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Navigating fear and coexistence: The social costs of crocodile threats in the Gin Ganga River, Nagoda Divisional Secretariat, Galle District, Sri Lanka

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Abstract

Human–crocodile conflict is a significant conservation and social issue worldwide. In Sri Lanka, such conflicts primarily involve saltwater crocodile and mugger crocodile populations inhabiting major river systems, including the Nilwala and Gin Ganga rivers and their surrounding wetlands. This study investigates the social costs associated with crocodile-related conflict, focusing on its implications for human safety, livelihoods, cultural practices, and community well-being. Drawing on the Social–Ecological Systems framework and Human–Wildlife Conflict Theory, this study examines the economic, psychological, and social dimensions of conflict while emphasizing the importance of incorporating local perceptions into conservation strategies. A qualitative research design was employed to explore the experiences of communities living along the Gin Ganga River in the Nagoda Divisional Secretariat, Galle District, Sri Lanka. Data were collected through semi-structured interviews, focus group discussions, and participant observation to obtain in-depth insights into community experiences. The findings indicate that the persistent threat of crocodile encounters generates fear and restricts mobility, disrupting daily activities and local livelihoods, particularly fishing, small-scale agriculture along riverbanks, and livestock-related activities. Beyond immediate physical risks, crocodile-related conflict contributes to substantial psychosocial distress, weakens social cohesion, limits access to culturally significant river spaces, and constrains traditional practices and educational activities. The river, once perceived as a source of sustenance and comfort, has increasingly become associated with fear and insecurity, creating considerable yet often overlooked social burdens for affected communities. The study concludes that addressing human–crocodile conflict requires a balanced approach that integrates wildlife conservation with community safety and promotes sustainable coexistence through inclusive policies, community participation, and awareness initiatives.

Introduction

Human–crocodile conflict (HCC) refers to interactions between humans and crocodilians that result in adverse consequences for human social, economic, or cultural well-being, as well as for the conservation of crocodilian species and their habitats (Crocodile Specialist Group [CSG], n.d.). It represents a significant conservation and social issue in tropical and subtropical regions where crocodiles inhabit freshwater and coastal ecosystems (Chakanyuka & Utete, 2022). Such conflicts have intensified due to increasing spatial overlap between expanding human populations and stable or recovering crocodile populations, particularly in Asia, Africa, and parts of the Americas (Whitaker & Srinivasan, 2020). This overlap may result in attacks on humans and livestock, damage to fisheries and fishing equipment, and psychological consequences, including fear and trauma among affected individuals and communities.

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Human–crocodile conflict is influenced by various biological and ecological factors, including crocodile population dynamics and environmental conditions such as water levels and temperature, which affect crocodile behavior and interactions with humans (Ojeda Adame et al., 2023). Conflict may be further exacerbated by habitat degradation, changes in water-resource management, and increasing human encroachment into crocodile habitats (Chakanyuka & Utete, 2022). Globally, HCC poses considerable challenges, particularly for communities located near crocodile habitats in Asia, Africa, and the Americas. Species such as the Nile crocodile (*Crocodylus niloticus*) in Africa and the mugger crocodile (*Crocodylus palustris*) and saltwater crocodile (*Crocodylus porosus*) in South and Southeast Asia are frequently associated with significant human–wildlife interactions. In Uganda's Murchison Falls area, fatal crocodile attacks have been documented primarily during fishing and water-collection activities, highlighting the risks associated with essential livelihood practices (Ashepet et al., 2024; Benansio et al., 2022). Similarly, communities around Lake Kariba in Zimbabwe experience frequent negative interactions with crocodiles, including attacks, damage to fishing nets, and livestock predation, all of which have implications for local livelihoods and conservation efforts (Matanzima et al., 2023).

In Sri Lanka, human–crocodile conflict primarily involves the saltwater crocodile (*Crocodylus porosus*) and the mugger crocodile (*Crocodylus palustris*), particularly within major river systems such as the Nilwala and Gin Ganga rivers and their surrounding wetlands (Samarasinghe, 2014). The Nilwala River basin, for example, has been identified as a hotspot for human–crocodile conflict due to factors such as rapid population growth, sand mining, riverbank encroachment, and increasing human activities involving drinking-water collection, bathing, fishing, and agriculture (Uluwaduge et al., 2018). Increasing interactions between humans and crocodiles impose substantial social costs, including loss of human life, damage to fishing equipment, and psychological distress (Benansio et al., 2022, 2024). Traditional conflict-mitigation practices in Sri Lanka, including "Kem" techniques, have demonstrated potential for reducing such conflicts by integrating cultural principles and local knowledge with contemporary conservation practices (Srishan, 2024). Responses to crocodile-related risks have also included retaliatory killing, habitat destruction, and the use of traditional protective structures such as "Kimbulkotuwa," or crocodile-excluding enclosures, to reduce the likelihood of attacks. However, unplanned translocations and increasing pressures on crocodile habitats continue to constrain effective long-term management (Karawita et al., 2025; Uluwaduge et al., 2018). Sustainable management approaches, including adaptive co-management frameworks, are therefore important for balancing community needs with crocodile conservation, as demonstrated by research conducted in Zimbabwe (Chakanyuka & Utete, 2022; Chakuya & Gondo, 2018).

From a theoretical perspective, Human–Wildlife Conflict (HWC) Theory, together with the Social–Ecological Systems (SES) Framework, provides a useful foundation for analyzing and mapping the social costs associated with crocodile presence in the Gin Ganga River area. HWC theory facilitates an examination of the causes, consequences, and human responses associated with conflicts between wildlife and local communities. It highlights the multiple costs arising when humans and wildlife compete for space and resources, including economic losses, physical risks, psychological distress, and social disruption. The SES Framework, in turn, conceptualizes human communities and ecosystems as interconnected and dynamic systems. It enables an examination of the complex relationships among human actors, including communities and institutions; environmental components, such as crocodile populations and riverine habitats; and governance structures. The framework also facilitates the identification of feedback mechanisms through which human activities, such as settlement expansion and fishing practices, influence crocodiles and their habitats, while crocodile presence and conflict simultaneously affect community behavior and social structures. Integrating these two theoretical perspectives therefore enables a more comprehensive understanding of human–crocodile interactions in the Gin Ganga area and facilitates the assessment of associated social costs across ecological, economic, psychological, social, and institutional dimensions.

In Sri Lanka, crocodile populations have fluctuated over time and remain vulnerable to increasing human encroachment and environmental change. The Gin Ganga, a 115.9 km-long river flowing through Galle District, supports crocodile populations, particularly mugger crocodiles, which inhabit freshwater environments along the river and nearby reservoirs. Although these crocodiles contribute to local biodiversity, their presence also results in recurrent interactions with communities living along the river. Crocodile populations and their habitats are increasingly affected by environmental and anthropogenic pressures, including sand mining, agricultural expansion, and the growth of human settlements. At the same time, increasing human use of riverine environments may contribute to conflict in the form of attacks on people, damage to livelihood assets, and psychological distress among local residents. Consequently, the social costs associated with crocodile presence extend beyond immediate physical risks. They also encompass economic

losses, including damage to fishing equipment and livestock predation; disruptions to livelihood activities; and broader community-level consequences such as fear, changes in social behavior, and altered patterns of natural-resource use.

