trust, and perceived benefits all contribute to shaping how communities respond to wolves and striped hyenas. These findings emphasize that coexistence should be understood as a multidimensional social–ecological process rather than merely the absence of conflict.

The results further suggest that community-based conservation initiatives have the potential to strengthen ecological knowledge, build trust, and encourage more positive perceptions towards carnivores. However, behavioral change is often gradual, and long-term engagement is required to reinforce positive values, beliefs, attitudes, and emotions that support coexistence.

Ultimately, the conservation of Indian grey wolves and striped hyenas in eastern India depends not only on protecting wildlife populations but also on strengthening relationships between people, institutions, and the landscapes they share. Therefore, locally grounded, participatory, and socially inclusive approaches will be essential for ensuring the long-term persistence of these carnivores in human-dominated landscapes.

7 Limitations and Recommendations

7.1 Limitations

The present study has several limitations. First, the sample size was relatively small and restricted to eight villages within Purulia district, which may limit the generalizability of the findings to other landscapes. Second, the study relied primarily on self-reported perceptions and attitudes rather than direct measurements of carnivore abundance, prey availability, or actual depredation events. Third, because the study employed a cross-sectional design, changes in ecological knowledge and tolerance over time could not be assessed; therefore, causal relationships between conservation interventions and observed outcomes should be interpreted with caution.

Although qualitative data provided important contextual information, some complex cultural beliefs, value systems, and social identities may not have been fully captured. In particular, values and beliefs associated with carnivores are multidimensional and may require more in-depth ethnographic approaches and broader questioning to understand their complexities. Similarly, respondents often emphasized immediate concerns such as protecting livestock from carnivores, whereas other dimensions of coexistence may have remained unexplored.

Despite deliberate efforts to include women participants, cultural and social constraints limited the participation of women in the study. Consequently, the perspectives of women may not have been adequately represented.

Finally, the study focused exclusively on the Indian grey wolf and striped hyena and did not investigate interactions involving other wildlife species occurring in the landscape.

7.2 Recommendations

Future studies should employ larger sample sizes and include additional villages and landscapes to improve the representativeness of findings. Longitudinal studies are needed to understand how ecological knowledge, values, attitudes, and tolerance change over time and how conservation interventions influence these processes.

Further ecological studies on herbivore diversity, abundance, and population trends in Purulia are recommended. The present study can serve as a baseline, and future investigations conducted over longer time periods may use these findings for comparison and monitoring changes through time.

Improved understanding of prey availability would provide valuable insights into predator–prey relationships and contribute to a better understanding of the extent to which Indian grey wolves and striped hyenas rely on wild prey and livestock resources in the landscape.

More detailed dietary studies on striped hyenas are also required in eastern India to determine the relative importance of carrion, livestock remains, and wild prey. Such information would improve understanding of their ecological role and help address prevailing misconceptions regarding the species.

Future research should simultaneously integrate local ecological knowledge and scientific ecological knowledge at larger spatial scales. Combining ecological surveys with social and ethnographic approaches would provide a more holistic understanding of human–carnivore relationships and may reveal additional traditional ecological knowledge that remains undocumented.

More in-depth studies focusing on cultural beliefs, value systems, and gender perspectives are recommended. Employing diverse questioning techniques and ethnographic approaches may help uncover dimensions of coexistence that are not easily captured through conventional questionnaires.

Greater collaboration between researchers and community-based organizations such as the Human and Environment Alliance League (HEAL) should be encouraged. Such organizations facilitate access to remote areas, support field research, and promote community participation. Their involvement would enable research across a wider range of carnivore species and communities and help address emerging human–wildlife conflicts through evidence-based conservation approaches.

Future researchers working in human dimensions and wildlife conservation should adopt interdisciplinary approaches integrating ecology, anthropology, sociology, forestry, economics, governance, law, and local history. Such broader perspectives would improve contextual understanding and contribute to more rigorous and meaningful conservation research.

Finally, more high-quality and context-specific research is required in eastern India. Strengthening collaboration among researchers, local communities, conservation organizations, and government agencies will be essential for developing effective long-term conservation strategies and promoting coexistence between people and wildlife.

