How do Big Cats Coexist ? Evidence of Dietary Partitioning Between Tigers and Leopards in Nepal

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ABSTRACT

Understanding how sympatric large carnivores coexist through resource partitioning is critical for their conservation in human-influenced landscapes where prey availability and human pressures fluctuate. This study examind and compared the dietary composition, prey selection, and dietary overlap of Royal Bengal tigers (Panthera tigris tigris) and common leopards (Panthera pardus) in two low-land protected areas of Nepal. The study draws from the analysis of prey remain identified in the 141 and 122 scats sample of tiger and leopard respectively collected between 2013 and 2015. Dietary overlap between the two predators was calculated using Pianka's niche overlap index. A total of 15 prey species including deomestic animals were identified revealing a broader prey-size range of tiger compared to leopard. While selective predation preffering larger herbivores was found in Chitwan, it was appeared more opputunistic patterns in Parsa. Dietary niche overlap between two predator was low to moderate (Pianka's index ~0.22–0.23), indicating that size-based prey partitioning and selective predation reduced direct competition and facilitate coexistence The study finding highlights the importance of maintaining diverse and abundant wild prey populations across all body-size classes to support the long-term coexistence and conservation of tigers and leopards in Nepal's Terai region.

Keywords : *Dietary overlap, prey selection, scat analysis, resource partitioning*

INTRODUCTION

Large carnivores play a critical role in ecosystems by regulating prey populations and suppressing mesopredators. While some ecosystems host only a single apex predator—such as the dingo (*Canis lupus dingo*) in Australia—others support multiple large carnivore species. This raises important ecological questions about how apex predators coexist in shared landscapes, particularly when they are closely related and have overlapping ecological requirements.

Dietary partitioning is one potential mechanism that facilitates coexistence among large carnivores. When sympatric species consume different prey types or sizes, direct competition may be reduced. However, significant overlap in diet and habitat use can increase interspecific competition, with implications for population viability and community dynamics (Polis *et al.*, 1989). Understanding the diets and prey preferences of co-occurring predators is therefore essential for elucidating their niche relationships and informing conservation strategies.

Nepal supports four large felid species: the Royal Bengal tiger (*Panthera tigris tigris*), common leopard (*P. pardus*), clouded leopard (*Neofelis nebulosa*), and snow leopard (*Uncia uncia*) (Aryal *et al.*, 2014). Tigers are confined to the lowland Terai grasslands and forests, snow leopards occur in the high Himalayas, and clouded leopards inhabit the mid-hills (Aryal *et al.*, 2014; 2015a, 2015b). Common leopards, in contrast, have the broadest ecological range, occupying habitats from the lowlands to the snow line and even venturing into human-dominated landscapes (Koirala *et al.*, 2012; Pečnerová *et al.*, 2021).

Despite recent gains from habitat restoration and anti-poaching measures, the total number of tigers in Nepal remains relatively low (355 individuals; DNPWC), and snow leopards are estimated at 350–500 individuals (DNPWC & DOFSC 2025). Population sizes for clouded and common leopards remain uncertain, though leopards are likely the most numerous and widely distributed. Where tigers and leopards co-occur, understanding their potential for competition or resource partitioning is crucial for long-term conservation planning. Similar concerns have been observed elsewhere—for example, in Africa, where lion recovery has contributed to declines in African wild dogs through competitive exclusion (Darnell *et al.*, 2014).

The Terai Arc Landscape has seen increasing numbers of tigers (Karki, 2011) and leopards (Thapa, 2011) following habitat restoration efforts. This study analyses dietary composition and prey selection of tigers and leopards in Chitwan National Park (CNP) and Parsa National Park (PNP) to better understand their coexistence mechanisms. By comparing prey species consumed, prey selection relative to availability, and dietary overlap between these sympatric carnivores, we aim to elucidate how resource partitioning and prey size preferences contribute to the persistence of both species in these shared habitats.

MATERIALS AND METHODS

Scat collection and prey identification

We examined the diets of tigers and leopards using scat analysis. A total of 263 scats were collected opportunistically from CNP and PNP, Nepal (Figure 1), between February 2013 and February 2015. Specifically, 107 tiger and 87 leopard scats were collected in CNP, and 34 tiger and 35 leopard scats were collected in PNP. Scats were found along firelines, elephant trails, and riverbanks. Tiger and leopard scats were distinguished based on size, appearance, and associated field evidence (e.g., pugmarks, scratch marks, urine scent, prey remains), with assistance from experienced senior park staff. For example, tiger scats tend to be larger in diameter and exhibit fewer, broader coils, while leopard scats are typically more twisted with tighter constrictions (Johnsingh, 1983). Any scats that were ambiguous or indistinguishable were excluded from analysis.

