Complex consequences of conservation success: Emerging human-tiger conflicts in Nepal

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Abstract

Between 1910 and 2010, range-wide tiger populations plummeted from around 100,000 to an estimated 3,200. Poaching, habitat destruction and human-wildlife conflict have all contributed to this dramatic decrease. In Nepal, the Bardia-Banke Complex, consisting of Bardia National Park (BNP) and Banke National Park (BaNP) and their buffer-zones, is a critical habitat to the Bengal tiger *Panthera tigris.* Conservation efforts in recent decades have contributed to increasing the tiger population. Despite this increase, no human fatalities associated with human-tiger conflict were reported in the decade prior to 2019: a crucial feature of conservation success. In 2019, ten reported human-tiger incidents resulted in seven human fatalities, three people badly injured, and one tiger taken into captivity. The question of why conflicts involving humans and tigers have suddenly increased requires urgent answers to inform future policy. The development and implementation of case-specific coexistence strategies is a prerequisite to the conservation of this iconic species. This paper explores the complex unintended consequences of conservation success and critically evaluates the circumstances that may explain this recent surge in human deaths and injuries.

Introduction

Globally, 20 out of 38 felid species are endangered due to diverse threats, including conflicts with humans (Macdonald & Loveridge 2010, Dhanwatey et al. 2013). Inskip & Zimmermann (2009) found that 75% of felid species globally are affected by conflict, with only 31% of conflict interventions scientifically evaluated. van Eeden et al. (2018) highlighted that some conflict interventions have the potential for success when used on a case-by-case basis, including livestock guardians, and financial incentives. The total number of individual felids and people impacted globally by human-wildlife conflict (HWC) has not been estimated.

Here we define human-felid conflicts to encompass felid incidents that involve both humans and livestock. For clarity, we distinguish between human-tiger and tiger-livestock incidents. Collectively, all the categories are components of human-felid conflict.

Human-felid conflicts threaten both felid conservation success, and human livelihoods and wellbeing in Nepal, with historical human-tiger conflicts in Chitwan National Park (Acharya et al. 2016, Bhattarai et al. 2019, Lamichhane et al. 2017). Little is published on human-tiger incidents in the Bardia-Banke complex. Bhattarai & Fischer (2014) reviewed compensation records from BNP, where payments were offered to families following the death of family members or livestock. From 1994–2007, twelve people were killed and four were injured by

Accepted by CatNews September 2020

tigers (an average of one event per year). By comparison, on average, four people a year are killed by tigers in Chitwan National Park (CNP), which currently has more tigers than BNP (CNP = 93, BNP = 87) (Dhungana et al. 2018, DNPWC & DFSC 2018), and a higher human density (CNP = 261.69 km^2 and BNP 210.65 km^2) (CBS 2012) and population than BNP (CNP = 300,897, BNP = 221,496) (Humdata 2011). The tiger population in Nepal is likely to increase due to the leadership of the Nepalese government and its role in the Global Tiger Recovery Programme (GTRP). The GTRP gives a target for all tiger range countries to double global tiger populations by 2022 from its population estimates in 2010 (GTIS 2012). The estimated tiger population from the 2018 tiger census was 235 across Nepal (DNPWC & DFSC 2018). Both the tiger population and human population have increased in the Terai Arc Landscape (TAL), where 7.5 million people live (population density 391.5 km^2) (MFSC 2015), increasing the probability of encounters between people and wildlife. If the current levels of conflicts and associated human and felid injury and death in the Bardia-Banke complex are not understood and mitigated, there is an obvious risk of escalation – to the serious detriment of local communities, and the tigers with which they cohabit.

Method

Living with Tigers Project LWT field staff in collaboration with the National Trust for Nature Conservation NTNC collected details of the incidents several months after the incidents took place. The following information was collected: name, date, GPS location, human gender, human age, community forest name, time of conflict event, location of conflict event, group size during the event, human activity before event, status of person after event, species involved, animal gender, animal age, animal injured, government actions, compensation and any other associated information such as livestock killed. The data were analysed in Microsoft Excel.