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Appendices

Appendix I

Summary of coded variables and categories used for tolerance assessment

Conceptual Model	Evaluated Variable	Category	With Intervention (n=46)(General + Committee)	Without Intervention (n=40)	Total (N=86)
Conflict Model	Depredation Frequency	Frequently	2 + 0	0	2 (2.33%)
		Often	15 + 4	14	33 (38.37%)
		Not recently	20 + 2	22	44 (51.16%)
		I don't know	3 + 0	4	7 (8.14%)
Psychological Model	Perceived Risk (Wolf)	High Risk	35 + 4	30	69 (80.23%)
		Low Risk	5 + 2	7	14 (16.28%)
		Did Not Answer	0 + 0	3	3 (3.49%)
	Perceived Risk (Hyena)	High Risk	25 + 3	24	52 (60.47%)
		Low Risk	8 + 1	13	22 (25.58%)
		Did Not Answer	7 + 2	3	12 (13.95%)
	Scavenging Knowledge	Good knowledge	30 + 6	24	60 (69.77%)
		No knowledge	7 + 0	14	21 (24.42%)

	<i>(Perceived Benefit)</i>	Did Not Answer	3 + 0	2	5 (5.81%)
	Personal Control	High control	39 + 6	38	83 (96.51%)
		Low control	1 + 0	2	3 (3.49%)
	Social Trust <i>(Post-kill response)</i>	Inform authority	17 + 6	6	29 (33.72%)
		Inform villagers	1 + 0	4	5 (5.81%)
		Inform no one	22 + 0	30	52 (60.47%)
Value Model	Attitude towards Poachers	Protectionist	33 + 6	20	59 (68.60%)
		Utilitarian	7 + 0	18	25 (29.07%)
		Did Not Answer	0 + 0	2	2 (2.33%)
Dependent Variable	Tolerance <i>(Response to babies)</i>	Stewardship	11 + 2	8	21 (24.42%)
		Passive co-existence	26 + 4	31	61 (70.93%)
		Intolerance	0	0	0
		Did Not Answer	3 + 0	1	4 (4.65%)

Appendix II

Distribution of emotional responses towards wolves and striped hyenas

Emotion	Category	Wolf			Hyena		
		With Intervention (Gen+Comm)	Without intervention	Total (N=86)	With Intervention (Gen+Comm)	Without intervention	Total (N=86)
Fear	Very much	4 + 0	6	11.63 %	8 + 2	8	20.93%
	Somewhat	18 + 2	9	33.72 %	14 + 3	9	26 (30.23 %)
	No	18 + 4	22	51.16 %	12 + 1	20	38.37%
	Did Not Answer	0 + 0	3	3.49%	6 + 0	3	10.47%
Anger	Very much	2 + 0	0	2.33%	0 + 0	1	1.16%
	Somewhat	13 + 0	13	30.23 %	6 + 0	3	10.47%
	No	25 + 6	24	63.95 %	28 + 6	33	77.91%
	Did Not Answer	0 + 0	3	3.49%	6 + 0	3	10.47%
Hatred	Very much	1 + 0	0	1.16%	0 + 0	0	0.00%
	Somewhat	0 + 0	2	2.33%	0 + 0	2	2.33%
	No	39 + 6	35	93.02 %	34 + 6	35	87.21%
	Did Not Answer	0 + 0	3	3.49%	6 + 0	3	10.47%

Joy	Very much	7 + 2	11	23.26 %	5 + 1	12	20.93%
	Somewhat	6 + 0	6	13.95 %	7 + 2	3	13.95%
	No	27 + 4	20	59.30 %	22 + 3	22	54.65%
	Did Not Answer	0 + 0	3	3.49%	6 + 0	3	10.47%

Appendix III

Statistical tests used to examine variation in tolerance

Statistical Test	<i>p</i> -value
Wilcoxon Rank-Sum	0.8517
Kruskal-Wallis	0.8517
Pearson's Chi-squared	0.8493