Understanding these social costs is essential for developing effective conflict-mitigation strategies that balance human well-being with crocodile conservation. A review of the Sri Lankan literature on human–crocodile conflict, particularly studies conducted in riverine environments such as the Nilwala River and other wet-zone localities, reveals several research gaps relevant to the Gin Ganga context. Existing studies have largely concentrated on ecological characteristics, crocodile populations, records of attacks, and the direct economic consequences of conflict, including livestock losses and damage to fishing equipment (Amarasinghe et al., 2015; De Alwis & Noy, 2019; Jayarathne et al., 2025). However, relatively limited attention has been given to the broader social costs of human–crocodile conflict, including psychological distress, fear, changes in patterns of river use, impacts on social cohesion, and long-term disruption of livelihoods, particularly in the Gin Ganga region. Furthermore, much of the existing research has focused on the Nilwala River, Matara, and other areas of southern Sri Lanka, whereas the Gin Ganga River area within the Nagoda Divisional Secretariat of Galle District remains comparatively underexplored despite reports of frequent crocodile encounters. Local sociocultural dynamics and community coping mechanisms in this area have also not been systematically examined. Accordingly, the present study seeks to address these gaps through a qualitative investigation that provides a context-specific understanding of human–crocodile conflict in the Gin Ganga area. Attention is given to the social impacts of the conflict, as well as to community experiences and patterns of adaptation and conflict mitigation. In doing so, the study seeks to address an important, localized knowledge gap within the broader literature on human–crocodile conflict in Sri Lanka and to generate insights relevant to conflict-mitigation and conservation policies.

This study aims to explore the multidimensional social impacts of crocodile presence on communities within the Nagoda Divisional Secretariat and to identify the mechanisms through which residents cope with and adapt to crocodile-related risks. More specifically, the primary objective is to examine the impacts of human–crocodile encounters on local communities. Based on this objective, the study addresses three research questions: (1) What are the multifaceted economic, psychological, and social impacts of crocodile encounters on local communities and their daily livelihoods? (2) How do community members perceive crocodiles, and what are their attitudes, beliefs, and levels of awareness regarding the risks associated with crocodile presence in their vicinity? (3) What coping strategies, adaptive mechanisms, and behavioral changes have residents adopted to mitigate the risks and challenges associated with crocodile presence, and how have these strategies affected their daily routines and livelihood activities? To address these questions, the study draws on 25 semi-structured interviews and four focus group discussions conducted with residents of the Gammaddegoda and Gonalagoda Grama Niladhari Divisions within the Nagoda Divisional Secretariat area (see Table 2).

This study contributes to the understanding of human–wildlife conflict, particularly human–crocodile conflict within Sri Lanka's riverine ecosystems. Compared with other river systems in Sri Lanka, including the Nilwala and Mahaweli, the Gin Ganga has received comparatively limited research attention regarding crocodile presence and its consequences for local communities. By applying the Social–Ecological Systems Framework and Human–Wildlife Conflict Theory, the study examines the economic, psychological, and social dimensions of human–crocodile conflict, with particular attention to social costs such as psychological trauma and changes in community behavior. It further emphasizes the importance of incorporating local perceptions and community agency into conservation initiatives, thereby contributing to a theoretical and empirical understanding of wildlife conflict that is more responsive to the social realities experienced by communities living in conflict-prone areas.

Method

Research design

The qualitative research design aims to investigate the social costs associated with the presence of crocodiles in the Gin Ganga River within the Nagoda Divisional Secretariat area, Galle District, Sri Lanka. The study employed in-depth data collection methods, including semi-structured interviews, focus group discussions, and non-participant observations, to obtain detailed insights into economic losses, psychological impacts, coping mechanisms, and changes in river-use patterns. Affected residents and key informants, including community leaders and local officials, were selected using purposive sampling techniques to capture diverse perspectives on human–crocodile interactions. The qualitative approach was considered appropriate for this study because it enables a nuanced examination of complex social issues that may not be fully captured through

quantitative methods. By incorporating local knowledge and exploring the underlying factors influencing community responses and conflict dynamics, this approach contributes to the development of culturally appropriate and ecologically sensitive conflict-mitigation strategies tailored to the Gin Ganga context.

Study area and population sampling

The research was conducted in three selected Grama Niladhari (GN) divisions within the Nagoda Divisional Secretariat area, Galle District, Sri Lanka (Figure 1), which have experienced the impacts of crocodile-related issues over the past five years. The selected GN divisions were Gammaddegoda North (GGN), Gammaddegoda South (GGS), and Gonalagoda (GG).

Table 1. Summary of participants in semi-structured interviews and focus group discussions

Data collection method	Inclusion criteria	Total number
Semi-structured interviews	Male or female members residing in the selected study area, aged between 20 and 75 years (this age range was considered suitable for providing authentic and reliable information).	25 people residing in Gammaddegoda South, Gammaddegoda North, and Gonalagoda Grama Niladhari Divisions
Focus group discussions	Participants residing in the selected study area, aged between 20 and 75 years (this age range was considered suitable for providing authentic and reliable information).	Three groups participated in the focus group discussions: Group one consisted of 8 farmers, Group two consisted of 8 fishermen, and Group three consisted of 8 sand miners.

Figure 1 depicts the study area. Galle District has an estimated population of 1,139,000, of whom 87.8% are rural residents engaged in agriculture (Department of Census and Statistics, 2014), making this population highly susceptible to the impacts of climate change.

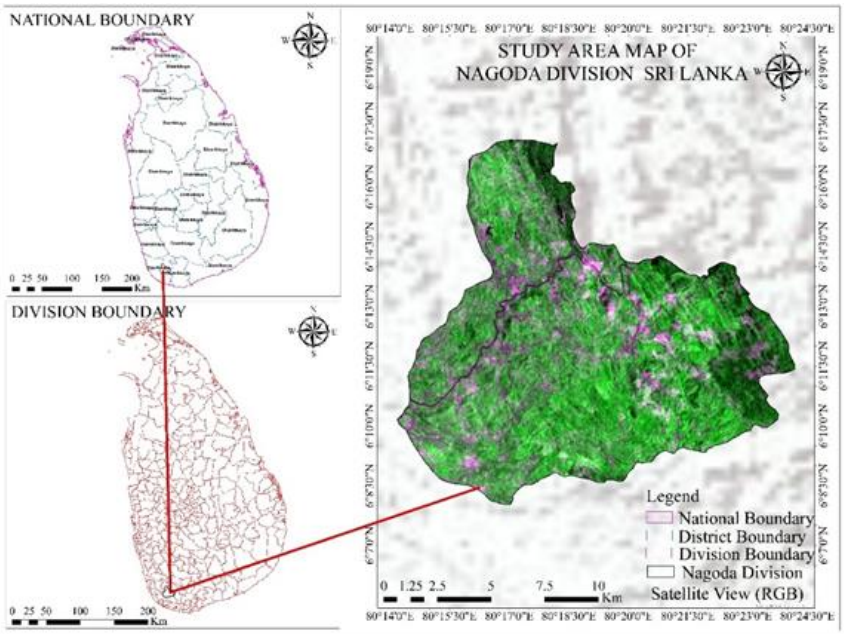


Figure 1. Location Map of the Nagoda Divisional Secretariat Area
Source: Developed by researchers based on GIS.