Emerging conflict in BNP-BaNP complex in 2019

Characteristics of the conflict events

In 2019, nine human-tiger incidents were recorded in the Bardia-Banke Complex, resulting in seven human fatalities and three severe injuries. One person was killed or injured in each incident except in one, where two people were involved: one was killed and the other injured (Table 1).

Table 1. Age and sex of humans involved in incidents in the Bardia-Banke complex in 2019.

Age	Women	Men	Total
>60 years	2	2	4
40-60 years	1	2	3
20-40 years	2	1	3
Total	5	5	10

The number of human-tiger incidents increased in the latter half of the year, with the maximum in November (Fig. 1). The events occurred in national parks (NP), buffer zone forests (BZ), community area in buffer zone or forests outside the BZ.
Bardia:

- One in February, Sitapur village, Simalkhalla community forest (BZ)
- Two in July–August: both in Geruwa district – one event in Bindrabahini community forest and one event in Gola village, Dangpur community forest (BZ)
- Three in September – early October, two in Bhagati community forest (BZ) and one in the agricultural fields outside the forest.

Accepted by CatNews September 2020

- One inside the National Park, near Gaida Machan in November (NP)

Banke:

- Two occurred in the buffer-zone in November (BZ)

The sample size is too small to indicate any pattern in seasonality or incident time (05:00, 07:30, 10:00, 11:30, 12:20 midday, 15:00, and 17:30 h), however it does show incidents occur throughout the day. For example, in November, dusk will be approaching at 17:00 h – the time of one event (Fig. 1). Early morning and late evening are considered the principal times when tigers hunt, although this varies widely (Carter et al. 2015, Macdonald & Loveridge, 2010). It would be prudent to avoid being in the forest when tigers are most active. Generally, tigers and leopards are inactive around midday, but if taken by surprise, they can be defensive. Seven incidents occurred in the buffer-zones (two in Banke BZ and five in Bardia BZ), whereas one incident occurred in the core area of BNP (park staff) and two in the forest outside of the protected area (Fig. 1 & 2). There was no particular relationship to distance from the national park boundary or the villages. However, five of the events occurred inside or close to a community forest, which are managed by local communities (DNPWC annual reports), suggesting the use of these habitats by tigers. The camera trapping of the LWT project and NTNC in community forests in BNP confirms tigers are utilising these habitats (Fig. 3).

