Journal of Tropical Biodiversity E-ISSN: 2774-4116

# Wild Cats Diversity and Activity Patterns in Bukit Baka Bukit Raya National Park, Kalimantan, Indonesia

**Persada Agussetia Sitepu[1], Juliarta Bramansa Ottay[2], Gusti Wicaksono[2*], Rusnadi[1] Firasadi Nursub'i[1], Risky Ananda Kurniawan[2], Utin Riesna Afrianti[1] and Tomi Ariyanto[2]**

[1]Bukit Baka Bukit Raya National Park. Sintang, 78613, Indonesia
[2]Mandala Katalika Indonesia (Manka). South Jakarta, 12510, Indonesia
*Correspondence Author: gusti_wicaksono@manka.id

## Abstract

Kalimantan is home to five species of wild cats, but scientific information about them is still limited. This study aims to examine the biodiversity, spatial distribution, relative abundance, activity patterns, and occupancy rate of wild cats in the Belaban Resort, Bukit Baka Bukit Raya National Park (BBBR NP). Data collection was conducted from March 2024 to August 2025 at 25 camera trap (CT) stations, which were operated for a total 6.756 trap-nights. The analysis includes calculation of the relative abundance index, occupancy, distribution, and activity patterns. A total 45 independent events of wild cats from three species were recorded, namely the sunda clouded leopard, leopard cat and marbled cat. The leopard cat has the highest relative abundance (5,01 events per 100 trap-nights). The sunda clouded leopard showed the highest occupancy probability (ψ = 0,794), while the marbled cat had the lowest abundance and occupancy. The spatial distribution showed that 60% of the camera stations recorded at least one species of wild cat, with two stations at elevation of 520-762 meters above the sea level recording to the highest detections, in line with the high presence of potential prey. There findings underscore the importance of maintaining forest cover, increasing area patrols, and involving the community in controlling hunting and encroachment as part of area management planning. Overall, the results of this study provide a scientific basis for the implementation of adaptive conservation and the strengthening of management strategies to ensure the sustainability of wild cat populations in the Belaban Resort, BBBR NP.

**Keywords**: camera trapping, kalimantan, occupancy, wild cats

OPEN ACCESS

**Submission**: 30 October 2025
**Accepted:** 26 November 2025
**Publication**: 8 December 2025

## INTRODUCTION

Kalimantan is home to five species of wild cats, namely the Sunda clouded leopard (*Neofelis diardi*), marbled cat (*Pardofelis marmorata*), borneo bay cat (*Catopuma badia*), flat-headed cat (*Prionailurus planiceps*), and leopard cat (*Prionailurus bengalensis*) (Ross et al., 2010). Of the five wildcat species in Kalimantan, only the Leopard Cat is currently categorized as having a

low risk of extinction. Habitat loss, forest degradation, and poaching are the main threats to the survival of wild cats in Kalimantan (Hearn et al., 2016a; IUCN, 2025).

Bukit Baka Bukit Raya National Park (BBBR NP) is a conservation area that is administratively located in two provinces, namely Central Kalimantan and West Kalimantan, Indonesia (Abduh et al., 2018). This area has an elevation range of 150-2.278 meters above sea level with three types of ecosystems: lowland dipterocarp forest, lower montane forest, and upper montane forest. This variation in elevation and ecosystem types makes this area highly biodiverse, ranging from herpetofauna and birds to mammals. At least 60 species of mammals have been recorded in BBBR NP, including two species of wild cats, namely the marbled cat and the sunda clouded leopard (Abduh et al., 2018; Inger et al., 2017; Anwari et al., 2023; Ariyanto et al., 2024; Kennedi et al., 2024). BBBR NP is identified as an important habitat for these two species and is predicted to have high habitat suitability. Additionally, this area functions as a corridor connecting habitats in Central Kalimantan and West Kalimantan (Hearn et al., 2016b; Hearn et al., 2016c).

In Kalimantan, ecological research on wild cats in recent years generally focused on peat swamp forest areas (Cheyne & Macdonald, 2011; Cheyne et al., 2013; Pallemaerts et al., 2020). Thus far, there has been very little research and scientific data specifically highlighting wild cats in lowland and montane forest habitats. Therefore, this study aims to examine the diversity, distribution, relative abundance, and activity patterns of wild cats as a basis for providing initial data for lowland and montane forest areas. This study is the first intensive effort to gather information on the distribution, relative abundance, and activity patterns of wild cats in BBBR NP. The results of this study are expected to provide a scientific foundation for the development of wild cat conservation strategies in BBBR NP and lowland and montane forest habitats.

## METHOD

### Study Area

Data collection was conducted from march 2024 to august 2025 in the Belaban Resort, Bukit Baka Bukit Raya National Park (0.60472° N, 112.244° E), located in Melawi Regency, West Kalimantan (Figure 1). The data collection area in Belaban Resort comprises lowland forest and lower montane forest and lower montane forest ecosystems at an elevation of 400-1.035 meters above sea level, covering an area of 5.000 hectares. In general, this area is dominated by primary forest with very good stand quality, and partly by secondary forest.