Codes	Number of coding references	Aggregate number of coding references	Number of items coded	Aggregate number of items coded
Codes\\Wolf Ecological Knowledge\\Diet\\Dead animals	7	7	1	1
Codes\\Wolf Ecological Knowledge\\Diet\\Goat, sheep and other prey	14	14	1	1
Codes\\Wolf Ecological Knowledge\\Diet\\Only goat and sheep	47	47	1	1
Codes\\Wolf Ecological Knowledge\\Wolf activity\\Both	7	7	1	1
Codes\\Wolf Ecological Knowledge\\Wolf activity\\Day	44	44	1	1
Codes\\Wolf Ecological Knowledge\\Wolf activity\\Morning or evening	3	3	1	1
Codes\\Wolf Ecological Knowledge\\Wolf activity\\Night	8	8	1	1
Codes\\Wolf Ecological Knowledge\\Wolf habitat\\Forest	55	68	1	1
Codes\\Wolf Ecological Knowledge\\Wolf habitat\\Forest\\Cave	15	15	1	1
Codes\\Wolf Ecological Knowledge\\Wolf habitat\\Forest\\Den	2	2	1	1
Codes\\Wolf Ecological Knowledge\\Wolf morphology\\Comparison to Dog or Golden Jackal	72	72	1	1
Codes\\Wolf Ecological Knowledge\\Wolf seasonality\\Other	5	5	1	1
Codes\\Wolf Ecological Knowledge\\Wolf seasonality\\Rainy	24	24	1	1
Codes\\Wolf Ecological Knowledge\\Wolf seasonality\\Summer	13	13	1	1
Codes\\Wolf Ecological Knowledge\\Wolf seasonality\\Whole year	8	8	1	1

Codes\\Wolf Ecological Knowledge\\Wolf seasonality\\Winter	9	9	1	1
Codes\\Wolf Ecological Knowledge\\Wolf sociality\\Pack	19	19	1	1
Codes\\Wolf Ecological Knowledge\\Wolf sociality\\Single	4	4	1	1
Codes\\Wolf Ecological Knowledge\\Wolf sociality\\Single-Pair-Pack	41	41	1	1

Appendix V

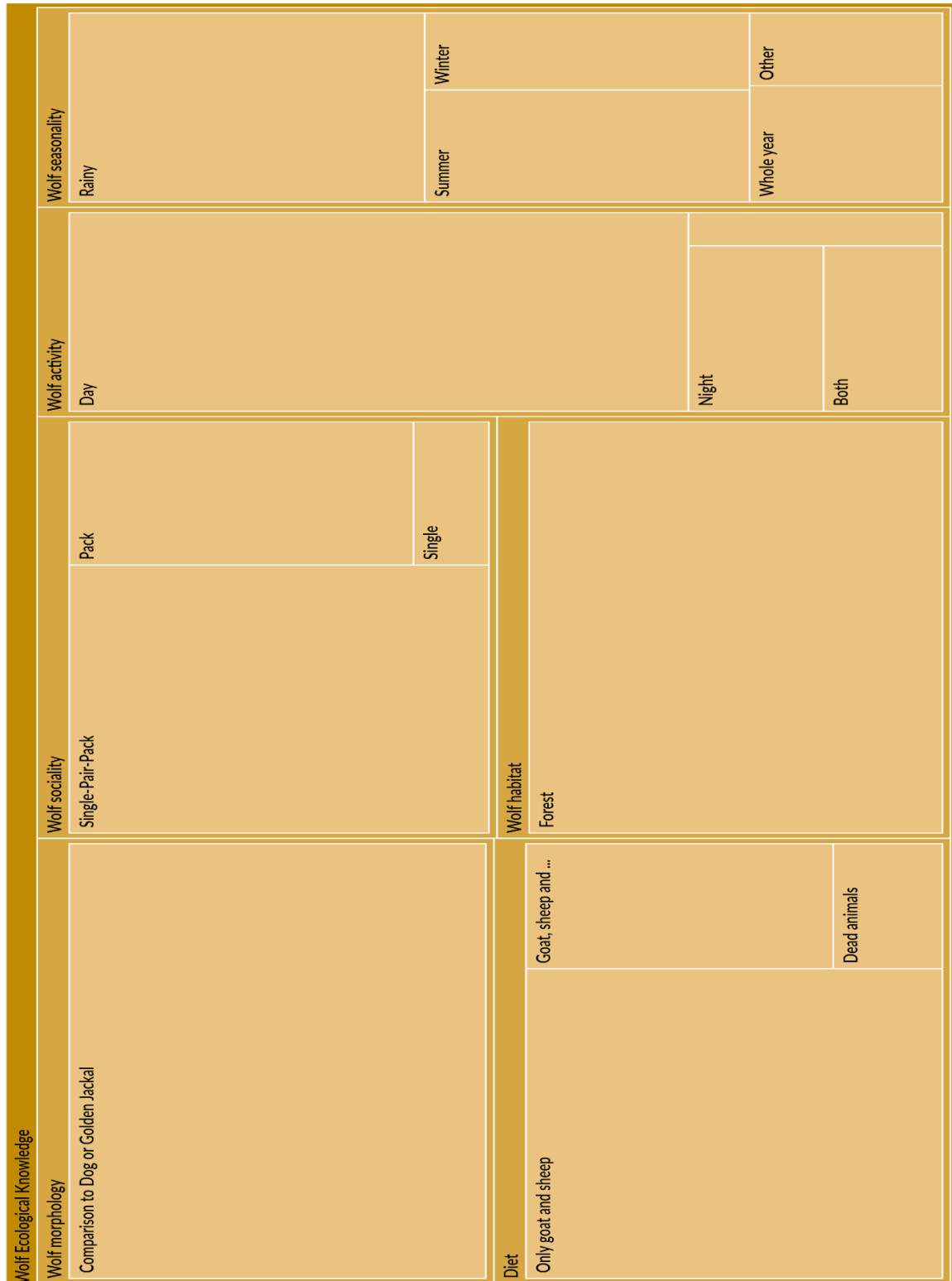
NVivo coding summary for hyena ecological knowledge

