

Wild versus Domestic Prey in the Diet of Reintroduced Tigers (*Panthera tigris*) in the Livestock-dominated Multiple-use Forests of Panna Tiger Reserve, India

The data was used to publish the above titled article in Plos One

Methods Used to analyse the data

Study Area

Our study was carried out in the PTR (24° 274' N to 24° 905' N latitude; 79° 556' E to 80° 273' E longitude), which is a protected area that is located in the Bundelkhand region of north-central Madhya Pradesh, India. The reserve covers a 1645 km² area and is divided into two management units, a core zone and a multiple-use buffer zone (Fig 1). The core zone is 550 km², while the buffer zone is 1095 km². Human activity is restricted and natural resource extraction is prohibited in the core zone, whereas the buffer zone is a multiple-use zone. The tiger reserve is approximately 30 km at its widest (range: 10 to 30 km) and approximately 100 km in length (Fig 1), and is surrounded by multiple-use and human-dominated lands. Please see S1 TextS4 Appendix for information on the climate, geography, and vegetation composition of the area.

Fig 1 Map of the study area, the Panna Tiger Reserve. The core and multiple-use buffer zones, villages, and water bodies are shown. The circles and triangles represent the spatial location of wild and domestic prey items killed by 10 radio-collared tigers between 2009 and 2014.

Traditional livestock management practices

Human presence and activity is high up to a 2 km distance from the centre of the villages during the daytime (07:00 to 17:00), with activity dropping between dusk to dawn (17:00 to 7:00). Water is a scarce resource in the study area, with reliable water bodies being limited. Consequently, people must share the same water bodies with their livestock and wildlife. Herders graze livestock up to a distance of 5 km from the village centre, with travel distances being highest during winter and rainy season to access good grazing sites and to keep cattle away from crops in the fields. This reverses in the summer months when temperatures get extremely hot and because livestock can also graze in fallow agricultural fields in villages. We examined the response of tigers using the buffer zones to these conditions near villages and water bodies.

Distribution of livestock in the PTR

The presence and distribution of livestock in PTR are influenced by local husbandry strategies and prevailing cultural practices [9, 2921]. Consequently, livestock that graze in the forests of the PTR buffer zone are grouped into three categories: (1) feral cattle, (2) native cattle that are owned but

are not economically valuable, e.g., for commercial milk production (3) valuable buffalos and goats that are economically valuable, e.g., for milk and goats for meat. First, feral livestock primarily cows and bulls. Second, owned native cattle, lacking village grazing lands, villagers drive several thousands of cows to graze in the forests of PTR, mostly during the winter and monsoon farming seasons. Such cattle graze in the forests unaccompanied by herders during the day and aggregate near the village fringes at night. Most native varieties of cows do not yield sufficient milk; thus, they are not considered economically valuable by villagers. Yet people keep them because of religious sanctions that prohibit selling cows to tanners [9]. Third, valuable livestock that provide livelihoods for people, including milk yielding cows, and buffalos and goats. These valuable animals are herded during the day and are corralled at night.

Study tigers

Over 20 terrestrial mammalian carnivores have been documented in the core and buffer zones of the PTR. Large terrestrial carnivores (>20 kg body weight) include the tiger, leopard, Indian wild dog or dhole (*Cuon alpinus*), wolf, striped hyena, sloth bear (*Melursus ursinus*), and domestic dog [2219].

The tigers are part of a reintroduction project that commenced in 2009. Six founder tigers, which were reintroduced between 2009 and 2013 (5♀ and 1♂), and 4-second generation tigers (1♀, 3♂; born between 2010 and 2011). All 6 founder tigers and 6 of their offspring have been fitted with VHF radio collars by reserve authorities. Details of this equipment are provided by Sarkar et al. [2336]. PTR tiger monitoring teams working in three 8-h shifts followed radio-collared tigers each day using a handheld VHF antenna between 2009 and 2014. The teams were tasked with recording the spatial locations of the tigers on an hourly basis. Following the signals from the transmitters, members from the monitoring team located individual tigers and homed-in. Tigers spent considerable time near carcasses and, whenever opportunity permitted, members from the team visually inspected kills after the animals left the carcass, recording details about the kill. Monitoring teams successfully recorded large bodied animal carcasses, but most of the carcasses of intermediate and smaller sized prey were either dragged deep into the thickets or were completely eaten by the tigers. Since we were more interested in livestock kills, the collected dataset provided sufficient information that was also reliable. The collected data were manually recorded into books maintained separately for each tiger and, where possible, photographs were taken. Recorded information on kills included the spatial locations of the kill, prey species, age group, and sex of prey. A small percentage (3%) of the kills could not be identified to the species level because carcasses were destroyed too much during the kill and subsequent feeding. Such information was excluded from the final analyses.

Categorisation of tiger kills

We classified potential mammal prey into 3 size-based categories: large (>150 kg), intermediate (20–149 kg), and small (<19 kg). Potential large sized prey animals included the sambar deer (*Rusa unicolor*), nilgai antelope (*Boselaphus tragocamelus*), domestic cow (*Bos taurus*), and domestic water buffalo (*Bubalus bubalis*). Potential intermediate sized prey included the young of sambar deer, nilgai and cattle, chital deer (*Axis axis*), wild boar, chinkara antelope (*Gazella bennettii*), and four-horned antelope (*Tetracerus quadricornis*). Potential small-sized prey included the plains grey langur (*Semnopithecus entellus*), the domestic pig, goat, and domestic dogs [3020].

Analysis of scats

We collected tiger scats from the buffer zone during 2015 to investigate the presence of small prey that might be poorly represented by kill data. Since scats and kills were from different years, we did not include scats analysis here, but we did use the findings to support kill data as a validation technique. For details, see “S2 Table A in S2 Appendix”.

Statistical analysis

We considered depredation rates (domestic versus wild) in relation to 3 landscape characteristics: management zone (core versus buffer zones), within and beyond 2 km of villages, and within and beyond 250 m of water sources.

In the first analysis, prey (domestic or wild) was the dependent variable, while zone (buffer/core), generation (first generation = mature adults; second generation = young adults) and sex (male/female) of tigers, and season (summer, rainy, winter) were included as independent variables. In the second analysis, we included “Distance,” which was the distance from the core zone boundary to kill location and “near villages” (inside/outside 2 km of villages, which are high human density areas) as independent variables. In the third analysis, we used “water” and “near water” (inside/outside 250 m of water body) as the independent variables (rather than those of village).

All analyses were performed using generalised linear models (GLMs) in R 2.12.0 [3126]. Adequate model fits were ensured by the stepwise removal of non-significant (significance $p < 0.05$) three-way and two-way interactions. We optimised the model based on all main effects and by only using the three-way and two-way interactions that were significant (See S1 Table Appendix for coefficients and the model selection procedure).