Data collection techniques and tools

A total of five key informant (KI) interviews were conducted with officials responsible for agricultural activities, Grama Niladhari officers, Social Service officers, forest officers, and disaster management officers in the Divisional Secretariat area. These interviews aimed to obtain insights into the impacts of crocodile-related issues and the vulnerable conditions of the community. Subsequently, 25 community members were selected using purposive sampling criteria based on their experiences of being affected by crocodile-related events and incidents between 2020 and 2024. Twenty-five semi-structured interviews were conducted with individuals from Gammaddegoda North, Gammaddegoda South, and Gonalagoda GN divisions to assess the impacts of human–crocodile interactions in the area.

The interviews collected information on demographic characteristics, direct losses caused by crocodiles (such as damage to fishing gear, livestock predation, and crop losses), effects on income and livelihood stability, psychological impacts (fear, trauma, anxiety, and behavioral changes), perceptions of safety near the river, changes in river-related rituals and customs, and community interactions. The demographic profiles of the respondents are presented in Table 2. The sample comprises 17 male and 8 female participants from diverse socio-demographic backgrounds. Additionally, three focus group discussions (FGDs) were conducted with different groups (farmers, sand miners, and fishermen) to facilitate collective reflections on the issue. These discussions enabled participants to share their experiences and perspectives on the topic. Field observations were also conducted to document activities that influence or alter traditional and cultural practices related to the river. The findings from interviews, discussions, and observations were integrated to support the analytical framework of the study. Table 3 presents the themes resulting from the analysis, along with their thematic descriptors. In the narratives presented, "KI" refers to key informant interviews, while "SI" refers to semi-structured interviews with community members.

Table 2. Demographic information of the respondents in selected GN divisions

No	Sex	Occupation	Age	GN/ DS Division	Location of Residence
		Key Informants			
1	F	Grama Niladhari	52	GGN	NA
2	M	Disaster Management Officer	37	NDS	NA
3	M	Social Service Officer	58	NDS	NA
4	F	Agricultural Officer	53	NDS	NA
5	M	Forest Officer	48	NDS	NA
		Respondents for Semi-structured Interviews			
1	M	Farmer	32	GGS	800 m away from the river
2	M	Sand Digger	45	GGS	400 m away from the river
3	M	Farmer	52	GGS	450 m away from the river
4	M	Farmer	48	GGS	750 m away from the river
5	F	Housewife	43	GGS	670 m away from the river
6	M	Sand Miner	44	GGS	1 km away from the river
7	M	Fisherman	39	GGS	1.5 km away from the river
8	F	Housewife	67	GGS	1 km away from the river
9	M	Farmer	70	GGN	470 m away from the river
10	M	Sand Miner	40	GGN	550 m away from the river
11	M	Farmer/Tea planter	51	GGN	500 m away from the river
12	M	Fishermen	37	GGN	1 km away from the river
13	F	Housewife	68	GGN	1.2 km away from the river
14	F	Development Officer	44	GGN	670 m away from the river
15	M	Farmer	55	GGN	350 m away from the river
16	M	Farmer	56	GGN	1 km away from the river
17	M	Farmer/Tea Planter	39	GG	950 m away from the river
18	F	Teacher	53	GG	800 m away from the river
19	M	Farmer/Tea planter	55	GG	450 m away from the river
20	F	Housewife	57	GG	1 km away from the river
21	M	Farmer	64	GG	970 m away from the river
22	F	Farmer/Tea planter	67	GG	650 m away from the river
23	M	Fishermen	56	GG	370 m away from the river
24	F	Farmer/Tea planter	53	GG	1 km away from the river
25	M	Sand Miner	47	GG	1.2 km away from the river

Source: Developed by researchers based on the sample.

Data analysis

Thematic analysis was selected as the data analysis method because it enables researchers to identify and interpret conceptual patterns within qualitative data (Graneheim & Lundman, 2004). The analysis process involved six steps: data familiarization, initial code generation, theme development, theme review and definition, theme naming, and final analysis writing (Graneheim & Lundman, 2004). Intersectionality was operationalized through a two-stage coding strategy. The first stage incorporated open and axial coding to identify thematic patterns related to human safety and psychological impacts, economic loss and livelihood disruption, social and community dynamics, environmental and ecological interactions, and conflict mitigation and management measures. In the second stage, an intersectional coding matrix was developed to compare

narratives based on key social positions and thematic nodes, examining patterns of exposure, coping responses, and outcomes. Coding was conducted independently by the lead author and a second coder, with discrepancies resolved through discussion and consensus to maintain analytical reflexivity. Selected cases were purposively chosen to illustrate diverse trajectories across social positions while ensuring participant privacy. Manual thematic analysis was used to guide the coding process and structure the data according to the research questions.

Researcher positionality and reflexivity

The researcher shares a similar socio-demographic background with the participant group and is fluent in Sinhala, the primary language used during interviews and focus group discussions. This insider status facilitated social and linguistic familiarity, which was crucial for building trust and encouraging participants from diverse socio-economic backgrounds to openly share their experiences. Due to their shared exposure to crocodile-related impacts and familiarity with local residential areas, cultural norms, and social contexts, the researchers were able to interpret participants' informal conversations for qualitative analysis. These similarities also encouraged participants to feel more open and comfortable when sharing their experiences.

The researchers maintained oversight through regular debriefings, field notes, and joint coding of transcripts. They underwent tailored training in qualitative interviewing, research ethics, and trauma-sensitive engagement before fieldwork. Insider positioning facilitated rapport and depth of disclosure. Interviews were first transcribed in Sinhala and then translated into English, with interpretive translation applied to terms that did not have direct English equivalents. This reflexive stance acknowledges that qualitative knowledge is co-produced through researcher–participant interactions and shaped by positionality, relational trust, and the broader politics of knowledge production.

Ethical considerations

The research followed standard ethical procedures, given the sensitive nature of the fieldwork topic and the need to protect the study population. It adhered to the ethical guidelines outlined in the Declaration of Helsinki for research involving human participants. The study objectives were clearly communicated to all participants, who were assured of their right to withdraw at any time. Prior to the interviews, participants provided informed verbal consent, considering their levels of education and willingness to participate. To ensure confidentiality, all collected information was anonymized by removing identifying details. Participants had access to psychological support referrals throughout the study, with the researcher prepared to help as needed.

Findings

Overview of the social costs of crocodile threats along the Gin Ganga River in the Nagoda Divisional Secretariat area

Participants shared their firsthand experiences and responses to numerous issues, vulnerabilities, and conflicts associated with crocodiles. Table 3 presents the major themes and sub-themes identified, along with qualitative insights from the collected data.