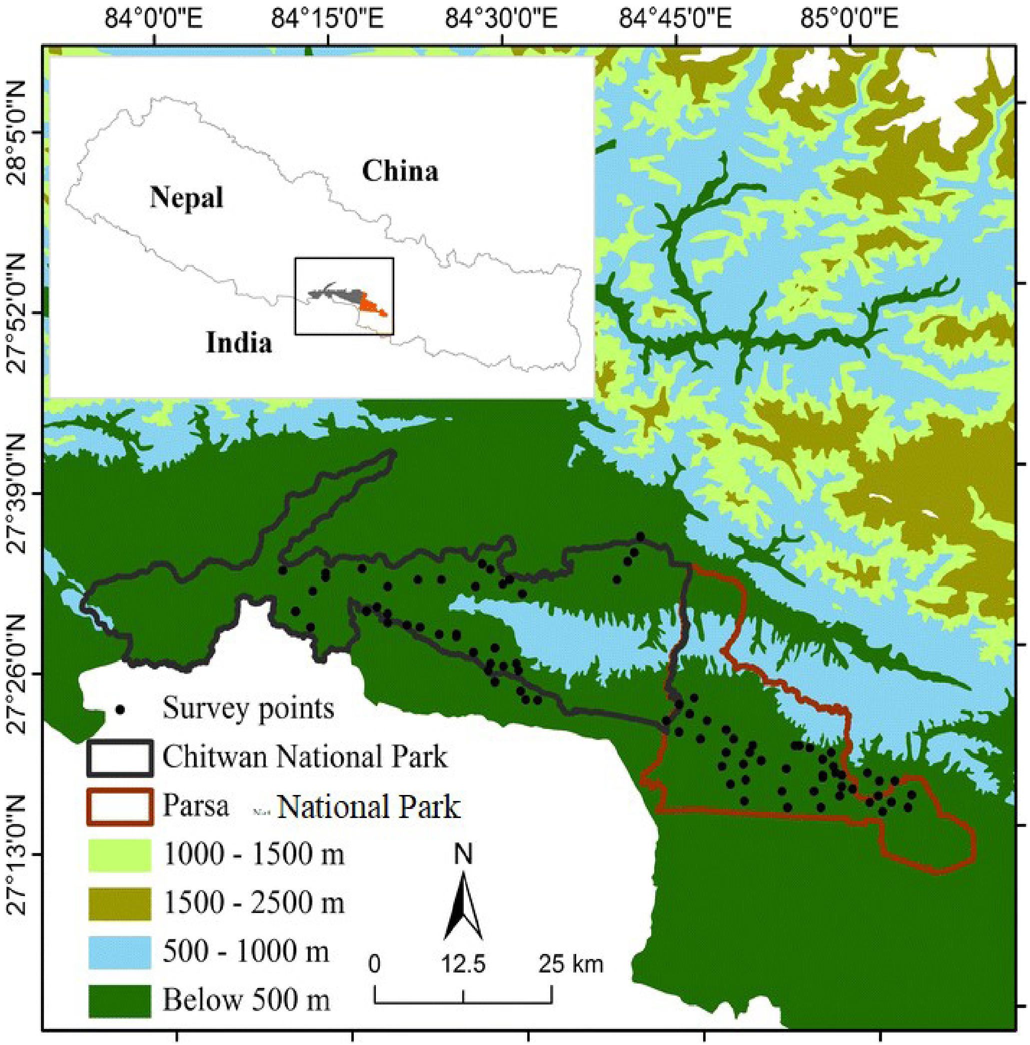

Figure 1. *Map of the study area in the Terai Arc Landscape of Nepal, showing Chitwan National Park and Parsa National Park. Survey locations are indicated as points, and a categorical elevation layer derived from a digital elevation model (DEM) provides topographic context. Map adapted from Koirala et al. (2016).*

Each fresh scat was stored with silica desiccant in a labelled, airtight zip-lock plastic bag (Naidu, 2009), and GPS coordinates were recorded for potential habitat mapping. In the lab, samples were washed with tap water using a fine mesh sieve and dried at ~60°C in an oven. Subsequently, samples were cleaned with a 1:1 ether-alcohol mixture and dried between absorbent papers.

Hair samples extracted from scats were used for prey identification. Medullary and scale patterns of hairs were prepared for microscopic examination following the methods of Mukherjee *et al.* (1994). Reference slides from known prey species were used to identify unknown hairs (Bahuguna *et al.*, 2010). For each scat, 20 hairs were randomly selected for analysis.

Diet analysis

We assessed the prey composition in tiger and leopard diets by calculating the frequency of occurrence and estimating the relative biomass consumed for each prey species (Mukherjee *et al.*, 1994; Ackerman *et al.*, 1984). Frequency of occurrence tends to overestimate the contribution of small-bodied prey due to their higher hair density per unit of body mass (Ackerman *et al.*, 1984; Weaver, 1993). Therefore, we applied correction factors (CFs) derived by Ackerman *et al.* (1984) from feeding trials on cougars (*Puma concolor*) to estimate biomass consumed:

$$Y_i = 1.98 + 0.035\, X_i$$

where X_i is the average live weight (kg) of prey species i, and Y_i is the estimated biomass consumed per scat. The average live body weights of prey species used in biomass calculations are provided in the Supplementary Material Table S2.