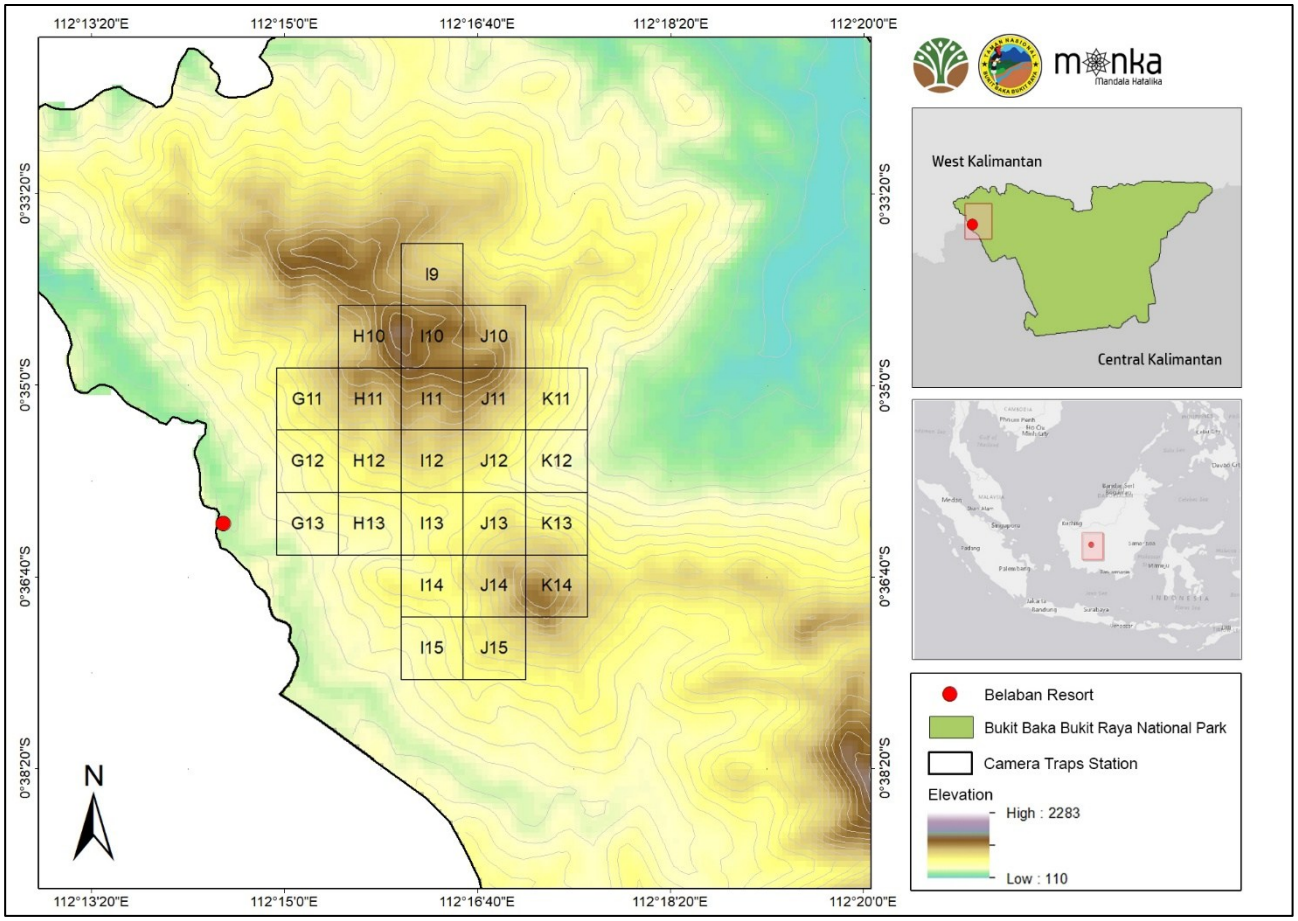


**Figure 1. Wild cat survey sites in Bukit Baka Bukit Raya National Park**

## Data Collection

Data collection in this study used a point sampling method with the installation of camera traps (CT) in 25 CT stations measuring 1 x 1 km each. At each station, a single camera unit was installed. The CTs were mounted on tree trunks at a height of 25-40 cm above the ground, facing the animal movement path. The CTs automatically recorded images and noted the time and date of the events. The type of CTs used were Bushnell and Browning Trail Strike Force. To complement the information on the presence of wildlife at the survey location, direct observations were also conducted to find signs of animal presence, such as tracks, scent, mark, scratches, droppings, and trail paths. Observation were made along the camera installation paths, and there findings were important considerations in determining the CT station to maximize the probability of detecting animals.

## Data Analysis

### Relative Abundance Index (RAI)

The RAI provides an estimate of the relative abundance of species based on the number of independent events per 100 trap-night. We applied the criteria by O'Brien et al. 2003, to determine the independent event successive image-captures of the same species taken within

30 considered as a single event. CT images were processed using picture information extractor to extract metadata and rename the files.

### Distribution

We calculated the total number of independent events (IE) for each cat species at each camera trap (CT) station. This data was used to create distribution maps to identify areas at each CT station location with low to high independent detection rates. Subsequently, we generated separate maps for each wild cat species showing detection locations, weighted based on four categories of IE counts, where a value of 1 indicates a low category, and values above 5 indicate a high category (Anirudh et al., 2024).

