COMPARATIVE ACTIVITY PATTERN ANALYSIS OF ENDEMIC CHEVROTAINS IN SRI LANKA

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Chevrotains are the most primitive ruminants, with few species surviving globally. Sri Lanka has two endemic species: *Moschiola meminna* in the dry zone and *Moschiola kathygre* in the wet zone. Data on their activity patterns are lacking due to their elusive nature. To address this knowledge gap, we conducted a comparative analysis of their activity patterns using camera trap surveys in Wilpattu National Park (WNP) for *M. meminna* and Sinharaja Forest Reserve (SFR) for *M. kathygre*. We placed camera traps covering >30% of each habitat type present in both study areas using a systematic random survey method. Camera trap timestamps were used to analyze the activity patterns. Time data were converted to radian time for cyclical time representation before analysis. Using the R package *'activity'*, species-specific activity levels and the proportion of the diel cycle during which each species was active were quantified. Activity level estimates were generated through 1,000 bootstrap iterations, with non-parametric von Mises kernel density estimators used to model the probability density functions of activity peaks. The analysis showed that the overall activity level of *M. meminna* in WNP was 0.50 (SE: 0.08). The activity pattern was recorded across multiple time intervals, with distinct peaks at 0400, 1100, and 1800 hrs. This suggests a cathemeral strategy, possibly to avoid midday heat while balancing foraging and predator avoidance. The lowest activity was recorded at 1500 hrs. The activity level of *M. kathygre* in Sinharaja was estimated at 0.39 (SE: 0.04). The activity pattern revealed distinct peaks of presence at 0400 and 2000 hrs, showing a nocturnal activity pattern. This behaviour is typical of forest ungulates that evade daytime predators and human activities. Their nocturnal habits may suggest competition with other herbivores or heightened sensitivity to disturbances in fragmented habitats. The higher overall activity level of *M. meminna* compared to *M. kathygre* suggests greater diurnal activity in open habitats (WNP) versus dense forests (SFR). These findings emphasize the importance of species-specific conservation strategies to protect Sri Lanka's endemic chevrotains. For *M. kathygre,* reducing human disturbance during nocturnal hours is crucial to maintain natural activity rhythms. For *M. meminna* in the dry zone, conservation should prioritize preserving thorn and dry mixed evergreen forests, along with habitat features such as litter cover that provide refuge and foraging resources.

Keywords: Chevrotains, activity, Sinharaja Forest Reserve, Wilpattu National Park, camera trap

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INTRODUCTION

Sri Lanka's mammalian fauna comprises of 135 species, including 21 (16%) endemics, shaped by the island's biogeographical history (Bennie et al., 2014; Dittus, 2014).Among these, the Family Tragulidae (chevrotains or mouse-deer) represents the most primitive living ruminants, with only a few species surviving globally. Sri Lanka is unique in harbouring two endemic chevrotain species: the Sri Lankan spotted chevrotain (*Moschiola meminna*), primarily found in the dry zone, and the yellow-striped chevrotain (*M. kathygre*), restricted to the wet zone (Duckworth & Timmins, 2015b, 2015a; Meijaard, 2011). Despite their ecological significance as prey, seed dispersers, and bioindicators of forest health, data on their activity patterns remain scarce due to their elusive nature (Meijaard, 2011). Activity patterns (any behaviour such as foraging, locomotion etc. during nocturnal, diurnal, crepuscular rhythm) reflect adaptations to predation risk, climate, and resource availability (Halle & Stenseth, 2000). However, despite extensive mammalian research in Sri Lanka, temporal behaviour of chevrotains remains understudied, particularly in their respective habitats. This study focuses on Wilpattu National Park (dry zone) and Sinharaja Forest Reserve (wet zone) to provide comparative insights into the activity rhythms of the two species. This study aims to: determine diurnal/nocturnal activity patterns of *M. meminna* (dry zone) and *M. kathygre* (wet zone).

METHODOLOGY

Camera trap surveys were conducted in WNP (Sep 2024-Apr 2025) and SFR (Dec 2018-Aug 2019) using systematic random sampling with 3×3 km² (WNP) and 1×1 km² (SFR) grids. Traps were placed 25-35cm high, spaced ~1km apart, facing north to avoid sunlight, with >30% habitat coverage. All cameras had IR sensors, no-glow flashes, and recorded 24/7 (with a 10-second trigger delay in video mode). Data included trap ID, GPS coordinates, timestamps, and habitat covariates. Camera stations were serviced every 1.5 months. No baits were employed. To analyze the activity patterns of *M. meminna* (WNP) and *M. kathygre* (SFR), camera trap timestamp data were processed using temporal niche modeling in the R package *'activity'*. Timestamps were converted into solar radians ($0–2\pi$) to represent cyclical time, and activity levels were estimated through 1,000 bootstrap iterations with von Mises kernel density estimators to model activity peaks.

