

## Short Communication:

# Notes on a new distribution record of the Critically Endangered Sunda Pangolin (*Manis javanica*) in Sabah, Malaysian Borneo

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**Abstract.** Sompud J, Sahar N, Adros C, Richard E, Sompud CB. 2023. Short Communication: Notes on a new distribution record of the Critically Endangered Sunda Pangolin (*Manis javanica*) in Sabah, Malaysian Borneo. *Biodiversitas* 24: 975-981. Sunda pangolin is a Critically Endangered species. The species used to be widespread in Sabah, but its presence has become very scarce due to poaching and illegal trade. For the past decade, there have been individual reports of the distribution of the Sunda pangolin in Sabah. The reports of the locality of the Sunda Pangolin were mainly from the eastern part of Sabah, where large and contiguous forests exist. More comprehensive information on the distribution of the Sunda pangolin is needed to pave ahead with the species conservation and law enforcement to curb poaching and its illegal trade. This study presents a new distributional record of Sunda pangolin in Sabah. The evidence of the new distribution was obtained during field research at SFERA@UMS within the Universiti Malaysia Sabah Hill, Kota Kinabalu, from 10 October to 8 December 2022. Additional evidence was found through citizen science. Based on the track and signs, camera trap image, and the reports from citizen science, we conclude that the Sunda pangolin exists in UMS forest, and at least two individuals have been reported. There are no published reports on the presence of the Sunda pangolin before this. The study also shows how vital citizen science is in biodiversity conservation.

**Keywords:** Camera trap, Citizen science, Manidae, SFERA@UMS, Universiti Malaysia Sabah

## INTRODUCTION

The Sunda pangolin can be found distributed in southeast Asia from Sumatra, Java, and Borneo. The species used to be common throughout Borneo, inhabiting forests including peat swamps up to montane forests up to 1,700 meters on Kinabalu (Phillipps and Phillipps, 2016). Sunda pangolin was also reported to inhabit secondary forests, cultivated land, and oil palm plantations (Chong et al. 2020). However, it has become rare due to poaching and illegal trade (Zhang et al. 2015).

The adult Sunda pangolin can grow up to 140 cm in total length with a body weight between 4-7 kg (Chong et al. 2020). The species exhibits sexual dimorphism (Phillipps and Phillipps 2016; Novriyanti and Takandjandji 2022). The male is more significant in body size and has a more extensive home range (43 ha) than the female (7 ha) (Lim and Ng 2007). Gray et al. (2022) reported from their Vietnam study that the average home range of Sunda pangolin was 1.58 km<sup>2</sup> and did not vary between sex. Nevertheless, the findings reported by Gray et al. (2022) were based on the rehabilitated pangolin individuals that may have expanded their home range before settling down. Sunda pangolins are nocturnal (Challender et al. 2012; Sompud et al. 2019) and often arboreal (Phillipps and Phillipps, 2016). Sunda pangolins are slow breeders. The gestation period reported by Yan et al. (2022) in captivity

