INTRASPECIFIC VARIATION IN SCHNEIDER'S LEAF-NOSED BAT *(Hipposideros speoris)* ACROSS THREE ECOLOGICALLY DISTINCT ROOSTS IN SRI LANKA

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Hipposideros speoris occurring across all bioclimatic zones is one of the most widespread bat species in Sri Lanka. This study focused on ecological traits and body morphometrics of three colonies of *H. speoris* from ecologically diverse locations namely a cave in Yakkala (62.6 m asl), a mine in Kegalle (155.3 m asl) and an abandoned building in Thanamalvila (91.29 m asl). The sites were selected to capture variation in roost structure, light exposure, elevation and colony size. Observations were conducted from August 2024 to April 2025. Bats were captured using both active and passive methods to obtain morphometric measurements, while roost environmental conditions were assessed. Light penetration was measured using a lux meter, and roost structure documented via direct observation. Roosts differed in structure and illumination. The Yakkala cave, with four natural openings allowed minimal light penetration (0.2 lux) into deeper roosting sections. The Kegalla mine, shared with *R. rouxii,* had a single main opening, and bats inhabited interior areas with no light penetration. In Thanamalvila, the roost had one dark entrance, with bats clustered beneath the ceiling. Estimated colony sizes were 50, 100 and 500 in Yakkala, Thanamalvila and Kegalle respectively. To reduce potential variations arising from age, sex or reproductive status, data were normalized prior to analysis. Significant differences were noted in several morphometric measurements across the colonies (One Way Anova, $P<0.05$). Traits showing significant variation included tibia length ($P=0.0001$), length of hind foot and claws ($P=0.00$), length of the thumb ($P=0.038$), and several metacarpal dimensions. Body size differed significantly, with Yakkala bats ($P=0.022$) being larger, while the Kegalle bats exhibited disproportionately longer hind feet and claws. In contrast, characters linked to echolocation, such as ear and nose leaf dimensions remained stable among populations. This study highlights heterogeneity across a widespread bat species, suggesting phenotypic plasticity that may facilitate adaptation to local environments. The consistency of echolocation traits supports the hypothesis that acoustic structures might be evolutionary preserved due to functional constraints. Overall, the findings may provide insights into intra-specific variation and the ecological influences, contributing to the understanding of cryptic diversity among Sri Lankan micro chiropterans.

Keywords: bat colonies, roost structure, morphometric variation, light exposure, phenotypic plasticity

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INTRODUCTION

Hipposideros speoris (Schneider's leaf-nosed bat), is a Microchiroptera distributed across all three bioclimatic zones of Sri Lanka (Yapa, 2017). They play a significant role as insect controllers, pollinators and seed dispersing agents (Kunz et al., 2011). Roost selection in bats is influenced by seasonality, climatic variations, predation risk, resource availability, social organization and energetic constraints related to body size and microhabitat (Kunz, 1982; Kunz & Lumsden, 2003; Vasko et al., 2020). Comparing roost structures and morphometrics across distinct ecological zones can reveal phenotypic plasticity, local adaptation and potential cryptic diversity in this micro-chiroptera in Sri Lanka.

This study aimed to characterize and compare roost structure of *H. speoris* at three ecologically distinct sites, and to assess spatial variation in body morphology.

METHODOLOGY

Permits for capturing and handling of bats were obtained from the Department of Wildlife Conservation, Sri Lanka (Permit Number WL/3/2/30/2024).

Bats were sampled using hand nets and mist nets (Polyester 38 mm mesh), using both active (daytime roosts between 0900 – 1700 hrs) and passive sampling methods (out-flight activity between 1830 and 1930 hrs). Roost structure and colony size and structure (single/mixed) were recorded by visual counts, The light penetration at each site was measured using a digital lux meter (Brannan, England). Each bat was weighed (Pesola Micro Spring Scale, 300 g) and measured (SPI Polymid dial vernier caliper, 150 mm).

Morphometrics were compared by One Way ANOVA ($\alpha = 0.05$) and Tukey's HSD (Honestly Significant Difference) using in R statistical software (R Core Team 2021).

RESULTS AND DISCUSSION

Table 1 Colony structure

Study site	Elevation	Colony structure	Individuals per colony	Sample size
Yakkala	62.6 m asl	Single	~50	6
Thanamalvila	91.29 m asl	Mixed	~100	8
Kegalla	155.3 m asl	Single	~500	8

Among the 19 standard morphometrics considered, significant among site – differences were found for,

Table 2: Morphometric variation of *H. speoris* across Yakkala, Kegalle and Thanamalvila

Variable	Mean ±SD			One way ANOVA	
	Yakkala	Thanamalvila	Kegalle	F statistic	P value
Hind foot and claws	7.57 ± 0.48	7.92 ± 0.72	24.29 ± 2.36	323.04	0.0*
Thumb	6.78 ± 1.67	5.20 ± 0.76	4.43 ± 0.55	3.91	0.038*
Tibia	21.8 ± 1.68	21.76 ± 1.50	15.41 ± 3.17	14.72	0.0001*
Leaf nose length	5.85 ± 0.85	4.48 ± 1.24	5.01 ± 0.59	18.14	0.0 *
Calcar	14.12 ±	11.67 ± 0.99	8.74 ± 1.18	8.26	0.003*
Head and body length	55.8 ± 4.74	52.15 ± 2.05	45.31 ± 4.10	4.74	0.022*
Third metacarpal	41.72 ± 2.50	40.48 ± 1.63	31.3 ± 0.47	20.89	0.0*
5th metacarpal	34.68 ± 2.08	35.34 ± 1.21	36 ± 1.50	6.21	0.008*

* $p < 0.05$ (significant)

Post hoc tests show that bats from Yakkala were heavier overall (15.50 ± 2.07 g), whereas individuals from Kegalle exhibited disproportionately long hind feet and claws (Figure 2). In contrast, ear and nose – leaf dimensions did not vary significantly ($p > 0.05$), suggesting strong stabilizing selection on echolocation structure (Kuc, 2010). These patterns point to ecological pressure shaping limb morphology, while acoustic traits remain conserved (Hodgkison et al., 2004; Marinello & Bernard, 2014).

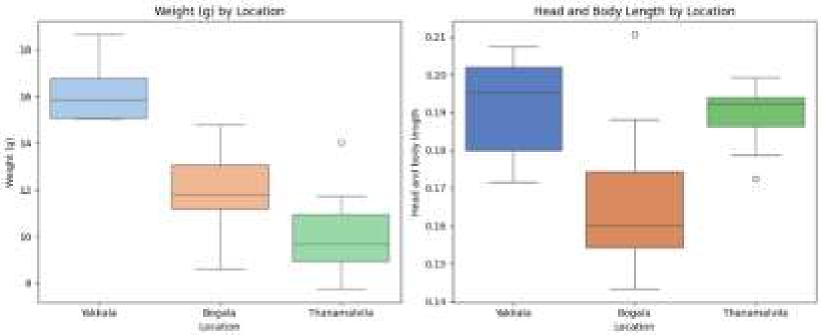

Figure 2: Variation of body weight and head - body length of *H. speoris* across Yakkala, Kegalle and Thanamalvila

CONCLUSIONS/RECOMMENDATIONS

The three *H. speoris* colonies from distinct ecological zones exhibit marked morphometric divergence particularly in limb and appendage traits likely reflecting site – specific adaptations or phenotypic plasticity. Consistence in echolocation related features underscores their functional importance and evolutionary constraint. Our findings advance understanding of intraspecific diversity in Sri Lankan micro chiropterans and lay groundwork for future studies on cryptic speciation and conservation.

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