INFLUENCES OF HUMAN ACTIVITIES ON MALAY CIVET’S (Viverra tangalunga) OCCUPANCY IN SARAWAK

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ABSTRACT

Malay Civet, Viverra tangalunga is one of the most commonly recorded carnivores by camera trapping surveys. This species occupies a diverse range of habitat types, therefore, the IUCN Red List classifies this species as Least Concern. Primarily a ground-dwelling species that has a wide distribution in Borneo, the Malay Civet enables a progressed perspective in understanding the effects of human activities towards a highly adaptable species. In this study, six protected areas that were categorized as low, medium and high volume of human activities were compared in relation to the intensity of human activities that corresponds to Malay Civet’s occupancy. Camera traps were placed in six selected protected areas, however the results showed extreme fluctuations between both protected areas under the high classifications of human activities as Gunung Gading National Park (GGNP) has high detection rate of Malay Civet whereas none were detected in Sarawak National Park (SNP). This suggests that high human activities may have influenced the Malay Civet’s activities in a protected area, other factors such as habitat preferences and geographical distribution may have higher influence on Malay Civet’s occupancy and dispersal in Sarawak.

Key words: Carnivore, disturbance, human activities, protected areas, Viverra tangalunga

INTRODUCTION

Sarawak, particularly recognized as the “Land of the Hornbills” and situated in the island of Borneo is the largest state in Malaysia, which encompasses a total landmass of 124,449.51 km² (Sarawak Government, 2016). However, Gaveau et al. (2016) reported that in 2015, intact forest areas plunged to 1,756,476ha in comparison to logged forests with 5,080,871 ha. Massive demands for agricultural production and land resources has caused increased depletion of virgin forests in Borneo with most landmasses converted into plantations since the early 1970s (Gaveau et al., 2014). In 2015, total logged forests in Borneo have accumulated to 16,802,893ha contrasting with intact forests area available of 20,531,822ha. However, this showed significant drop of forested area since 1973 with initial area assessed of 55,836,571ha (Gaveau et al., 2016). Approximately 57-60% of forest conversion in Malaysian Borneo is caused by rapid conversion of which largely due to oil palm plantations (Elaeis guineensis) yet lesser areas included Acacia (Acacia sp.) and rubber tree (Hevea brasiliensis) (Gaveau et al., 2014, 2016). This hence pressurizes the rise of protected areas gazettement numbers in the state in order to thwart the rapid shrinking of remained forested landscape (Mathai et al., 2010).

Subsequently, these protected areas were promoted as tourism attractions in improving socio-economic growths in the country along with engaging the public for conservation and maintenance support (Huhtala, 2007; Wouters, 2011). In 2016, protected areas in Sarawak alone generated approximately 5.7 million Ringgit Malaysia of revenue collection thus signifies the importance of protected areas not only for conserving biodiversity yet also for the nation’s development (Forest Department Sarawak, 2017).

In order to understand the ability of these protected areas in witholding and conserving species alongside anthropogenic activities, camera traps were set in selected protected areas focusing on the ‘Least Concern’, widely distributed, the...
ground-dwelling Malay Civet, *Viverra tangalunga* (Gray, 1832). Malay Civet is chosen due to its presumed stable, large population and high density (Duckworth *et al.*, 2016).

**MATERIALS AND METHODS**

Bushnell Trophy camera traps were installed in six protected areas within Sarawak with four of the locations sampled are national parks whereas the other two are wildlife sanctuary (Figure 1). Samunsam Wildlife Sanctuary (SWS) and Lanjak Entimau Wildlife Sanctuary (LEWS) are classified under ‘low’ level of human activities, Pelagus National Park (PNP) and Sungai Meluang National Park (SMNP) are classified under ‘medium’ level of human activities while Santubong National Park (SNP) and Gunung Gading National Park (GGNP) are classified under ‘high’ level of human activities. Camera traps were mounted on trees approximately 30-40 cm above ground with GPS coordinates of each camera site recorded. The details of camera trapping setting were described in Mohd-Azlan and Engkamat (2013). Distribution of 129 mounted camera traps was mapped using QGIS (ver. 2.18.7) and data analyses were analyzed and projected using RStudio (ver. 1.0.143). Occupancy analysis was conducted using PRESENCE (ver. 11.8). Occupancy covers a proportion of an area, patches or sites occupied by a species whereas detection is the likelihood of detecting a species in a sampling occasion (Rovero *et al.*, 2014). The anthropogenic activity classifications was categorized by ‘low’ for the locations that are restricted and inaccessible to the public, ‘medium’ for open yet difficult to access by the public due to the remoteness of the location with no facilities or infrastructures available while ‘high’ is for the locations that are open and easily assessed by the public for tourism and recreation.