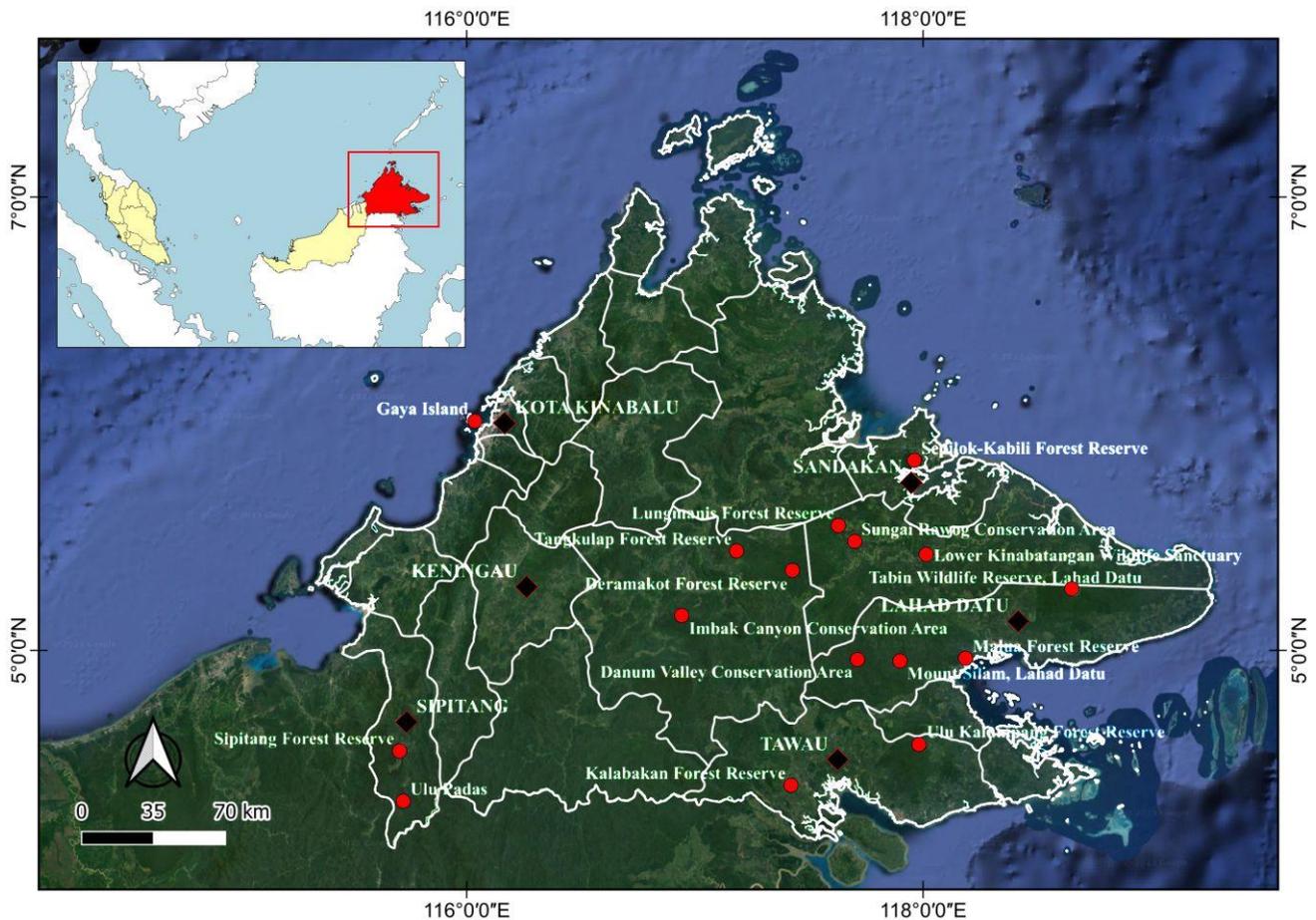
was from 120 to 150 days, but it can be up to 180 days (Zhang et al. 2015). The female Sunda pangolin produces one infant each time she gives birth (Zhang et al. 2015; Phillipps and Phillipps 2016), and the baby clings to the mother's back to traveling until the infant becomes independent (Phillipps and Phillipps 2016). Pangolins offer invaluable ecosystem services to the forests because it feeds on termites and ants (Phillipps and Phillipps 2016; Chong et al. 2020; Novriyanti and Takandjandji 2022). The only known natural predator of the Sunda pangolin in Borneo is the clouded leopard (Phillipps and Phillipps 2016).

For the past decade, there have been individual reports of the distribution of the Sunda pangolin in Sabah (Figure 1). Most reports of the Sunda Pangolin in Sabah were mainly from the larger contiguous forests in the eastern part of the state. Only two locations were reported on the western side of Sabah, and one was on Gaya island.