Codes	Number of coding references	Aggregate number of coding references	Number of items coded	Aggregate number of items coded
Codes\\Hyena Ecological Knowledge\\Hyena activity\\Both	4	4	1	1
Codes\\Hyena Ecological Knowledge\\Hyena activity\\Night	38	38	1	1
Codes\\Hyena Ecological Knowledge\\Hyena diet\\Dead animals	43	43	1	1
Codes\\Hyena Ecological Knowledge\\Hyena diet\\Hyena prey\\Dog	3	3	1	1
Codes\\Hyena Ecological Knowledge\\Hyena diet\\Hyena prey\\livestock	5	7	1	1
Codes\\Hyena Ecological Knowledge\\Hyena diet\\Hyena prey\\livestock\\Goat and sheep	1	1	1	1
Codes\\Hyena Ecological Knowledge\\Hyena diet\\Hyena prey\\livestock\\Poultry	1	1	1	1
Codes\\Hyena Ecological Knowledge\\Hyena habitat\\Jungle	14	41	1	1
Codes\\Hyena Ecological Knowledge\\Hyena habitat\\Jungle\\Cave	27	27	1	1
Codes\\Hyena Ecological Knowledge\\Hyena seasonality\\Rainy	7	7	1	1

Codes\\Hyena Ecological Knowledge\\Hyena seasonality\\Summer	5	5	1	1
Codes\\Hyena Ecological Knowledge\\Hyena seasonality\\Whole year	17	17	1	1
Codes\\Hyena Ecological Knowledge\\Hyena seasonality\\Winter	8	8	1	1
Codes\\Hyena Ecological Knowledge\\Hyena sociality\\Pack	6	6	1	1
Codes\\Hyena Ecological Knowledge\\Hyena sociality\\Single	22	22	1	1
Codes\\Hyena Ecological Knowledge\\Hyena sociality\\Single-Pair-Packs	23	23	1	1