Table 3. Major themes and sub-themes along with qualitative insights from collected data

Major themes	Sub-themes	Qualitative insights
Human safety and Psychosocial impacts	Incidence and nature of crocodile attacks on people	*Something grabbed my leg, and I quickly pulled myself out of the water with all my strength. It was then that I realized I was being attacked by a crocodile. My right leg was severely injured and bleeding. I had to be hospitalized for two months*
	Fear, Trauma, and Community Anxiety	*We have completely avoided the river out of fear of crocodile attacks. After my brother was attacked, we stopped using the river altogether, even though we rely on it for our daily water-related activities. There is a belief that once a crocodile attacks someone, it will return to the same place due to the taste of blood. This fear prevents us from going near the river or even to the riverbank*
	Changes in daily activities and river usage due to safety concerns	*Once we became aware of the presence of crocodiles in the river, we stopped going there for bathing, swimming, or fishing at night. Villagers used to rely on small-scale night fishing to meet*

		their fish needs, but we have discontinued this tradition due to the attacks.
Economic loss and livelihood disruption	Loss of Livelihood	*Inland fishing is a common practice to meet our fish requirements and serves as a source of income. However, the presence of crocodiles in the river has posed a threat to our fishing activities, impacting our livelihoods and cultural practices.*
	Livestock predation and Related Economic Costs	*Recently, there have been reports of cattle being lost due to crocodile attacks, resulting in significant economic losses for us. Our family is now unable to meet our milk needs*
	Impact on Agriculture along the Riverbanks	*Due to the presence of crocodiles in the river banks, we have completely abandoned our agricultural activities in those areas*
Environmental and Ecological Interactions	Encroachment into crocodile habitats and habitat degradation	*The rivers, riverbanks, and nearby wetlands have become habitats for crocodiles. While crocodiles have a right to live, they pose a serious threat to humans. They have started moving closer to human habitats in search of food, leading to a dangerous situation of human-crocodile response in the area*
	Impact of Human Activity on Crocodile Behavior	*the presence of human waste, including hospital discharges, in the river has created an environment conducive to crocodile habitation*
Social and community dynamics	Impact on social rituals and cultural activities connected to the river	*The river serves as the primary source of water for agriculture, especially paddy cultivation, and daily life in the region, leading to its reverence out of necessity and gratitude. This reverence is reflected in various rituals, with the most significant one being the "Gangä Röyada"(ගඟ රෝයද) or the "River Vow." However, this ritual has now ceased to be practiced.*
	Conflicts or cooperation between community members over resource access and crocodile management	*We are unable to fish or harvest vegetables along the riverbanks due to this issue. We have resorted to using common land for these activities, which has led to conflicts within the community.*
Community responses and coping strategies	Community-Based Early Warning and Collective Response Systems	*They have an informal early warning system where sightings of large or aggressive crocodiles are immediately reported to neighbors and village leaders*
	Spiritual Deterrence and Ritualistic Coexistence	*Crocodiles were considered sacred animals and symbolized as the vehicle of the Ganga Deviyo or Koholé Deviyo. It was believed that harming crocodiles was not advisable, as they would not harm humans if left unharmed.*
	Behavioral Adaptation and Spatial Risk Management	*My grandfather passed down a valuable lesson to me, which I now share with my grandchildren: the river belongs to the kimbula (crocodile) after sunset. We can enjoy it during the day, but they reign over it at night*

Human safety and Psychosocial impacts

The presence of crocodiles in the Gin Ganga River area poses a serious threat to human safety and has significant psychological impacts on local communities. Regular encounters between humans and crocodiles, particularly during flooding events, raise the risk of attacks, resulting in injuries, fatalities, and lasting trauma.

Incidence and nature of crocodile attacks on people

Crocodile attacks on humans within the study area, though sporadic in nature, are characterized by their severity and profound consequences. Such incidents predominantly occur because of human engagement in water-related activities, including bathing, fishing, and washing clothes, in riverine and muddy environments that constitute crocodile habitats. Many attacks are recorded during daylight hours, corresponding to periods of peak human activity near water bodies. Children and individuals residing in proximity to these habitats are particularly vulnerable to attack. The physical injuries sustained are further compounded by significant psychological trauma among the affected population, resulting in substantial disruptions to daily routines and a marked erosion of the community's perception of personal safety.

> *"It was a Poya day when I went to the river to bathe and give my dog a shower. It was around 12:30 to 1:30, and the river was peaceful and quiet. After showering my dog, I started to bathe. Suddenly, something grabbed my leg, and I quickly pulled myself out of the water with all my strength. It was then that I realized I was being attacked by a crocodile. My right leg was severely injured and bleeding. I had to be hospitalized for two months."* (Male, 40 years old, SI- GGN)

The attacks typically occur in areas where humans and crocodiles share habitats, particularly in shallow waters or near riverbanks. These incidents usually involve crocodiles surprising humans through ambushes from the water, often after observing their activities for some time. This behavior suggests a predatory nature rather than random encounters. One respondent shared their experience of a crocodile attack, stating,

> *"The crocodile carefully observes human activities along the river. It basks in the sun on the riverbanks and then silently slips into the water. Its stealthy movements make it difficult for anyone to detect its presence. When people bring their cows to drink water or bathe their dogs, the crocodile suddenly emerges and attempts to attack."* (Male, 55 years old, SI- GG)

Fear, trauma, and community anxiety

Fear, trauma, and community anxiety are prevalent in the area due to crocodile attacks, which are reinforced by both direct and indirect experiences of these incidents. Victims and their families frequently bear long-term psychological trauma resulting from physical injuries, loss of livelihood, and the unpredictable nature of the attacks. The community's widespread fear is strengthened by repeated encounters and fatalities, leading to an atmosphere of insecurity that hinders daily activities such as bathing, fishing, and farming near water bodies.

> *"We have completely avoided the river out of fear of crocodile attacks. After my brother was attacked, we stopped using the river altogether, even though we rely on it for our daily water-related activities. There is a belief that once a crocodile attacks someone, it will return to the same place due to the taste of blood. This fear prevents us from going near the river or even to the riverbank."* (Male, 37 years old, SI- GGN)

Anxiety spreads through social networks as stories of attacks circulate, leading to intensified vigilance, altered behavior, and avoidance of certain areas perceived as dangerous. This collective fear has impacted mental health by causing stress and persistent worry about personal and family safety.

> *"There have been multiple sightings of crocodiles in our area recently, indicating that there may be more than five in the vicinity. Whenever someone spots a crocodile, news spreads quickly throughout the village, causing fear among the residents. This fear makes it difficult for us to venture outside at night or during rainy weather, as we constantly worry about the presence of crocodiles nearby. Even our children are scared to sleep near the house because of this situation."* (Female, 44 years old, SI- GGN)

The psychological impact of attacks is compounded by the socio-economic burden, which includes medical expenses and loss of productivity. This enduring community trauma extends well beyond the immediate aftermath of attacks, disturbing community cohesion and the ability to utilize natural resources.

> *"In the past, we used river water for various daily needs, excluding drinking. During dry seasons, we dig wells along the riverbanks to meet our water requirements. However, due to the presence of crocodiles and the risk of attacks, we can no longer rely on this practice. The river remains unpolluted, and people continue to respect and protect it. Despite its abundant water resources, fear of crocodile attacks prevents us from utilizing them."* (Female, 68 years old, SI- GGN)

These events create a pervasive sense of fear and insecurity among residents, disrupting their daily lives and livelihoods, especially in flood-prone areas where crocodiles encroach upon human settlements. The psychological impact includes anxiety and trauma among victims and community members, exacerbated by the loss of productive capacity.

Changes in daily activities and river usage due to safety concerns

Safety concerns related to crocodile attacks have resulted in significant changes in daily activities and river practices in the area. People have become more careful and tend to avoid traditional activities like bathing, fishing, and washing clothes in the Gin Ganga River and nearby water bodies, especially during periods of

increased crocodile activity. This avoidance of riverine areas disrupts regular livelihoods and cultural practices that rely on river access.