Prey selection

Prey selection was evaluated by comparing observed prey use in predator scats to expected use based on prey availability, following established approaches that integrate both prey density and biomass consumption rates (Karanth & Sunquist, 1995; Link & Karanth, 1994). The expected proportion of each prey species (p_i) under the null hypothesis of non-selective predation was calculated as:

$$p_i = \frac{d_i \lambda_i}{\sum d_i \lambda_i}$$

where d_i is the density of prey species *i*, and λ_i is the prey-specific scat production rate, defined as:

$$\lambda_i = \frac{Y_i}{X_i}$$

Here, X_i represents the mean body weight of prey species i, and Y_i is the biomass consumed per scat, derived from regression equations linking body mass to digestion rates (e.g., Chakrabarti *et al.*, 2016).

Observed prey frequencies in scats were tested against these expected proportions using chi-square goodness-of-fit statistics. To robustly account for variability in prey density estimates and scat production rates—and to reduce the risk of Type I errors—parametric bootstrap simulations were conducted with 10,000 replicates per group. This approach generated empirical p-values reflecting the probability of observing chi-square components as extreme as those calculated, under the null hypothesis of random prey use.

Multiple comparisons across prey species were addressed by applying Holm and Bonferroni corrections to bootstrap-derived p-values to control family-wise error rates. Domestic livestock were excluded from prey selection analyses due to the absence of reliable density data. Density estimates were available for the four primary wild prey species included in the analyses.

To further explore prey-specific deviations from expected use, chi-square components were calculated for each prey species, quantifying their individual contributions to the overall chi-square statistic. Positive deviations indicated over-selection (prey used more than expected), while negative deviations indicated under-selection. Statistical significance of these deviations was assessed using Holm-adjusted p-values derived from bootstrap simulations.

1.1. Diet overlap

The dietary overlap between tigers and leopards was assessed using Pianka's Index of Niche Overlap (Pianka, 1973), which ranges from 0 (no overlap) to 1 (complete overlap):

$$O_{tl} = \frac{\sum P_{it} P_{il}}{\sqrt{\sum P_{it}^2 \sum P_{il}^2}}$$

where:

- O_{tl} = dietary overlap between tiger and leopard,
- P_{it} = proportion of prey species iii in tiger diet,
- P_{il} = proportion of prey species iii in leopard diet.

Values of P_i were calculated from the raw frequency of occurrence of prey species in scats, without biomass correction. This method reflects the proportion of scats containing each prey species, providing a measure of dietary overlap based on prey presence rather than biomass consumed.

RESULTS

Diet composition and biomass consumption

Between 2013 and 2015, we collected a total of 141 tiger scats and 122 leopard scats from CNP and PNP. In total, remains from 15 prey species were identified, with 13 prey species found in tiger scats and 9 in leopard scats. Sixteen of the tiger scats and fifteen of the leopard scats contained remains of two prey species; all others contained a single prey species.

Across both study areas, the frequency of occurrence in tiger scats indicated that their diet primarily consisted of chital

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(*Axis axis*), gaur (*Bos gaurus*), sambar (*Rusa unicolor*), and wild pig (*Sus scrofa*), comprising around 67% of the total diet in PNP and about 47% in CNP. Leopards consumed mainly goat (*Capra hircus*), barking deer (*Muntiacus muntjak*), langur (subfamily Colobinae), chital, and wild pig, which collectively made up around 70–85% of their total prey occurrences. For site-specific frequencies, see Table 1 (CNP) and Table 2 (PNP).

In CNP, chital made up 25.3% of tiger prey items by frequency of occurrence, followed by sambar at 10.1%. However, in terms of biomass contribution, sambar accounted for the largest share (108.7 kg; 24.0%), slightly exceeding chital (106.0 kg; 23.4%). Natural prey accounted for 72.85% of the total biomass consumed by tigers in CNP, while domestic livestock (buffalo, cow, goat, dog) made up the remaining 27.15% (Table 1). For leopards in CNP, the most frequently consumed wild prey were barking deer (21.9%) and langur (20.6%), while goat was the most consumed domestic prey species (13.7% frequency; 16.1% of biomass).

In PNP, tiger diet was dominated by chital (28.8% frequency; 120.5 kg; 22.7% biomass), followed by wild pig (25.8% frequency; 118.6 kg; 22.3% biomass) and gaur (7.6% frequency; 174.2 kg; 32.8% biomass). Goat contributed 1.8% to the total biomass consumed by tigers (Table 2). Leopard diet in PNP was composed primarily of chital (30.6% frequency; 128.1 kg; 40.4% biomass), wild pig (20.4% frequency; 94.0 kg; 29.6% biomass), langur (16.3% frequency; 38.0 kg; 12.0% biomass), and barking deer (12.2% frequency; 34.9 kg; 11.0% biomass). Domestic livestock contributed 4.1% of the biomass in the leopard diet in PNP (goat only).