### Occupancy

An occupancy model was conducted to estimate the area occupied by the species. This model consists of two main components: the occupancy process, which describes the probability of a location being occupied by a species (ψ), and the probability of a species being detected when it is truly present (p) (MacKenzie et al., 2017). The data used consisted of a detection-on-detection matrix (detection history) with a total of 499 observation occasions. Each row represented a location (site) and each column represented an occasion. The analysis approach used a single-season occupancy model within a Bayesian framework with R software version 4.5.0 and the wiqid package version 0.3.3 (Meredith, 2022). The analysis was performed using the BoccSS0 function from the wiqid package, with non-informative priors ψ~Beta(1,1) and p~Beta(1,1). Posterior estimates were obtained through the Markov Chain Monte Carlo (MCMC) approach with three independent chains, each with 30.000 iteration, with the first 2.000 iterations discarded as burn-in. The mean and 95% credible interval values from the posterior distribution were reported as the main parameter estimates. This approach allows for the estimation of occupancy probability that accounts for detection uncertainty, providing a more accurate picture of species presence status at the study site.

### Activity Patterns

Wild cat activities were categorized into two groups: nocturnal activities and diurnal activities. Nocturnal activities were defined as activities occurring between 18:00 and 05:00, representing the sunset and sunrise times in the area. Meanwhile, diurnal activities were categorized as activities occurring between 06:00 and 17:00, corresponding to the daytime period in the study area.

## RESULT

We operated camera traps at 25 camera trap (CT) stations during the years 2024-2025, with a total of 6.756 camera trap nights. We obtained 1.165 independent events, 1.147 of which were independent events of animals (98,45%) and 18 (1,54%) were independent events of humans. A total of 49 species of animals were recorded in this survey, including mammals (16 families, 32 species), birds (10 families, 16 species), and reptiles (1 family, 1 species).

The total number of independent events of wild cats is 45 from 3 species of wild cats, which constitutes 3,92% of all recorded animal photos. The leopard cat (*Prionailurus bengalensis*) is the most frequently detected species, with an overall relative abundance of 5,01 events per 100 trap-nights, while the marbled cat (*Pardofelis marmorata*) is the least detected species, with 0,80 events per 100 trap-nights (Table 1). From the recordings over 6.756 camera trap night, it took us 7 days from all stations to obtain the first photo of the leopard cat. It took 33 days to record the marbled cat, and 37 days to obtain the first recording of the sunda clouded leopard (*Neofelis diardi*).

**Tabel 1. Total number of independent events, relative abundance index, and percentage of nocturnal activity of wild cats recorded in Belaban Resort, BBBR NP.**

| Species | Independent events | Relative abundance index (events per 100 trap nights) | % nocturnal activity |
|---|---|---|---|
| Sunda Clouded leopard *Neofelis diardi* | 16 | 3.21 | 60 |
| Leopard cat *Prionailurus bengalensis* | 25 | 5.01 | 96.34 |
| Marbled cat *Pardofelis marmorata* | 4 | 0.80 | 0 |

Wild cats were detected at 15 CT stations of 60% of the total 25 CT stations (Figure 2). CT station H13 at an elevation of 520 meters above sea level (masl), and CT station K13, at an elevation of 762 masl, had the highest capture rates of wild cat species, as each recorded three types of wild cats. CT station H13 had the highest number of independent detections, with a total of 13 detections. The detection of prey animals also showed a similar pattern. CT station H13 recorded the highest percentage of potential prey presence, which was 18.92%, while the other CT stations the percentage of potential prey presence was recorded below 10% (Figure 2).

The results of the occupancy model analysis show variations in the presence and detection probabilities among the three wild cat species identified in the study area. The sunda clouded leopard (*Neofelis diardi*) has the highest occupancy probability, which is 0,794 (95% HD: 0,547-1,00), with a very low detection probability of 0.0029 (95% HD: 0.00148–0.00481). Meanwhile, the leopard cat (*Prionailurus bengalensis*) shows a medium occupancy probability of 0.48 (95% HD: 0.262–0.709) with a detection probability of 0.00832 (95% HD: 0.00492–0.0119). The

marbled cat (*Pardofelis marmorata*) has the lowest occupancy, which is 0.332 (95% HD: 0.0247–0.818) with a detection probability of 0.00252 (95% HD: 0.000111–0.00633) (Figure 3).