> *"Once we became aware of the presence of crocodiles in the river, we stopped going there for bathing, swimming, or fishing at night. Villagers used to rely on small-scale night fishing to meet their fish needs, but we have discontinued this tradition due to the attacks. Additionally, we avoid using the road that runs alongside the river at night due to the crocodile threat."* (Male, 52 years old, SI- GGS)

People have adjusted travel routes, limited children's outdoor activities near water, and decreased nighttime water usage to reduce the risk.

> *"It was common for children to gather at the river in the evening and play together in the water, regardless of gender. They would swim and jump into the river from trees on the riverbank. But we do not allow our children to do water activities, and also, we do not allow them to play outside in the evening when getting dark."* (Female, 57 years old, SI- GG)

Behavioral changes such as heightened vigilance and fear, resulting from human–crocodile interactions, lead to limitations in resource use and social interactions in riverside surroundings. These changes not only impact safety perceptions but also affect the socio-economic fabric of affected communities. The pervasive fear, trauma, and anxiety experienced by individuals are critical social outcomes of this conflict. The concept of a "landscape of fear" is well-established in ecology and applies to human populations in human-wildlife conflict contexts (Laundré et al., 2010). Interviews reveal a community where mental models are dominated by the threat of crocodiles, impacting daily activities such as sleep, children's play, and resource utilization. This psychological burden signifies a direct cost that aggravates other vulnerabilities. The trauma from crocodile attacks, coupled with the chronic stress of living in fear, diminishes the community's human capital and collective ability to respond effectively. This aligns with human-wildlife conflict theory, highlighting the significant impact of "psychic costs" on decision-making and well-being, alongside direct economic losses (Barua et al., 2013).

Economic loss and livelihood disruption

Loss of livelihood

The loss of livelihood in the area is a critical consequence of crocodile attacks on people. Many inhabitants rely heavily on agriculture, fishing, and livestock farming, which are severely disrupted by these incidents. Crocodile attacks not only cause physical harm to victims, reducing their ability to work and generate income, but also result in the loss of domestic animals, further worsening economic suffering. The fear of attacks limits access to riverine resources vital for farming and fishing, leading people to alter or abandon traditional livelihoods.

> "*Livelihoods based on the river are common in the area, with fishing being a significant part of the local culture. Inland fishing is a common practice to meet our fish requirements and serves as a source of income. However, the presence of crocodiles in the river has posed a threat to our fishing activities, impacting our livelihoods and cultural practices*." (Male, 48 years old, SI- GGS)

Medical expenses, physical disabilities resulting from attacks, and psychological trauma contribute to the economic burden on affected families, leading to protracted disruption of livelihoods. Notwithstanding efforts by some communities to offset losses through alternative income sources, the economic impacts remain a significant barrier to sustainable development in the region.

> *"I am a cattle farmer who produces curd. We used to bring our cattle to drink water, and they would often stay near streams for mud bathing. However, a year ago, one of our cattle was attacked and eaten by a crocodile, which has made us fearful of keeping our cattle near the river. This has posed a significant challenge to our livelihood as we are unsure of where crocodiles may be present."* (Male, 67 years old, SI- GG)

Livestock predation and related economic costs

Livestock predation by crocodiles in the area results in significant economic costs and social impacts on the local community. Crocodiles often attack and kill domestic animals like cattle and dogs, which are essential to the livelihoods of rural households reliant on farming and animal husbandry. This loss not only reduces the immediate economic resources of families but also jeopardizes their long-term income stability, as livestock play a vital role in providing food, labor, and financial security.

> *"We are afraid to keep our cattle near the river as we do not know where the crocodiles are located. Recently, there have been reports of cattle being lost due to crocodile attacks, resulting in significant economic losses for us. Our family is now unable to meet our milk needs ourselves."* (Male, 55 years old, SI- GGN)

The economic burden of livestock predation by crocodiles in the Nagoda area includes the cost of replacing lost animals and the reduction in productivity of milk, meat, and labor. In addition to the direct financial losses, livestock predation also contributes to community fear and insecurity, escalating human-wildlife conflict. This stress can result in retaliatory measures against crocodiles, hindering conservation efforts and perpetuating a cycle of conflict and economic challenges. To address these issues, effective management strategies and compensation mechanisms are essential to minimize costs and promote peaceful coexistence between humans and crocodiles in the region.

> *"We have no choice but to address this issue. We have repeatedly informed the parties responsible about the need to protect us from crocodiles and provide a solution. However, our concerns have been ignored. Without a viable solution, people are considering taking matters into their own hands and killing these animals. This is not just due to economic losses but also out of fear and anxiety."* (Female, 44 years old, SI- GGS)

Impact on agriculture along the riverbanks

The crocodile issue in this area has had a negative impact on agriculture along the riverbanks. The presence and behavior of crocodiles near agricultural lands pose safety risks, restricting farmers' access to their fields, particularly those near the Gin Ganga River. This hinders farmers from carrying out essential farming activities like planting, weeding, and harvesting, resulting in reduced agricultural productivity.

> *"Previously, we used to harvest a variety of vegetables, bananas, and other useful plants along the riverbanks. The fertile soil in this area made it ideal for cultivation, providing us with a convenient source of fresh produce. This practice was successful and beneficial for meeting our vegetable needs. However, this tradition has now disappeared, and we have missed out on this valuable opportunity."* (Male, 56 years old, SI- GGN)

The fear of crocodile attacks discourages farmers from working in specific areas or during certain times of the day, disrupting agricultural cycles. Flooding caused by crocodile habitats can also harm crops and soil quality, exacerbating the challenges faced by farming communities. These disruptions lead to economic losses as agricultural productivity declines and livelihoods dependent on farming become more precarious.

> *"Due to the presence of crocodiles in the river banks, we have completely abandoned our agricultural activities in those areas. The risk of crocodile attacks during both day and night has made it too dangerous for us to continue farming there. This has severely disrupted our agricultural cycle along the riverbanks."* (Male, 44 years old, SI- GG)

Environmental and ecological interactions

Encroachment into crocodile habitats and habitat degradation

The riverbank and nearby areas are natural habitats for crocodiles. While there have not been historical issues related to crocodiles in this river, encroachment into their habitats and habitat degradation have led to amplified crocodile attacks and related social problems for local communities. As human settlements and agricultural activities expand closer to the riverbanks and wetlands, traditional crocodile habitats are being encroached upon, resulting in a greater overlap between human activities and crocodile territories. This disruption of the crocodiles' natural environment leads to habitat loss and fragmentation, forcing crocodiles to venture into human-inhabited areas in search of food and shelter. This increased proximity raises the likelihood of human–crocodile encounters and attacks, causing fear and insecurity within the community. Villagers are compelled to change their way of life, limiting their access to natural resources and agricultural land near the river, which in turn impacts their economic stability.