Table 1. *Relative biomass consumption of prey species by tiger (Panthera tigris) and leopard (Panthera pardus) in CNP. Biomass estimates were calculated using the regression-based correction factor equation Y = 1.980 + 0.035 × X, where X is the average live body weight of each prey species (in kg).*

Prey	Frequency (%)	CF (Y = 1.980 + 0.035X)	Total biomass	Relative biomass (%)
Tiger				
Barking deer	6.3	2.9	18.1	4.0
Buffalo	3.8	15.5	58.7	13.0
Chital	25.3	4.2	106.0	23.4
Cow	2.5	13.4	34.0	7.5
Domestic dog	8.9	2.3	20.6	4.6
Gaur	1.3	23.0	29.2	6.4
Indian Hare	6.3	2.1	13.4	3.0
Langur	5.3	2.3	12.4	2.7

Rhesus Monkey	2.3	2.2	5.0	1.1
Sambar	10.1	10.7	108.7	24.0
Wild pig	10.1	4.6	46.6	10.3
Unidentified	6.3			
Leopard				
Barking deer	21.9	2.9	62.6	23.0
Birds	2.7	2.1	5.6	2.1
Buffalo				
Chital	11.0	4.2	45.9	16.8
Cow				
Domestic dog	1.4	2.3	3.2	1.2
Gaur				
Goat	13.7	3.2	43.9	16.1
Indian Hare				
Langur	20.6	2.3	47.9	17.6
Rhesus Monkey	9.6	2.2	21.2	7.8
Sambar	2.7	10.7	29.4	10.8
Wild pig	2.7	4.6	12.6	4.6
Unidentified	13.0			

Table 2. Relative biomass consu\mption of prey species by tiger (Panthera tigris) and leopard (Panthera pardus) in Parsa National Park (PNP). Biomass estimates were calculated using the regression-based correction factor equation Y = 1.980 + 0.035 × X, where X is the average live body weight of each prey species (in kg).

Prey	Frequency (%)	CF (Y = 1.980 + 0.035X)	Total biomass	Relative biomass (%)
Tiger				
Barking deer	9.1	2.9	26.0	4.9
Buffalo				
Chital	28.8	4.2	120.5	22.7
Cow				
Domestic dog				
Gaur	7.6	23.0	174.2	32.8
Goat	3.0	3.2	9.7	1.8
Indian Hare				
Langur	5.6	2.3	12.9	2.4
Rhesus Monkey	9.1	2.2	20.1	3.8
Sambar	4.6	10.7	48.8	9.2
Wild pig	25.8	4.6	118.6	22.3

Unidentified	6.1			
Leopard				
Barking deer	12.2	2.9	34.9	11.0
Bird	4.1			
Buffalo				
Chital	30.6	4.2	128.1	40.4
Cow				
Domestic dog				
Gaur				
Goat	4.1	3.2	13.1	4.1
Indian Hare				
Langur	16.3	2.3	38.0	12.0
Rhesus Monkey	4.1	2.2	9.0	2.8
Sambar				
Wild pig	20.4	4.6	94.0	29.6
Unidentified	8.2			

Abundance of wild prey

Secondary data on prey availability were obtained from government reports and published literature. According to DNPWC (2014), the densities (individuals/km²) of four major prey species in PNP—wild pig, chital, sambar, and barking deer—were 5.07, 9.6, 2.15, and 2.05, respectively (Dhakal *et al.*, 2014). The relative ungulate density in PNP increased from 6.6 individuals/km² (Karki, 2011) to 25 individuals/km² (Dhakal *et al.*, 2014). Despite this increase, prey abundance in PNP remained relatively low, which was reflected in the earlier estimated tiger population of only four individuals (DNPWC, 2014). However, recent estimates show a substantial rise, with the population reaching 41 individuals (DNPWC & DFSC, 2022).

In contrast, the density of the same four prey species in CNP was higher—4.43 (wild pig), 44.75 (chital), 4.02 (sambar), and 3.65 (barking deer) individuals/km² (DNPWC, 2014). The relative ungulate density in CNP was 51.5 individuals/km², considerably higher than that of PNP (Karki, 2011).