Activity patterns were classified as nocturnal (18:30–05:30 h), diurnal (06:30–17:30 h), crepuscular (05:30–06:30 h & 17:30–18:30 h), or cathemeral based on peak activity periods, allowing for robust characterization of diel activity while accounting for temporal autocorrelation.

RESULTS AND DISCUSSION

The study revealed distinct activity patterns between the two endemic chevrotain species. *M. meminna* in WNP exhibited cathemeral activity (activity level 0.5, CI: 0.30-0.46) with consistent engagement throughout the diel cycle. This pattern likely reflects adaptations to WNP's ecological conditions, where dense understory provides continuous cover and influences predator-prey dynamics. The uniform activity distribution suggests behavioural flexibility in response to multiple pressures, including thermoregulation and human disturbance. In contrast, *M. kathygre* in SFR displayed a nocturnal, bimodal pattern with distinct peaks at 04:00 and 20:00 (activity level 0.40, CI: 0.30-0.46). The concentrated nighttime activity may optimize foraging while minimizing predation risk and thermal stress in the wet zone habitat. The observed prolonged inactivity periods suggest behavioural adaptations to SFR's high-productivity environment, where shorter foraging durations suffice, and potential responses to anthropogenic pressures.

Notably, both species shared peak activity times around 04:00 and 20:00, indicating possible evolutionary conserved temporal niches despite habitat differences. However, *M. meminna* demonstrated greater overall activity than its wet-zone counterpart. These interspecific differences likely reflect distinct ecological adaptations: WNP's dry-zone conditions may necessitate more continuous activity for resource acquisition, while SFR's resource-rich environment permits more concentrated nocturnal foraging. The findings underscore how habitat characteristics (vegetation structure, productivity) and associated pressures (predation, climate) shape temporal behaviour in these elusive ungulates, providing crucial baseline data for their conservation in Sri Lanka.

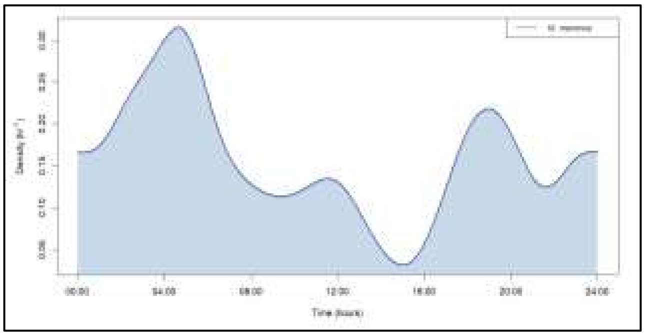

Figure 01: Activity pattern of M. meminna in WNP

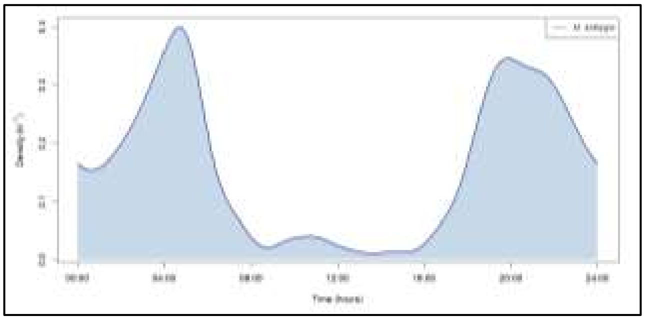

Figure 02: Activity pattern of M. kathygre in SFR

CONCLUSION/RECOMMENDATIONS

This study compared activity patterns of Sri Lanka's endemic chevrotains: *M. meminna* showed cathemeral activity in dry zone forests, while *M. kathygre* exhibited nocturnality in wet zone rainforests. These behavioural differences reflect distinct evolutionary adaptations to their respective habitats. Conservation efforts must address each species' specific needs - protecting dense understory for the nocturnal *M. kathygre* and managing dry forest resources for *M. meminna*. Both species require ongoing monitoring, habitat preservation, and reduced human disturbance. The findings emphasize the importance of habitat-specific approaches for conserving these evolutionarily unique ungulates, especially considering the effects of climate change on Sri Lanka's ecosystems. Future research should focus on long-term behavioural monitoring and evaluation of conservation interventions.

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