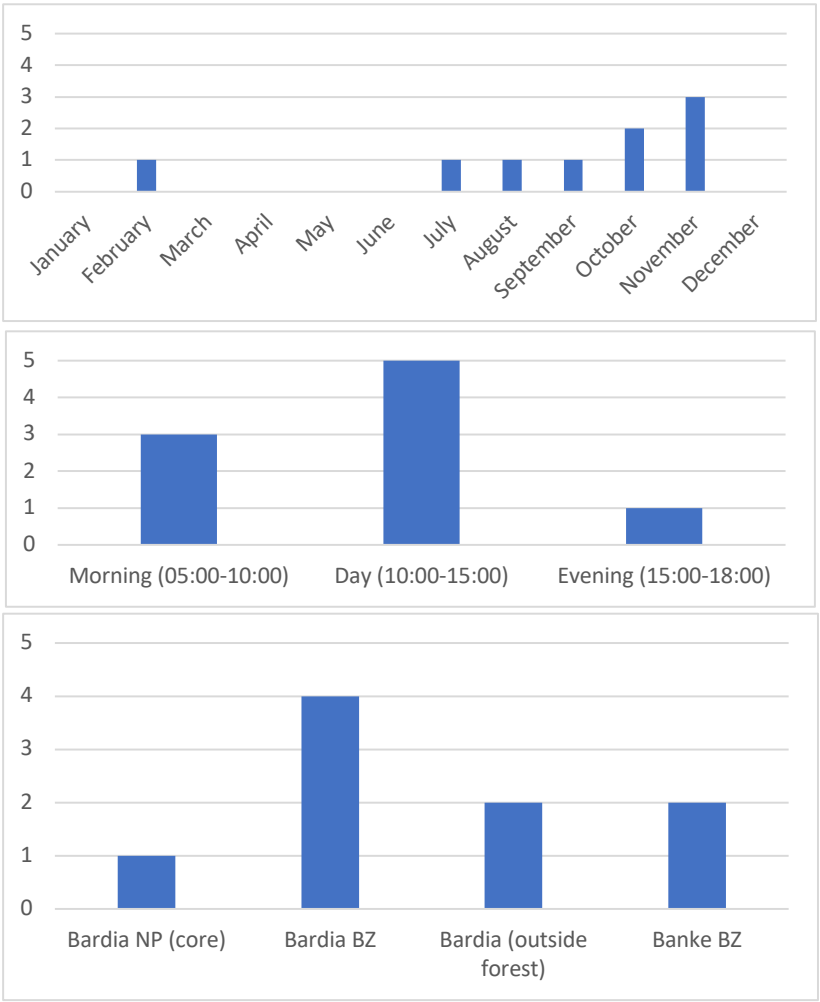

Fig.1. Spatial and temporal distribution of human-tiger incidences in the Bardia-Banke complex in 2019, a) Monthly distribution, b) Time of the incidents, c) Location.