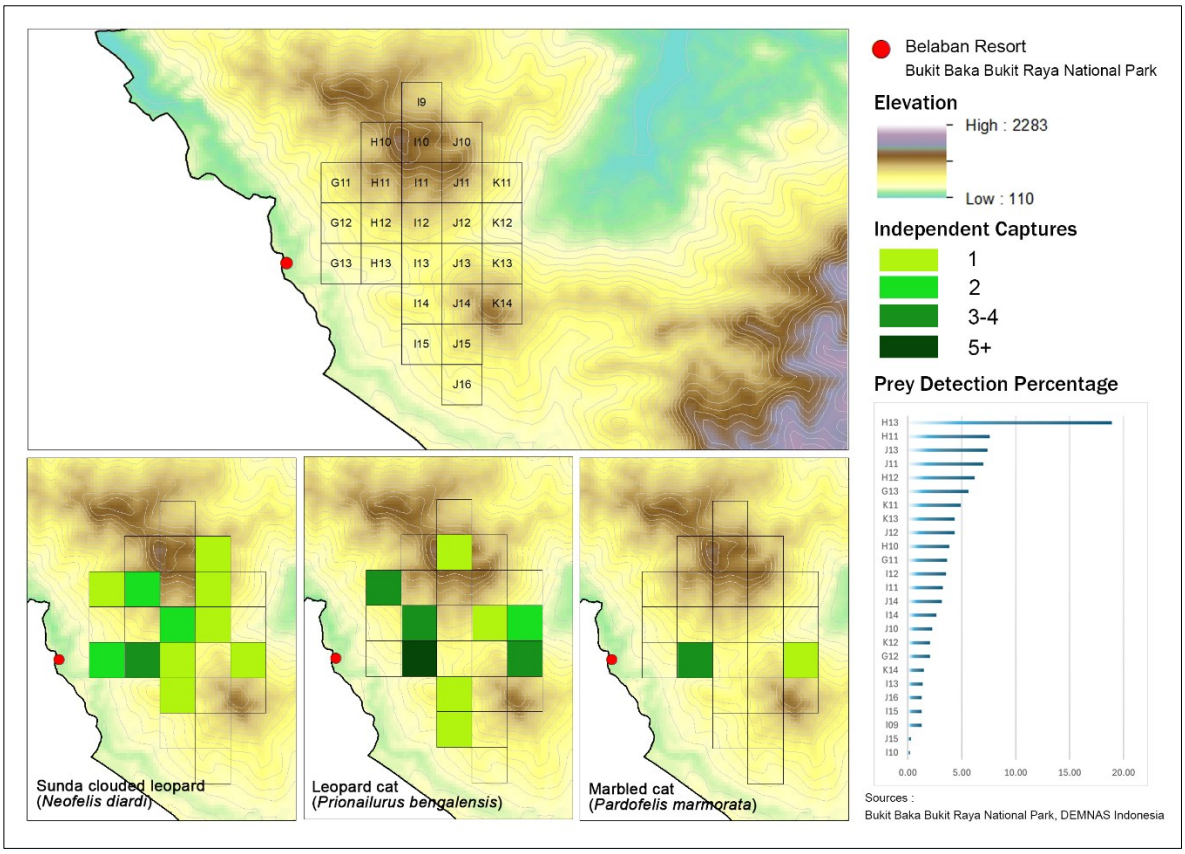


**Figure 2. Species distribution map for three wild cat species recorded in Belaban Resort, Bukit Baka Bukit Raya National Park, West Kalimantan, Indonesia.**

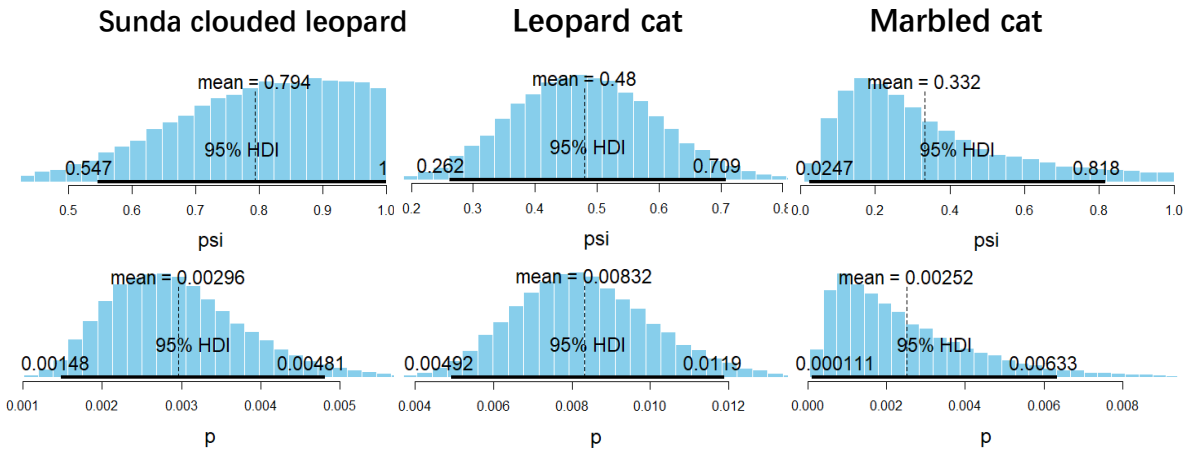


**Figure 3. Occupancy model analysis for three wild cat species in Belaban Resort, BBBR NP**

We analyzed the activity patterns of wild cats based on combined camera trap recordings in Belaban Resort, BBBR NP, from March 2024 to August 2025, with a total of 143 photo captures for three wild cat species. Two species have similar activity patterns, namely the sunda clouded leopard and the leopard cat, which are predominantly active at night, while the marbled cat is

entirely active during the day. The sunda clouded leopard shows 60% nocturnal activity and 40% diurnal activity. The leopard cat is predominantly nocturnal (96,34%) and only 3,66% diurnal. Meanwhile, the marbled cat is recorded as 100% diurnal (Table 1). The sunda clouded leopard is most active at night, particularly around 22:00. The leopard cat and marbled cat each have two activity peaks: the leopard cat at 18:00 and 03:00. While the marbled cat at 11:00 and 17:00 (Figure 4).