**RESULTS AND DISCUSSION**

*Viverra tangalunga* was recorded in all the selected protected areas with the exception of SNP yet sampling effort in SNP alone accumulated 7,362 trap days. This result contradicts largely with GGNP as having the highest detection among all protected areas though both GGNP and SNP are greatly influenced by human disturbances. The absence of *Viverra tangalunga* in SNP raises questions of this...
INFLUENCES OF HUMAN ACTIVITIES ON MALAY CIVET’S (*Viverra tangalunga*) OCCUPANCY

Species existence in this isolated and fragmented forest since past surveys showed detection in various habitat types such as mixed planted forest (Giman *et al.*, 2007; Wahyudi & Stuebing, 2013), logging concession (Mathai *et al.*, 2010), *Acacia*/secondary forest (McShea *et al.*, 2009), mixed-swamp forest (Cheyne *et al.*, 2009), and conservation forest area (Bernard *et al.*, 2013). In a logging concession study in Sarawak by Mathai *et al.* (2010) and in a mixed-use forest in East Kalimantan by Wahyudi and Stuebing (2013), *Viverra tangalunga* was among the most frequently detected small carnivore. However, Meijaard and Sheil (2007) stated that the Malay Civet might persist in newly logged forest but not in a forest regenerated after logging.

Photographic captures recorded indicate opposite relationship between *Viverra tangalunga* and *Homo sapiens* as high number of Malay Civet’s detection showed lower number of human’s detection. *Homo sapiens* activity pattern’s peak in SNP is almost as high as *Viverra tangalunga* activity pattern’s peak in GGNP (Figure 2). This may imply the contrast correlation between both species. Among all sampled protected areas, SNP denotes

Fig. 2. Photographic captures of both *Viverra tangalunga* and *Homo sapiens* in all six protected areas based on low, medium and high categorization of human activities (a=LEWS, b=SWS, c=PNP, d=SMNP, e=GGNP, f=SNP).
highest anthropogenic activities. GGNP recorded the highest independent events of Malay Civet and highest detection estimates yet SMNP resulted in the highest occupancy estimates (Table 1).

Behavioural patterns of Malay Civet in four protected areas showed consistent nocturnal patterns with peaks at 0600 and 2100 yet infrequently active during the day with exception from 1000 to 1600 (Figure 3). SWS was excluded due to having less than $n=20$ independent events of photographic captures. Bernard et al. (2013) supported the nocturnal activity. Mathai et al. (2010) suggested that Viverra tangalunga are crepuscular with nocturnal activity while Brodie and Giordano (2010) suggested that the Malay Civet is predominantly nocturnal and crepuscular.

Visitors’ records for both local and foreign tourists showed substantial increase between the year 2015 to 2016 for SNP with more than 3,000 visitors in a month between August until October 2016 although little changes in the number of visitors between both year for GGNP (Figure 4). Nonetheless, the overwhelming number of visitors entering protected areas may have prompted Viverra tangalunga avoided major trails in SNP in search for less disturbed forests.

In addition, human presence in SNP dated back to the 5th century which then acts as an important trading port and now one of Sarawak’s richest archaeological site (Tacon et al., 2010; Sanib, 2012) suggesting the intensity of human activities in the area throughout the century. Moreover, the insular nature of Santubong peninsular (cut off from the mainland) and the steepness of the mountainside may have contributed to the Malay Civet’s non-detection. Hence, other factors such as habitat, environment, and geographical landscape may also have influenced on Malay Civet’s home range and dispersal in Sarawak. Therefore, with increased loss of intact forest and tourism driven protected areas, the capacity of protected areas in sustaining wildlife species alongside human disturbances needs to be identified and monitored in order to prevent further species extinction.

**Table 1.** Occupancy and detection estimates for Viverra tangalunga in protected areas

<table>
<thead>
<tr>
<th>Protected areas</th>
<th>Occupancy estimate ($\Psi$)</th>
<th>Detection estimate ($p$)</th>
</tr>
</thead>
<tbody>
<tr>
<td>LEWS</td>
<td>0.684</td>
<td>0.093</td>
</tr>
<tr>
<td>SWS</td>
<td>0.604</td>
<td>0.069</td>
</tr>
<tr>
<td>PNP</td>
<td>0.748</td>
<td>0.242</td>
</tr>
<tr>
<td>SMNP</td>
<td>0.863</td>
<td>0.123</td>
</tr>
<tr>
<td>GGNP</td>
<td>0.685</td>
<td>0.262</td>
</tr>
<tr>
<td>SNP</td>
<td>NA</td>
<td>NA</td>
</tr>
</tbody>
</table>

Fig. 3. Activity patterns of Viverra tangalunga in the selected protected areas in Sarawak showing that this species is active mostly at night.
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