> *"In the past, the issue of crocodiles was not present in the area, but now we are facing this problem. The river, riverbank, and nearby wetlands have become habitats for crocodiles. While crocodiles have a right to live, they pose a serious threat to humans. They have started moving closer to human habitats in search of food, leading to a dangerous situation of human-crocodile response in the area."* (Grama Niladhari, Female, 52 years old, KII- GGN)

People living near degraded habitats face the challenge of ensuring their safety while dealing with disruptions to their livelihoods due to restricted access to their lands and water resources. This situation has also resulted in retaliatory killings of crocodiles, complicating conservation efforts and potentially disrupting the ecological balance. Habitat encroachment and degradation not only escalate human-wildlife conflict by increasing crocodile attacks but also have cascading effects on community well-being, economic livelihoods, and biodiversity conservation in the area.

> *"Humans have the right to life, and animals also have the same right. We cannot violate animal rights to protect human life. This balance must be maintained with proper safety measures in place. However, people now face the dual burden of ensuring safety while engaging in activities related to their livelihoods near rivers and surrounding areas. There is a threat of crocodile killings by the community, which challenges environmental conservation efforts."* (Forest officer, 48 years old, KII- NDS)

Impact of human activity on crocodile behavior

The increasing human–crocodile conflict in the area is not an accidental occurrence but a direct and predictable result of a chain of ecological and behavioral changes, mainly caused by human activities. This conflict arises from an important change in the crocodile's natural habitat and food chain, which subsequently influences its behavior. This alteration erodes the traditional separation between humans and crocodiles, resulting in a rise in negative interactions.

The main cause of this conflict is widespread habitat modification and resource competition. Wetlands and natural riverbanks are being converted for agriculture, aquaculture, and residential development, leading to the destruction of the crocodile's natural habitat. This encroachment has two main impacts: it eliminates critical basking and nesting sites for crocodiles, pushing them closer to human settlements, and it reduces the population of their natural prey, such as fish, amphibians, and reptiles (Sazatornil et al., 2016). Additionally, overfishing in rivers and estuaries further diminishes the crocodile's primary food source. With their natural prey base shrinking, crocodiles are forced to find alternative food sources to survive.

> *"The Gin River in Sri Lanka was known to be free of crocodiles for a long time. However, due to various factors, the river is now facing a threat. Rivers like Nilvala are overfished, leading crocodiles to seek alternative food sources and habitats due to the destruction of their usual habitats. Additionally, the presence of human waste, including hospital discharges, in the river has created an environment conducive to crocodile habitation."* (Male, 58 years old, KII- NDS)

Many human activities unintentionally train crocodiles to associate people with food. The common practice of discarding fish offal, kitchen waste, and animal carcasses into waterways near homes or fishing landing sites has created a powerful and consistent food reward. Through associative learning, crocodiles have begun to link human presence, sounds, and settlements with an easy meal. Furthermore, the daily, non-threatening activities of bathing, washing clothes, and collecting water led to habituation, where crocodiles lose their distinctive wariness (neophobia) of humans. This loss of fear, combined with a conditioned food association, has transformed crocodiles from reclusive predators into bold opportunists that actively patrol areas of high human activity.

At the heart of the conflict is the direct overlap in the use of the Gin Ganga Resource System by humans and crocodiles. The data indicates that crocodile attacks are not accidental but are focused on where human activities (bathing, fishing, washing) encroach upon critical crocodile habitat (pools, basking sites, nesting areas). This creates a "spatial trap" (Pooley et al., 2017). This forces a behavioral shift, where crocodiles begin to perceive livestock and humans as alternative prey, a phenomenon documented in other crocodilian populations (Wallace et al., 2011). This creates a positive feedback loop: human activity degrades habitat and reduces natural prey, leading to increased crocodile attacks on humans/livestock, which in turn increases human fear and leads to retaliatory intentions, further destabilizing the system.

Social and community dynamics

The conflict between humans and crocodiles in the area goes beyond a simple wildlife management issue. It is a momentous social crisis that restructures community dynamics and daily practices. The continuous risk of crocodile attacks interrupts conventional patterns of life, creating a culture of fear that limits access to water for essential activities like bathing, laundry, and work. This situation undermines economic security, particularly affecting marginalized groups, including women and fishermen, and leads to conflicts within the community over how to address the problem.

Impact on social rituals and cultural activities connected to the river

Crocodile attacks in the area have significantly obstructed social rituals and cultural activities related to the river, which are critical elements of community identity and unity. The Gin Ganga River holds cultural significance as a site for rituals such as bathing during religious festivals, washing clothes, and communal gatherings rooted in local customs. These activities promote social cohesion and cultural heritage, often passed down through generations. The rituals linked to the Gin Ganga reproduce a blend of ancient animistic beliefs, Buddhist practices, and practical agrarian traditions. The river is not merely a water source but a sacred, living entity intertwined with the cultural heritage of the area.

> *"Historically, the river holds significant importance as it is believed to be under the protection of local deities such as Devas and Yakshas, who must be appeased for their blessings. The river serves as the primary source of water for agriculture, especially paddy cultivation, and daily life in the region, leading to its reverence out of necessity and gratitude. This reverence is reflected in various rituals, with the most significant one being the "Gangä Röyada"(ගඟ රෝයද)[1] or the "River Vow." However, this ritual has now ceased to be practiced."* (Male, 70 years old, SI- GGN)

Due to the threat of crocodile attacks, participation in river-related rituals and cultural events has declined significantly. Fear of encounters with crocodiles has limited access to riverbanks for religious and social activities, disrupting traditions that depend on proximity to water. This avoidance not only impacts individual spiritual practices but also weakens community bonds as shared cultural experiences diminish. Some communities may adapt rituals or move them to safer locations, but these changes often result in a loss of the original spiritual and cultural significance associated with the river, leading to a decline in cultural heritage.

> *"Water is crucial for the paddy fields in the area. The beginning and end of the cultivation seasons (Yala and Maha) are marked by community rituals. One such ritual is Gam Maduwa (Village Pavilion). There are some sub-rituals related to the river in the Gam Maduwa.[*] However, we have now stopped these sub-rituals involving the river and instead have chosen alternative places such as small streams, which do not fulfill the traditional ritual properly. In the past, all villagers would gather near the river for these practices, but this is no longer the case."* (Female, 57 years old, SI- GG)

The disruption of river-centric rituals reflects broader social anxieties and shifts in community dynamics, as safer alternatives may not be as accessible or meaningful. Additionally, the psychological impact of the risk of attacks pervades these cultural contexts, leading to a lasting sense of vulnerability. As a result, the relationship between people and their environment becomes strained, impacting cultural identity and the social cohesion of the community.

Conflicts or cooperation between community members over resource access and crocodile management

Conflicts and cooperation among community members regarding resource access and crocodile management in the area are complex social dynamics influenced by crocodile attacks and their broader impacts. The presence of crocodiles near vital water bodies and riverbanks limits access to essential resources like fishing grounds, agricultural lands, and water for domestic use. Some community members suffer economic losses and safety risks from attacks or livestock predation, leading to increased tensions and conflicts over the utilization and control of these scarce and hazardous resources.