Prey selection

Due to the lack of reliable data on domestic prey availability, only four primary wild prey species were included in the selection analysis. In CNP, tigers exhibited significant positive selection for sambar (Holm-adjusted $p < 0.0001$), barking deer ($p = 0.0017$), and wild pig ($p < 0.0001$), all consumed significantly more than expected based on availability. In contrast, chital (spotted deer) was significantly under-selected ($p < 0.0001$)

despite its substantial biomass contribution in the diet. Leopards showed significant positive selection for barking deer ($p < 0.0001$) and significant under-selection for chital ($p < 0.0001$). Although sambar appeared over-selected by leopards, this was not statistically significant after Holm correction ($p = 0.103$). Wild pig predation by leopards did not differ significantly from expectation ($p = 0.654$). These results indicate distinct prey preferences with statistically robust deviations from expected predation in CNP. These selection patterns are also clearly illustrated by comparing observed and expected prey proportions (Figure 2), where over- and under-representation of key species such as sambar and chital are visually apparent. Chi-square contributions to overall selection patterns are shown in Figure S1.

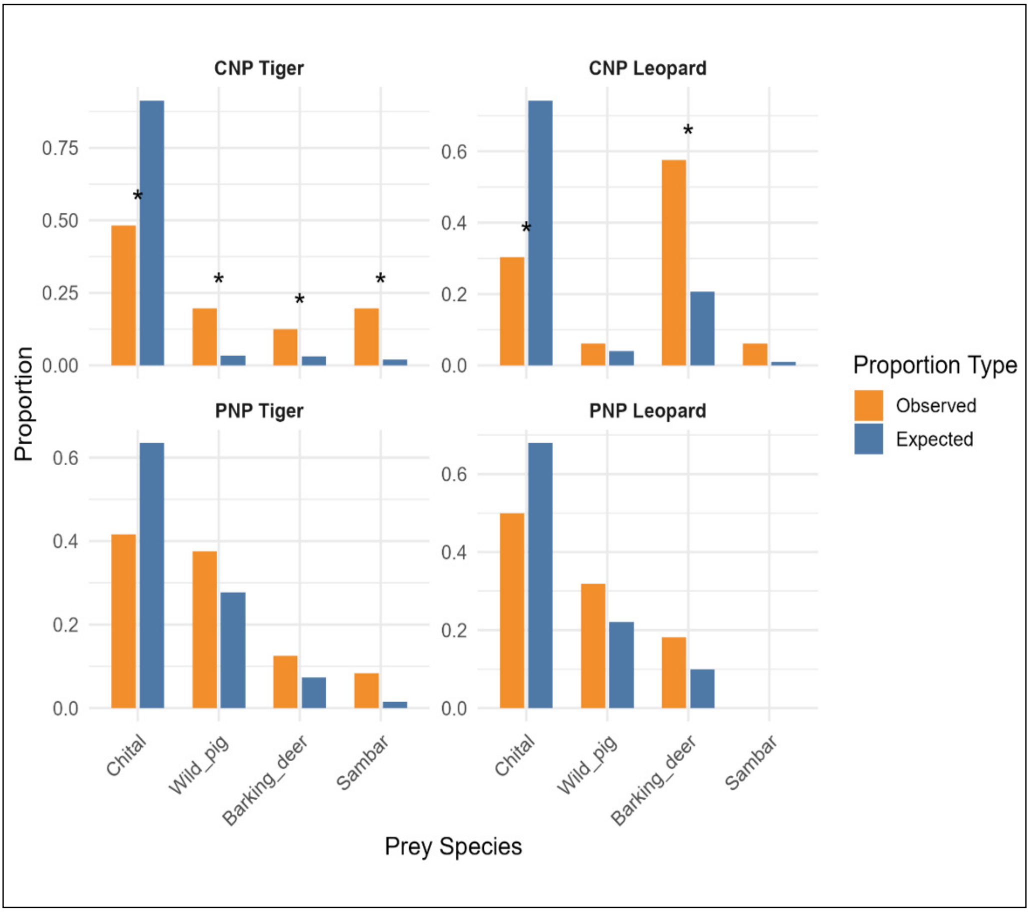

Figure 2. *Observed versus expected prey proportions in tiger and leopard diets across CNP and PNP. Bars show the proportion of each prey species in scats (observed) compared to expected proportions based on prey availability estimates. Facets separate predator-site groups. Asterisks (*) indicate prey species with statistically significant deviations between observed and expected proportions based on Holm-adjusted p-values (α = 0.05).*

In Parsa National Park (PNP), tigers showed marginal positive selection for barking deer (p = 0.698, not significant) and sambar (p = 0.150, not significant), while chital was under-selected but also not significant after correction (p = 0.133). Wild pig use was higher than expected but not statistically significant (p = 0.698). Leopards positively selected barking deer and wild pig, but neither was significant after adjustment (p = 0.530 and p = 0.530, respectively). Spotted deer was under-selected (p = 0.319, not significant), and sambar was absent from leopard scats, indicating strong avoidance. Overall, prey selection patterns in PNP did not show statistically significant deviation from availability, highlighting spatial variation in prey preferences between tiger and leopard populations. Visual comparison of observed and expected proportions (Figure 2) similarly shows trends in prey use, although none reached statistical significance after correction. Chi-square contributions are provided in Annex (Figure S1).