Accepted by CatNews September 2020

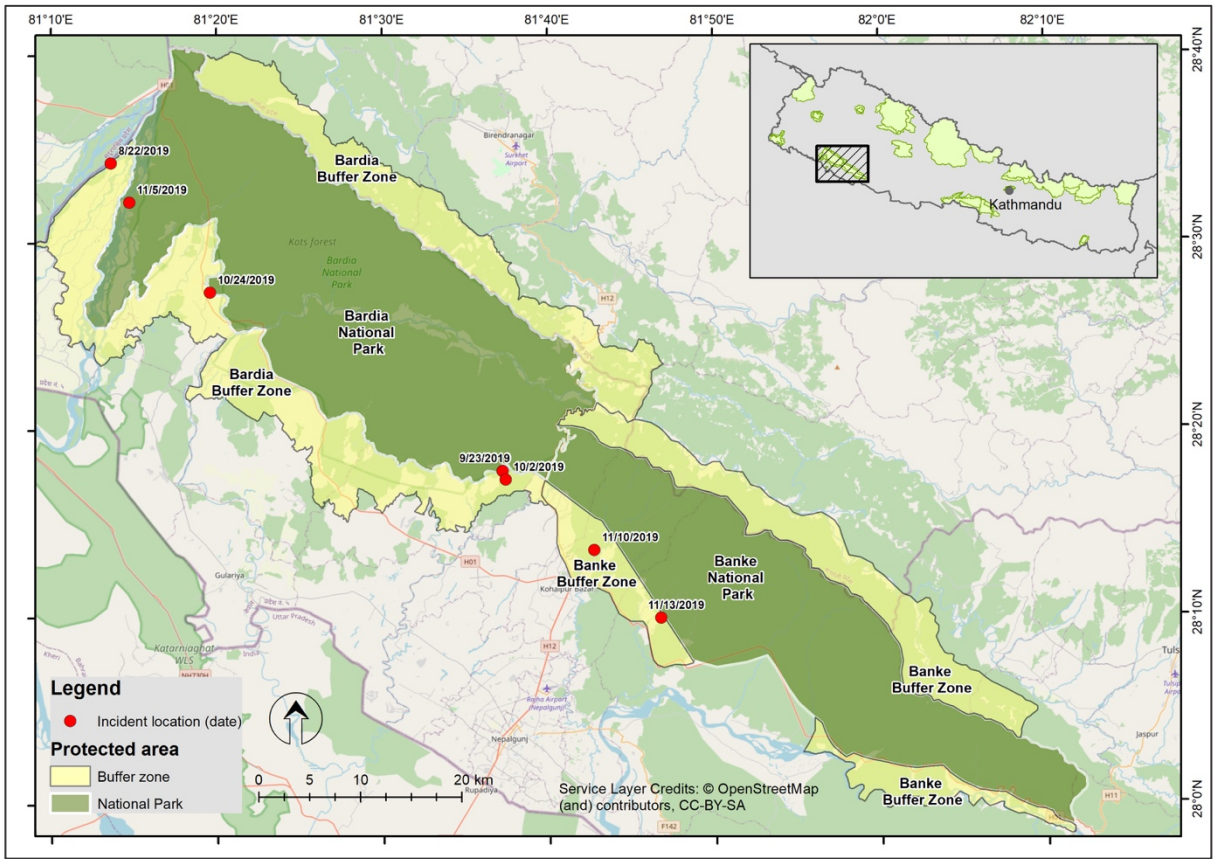

Fig.2. Bardia National Park and Banke National Park with locations of human-tiger conflict event locations (red). Seven incidents are shown, as three events did not have accurate location information. Showing where this Complex occurs within Nepal. Dates are in MM/DD/YYYY.

Fig.3. Tiger recorded in grassland near a community in Bardia National Park during the Living with Tigers research (Date is shown MM/DD/YYYY).

In the quest for general insights and recommendations to reduce risk, we now summarise the salient features of each incident.

Accepted by CatNews September 2020

The tigers

In BNP, the locations and times of the incidents suggest that different tigers are involved:

- One in Sitapur in February, a female tiger, had previous injuries. Members of the community reported seeing a female tiger with a cub in the vicinity, raising the possibility that she was defending her cub.
- The event in July, in Bindrabahini community forest, the tiger's sex, age and condition was unknown.
- Another individual, in Dangpur community forest, Gola, in August, was identified as an old male. Members of the Dangpur community regularly reported tigers at nearby water, perhaps evidencing a location where the risk of encounters is high.
- Another individual that visited Bhurigan village in September, was an old male, and visibly injured, and was previously seen near houses. Possibly the same individual in Gola.
- The two events in October in Bhagati community forest probably involve the same tiger, a male, but neither his age nor his condition were ascertained. This tiger was captured and placed into captivity.
- The last event in BNP core area, in November, involved an adult male tiger, possibly the same individual in Geruwa in August.
- In the buffer-zone of BaNP, two incidents, probably involving the same tiger, occurred one day apart (November 10 & 11, 2019) at about 10 km distance. The tiger's sex, age and condition were unknown.

A study in Chitwan concluded that non-territorial tigers (dispersing young or old, evicted individuals), are most likely to be involved in incidents with humans. Illness or injury may be other precursors to incidents. Visible injuries can include scars and injuries from fighting other tigers, carnivores or from prey (Lamichhane et al. 2017). Insofar as juvenile dispersal and territorial displacements are predictors of risk to people, this risk may be exacerbated as an unwelcome outcome of the increase in tiger numbers as a result of effective conservation measures. Ultimately, space for tiger territories will become a limiting factor within the parks, buffer-zones and adjoining forests. Mitigating conflict and, most especially, human injury, death, and even disquiet, is a priority.

The people

People of various ages and both sexes were involved in these incidents. Their behaviour, rather than age or sex, may be an important predictor of risk. The first and second people involved in human-tiger incidents were on the same occasion at 18:00 h. An older man collecting grass for his goats 30 m from his house, alone, encountered a tiger. He escaped with the help from a neighbour (victim two), but both men were injured, and the first died on the way to the hospital. The third victim, male, was injured during an incident in July in Geruwa community forest. Victim four, in August was one of a group of three women collecting grass near water at 12.20 h, at a location where tigers were regularly sighted. The victim died instantly; her companions were unharmed. Victim five, in September was also one of a group of three women collecting grass from a community forest, where the incident occurred at 11.30 h, her two friends came to help, and the tiger left. The victim was taken to hospital and survived. The sixth incident occurred nine days later, in October, in the same community forest, again one of a group of women collecting grass for livestock at 17.30 h. During this incident, a male tiger killed three goats, ands injured the women, who died at hospital. Victim seven, in October, attempted to intervene when a tiger was predating his pigs at 05.00 h. He died immediately. In the preceding days, a tiger had been sighted at other houses in that village ambushing livestock. The tiger was removed by BNP and NTNC into

Accepted by CatNews September 2020

captivity. The eighth victim in November, male and staff member of BNP, was collecting grass for captive elephant fodder and was accompanied by an elephant and two other staff members. The incident occurred at 11.30 h and the man died immediately. The last two incidents in BaNP buffer zone occurred one day apart in November. Two elderly women were killed while they were collecting forest products, one at 16:00 h and the other at 12:30 h. In acknowledgement of the personal tragedy and loss to a household of wage-earners, government relief of 1 million Rupees (~$10,000) was paid to the bereaved families.