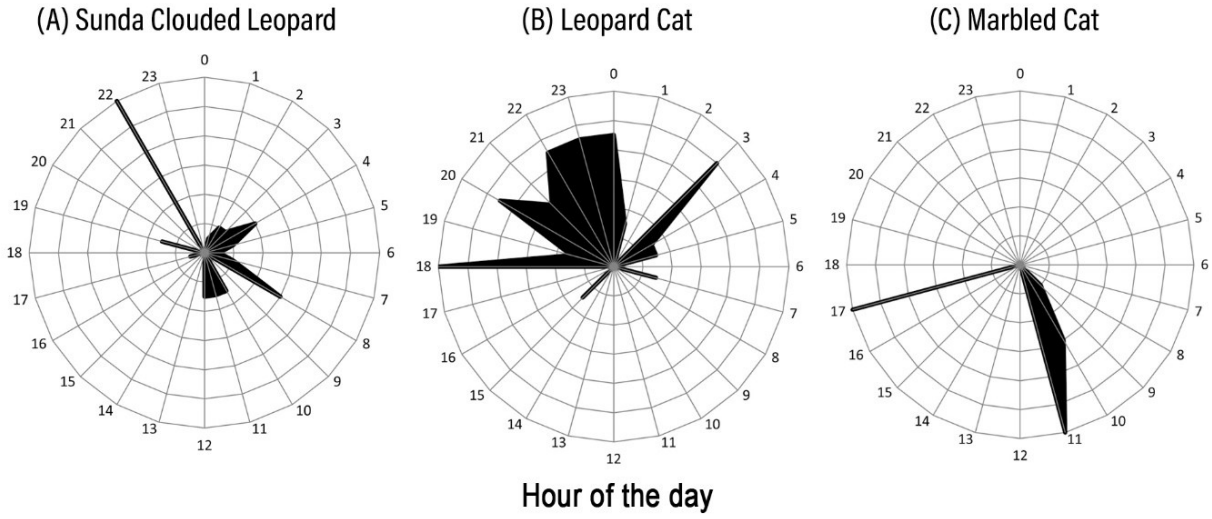


**Figure 4. 24-hour activity levels of (a) sunda clouded leopard *Neofelis nebulosa* (45 photo-captures), (b) leopard cat *Prionailurus bengalensis* (82 photo-captures), and (c) marbled cat *Pardofelis marmorata* (16 photo-captures) based on combined camera trap records in Belaban Resort, BBBR NP**

## DISCUSSION

Three species of wild cats were detected through camera trap surveys in Belaban Resort, BBBR NP, namely the sunda clouded leopard (*Neofelis diardi*), the leopard cat (*Prionailurus bengalensis*), and the marbled cat (*Pardofelis marmorata*). The detecton of three out of five wild cat species confirms that Belaban Resort in BBBR NP is a crucial habitat for wild cat species in Kalimantan. Moreover, this finding was obtained from a relatively small sample coverage area of 5.000 hectares. We suspect that with an expanded survey sample size, the chances of detecting the presence of the other two wild cat species, namely borneo bay cat (*Catopuma badia*) and the flat-headed cat (*Prionailurus planiceps*), would increase. This suspicion is supported by records of the borneo bay cat (*Catopuma badia*) being detected through camera traps and direct encounter with the flat-headed cat (*Prionailurus planiceps*) in other resorts (Balai BBBR NP, unpublished data).

The lowland primary forest and lower montane primary forest ecosystems in Belaban Resort are optimal habitats for wild cat populations, as almost all wild cat species in Kalimantan, except

for the leopard cat, are forest-dependent species that rely heavily on the quality and availability of forest cover (Ross et al., 2010). This is reflected in this survey, especially when compared to various other locations in Kalimantan.

In Sebangau, for example, Cheyne & Macdonald (2011) recorded the relative abundance of the sunda clouded leopard at only 2,74 events per 100 trap-nights, the leopard cat at 2,45 events per 100 trap-nights, and the marbled cat at 0,22 events per 100 trap-nights. The Rungan-Kahayan landscape in Central Kalimantan showed even lower numbers, with 0,02, 0,03 and 0,03 events per 100 trap-nights for the three species, respectively (Anirudh et al., 2024). Meanwhile, a study in Gunung Palung National Park by Leo et al. (2024), which focused on lowland rainforest and reforested peat areas, only managed to detect two species: the leopard cat with a relative abundance of 0,09 events per 100 trap-nights and the marbled cat at 0,17 events per 100 trap-nights.

