(129)

Altitudinal Segregation of Non-Volant Mammals along a One-Kilometer Elevation Gradient in the Highlands of Sri Lanka

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Abstract

Altitudinal segregation is an ecological phenomenon where different species are distributed only in distinct elevation bands in mountainous regions. Here, we examined the altitudinal segregation of non-volant mammals, terrestrial species incapable of sustained flight, along a one-kilometer elevation gradient in a sub-montane region of Sri Lanka to categorize them by elevation, habitat, and temporal factors. Wildlife census techniques such as camera trapping, scat and pellet sampling, small mammal trapping, and opportunistic observations, were conducted from the Samanalawewa Basin (480 m above mean sea level) to Hawagala Peak (1,420 m AMSL) in the Issengard Biosphere Reserve, Belihuloya, from November 2022 to April 2024, recording 20 mammal species, including five endemics and seven threatened species. All species, except the Feral Water Buffalo (FWB) (*Bubalus bubalis*), were recorded in the mid-elevation range (650-1,100 m AMSL). Four species, Barking Deer (BD) (*Muntiacus muntjak*), Wild Boar (WB) (*Sus scrofa*), Mouse sp., and Golden Palm Civet (GPC) (*Paradoxurus zeylonensis*) span all elevation ranges (480-1,420 m AMSL). The Dusky-striped Squirrel (DSS) (*Funambulus obscurus*) is restricted to mid-elevations, while the FWB is confined to high elevation range. Most species peaked at mid-elevation, indicating the mid-domain effect. Cluster analysis identified two primary clusters. The first, consisting of 13 predominantly nocturnal species, includes a subcluster of nine species from lower elevations with higher temperatures, divided into mid-elevation forest species and a singleton cluster for WB, found across all elevations. The forest subcluster is split into two groups: one with higher elevation species, including GPC, Indian Pangolin (*Manis crassicaudata*), and another with lower elevation species, including Asian Palm Civet (*Paradoxurus hermaphroditus*), Crested Porcupine (*Hystrix indica*), Yellow-striped Chevrotain (*Moschiola kathygre*), and Indian Small Civet (*Viverricula indica*). A separate subcluster includes higher elevation species, with the FWB as a singleton due to its restriction to high elevations. Leopard (*Panthera pardus*), Black-naped Hare (*Lepus nigricollis*), and Sambar (*Rusa unicolor*) are clustered together, with the latter two further grouped by their grassland habitat preference. The second cluster comprises seven diurnal species, including a singleton for the high-elevation Purple-faced Langur (*Semnopithecus vetulus*). The remaining species from lower elevations are split into two subclusters: one with relatively higher elevation species, such as BD, DSS, and Stripe-necked Mongoose (*Herpestes vitticollis*), and another with lower elevation species, including Indian Palm Squirrel (*Funambulus palmarum*), Giant Squirrel (*Ratufa macroura*), and Toque Macaque (*Macaca sinica*). Principal Component Analysis supports these clustering patterns, showing that temperature, habitat, and elevation drive mammal segregation in this transect. Understanding these distribution patterns can be useful for conservation planning since some altitudinally segregated species are endemic and threatened.

Keywords: *Altitudinal segregation, Non-volant mammals, Mid-domain effect, Cluster analysis, Issengard Biosphere Reserve*