> *"We are unable to fish or harvest vegetables along the riverbanks due to this issue. We have resorted to using common land for these activities, which has led to conflicts within the community. We are now*

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[1]This is a form of votive offering (bara) made to the river deity, typically to seek healing, give thanks for a wish fulfilled, or ask for protection. The purpose of this ritual is to cure illnesses (especially in children), to give thanks for the birth of a child, or to seek general prosperity. A local shaman or elder (often a Kapu Mahattaya or Maduwa), or sometimes the family themselves, conducts the ritual at a specific, traditionally recognized spot along the riverbank. Offerings (pujawa) are prepared, which typically include: 1) A "Röyada Mal Pela" (රෝයද මල් පෙළ): A string of seven specific flowers (like Manori, Ratmal, and Ankenda). 2) A "Panduru": A tray made of banana leaves holding seven small mounds of cooked red rice (kekulu haal), seven small oil lamps (pahan), and seven betel leaves. Further in includes Juggery, bananas, coconuts, and sometimes a small, symbolic raft made of plantain stems. Chants (kavi) are recited, invoking the river deity and stating the purpose of the vow. Then the offerings are then gently placed into the flowing water, allowing the river to carry them away, symbolizing the acceptance of the offering by the deity.

[*]A community ceremony is held to seek blessings for a successful harvest and to ensure ample water from the river. This involves making offerings to the village deity (Gam Deviyo) and the river deity

at risk of conflicts with fellow community members as well as crocodile attacks." (Female, 68 years old, SI- GGN)

At the same time, there are examples of cooperation among community members who recognize the need for collective action to mitigate risks and succeed in crocodile populations sustainably.

This cooperation often involves sharing knowledge about crocodile behavior, implementing safety measures, and participating in community awareness and outreach programs aimed at reducing attacks.

> *"However, we need to protect ourselves as no responsible parties have addressed this issue for a long time. They simply put up notices warning about crocodiles without taking proper action. This is not an effective way to address the problem. Currently, people in the area are taking matters into their own hands to mitigate the risk, both legally and illegally. The younger generation is particularly active in raising awareness about crocodile behavior and the issue at hand. They are also attempting to trap crocodiles to ensure the safety of the community."* (Male, 45 years old, SI- GGS)

Conflicts may arise when individual interests clash with collective measures, such as when some inhabitants oppose boundaries on resource use or engage in retaliatory killings of crocodiles in response to attacks. These conflicting attitudes highlight the challenge of balancing livelihood needs with conservation goals in an area where human-wildlife boundaries are blurred. Effective management in Nagoda depends on fostering inclusive community engagement, ensuring equitable resource access, and improving communication to build trust and promote coexistence between humans and crocodiles in the landscape.

The actors in this SES, the local communities, experience the conflict most acutely through damage to their livelihoods and cultural practices. The findings show severe impacts on fishing, riverbank agriculture, and livestock rearing, which are primary sources of income and livelihood generated from the resource system. This aligns with global HWC research where the economic costs are often borne disproportionately by local communities (Barua et al., 2013). More profoundly, the conflict has led to the disintegration of deeply embedded social norms and cultural values. The termination of the *Gangä Röyada* and the alteration of the *Gam Maduwa* ceremony represent a catastrophic erosion of cultural heritage. These rituals are not merely superstitions; they are fundamental governance systems that have historically regulated human interaction with the river, enforcing respect and sustainable use (Torres et al., 2018). Their collapse signifies a breakdown in the traditional institutional framework that once managed the social-ecological relationship, leaving a vacuum filled by fear and insecurity.

Community responses and coping strategies

Community-based early warning and collective response systems

In this strategy, the focus is on how the community organizes itself to share information and respond to threats, transforming individual information into collective security. The risk is shared by the whole community living along the river, making collective coping strategies the most effective. These strategies rely on communication and mutual aid. Important components of this approach include Information Sharing, Collective Monitoring, and Unified Response Protocols implemented within the community.

> *"The community here employs various coping strategies to deal with crocodile encounters. They have an informal early warning system where sightings of large or aggressive crocodiles are immediately reported to neighbors and village leaders. Fishermen and farmers working on the river serve as a surveillance network, keeping track of crocodile locations and movements. In case of an attack or a missing person, the community follows a pre-established protocol involving mobilizing search parties, using boats and nets, and informing authorities. This collective action ensures a structured response during a crisis and offers social support to the affected family."* (Disaster Management officer, Male, 37 years old, KII- NDS)

Spiritual deterrence and ritualistic coexistence

This theme examines how the community organizes rituals as a psychological and cultural tool to manage fear, assert control, and establish a "contract" for coexistence with the powerful spirit believed to govern the crocodiles. For communities along the Gin Ganga, the crocodile is more than a predatory reptile; it is a powerful spiritual entity deeply rooted in the local cultural cosmology. This perception serves as the basis for a sophisticated coping strategy that goes beyond mere physical avoidance. Instead of seeing the river as an antagonistic environment to conquer, the community has developed a system of ritualistic coexistence, a set of symbolic practices and beliefs aimed at negotiating a shared existence with this formidable creature. This

approach depends on spiritual deterrence not through direct confrontation, but through conciliation, respect, and a continuous ritual dialogue with the forces believed to govern the natural world. In this framework, the crocodile is frequently seen as the guardian or physical manifestation of the river deity, making any attack not a random act of nature, but a significant event within a moral and spiritual order. Therefore, the community's primary strategy is to live in a state of ritualized harmony, using agreed ceremonies and taboos to ward off misfortune by maintaining a positive relationship with the spiritual realm that governs it.

> *"In history, crocodiles were considered sacred animals and symbolized as the vehicle of the Ganga Deviyo or Koholé Deviyo. It was believed that harming crocodiles was not advisable, as they would not harm humans if left unharmed."* (Male, 70 years old, SI- GGN)

Making Vows (Gangä Röyada) is a specific coping strategy in the region. Before engaging in high-risk activities, such as a fishing expedition in a known crocodile area, individuals or families may perform a small vow to the river deity. They offer flowers, betel, or rice, seeking protection for a safe return.

> *"Before engaging in activities in the river, such as fishing or sand mining, we make a vow not to harm the river significantly. We offer flowers (Manori, Ratmal, and Ankenda) and betel, seeking protection. We believe that by doing so, we will be safeguarded until we return home."* (Male, 45 years old, SI- GGS)

Taboos and prohibitions are specific coping mechanisms followed by the community in the area. They believe that polluting the river or showing disrespect, such as urinating in it or using foul language on its banks, will anger the deity and potentially lead to a crocodile attack. This cultural belief serves as a strong deterrent for keeping the river clean and maintaining a respectful attitude. By adhering to these strategies, the community believes that they can avoid harm from the crocodile.

Behavioral adaptation and spatial risk management

People use this strategy based on a practical understanding of crocodile behavior and habitat, which leads to rules that minimize encounters. Through observation and tragic experiences, community members have learned when and where crocodiles are most active. Their coping mechanisms are designed to manage this spatial and temporal risk.

One of the main mechanisms identified is temporal avoidance, which involves avoiding the river at dawn, dusk, and night when crocodiles are most actively hunting. This unwritten rule has been passed down through generations.

> *"My grandfather passed down a valuable lesson to me, which I now share with my grandchildren: the river belongs to the kimbula (crocodile) after sunset. We can enjoy it during the day, but they reign over it at night. This straightforward rule has safeguarded our community for many generations."* (Male, 70 years old, SI- GGN)

Another respondent elaborated:

> *"I always bring my boat back well before dusk. I avoid being on the water when it's getting dark because that's when the crocodiles are most active. It's not fear, it's just being cautious*." (Male, 39 years old, SI- GG)

Location avoidance is identified as the next mechanism within the community. People mark specific high-risk zones, such as deep, muddy pools, areas near river bends, and spots with dense mangrove cover, as "forbidden" areas or areas requiring extreme caution when bathing, washing, or fishing.