Dietary overlap

Pianka's index of dietary overlap between tigers and leopards was 0.23 in PNP and 0.22 in CNP, indicating a low level of dietary overlap in both parks (see in Annex: Table S1). As the index ranges from 0 (no overlap) to 1 (complete overlap), these values suggest that tigers and leopards utilize largely different prey resources. The small numerical difference between parks was not statistically significant ($F = 1.25$, $df = 8$, $p = 0.37$), suggesting that dietary overlap is similarly limited in both areas. The low overlap likely reflects differences in prey preferences and hunting strategies between the two species, particularly in areas with diverse prey communities.

DISCUSSION

This study revealed distinct prey selection patterns by tigers and leopards across CNP and PNP. Tigers generally selected larger prey such as sambar, whereas leopards tended to focus more on medium to smaller prey species, including barking deer and langur. Notably, despite the relatively high availability and biomass contribution of spotted deer (chital, *Axis axis*), both tigers and leopards consumed them less than expected based on prey availability, indicating potential avoidance or lower vulnerability. This underutilization contrasts with some earlier studies in South Asia reporting positive or neutral selection for spotted deer by tigers and leopards (e.g., Karanth & Sunquist, 1995; Bagchi *et al.*, 2003). The divergence in our findings may reflect behavioral, spatial, or ecological differences in prey populations within our study sites.

Several factors may explain the under-selection of spotted deer by tigers in our study area: their social behavior, which can reduce vulnerability to predation (Karanth & Sunquist, 1995; Sunquist & Sunquist, 1989); their spatial distribution toward park peripheries; and potentially lower local densities in sampled areas. Similarly, the relatively lower selection of spotted deer by leopards aligns with previous research from South Asia indicating smaller predators often avoid larger or more vigilant prey (Bhattari & Kindlmann, 2012; Lovari *et al.*, 2015).

In CNP, tigers showed strong positive selection for sambar, wild pig, and barking deer, which aligns with previous studies indicating sambar as an important large prey for tigers in Nepal and India (Grey, 2009; Schaller, 1967; Biswas & Sankar, 2002, Upadhyaya *et al.* 2018). Leopards also significantly over-selected barking deer but under-selected chital. Although sambar appeared in leopard diets, selection was not statistically significant, possibly due to small sample size or scavenging behavior. The large size of sambar likely contributes to its avoidance by leopards in both parks.

In PNP, however, none of the selection patterns were statistically significant after multiple testing correction. Tigers showed apparent preferences for sambar and barking deer, and leopards consumed more barking deer and wild pig than expected, but these trends did not meet the threshold for significance. This suggests prey selection in PNP may be more opportunistic, possibly influenced by lower prey densities or increased competition.

These results collectively highlight that selection for prey species like sambar, wild pig, and barking deer is context-dependent and stronger in CNP than in PNP. The smaller size and possibly lower anti-predator defenses of barking deer and wild pig compared to spotted or sambar deer may explain their higher vulnerability and over-selection, particularly in CNP.

Another possible explanation for variation in prey selection lies in species-specific nutritional preferences and prey macronutrient composition. According to the nutritional geometry framework (Raubenheimer 2011), predators may preferentially target prey that better align with their intake target—an optimal balance of macronutrients such as protein and lipid—rather than simply pursuing the most abundant prey or those most accessible. In felids, recent work suggests that even obligate carnivores exhibit fine-scale regulation of protein and lipid intake, which could influence prey choice in the wild (Kohl *et al.*, 2015). We hypothesize that differences in prey selection patterns between CNP and PNP may be partly driven by the macronutrient profiles of available prey—with sambar, wild pig, and barking deer potentially providing more favorable protein-to-fat ratios than chital—and that tigers may opportunistically seek species that better meet these nutritional needs. This adds a functional and mechanistic dimension to prey selection beyond mere availability or vulnerability.

While clear selection patterns were evident in CNP, prey selection in PNP was weaker and largely non-significant.

This may reflect several ecological and behavioral factors, but could also relate to nutritional constraints. In habitats like PNP, where prey densities are lower and large-bodied prey such as sambar are less abundant, predators may be forced to consume prey out of necessity rather than preference. From a nutritional geometry perspective, this suggests that tigers and leopards in PNP may experience a nutritional constraint, where limited prey options constrain their ability to regulate intake toward an optimal macronutrient balance.

Prey species differ not only in size but also in macronutrient composition, with some providing higher protein content and others offering more lipids or essential micronutrients (Kohl *et al.*, 2015). For example, larger ungulates like sambar often have higher lipid reserves and protein content that better meet the energetic and nutritional demands of large carnivores, while smaller species may be lower in these nutrients or have less favorable nutrient ratios. If such nutritionally superior prey are scarce or absent in PNP, predators may exhibit reduced selectivity and adopt a more generalist diet.