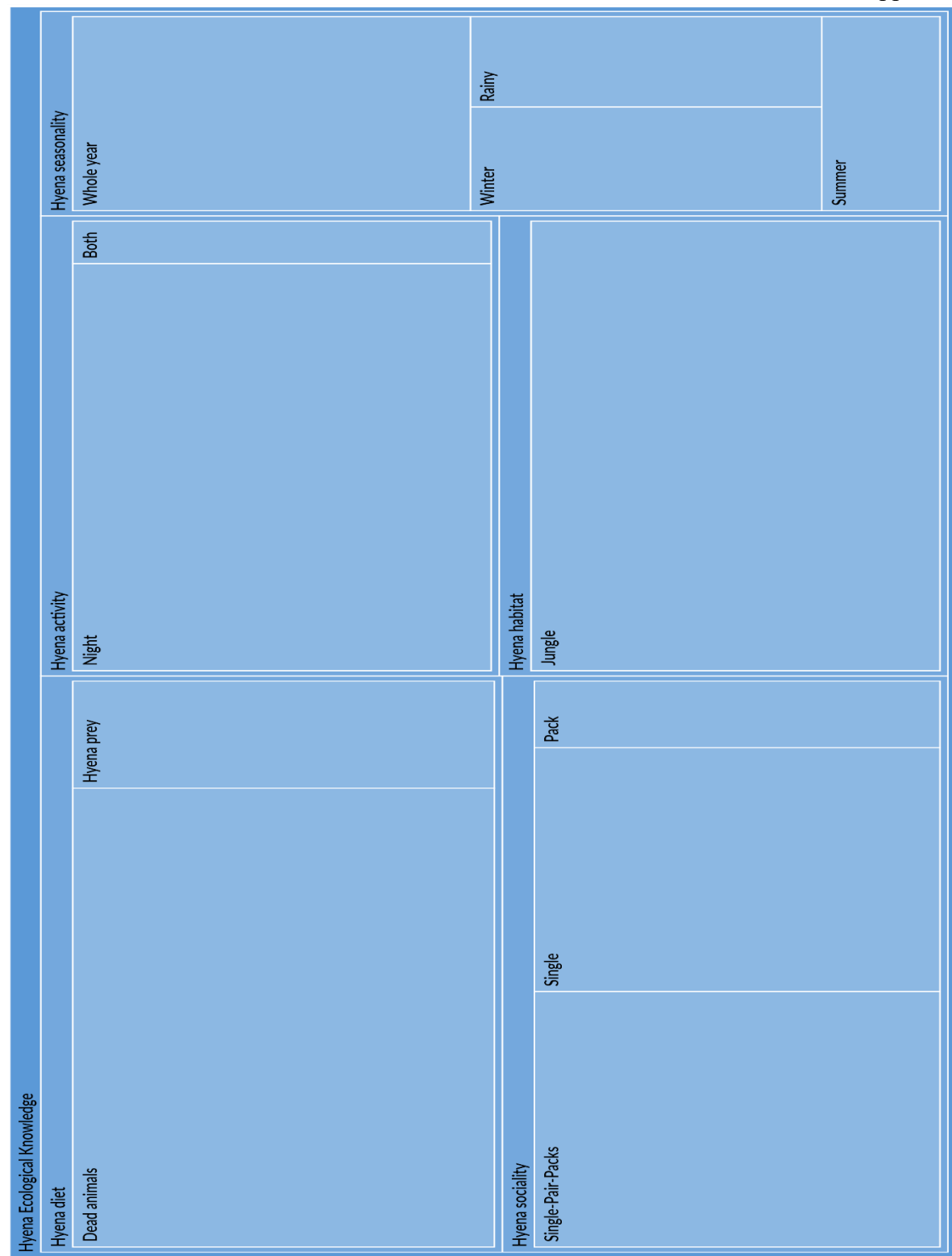
Tree map visualization of wolf ecological knowledge codes

Appendix VI



Tree map visualization of striped hyena ecological knowledge codes

Appendix VII



Summary of conservation intervention variables and categories

Evaluated Variable	Category	With Intervention (n=46)(General + Committee)	Without Intervention (n=40)	Total (%)
Intervention Frequency	Frequently	0 + 1	1	2.33%
	Often	26 + 4	3	38.37%
	Not happened since long time	8 + 1	33	48.84%
	I don't know	6 + 0	3	10.47%
Intervention Details <i>(Who conducted it?)</i>	NGO / Organization Only	12 + 4	0	18.60%
	Joint Efforts (Forest Dept + NGOs)	8 + 2	0	11.63%
	Government / Forest Dept Only	7 + 0	7	16.28%
	Not Sure / Did not answer	13 + 0	33	53.49%
Intervention Learning <i>(What was learned?)</i>	Ecological Interdependence & Co-existence	15 + 0	9	27.91%
	Practical Compensation Knowledge <i>(Seed Goat Bank)</i>	8 + 6	0	16.28%
	Not Sure / Did not attend	17 + 0	31	55.81%
Programs Needed	Direct Conservation & Forest Education	18 + 5	15	44.19%
	Skill Development & Livelihood Training	3 + 1	3	8.14%