This relatively high abundance may also be influenced by the presence and diversity of prey as well as the relatively low intensity of disturbances. We recorded at least 19 species that have the potential to be prey for these wild cats, consisting of terrestrial mammals and birds (Lee et al., 2014). This finding is consistent with our observations, which showed that CT Station H13 recorded the highest percentage of potential prey presence and the highest number of wild cat detections. As for threats, although hunting activities were recorded, their frequency was quite low, at 1.40 events per 100 trap-nights. Meanwhile, threats such as logging, forest fires, and large-scale encroachment were not found in Belaban Resort. This condition is very different from other locations, such as Sebangau and Rungan, which face various threats such as fires, fragmentation, or land degradation (Cheyne & Macdonald, 2011; Anirudh et al., 2024). According to Simbolon, 2000, in recent years, forest fires have occurred almost every year and have become a major threat to biodiversity conservation and environmental quality degradation.

The analysis of the comparison of relative abundance and occupancy rates of the three wild cat species in Belaban Resort shows significant pattern differences, reflecting different space utilization strategies, habitat preferences, and ecological adaptations level for each species. The leopard cat exhibits highest relative abundance, indicating a strong adaptation ability to various habitat types, including edge areas, forest-garden mosaics, and fragmented habitats (Ross et al., 2010; Mohamed et al., 2016). This pattern aligns with its ecological characteristics as a flexible generalist, capable of utilizing abundant food sources such as rats and other small animals, which are the main prey of the leopard cat (Rajaratnam, 2000).

On the other hand, the clouded leopard has a higher occupancy rate (proportion of area occupied) despite its medium relative abundance. This indicates that the clouded leopard tends to be widely distributed across the area, but with relatively low detection rates and individual density. The low detection rate may be due to the dense tree canopy, causing the clouded leopard, as an arboreal animal, to rarely walk on the forest floor (Sollman et al., 2014). The high occupancy rate represents that the habitat in Belaban still provides sufficient canopy forest structure to support their population sustainability, even though their space usage intensity is not as high as the leopard cat. Meanwhile, the marbled cat shows the lowest abundance and occupancy values among the three species. As a species highly dependent on primary forest cover, the low detection may reflect a combination of natural rarity, elusiveness, and a tendency to avoid forest edges and human activity centers (Hearn et al., 2016; Ross et al., 2016) in most areas of Belaban.

The examination of inter-specific competition through the overlap of time utilization shows that these three species tend to use different activity times. The nocturnal tendency for the clouded leopard and the diurnal tendency for the marbled cat are consistent with several previous findings, as well as the relatively high degree of overlap between the clouded leopard and the leopard cat (Nakabayashi et al., 2021; Lynam et al., 2013). These differences in daily activity patterns serve as an important mechanism to reduce the potential for direct competition, especially when species share the same space but have overlapping habitat preferences (Farris et al., 2020; Cong et al., 2024). This temporal separation pattern may also be influenced by the daily behavior of each species' preferred prey (Ramesh et al., 2012; Bischof et al., 2014), indicating that behavioral adaptation also plays a significant role in the coexistence of these three species.

The findings regarding the spatial, temporal, and occupancy patterns of the three wild cat species in Belaban Resort open several important research opportunities for the future. One of the main priorities is to be more accurately estimate the population density of the sunda clouded leopard using the spatially explicit capture recapture (SECR) approach. Given that the clouded leopard shows a wide occupancy rate but moderate relative abundance, density analysis becomes crucial to understand whether the existing population is stable, declining, or simply widely dispersed but in small numbers. Density research can be deepened by adding habitat variables such as canopy density, primary forest cover, availability of large trees, or anthropogenic disturbance factors.

Additionally, another research opportunity is to integrate occupancy models with environmental variables to understand the factors that most contribute to the presence of each

species. For example, the leopard cat is likely to more responsive to prey availability and proximity to open areas, while the sunda clouded leopard and marbled cat may be more influenced by the quality of primary forest, vertical structure, and the level of human disturbance. Multi species occupancy model analysis also provides an opportunity to understand the forms of ecological interactions, whether the three species negatively affect each other (competition), are neutral, or show stable coexistence (Kyaw et al., 2021).

From a conservation perspective, these results emphasize that the presence of wild cats is highly dependent on complex, layered, and undegraded forest habitat conditions. For the sunda clouded leopard and marbled cat, which are highly dependent on primary forests and sensitive to environmental changes and various disturbances caused by human activities such as habitat fragmentation, new road construction, forest encroachment, and poaching, these factors can have negative impacts on their long-term populations (Macdonald et al., 2018; Hearn et al., 2019; IUCN/SSC Cat Specialist Group, 2024). Meanwhile, for the more adaptive leopard cat, conservation strategies can focus on managing human disturbances, especially poaching and pressure on small prey, and ensuring that the landscape continues to provide an adequate habitat mosaic.

Therefore, conservation efforts need to focus on maintaining primary forest cover in Belaban Resort and its buffer zones through intensified patrol activities. Additionally, involving local communities to minimize poaching and forest conversion should be integrated into area management planning. Overall, the combination of further research and adaptive conservation measures will strengthen the ability of area managers to ensure the sustainability of wild cat communities in Belaban Resort, BBBR NP.