Additionally, the availability of domestic animals in PNP introduces alternative prey with often higher fat content, which could influence predator foraging decisions by partially compensating for nutritional deficits in wild prey (Coogan and Raubenheimer 2016). However, reliance on domestic livestock can have trade-offs related to human conflict and accessibility.

Higher predator densities in PNP, combined with habitat fragmentation and lower prey biomass, may increase competition and reduce opportunities for selective foraging. Smaller average prey size and patchier distribution could force tigers and leopards to broaden their diet, prioritizing prey availability over nutritional quality. Habitat structure differences—such as denser vegetation or human disturbance—may also influence prey vulnerability and predator hunting efficiency, further complicating nutritional regulation.

Together, these factors likely interact to shape the observed lack of significant prey preference in PNP, highlighting the complex interplay between ecological context, nutritional needs, and predator-prey dynamics.

Although spotted and sambar deer were selected less frequently relative to availability, their biomass contributions were substantial, especially for tigers. This highlights the importance of large prey in meeting the energetic requirements of these apex carnivores, even if consumed less frequently.

Domestic livestock constituted a notable portion of tiger and leopard diets in CNP, contributing approximately 27% of consumed biomass, reflecting higher spatial overlap between predators and human-dominated landscapes. In contrast, domestic prey made up a smaller fraction (around 4%) in PNP, likely due to lower carnivore densities and possibly different landscape use patterns.

The results suggest partial dietary partitioning and selective predation on the major wild prey species, with somewhat lower dietary overlap between tigers and leopards in CNP compared to PNP. Pianka's dietary overlap index was low in both parks (0.22 in CNP and 0.23 in PNP) and the small difference was not statistically significant. Nonetheless, subtle differences in dietary composition and prey preferences may reflect niche partitioning that facilitates coexistence.

Notably, dietary overlap for domestic prey was highest for dogs in CNP (0.84) and goats in PNP (0.58). Among wild prey, rhesus monkeys showed moderate overlap in CNP (0.54), followed by wild pig and sambar (both 0.46). While we lacked fine-scale spatial data, scat distributions suggest leopards may utilize peripheral areas more extensively than tigers, indicating spatial niche partitioning, especially in the park periphery.

The lower abundance and biomass of large prey species in PNP, like sambar likely constrain tiger population size (Thanet *et al.,* 2015) compared to CNP, where prey densities are higher (51.5 vs. 25 individuals/km² for major ungulates). This prey limitation, coupled with higher leopard densities in PNP (Thapa *et al.*, 2014), may contribute to competitive pressures that influence tiger demographics and habitat use.

Tigers exhibited some consumption of smaller prey species, potentially reflecting a response to prey depletion or limited availability of larger ungulates. Such shifts could increase interspecific competition by overlapping more with leopard prey niches (Sunquist, 1981; Karanth & Sunquist, 1995). However, current reports indicate increasing leopard populations in the area (Thapa *et al.*, 2015), suggesting complex dynamics govern predator coexistence.

The presence of large prey items (e.g., sambar) in leopard scats, especially in CNP, may reflect predation on subadult individuals or scavenging of tiger kills, as large prey capture by leopards is less common due to size constraints.

Overall, our findings indicate that tigers and leopards partition their diets by prey size and species, enabling coexistence within overlapping habitats. The maintenance of diverse prey communities spanning multiple size classes appears critical to support both carnivores. Future research exploring nutritional drivers, spatial habitat use, and temporal activity patterns will enhance understanding of mechanisms facilitating sympatry.

Given the broad dietary niches and partial overlap observed, conservation efforts should focus on sustaining abundant and diverse prey populations, mitigating livestock predation conflicts, and preserving habitat heterogeneity to support both species.

This analysis reinforces that tigers and leopards in these Terai forests exhibit selective predation patterns consistent with prior research (Ramesh *et al.*, 2009), while also highlighting local variations likely driven by prey availability, habitat characteristics, and interspecific interactions.

CONCLUSION

Our study demonstrates that tigers and leopards in CNP and PNP exhibit distinct but overlapping prey selection patterns shaped largely by prey size, availability, and ecological context. In CNP, both predators showed clear, statistically significant selection for certain prey, while in PNP, selection patterns were less pronounced and not statistically significant, suggesting a more opportunistic strategy. This dietary partitioning likely facilitates their coexistence despite spatial and resource overlap. Maintaining diverse and abundant wild prey populations across size classes is essential for the long-term conservation of these apex predators. Moreover, addressing livestock depredation and understanding predator-prey dynamics in changing landscapes will be critical to mitigating human-wildlife conflict and promoting the sustainability of tiger and leopard populations in the Terai region.