The known distribution of the Sunda pangolin from the recent decade was tabulated from 2012 – 2022 (Table 1). Older records were not included. There were 15 known locations of the Sunda pangolin derived from nine past studies. The most recent one was from Suis et al. (2021) and Laneng et al. (2021), which reported the species in Lungmanis and Kalabakan forest reserves, respectively. According to Payne et al. (1985), the Sunda pangolin was common in the islands around Sabah. However, only Gaya

Island has an extant population now (Sompud et al. 2019). All reported locality was detected using camera traps except for Suis et al. (2020) and Suis et al. (2021), which detected Sunda pangolin by transect survey walk through

the tracks and signs. This study presents a new distributional record of Sunda pangolin found on the west coast of the Sabah region.



**Figure 1.** The reported presence of Sunda pangolin throughout Sabah, Malaysia

**Table 1.** The recent ten years' reports of Sunda pangolin were detected throughout Sabah in chronological order

Study	Locality	Methods of detection
Samejima and Ong (2012)	Deramakot & Tangkulap forest reserves	Camera trap survey
Bernard et al. (2013)	Imbak Canyon Conservation	Camera trap survey
Ishige et al. (2017)	Deramakot forest reserves	Environmental DNA and Camera trap survey
IUCN SSC Pangolin Specialist Group et al. (2018)	<ul style="list-style-type: none"> <li>• Sipitang forest reserve</li> <li>• Tabin wildlife reserve</li> <li>• Ulu Kalumpang forest reserve</li> <li>• Malua forest reserve</li> <li>• Danum Valley</li> <li>• Ulu Padas</li> <li>• Sepilok-Kabili forest reserve</li> <li>• Lower Kinabatangan wildlife sanctuary</li> </ul>	Camera trap survey
Sompud et al. (2019)	Gaya Island	Camera trap survey
Bernard et al. (2019)	Sungai Rawog Conservation Area	Camera trap survey
Suis et al. (2020)	Mount Silam	Transect survey
Laneng et al. (2021)	Kalabakan forest reserve	Camera Trap survey
Suis et al. (2021)	Lungmanis forest reserve	Transect survey

## MATERIALS AND METHODS

### Study area

This study was conducted at the Universiti Malaysia Sabah (UMS) campus. It is situated on the west coast of the Sabah region (Norfadilah and Er 2020; Rosazman and Kunjuraman 2015). The campus of UMS covers 4.04 km<sup>2</sup> (Majuakim et al. 2018). About one-quarter of the ground cover on the campus consists of a forested area known as the UMS Hill forests. The UMS forest is a secondary forest that covers 1.02 km<sup>2</sup> that has 302 plant species found here (Majuakim et al. 2018). The UMS Forest is adjacent to forested state land. Together they form a forest island of about 2.2 km<sup>2</sup>. The topography of the forested area is hilly, occasionally with steep slopes. The highest point is 190 m a.s.l, or UMS Hill peak (Majuakim et al. 2018). The climate here is typically tropical, with an average temperature of 28 degrees Celsius and an annual rainfall of 2,700 mm.

### Procedures

#### Camera trap survey

A purposive sampling was conducted using camera traps to collect the presence or absence of the Sunda pangolin from 10 October to 8 December 2022. The camera trap used in this study was a Suntek model of Trail camera HC-800M. Thirteen units of camera traps were deployed at SFERA@UMS. SFERA stands for Sustainable Forest Education and Research Area at Universiti Sabah Malaysia. The camera was installed on a tree trunk about one meter high (Hiew et al. 2022) and was set at high sensitivity motion detection, recording three consecutive still photos (Bernard et al. 2013). There are ten termite mounds located in SFERA@UMS. At least one unit of camera trap was installed at each termite mound that