## CONCLUSION

The camera trap survey in Belaban Resort, BBBR NP, successfully detected three wild cat species: the sunda clouded leopard, the leopard cat and the marbled cat. This confirms that the area is an important habitat for the wild cat community in Kalimantan. The high relative abundance of these species compared to various other locations in Kalimantan influenced by the well-preserved primary forest conditions, high prey diversity, and low levels of anthropogenic disturbance. Occupancy and activity patterns analyses indicate coexistence mechanisms through spatial and temporal separation, where the leopard cat is the most adaptive, while the sunda clouded leopard and marbled cat are highly dependent on primary forest quality. These findings underscore the need to maintain forest cover, increase area patrols, and involve the community in controlling poaching and encroachment as part of area management planning.

## ACKNOWLEDGMENT

Thank you to the entire field team from the BBBR NP Authority, Manka, and the Belaban Ella village community. We hope this manuscript will be useful for everyone.

## REFERENCES

Abduh, M., Priyandono, H., & Harikurniawan, A. (2018). Database Keanekaragaman Hayati Balai Taman Nasional Bukit Baka Bukit Raya. *Balai Taman Nasional Bukit Baka Bukit Raya. Sintang*.

Anirudh, N. B., Deere, N. J., Estrada, E., Hidayat, R., Struebig, M. J., & Supriatna, J. (2024). Mammals Of The Rungan–Kahayan Landscape, Central Kalimantan, Indonesia. Taprobanica, 13(2), 101-115.

Anwari, M. S., Riko, E., Nurhaida, N., & Purwano, S. (2023). Keanekaragaman Jenis Dan Kepadatan Burung Diurnal Pada Kawasan Wisata Alam Resort Belaban Sptn Wilayah I Nanga Pinoh BBBR NP. *JURNAL HUTAN LESTARI*, *11* (3), 592-602.

Ariyanto, T., Riyandi, R., & Rousdy, D. W. (2024). Estimasi Kepadatan Populasi Burung Rangkong (Bucerotidae) Di Jalur Pendakian Bukit Baka Kawasan Taman Nasional Bukit Baka Bukit Raya Kalimantan Barat. *Protobiont*, *13* (1).

Bischof, R., Ali, H., Kabir, M., Hameed, S., & Nawaz, M. A. (2014). Being the underdog: an elusive small carnivore uses space with prey and time without enemies. *Journal of Zoology*, *293*(1), 40-48.

Cheyne, S. M., & Macdonald, D. W. (2011). Wild felid diversity and activity patterns in Sabangau peat-swamp forest, Indonesian Borneo. *Oryx*, *45*(1), 119-124.

Cheyne, S. M., Stark, D. J., Limin, S. H., & Macdonald, D. W. (2013). First estimates of population ecology and threats to Sunda clouded leopards *Neofelis diardi* in a peat-swamp forest, Indonesia. *Endangered Species Research*, *22* (1), 1-9.

Cong, W., Li, J., Hacker, C., Li, Y., Zhang, Y., Jin, L., ... & Zhang, Y. (2024). Different coexistence patterns between apex carnivores and mesocarnivores based on temporal, spatial, and dietary niche partitioning analysis in Qilian Mountain National Park, China. *Elife*, *13*, RP90559.

Farris, Z. J., Gerber, B. D., Karpanty, S., Murphy, A., Wampole, E., Ratelolahy, F., & Kelly, M. J. (2020). Exploring and interpreting spatiotemporal interactions between native and invasive carnivores across a gradient of rainforest degradation. *Biological Invasions*, *22*(6), 2033-2047.

Hearn, A. J., Ross, J., Macdonald, D. W., Samejima, H., Heydon, M., Bernard, H., ... & Wilting, A. (2016a). Predicted distribution of the bay cat *Catopuma badia* (Mammalia: Carnivora: Felidae) on Borneo. Raffles Bulletin of Zoology, 2016(S33).

Hearn, A., Ross, J., Macdonald, D., Bolongon, G., Cheyne, S., Mohamed, A., ... & Wilting, A. (2016b). Predicted distribution of the Sunda clouded leopard *Neofelis diardi* (Mammalia: Carnivora: Felidae) on Borneo. *Raffles Bulletin of Zoology*, *2016*(S33).

Hearn, A. J., Ross, J., Alfred, R., Samejima, H., Heydon, M., Cheyne, S. M., ... & Semiadi, G. (2016c). Predicted distribution of the marbled cat *Pardofelis marmorata* (Mammalia: Carnivora: Felidae) on Borneo. *Raffles Bulletin of Zoology*.

Hearn, A. J., Ross, J., Bernard, H., Bakar, S. A., Hunter, L. T., & Macdonald, D. W. (2016d). The first estimates of marbled cat *Pardofelis marmorata* population density from Bornean primary and selectively logged forest. *PLoS One*, *11*(3), e0151046.

Hearn, A. J., Ross, J., Bernard, H., Bakar, S. A., Goossens, B., Hunter, L. T., & Macdonald, D. W. (2019). Responses of Sunda clouded leopard *Neofelis diardi* population density to anthropogenic disturbance: refining estimates of its conservation status in Sabah. *Oryx*, *53*(4), 643-653.

Inger, R. F., Stuebing, R. B., Grafe, T. U., & Dehling, J. M. (2017). A Field Guide to the Frogs of Borneo. Kota Kinabalu, Sabah, Malaysia.

