COMMUNITY STRUCTURES OF MID-SIZED TO LARGE-BODIED MAMMALS IN TROPICAL LOWLAND AND LOWER MONTANE FORESTS IN GUNUNG PUEH NATIONAL PARK, WESTERN SARAWAK, BORNEO

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Habitat types are closely associated with altitude gradients in tropical rainforests and play an essential role in species assemblages where terrain heterogeneity is often used to understand effects of climate change on species distribution. The response of larger mammals to habitat variation along altitudes is largely unexplored in Borneo. This study has utilised camera traps to better understand the community structure of larger mammals in Gunung Pueh National Park. Gunung Pueh National Park (1550 m a.s.l.) contains two major habitat types, which include lowland forests (< 1100 m a.s.l.) and the lower montane (> 1100 m a.s.l.) forests. The spatio-temporal niches of mid-sized to large-bodied mammal species across these altitude gradients and habitats were assessed. Cameras located at 23 locations, along varying altitude gradients, resulted in 3109 trap nights. Using these cameras, the collected recordings have revealed a total of 22 mid-sized to large-bodied mammals, including 19 species recorded in lowland forest areas, and 18 species in the lower montane forest areas; 15 species were found in both habitats. Four species were exclusively detected in the lowland forest, namely *Rusa unicolor*, *Viverra tangalunga*, *Presbytis chrysomelas*, and *Hystrix brachyura*. Three species were detected only in the lower montane forest, namely *Herpestes semitorquatus*, *Mustela nudipes*, and *Hemigalus hosei*. In the lowland forest, *Macaca nemestrina* was recorded with the highest naïve occupancy (naïve ψ = 1.00), while *Hemigalus derbyanus* had the highest naïve occupancy (naïve ψ = 0.93) in the lower montane forest. The temporal diel activity patterns of selected species in the two habitats have shown relatively close similarities, with overlapping patterns ranging between 67–90%. The further conservation of a large area, which encompasses mountainous ranges, is recommended to facilitate the conservation efficacy of such Protected Areas and for supporting diverse, mid-sized to large-bodied mammals in Borneo.

Key words: activity pattern, altitude, detection, habitat, occupancy

Introduction

Montane forests (> 1000 m a.s.l.) are critical habitats for biodiversity and cover less than 1% of Sarawak's topography (Hazebroek & Kashim, 2000; Steinmetz et al., 2008). The unique topography, biotic and abiotic conditions of montane forests harbour high levels of species endemism often categorised as «cool-adapted upland species» (Still et al., 1999; Williams et al., 2003). Populations of upland or mountaintop specialists are considered to be incredibly fragile and vulnerable to the effects of climate change (Williams et al., 2003).

Species richness is expected to be different between habitat zones along the altitude gradients due to different habitat complexity. Lowland forests often have taller trees and include a greater diversity of fruiting trees, supporting more large-bodied animals (Hazebroek & Kashim, 2000; Dalling et al., 2016). Lowland forests are often associated with biodiversity hotspots in the tropics as they are rich in biodiversity and often exposed to rapid anthropogenic activities (Steinmetz et al., 2008). In contrast, montane forests are less diverse in terms of forest structure and assemblages, where trees are often smaller and more slender in character with leaves being relatively smaller and thicker (Hazebroek & Kashim, 2000).

Habitat types can affect activity patterns and resource partitioning of species. For example, sympatric species tend to reduce competition through differing their diet, activity rhythm and/or habitat (Dirzo & Raven, 2003; Hearn et al., 2018). Furthermore, temporal activity rhythm of larger tropical mammals may also depict their responses towards the synergistic effects of habitat degradation and anthropogenic activities, e.g. a species could be more nocturnal in areas of higher human activity (Griffiths & Schaik, 1993; Norris et al., 2010). The diel activity pattern of prey species is often also closely associated with their predators. Therefore, shifts in the predator's activity patterns will influence the survival rate