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Annex: Suplimentary results

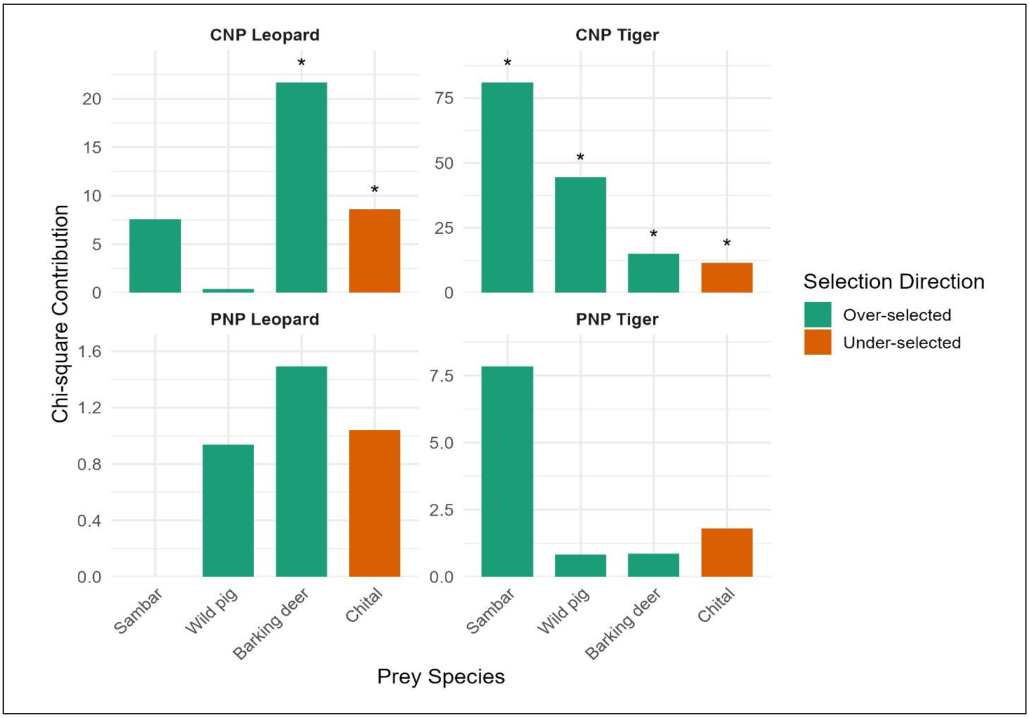

Figure S1*: Chi-square contributions of prey species to deviations from expected use in tiger and leopard diets in Chitwan (CNP) and Parsa (PNP) National Parks. Bars represent each prey species' contribution to the total Chi-square statistic from goodness-of-fit tests comparing observed diet proportions to expected availability estimates. Bars are coloured to indicate whether prey were over-selected (used more than expected) or under-selected. Asterisks (*) denote prey items with statistically significant deviations based on Holm-adjusted p-values (α = 0.05).*

Table S1: *Pianka's index of dietary overlap between tigers and leopards*

Animals	Pianka's index	
	Chitwan	Parsa
Barking deer	0.2	0.39
Birds	0	0
Chital deer	0.13	0.07
Goat	0	0.58
Langur	0.24	0.24
Rhesus monkey	0.54	0.34
Sambar deer	0.46	0
Wild Pig	0.46	0.19
Unidentified	0	0.29
Average	0.22	0.23

Table S2: Average live weight of prey animals

Animals	Average live weight (KG)	References
Barking deer	25	Miazi, O. F., Miah, G., Bilkis, T., Khan, M. K. I., Das, A., Momin, Zoo. Int J Genet Genomics, 4(5), 40-44.
Wild Buffalo	385	Riaz, R. (2018). Accuracy of estimates for live body weight using scha Journal of Science, 70(3).
Spotted deer	63	Kushwaha, P. K. (2018). Wild Ecology of Spotted Deer https://doi.org/10.3126/av.v6i0.20103
		Azad, M. A. K., Hossain, M. M., & Bhuiyan, A. K. F. H. (2005). Fee research, 1(1), 48-52.
Cattle(Cow)	327	Riaz, R. (2018). Accuracy of estimates for live body weight using scha Journal of Science, 70(3).
Dogs	10	Salt, C., Morris, P. J., German, A. J., Wilson, D., Lund, E. M., Cole, One, 12(9), e0182064.
Gaur	600	Khaewphakdee, S., Simcharoen, A., Duangchantrasiri, S., Chimchom Evolution, 10(11), 5152-5159.
Indian hare	4	https://animalinformation.com/animal/indian-hare/
Langur	10	Roy, D., & Nagarajan, R. (2018). Biology, ecology, and conservation Singapore: Springer Singapore.
Rhesus monkey	6.5	https://primate.wisc.edu/primate-info-net/pin-factsheets/pin-factsh
Sambar deer	250	https://en.wikipedia.org/wiki/Sambar_deer
Willd boar	75	https://weightofstuff.com/how-much-does-a-wild-boar-weigh/
Goat	35	Goat , weighted goats in the buffer zone