<i>(What is desired next?)</i>	Human-Wildlife Conflict Management	2 + 0	1	3.49%
	Not Sure / Not interested	17 + 0	21	44.19%
Support Motivation	Interested / Willing to participate	37 + 6	35	90.70%
<i>(Willing to participate?)</i>	Not sure / Did not answer	3 + 0	5	9.30%

Appendix IX

Questionnaire

1. Name:
2. Name of the village:
3. Gender:
4. 1° Occupation:
5. 2° Occupation:
6. Religion and Caste:
7. Language:
8. Education:
9. Mobile number:
10. Can you identify this species (Photographs of wolf will be shown)?

Yes

No.....

Species 1



11. If yes which animal.....

12. What are their morphological features? (Give hints)

Wolf

13. What do they eat in your opinion?

Wolf.....

14. Do they hunt? What do they hunt?

Wolf

15 Where do they live?

Wolf.....

16 When do they become active?

	Day	Night	Not sure
Wolf			

17 What time of the year it can be seen the most?

Wolf.....

18 Have you seen wolf recently within a year?

	Yes	No	Where
Wolf			

19 How do they live?

	Alone	Pack	Not sure
Wolf			

20 Do you think wolf as shy and don't prefer to come near humans or village?

	Yes	No	Not sure
Wolf			

21 If you see wolf in your village, what would you do? Try to understand their beliefs? -

Whats the benefit?

Wolf

22 How do you feel about wolf?

Wolf	No	Somewhat	Very much
Fear			
Joy			
Angry			
Hatred			
Neutral			

23 Can you identify this species (Photographs of wolf will be shown)

Species 2



Yes No.....

24 If yes which animal.....

25 What are their morphological features? (Give hints)

Hyena

26 What do they eat in your opinion?

Hyena.....

27 Do they hunt? What do they hunt?

Hyena

28 Where do they live?

Hyena.....

29 When do they become active?

	Day	Night	Not sure
Hyena			

30 What time of the year it can be seen the most?

Hyena.....

31 Have you seen Hyena recently within a year?

	Yes	No	Where
Hyena			

32 How do they live?

	Alone	Pack	Not sure
Hyena			

33 Do you think hyena as shy and don't prefer to come near humans or village?

	Yes	No	Not sure
Hyena			

34 What is scavenging? Is it important? How?

Are you aware, which among Hyena and Hyena does scavenging?

Hyena.....

Hyena.....

35 If you see hyena or Hyena in your village, what would you do? Try to understand their beliefs -Whats the benefit?

Hyena

36 How do you feel about hyena?

Hyena	No	Somewhat	Very much
Fear			
Joy			
Angry			
Hatred			
Neutral			

37 How often livestock depredation is occurring now a days in your village?

Frequently.....

Often.....

Not recently.....

I don't know.....

38 What is your reaction if you see a hyena or wolf attacks a livestock in your presence?

39 What is your response after a livestock gets killed?

Do nothing			
Inform authority		Which authority? Do you have any number to contact them?	
Go for retaliatory killing		How do you do?	
Other		What?	

40 What would you do, if a poacher comes to your village for catching animals and birds?

	Yes	No		
Do nothing			Why?	
Support him			Why? How?	
Inform authority			Which?	
Other			What?	

41 What would you do, if you find babies of hyena and wolf?

42 How often conservation interventions occur here?

Frequently.....

Often.....

Not happened since long time.....

I don't know.....

43 How many have happened in the last year?

- 44 What are the conservation interventions or awareness programs which occurred here?
What were they?
- 45 What have you learnt from them?
- 46 What other programs you need?
- 47 How motivated are you to support or involve in conservation interventions for wolves and hyena in your area if it happens now? **Or** If adequate conservation interventions or awareness programs happen, How motivated are you to involve in them? Would you involve?

Appendix X

Representative landscapes of the study area in Purulia district, West Bengal.

a. Village landscape



b. Cows and calf grazing in a scrubland



c. Village pond



d. Golden jackal



e. Peacock



f. Fuelwood collection from the forest



Semi-structured interviews and community interactions conducted in different villages of Purulia district during June–July 2025.