> *"See that deep, dark pool under the Kumbuk tree? We believe that a crocodile will be there at any time. It is known as the Crocodile Pool. No one dares to go near or bathe there. Even the animals are wary of that place. We are familiar with every dangerous bend in this river."* (Male, 56 years old, SI- GGN)

A female respondent further explained:

> *"I tell my children they cannot play in the river, but they can bathe in the stream near the house. It is common knowledge that the river is not safe for swimming due to the presence of crocodiles."* (Female, 53 years old, SI- GG)

Discussion

The psychosocial burden: Living in a state of perpetual fear

The empirical data reveals that the community is experiencing profound psychosocial trauma stemming from both direct crocodile attacks and the pervasive, ever-present threat of danger. This finding is significant not merely for documenting psychological distress but for illuminating how existential risk becomes embedded in the fabric of daily life, fundamentally altering the relationship between communities and their environments. The data suggest that this trauma is not episodic or localized but has generated what can be described as a culture of fear, a pervasive orientation that shapes perception, behavior, and social interaction in ways that extend far beyond the immediate context of crocodile encounters. This culture of fear manifests in altered daily routines, restricted access to water resources, heightened vigilance, and the internalization of risk as a permanent feature of community life.

This pattern aligns substantively with global research on human-wildlife conflict, which increasingly recognizes the psychological impacts as a critical but systematically neglected dimension of conflict assessment (Barua et al., 2013). The significance of this alignment lies not merely in confirming existing findings but in highlighting how the psychological dimensions of conflict are often marginalized in policy frameworks that prioritize economic or conservation outcomes. As Barua et al. (2013) argue, the failure to address psychological impacts represents a fundamental gap in human-wildlife conflict scholarship and practice, perpetuating a cycle of suffering that is invisible to quantitative assessments focused on direct economic losses. The present study contributes to addressing this gap by providing empirical evidence from a context where psychological impacts are both acute and deeply embedded in community consciousness.

Livelihood disruption and deepening economic vulnerability

The responses have significantly affected the economic stability of the community, particularly in the fishing, agriculture, and livestock sectors. The decline in fishing activities, which are not only a cultural tradition but also a vital source of income, has had a direct negative impact on livelihoods. This situation is consistent with research conducted in other areas like Botswana and Nepal, where the presence of predators has forced communities to abandon productive lands and water sources, exacerbating poverty (Karanth & Nepal, 2012; Mbaiwa, 2018). Livestock predation poses a dual economic challenge: the immediate loss of valuable assets and the long-term expenses associated with preventing future attacks, such as securing alternative grazing and water sources for cattle. This underscores the concept of "hidden costs" in human-wildlife conflict, where the efforts to mitigate conflict can be as financially burdensome as the direct losses incurred (Treves et al., 2009). The abandonment of fertile riverbank gardens, seen as a "golden opportunity," underscores how safety concerns can result in the relinquishment of highly productive land. This exacerbates food insecurity and economic strain.

Erosion of cultural heritage and social cohesion

One of the most significant costs documented is the loss of cultural rituals and social practices associated with the Gin Ganga. The discontinuation of the *Gangä Röyada* (River Vow) and the alteration of the *Gam Maduwa* (Village Pavilion) ceremony signify a break in the sacred bond between the community and the river deity. This supports research by Torres et al. (2018) on the role of "cultural keystone species" and ecosystems, where the loss of a natural resource leads to the erosion of associated cultural knowledge and social identity. The river was more than just a physical space; it was a central pillar of cultural and spiritual life. The loss of these practices disrupts the intergenerational transmission of rituals, weakening social cohesion and collective identity. Additionally, the data shows increasing social conflicts over access to safer resources, highlighting how environmental stress can erode community solidarity, a phenomenon seen in other common-pool resource dilemmas (Ostrom, 2009).

Behavioral adaptation and community-led risk management

In response, the community has developed a sophisticated suite of coping strategies grounded in local knowledge. The practices of temporal and spatial avoidance are rational risk-management behaviors observed in communities coexisting with dangerous wildlife worldwide, such as in the Sundarbans with tigers (Dickman, 2010). The community's precise mental mapping of "crocodile pools" and their avoidance of the river during high-risk times showcase a profound understanding of crocodile behavior. The strategy of "Spiritual Deterrence and Ritualistic Coexistence," though culturally distinct, serves a universal purpose: offering a sense of empowerment and control during potential danger. These rituals serve as a psychological tool to manage anxiety by framing the interaction with crocodiles within a spiritual context (Whitaker & Srinivasan, 2020).

This strategy also enforces pro-environmental behavior, such as prohibiting river pollution, which aligns with broader conservation ethics.

The underlying drivers: Habitat encroachment and behavioral shifts

The conflict is primarily caused by human-induced ecological changes. Data indicates that habitat degradation in surrounding areas and the decline of natural prey are forcing crocodiles into the Gin Ganga, leading to more frequent interactions with humans. This aligns with the global trend where habitat loss and fragmentation are key factors in human-wildlife conflicts (Nyhus, 2016). The community has observed that crocodiles are losing their fear of humans and associating them with food, possibly due to waste disposal practices. This suggests a concerning trend of habituation and conditioning in crocodiles. This behavioral shift, documented in crocodilians by Abdul Gani et al. (2022), turns them from reclusive predators into bold opportunists. The conflict in Nagoda is not just a problem of crocodile presence; it is a symptom of a disrupted ecosystem where natural boundaries have been erased, leading to a dangerous proximity between humans and wildlife.

Conclusion

The findings in this overview show that the real "cost" of this conflict goes beyond just the number of incidents. It is evident in the ongoing erosion of community well-being. The psychosocial trauma experienced by residents, coupled with economic constraints and changes in daily behavior, has fundamentally altered the relationship between the people and their life-sustaining river. This has taken a toll on their social and psychological well-being. The river, once a source of nourishment and comfort, now instills fear, leading to the silent sacrifices made by a resilient community.

This research highlights the human-crocodile response in the Gin Ganga as a significant socio-ecological crisis, reshaping the relationship between the people of Nagoda and their river. The crocodile crisis has turned the once life-giving river into a source of danger. The community's perceptions are a mix of ecological knowledge and spiritual beliefs, shaping their response to the situation. While their adaptive behaviors and collective action show human resilience, these measures are temporary solutions with long-term consequences. The current strategies manage risk but fail to resolve the conflict, leading to ongoing economic, psychological, and cultural challenges for the community. To ensure a sustainable future, it is crucial to move beyond local coping mechanisms and involve external support and collaborative governance to address the underlying causes of this enduring conflict.

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Authors' Contributions

Pulsie Epa: Conceptualization, formal analysis, visualization, writing – original draft, and writing – review & editing. **Suranjith Gunasekara:** Formal analysis and writing – review & editing. All authors reviewed and revised the manuscript and approved the final version.

Statement of Originality and Plagiarism-Free Work

The authors declare that this manuscript is an original work, has not been published elsewhere, and is not under consideration for publication by any other journal. All sources have been properly acknowledged through appropriate citations and references.

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