FINE-SCALE DISTRIBUTIONS OF CARNIVORES IN A LOGGING CONCESSION IN SARAWAK, MALAYSIAN BORNEO

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Running head: Habitat associations of Bornean carnivores

ABSTRACT

Coarse-scale patterns of distribution and abundance of species are the outcome of processes occurring at finer spatial scales, hence the conservation of species depends on understanding their fine-scale ecology. For Bornean carnivores, little is known about fine-scale predictors of species occurrence and it is assumed that the two main threats to wildlife on Borneo, habitat
disturbance and hunting, also impact their occurrence. To increase our understanding of the
Borneo carnivore community, we deployed 60 cameras in a logging concession in northern
Sarawak, Malaysian Borneo, where different landscape covariates, both natural and
anthropogenic, were present. We built single-species occupancy models to investigate fine-
scale carnivore occupancy. Overall, forest disturbance had a negative effect on Hose’s civet
(Diplogale hosei), banded civet (Hemigalus derbyanus) and yellow-throated marten (Martes
flavigula). Further, banded civet had greater occupancy probabilities in more remote areas.
Logging roads had the most diverse effect on carnivore occupancy, with Hose’s civet and
masked palm civet (Paguma larvata) negatively affected by roads, whereas Malay civet
(Viverra tangalunga), short-tailed mongoose (Herpestes brachyurus) and leopard cat
(Prionailurus bengalensis) showed higher occupancy closer to roads. Canopy height, canopy
closure, number of trees with holes (cavities) and distance to nearest village also affected
occupancy, though the directions of these effects varied among species. Our results highlight
the need to collect often overlooked habitat variables: moss cover and ‘kerangas’ (tropical
heath forest) were the most important variables predicting occurrence of Hose’s civet. The
preservation of such forest conditions may be crucial for the long-term conservation of this
little-known species. Our results confirm that logged forests, when left to regenerate, can host
diverse carnivore communities on Borneo, provided less disturbed habitat is available nearby,
though human access needs to be controlled. We recommend easy-to-implement forest
management strategies including maintaining forest next to logging roads; preserving fruiting
trees and trees with cavities, both standing and fallen; and blocks of remote, less disturbed,
mid- to high-elevation forest with understorey vegetation.

KEYWORDS
Borneo, Camera trapping, Carnivores, Forest disturbance, Habitat associations