IUCN. (2025). *The IUCN Red List of Threatened Species*.Version 2025-1. www.iucnredlist.org

IUCN/SSC Cat Specialist Group. (2024). *Marbled Cat (Pardofelis marmorata)*. Diambil dari https://www.catsg.org/living-species-marbledcat

Lee, O., Lee, S., Nam, D. H., & Lee, H. Y. (2014). Food habits of the leopard cat (*Prionailurus bengalensis euptilurus*) in Korea. *Mammal Study*, *39*(1), 43-46.

Leo, S., Izza, Q., Finley, N. L., Sumardi, I., & Andiani, J. (2024). Wildlife Species Recorded by Camera Traps in Reforested Lowland Rainforest and Peat Swamp Forest of Gunung Palung National Park, Indonesia. *Tropical Natural History*, *24*, 8-19.

Kennedi, U. F., Purwanto, S., Jakaria, M., Kusrini, M. D., Prabowo, O. J., Yanto, A. V., & Maddock, S. T. (2024). Amphibians and Reptiles Diversity in Bukit Baka Bukit Raya National Park, West Kalimantan. *Media Konservasi*, *29*(1), 1-12.

Kyaw, P. P., Macdonald, D. W., Penjor, U., Htun, S., Naing, H., Burnham, D., ... & Cushman, S. A. (2021). Investigating carnivore guild structure: spatial and temporal relationships amongst threatened felids in Myanmar. *ISPRS International Journal of Geo-Information*, *10*(12), 808.

Lynam, A. J., Jenks, K. E., Tantipisanuh, N., Chutipong, W., Ngoprasert, D., Gale, G. A., ... & Leimgruber, P. (2013). Terrestrial activity patterns of wild cats from camera-trapping. *Raffles Bulletin of Zoology*, *61*(1).

Macdonald, E. A., Cushman, S. A., Landguth, E. L., Hearn, A. J., Malhi, Y., & Macdonald, D. W. (2018). Simulating impacts of rapid forest loss on population size, connectivity and genetic diversity of Sunda clouded leopards (*Neofelis diardi*) in Borneo. *PloS one*, *13*(9), e0196974.

MacKenzie, D. I., Nichols, J. D., Royle, J. A., Pollock, K. H., Bailey, L., & Hines, J. E. (2017). *Occupancy estimation and modeling: inferring patterns and dynamics of species occurrence*. Elsevier.

Meredith M (2022). *wiqid: Quick and Dirty Estimates for Wildlife Populations*. R package version 0.3.3, https://github.com/mikemeredith/wiqid.

Mohamed, A., et al. (2016). *Predicted distribution of the leopard cat Prionailurus bengalensis (Mammalia: Carnivora: Felidae) on Borneo*. Raffles Bulletin of Zoology, (33), 180–185.

Nakabayashi, M., Kanamori, T., Matsukawa, A., Tangah, J., Tuuga, A., Malim, P. T., ... & Hanya, G. (2021). Temporal activity patterns suggesting niche partitioning of sympatric carnivores in Borneo, Malaysia. *Scientific reports*, *11*(1), 19819.

O'Brien, T. G., M. F. Kinnaird & H. T. Wibisono (2003). Crouching tigers, hidden prey: Sumatran tiger and prey populations in a tropical forest landscape. *Animal Conservation*, 6(2): 131–139.

Pallemaerts, L., Kulu, I. P., Jeffers, K. A., Macdonald, D. W., & Cheyne, S. M. (2020). Male residency of Sunda Clouded Leopard *Neofelis diardi* (Cuvier, 1823) (Mammalia: Carnivora: Felidae) in a peat swamp forest, Indonesian Borneo. *Journal of Threatened Taxa*, *12*(16), 17222-17228.

Rajaratnam, R. (2000). *Ecology of the leopard cat (Prionailurus bengalensis) in Tabin Wildlife Reserve, Sabah, Malaysia* (Doctoral dissertation, Universiti Kebangsaan Malaysia).

Ramesh, T., Kalle, R., Sankar, K., & Qureshi, Q. (2012). Spatio-temporal partitioning among large carnivores in relation to major prey species in W estern G hats. *Journal of Zoology*, *287*(4), 269-275.

Ross, J., Brodie, J., Cheyne, S., Datta, A., Hearn, A., Loken, B., Lynam, A., McCarthy, J., Phan, C., Rasphone, A., Singh, P. & Wilting, A. (2016). *Pardofelis marmorata*. The IUCN Red List of Threatened Species 2016:e.T16218A97164299. http://dx.doi.org/10.2305/IUCN.UK.2016 1.RLTS.T16218A97164299.en

Ross, J., Hearn, A. J., Bernard, H., Secoy, K., & Macdonald, D. (2010). A Framework for a Wild Cat Action Plan for Sabah. Global Canopy Programme.

Simbolon, H. (2000). Forest and land fires in Indonesia: A serious threat to the conservation of Biodiversity. *Global Environmental Research on Biological and Ecological Aspect. Center for Global Environmental Research, NIES, Japan*, *1*, 25-34.

Sollmann, R., Linkie, M., Haidir, I. A., & Macdonald, D. W. (2014). Bringing clarity to the clouded leopard *Neofelis diardi*: first density estimates from Sumatra. *Oryx*, *48* (4), 536-539.