

DISTRIBUTION, RELATIVE ABUNDANCE AND OCCUPANCY OF SELECTED MAMMALS ALONG PAVED ROAD IN KUBAH NATIONAL PARK, SARAWAK, BORNEO

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Received: 31.01.2018

Research on ecological impacts of roads has seldom been studied on Borneo. This includes information on their influence on wildlife dynamic in National Parks and other areas harbouring biodiversity. This knowledge is important to prescribe best management practices, by avoiding, minimising and compensating for adverse impacts such structures may have on individuals, populations and communities. In order to understand the effects of a paved road, located within a protected area (Kubah National Park, Sarawak, western Borneo), on the local mammal species, we set up an array of 20 camera traps using stratified sampling, along a spatial gradient of five distance categories from the road. This ranged from the edge of the road to the interior part of the forests, in the following manner: A) 0–5 m at the edge, B) 5–100 m, C) 100–200 m, D) 200–300 m, and E) 300–400 m. We explored the relationships between the distance to the road with mammalian species richness, and subsequently, for carnivores, ungulates, and Viverridae sp. (civets) and finally, attempted to estimate the density of these animal groups. Camera trap surveys accumulated 2161 camera days, which resulted in 1938 independent animal photos that consisted of 19 species of wild mammals, six species of birds and one reptile species along the gradient. This study suggests that areas close to the road (0–5 m) are used significantly less than other areas ($n = 8$), while cameras located within the distance range from 5–100 m and 100–200 m detected the highest number of species ($n = 18$). The highest numbers of ungulates and members of the family Viverridae (civets) were recorded at 5–100 m, while the distance category 100–200 m recorded the most numbers of carnivores. Several species that could be tolerant to some level of disturbance, such as the leopard cat (*Prionailurus bengalensis*), banded palm civet (*Hemigalus derbyanus*), long-tailed porcupine (*Trichys fasciculata*), and lesser mousedeer (*Tragulus kanchil*) showed preference at 5–100 m. This might be due to their general diet behaviour and abundance of food resources nearby the forest edge. The findings from this study need to be carefully interpreted as it is based on a small scale project, therefore may not provide information required to quantify and mitigate the negative effects of roads in protected areas. Comprehensive long-term monitoring with appropriate replications, will be required for making appropriate management recommendations for enhancing conservation within the protected areas of Sarawak.

Key words: forest edge, forest fragmentation, large mammals, physical barrier, wildlife dynamics

Introduction

Borneo, world's third largest island, is located in the biodiversity hotspot region of Sundaland (Myers et al., 2000). It is a reservoir of some of the most extensive tropical rain forest in the world, harbouring a rich flora and fauna with high levels of endemism (Taylor et al., 1999; Myers et al., 2000; Koh & Wilcove, 2008; Brodie et al., 2015a,b). The Bornean rain forests are threatened by rampant forest conversion to oil palm, logging, hunting for bush meat, forest fires and the wildlife trade (Taylor et al., 1999; Bennett et al., 2002; Kinnaid et al., 2003; Sodhi et al., 2004; Nakagawa et al., 2006; Linkie et al., 2007; Gaveau et al., 2014; Brodie et al., 2015b). These have necessitated the establishment of protected areas, such as national parks and nature reserves.

Sarawak, the largest State in Malaysia, have gazetted 56 protected areas since the 1950s which includes 37 national parks (including marine parks), five wildlife sanctuaries, and 14 nature reserves, together forming 9418.014 km² of protected area system (FDS, 2017). However, intensive logging in Sarawak, that started in the early 1970s may have resulted in many of the recently gazetted national parks with a logging history and often surrounded by plantations or timber concessions (Mathai et al., 2013; Gaveau et al., 2014). Even though a logged forest is able to sustain similar densities of particular species as sufficiently as unlogged forest after more than 10 years, illegal hunting introduced by the presence of logging roads within the forests causes long-term negative impacts on the species richness (Velho et al., 2012; Brodie et al., 2015b).