Conclusion

Even though the sample size is small, a sudden rise in human-tiger incidents requires close attention and it is important to mitigate at the earliest possible opportunity. The most obvious common denominator of these incidents appears to be the behaviour of the people: they were invariably engaged in livestock herding or collecting grass/fodder, where this is consistent with previous research, where 45% of conflict incidents (2003–2013) in CNP occurred while collecting natural resources (Silwal et al. 2017). These risks could be mitigated by implementing safe working practices, obviating the need to collect natural resources from the forest and constructing predator proof pens. We report elsewhere the findings of the LWT project (Fitzmaurice et al. in prep), which, recommend increasing alternative fuel sources, providing alternative livestock fodder habitat and increasing household income to reduce the need to spend time inside the forest collecting resources.

As is standard practice in the treatment of serious injury, a quick response is crucial for increasing the chances of victim's survival (Suk Na & Banerjee 2015, Lankester 2008). Three victims died on the way to hospital and one more died at hospital. This need is particularly evident in the Terai Arc Landscape, because risks also arise from elephants, leopards and rhinos (Acharya et al. 2016). Local medical centres could provide emergency treatments and counselling for traumatised victims. The published literature clearly indicates that human-felid conflict, for example, over predation on livestock, can involve grievous and even fatal injury to people, and provoke retaliatory killing of tigers. One study in Bangladesh documents villagers killing tigers to protect themselves and livestock, and out of revenge for previous conflict events (Saif et al. 2016). In Nepal, such retaliatory killing of tigers is uncommon (Lamichhane et al. 2017). Clearly, this remarkable tolerance is likely to be eroded if conflict cannot be mitigated and risks to human life radically reduced.

What solutions can save tigers and people?

Amongst many potential conflict interventions, the following seem promising in this context: economic incentive schemes, guarding dogs and compensation schemes; in contrast translocations appear generally ineffective (Inskip & Zimmermann 2009). Each method must be customised to the particular local circumstances, as had been the goal of the Living with Tigers Project and interventions by the National Trust for Nature Conservation (NTNC). That experience leads us to recommend, in collaboration with all stakeholders:

1. A regular monitoring system should be established, featuring participatory camera trapping in the community forests and early warning to the villagers when tigers are active.
2. The camera trapping could be combined with footprint identification to monitor tigers. The WildTrack (2019) footprint database for tigers and leopards, started by the LWT project in Nepal, could be continued. This facilitates rapid identification of a conflict individual and matches footprints and camera trap images from DNPWC/NTNC and other camera trapping projects across CNP, BNP and BaNP.

Accepted by CatNews September 2020

3. Social science research should investigate the characteristics of people most at risk and seek to minimise it.
4. Investigate both spatial and temporal overlap in activities of people and these felid species, to identify hotspots of risk where education and training can be focused on safe working practices.
5. Predator proof pens should be constructed to reduce livestock predations and perhaps also reduce the motivation for felids and other livestock predators to visit communities.
6. Behaviour change campaigns with communities to encourage safe working practices should be offered to all ages.
7. A post conflict event strategy should be developed, featuring rapid response teams.
8. Local medical centres should be created.

Acknowledgements

The Living with Tigers Darwin Initiative Project (Ref. no. 23013), run by Chester Zoo in partnership with Oxford University's Wildlife Conservation Research Unit (WildCRU), Green Governance Nepal NGO, the Nepalese government's Department of National Parks and Wildlife Conservation (DNPWC) under the Ministry of Forests and Environment, National Trust for Nature Conservation (NTNC) and eight communities across Bardia and Chitwan National Parks, aims to reduce human-felid conflicts and poverty in Nepal (Chester Zoo 2019). Thanks must go the LWT field team, Ram Krishna Chaudhary and Gautam Raj Chaudhary and the Director of Green Governance Nepal, Kiran Timalsina.

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Accepted by CatNews September 2020