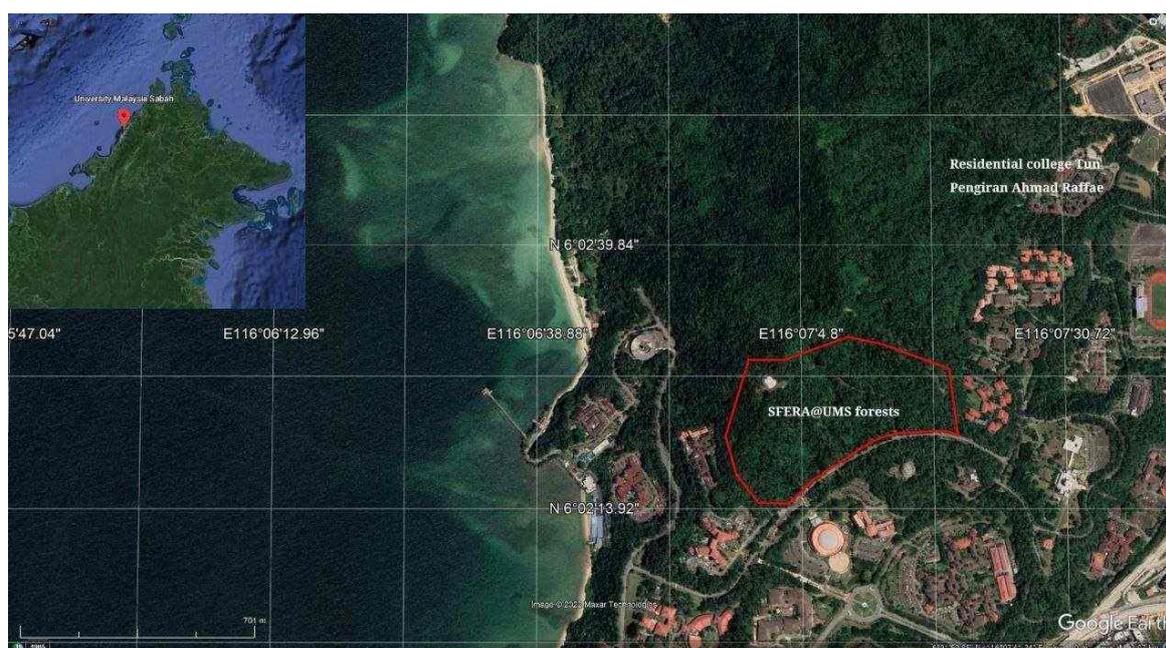
operated for 24 hours. Each camera trap was checked monthly to ensure they were functioning and the retrieval of data.

#### Informal questionnaire survey

A standard questionnaire survey was also conducted during the study to collect information from the UMS residents to document sightings of the Sunda pangolin in UMS vicinities. A standard questionnaire in the google form was created and disseminated among the UMS residents. The questionnaire contains two parts. The first part collects the basic information of the respondents. This section will enable our research team to contact them should we require further information. The second section collects information on the sightings of wildlife around the UMS campus, including time, date, and observed behavior displayed by the wildlife. We also requested that the respondents include still photos or video footage of the wildlife.

## RESULTS AND DISCUSSION

The evidence of the new distribution of Sunda pangolin was obtained during field research at SFERA@UMS within the UMS Hill forest, Kota Kinabalu (Figure 2). SFERA@UMS is 0.25 km<sup>2</sup> of land set aside as a Forest Reserve by the UMS management to be utilized for forest research and education development (Borneo Post 2022). The Faculty of Tropical Forestry is now managing this forest since early 2021. In 2022, the area became one of the living labs of the Faculty of Tropical Forestry for research, training, and education.



**Figure 2.** The location of SFERA@UMS forest within the UMS Hill forest where we found the termite mounds with Sunda pangolin diggings. (Source: Google Earth)



**Figure 3.** Termite mound that was discovered in the forest of SFERA@UMS. Termite mound with relatively recent diggings where camera traps were installed

The presence of the Sunda pangolin was first noticed during our field research in SFERA@UMS (Figure 3). One of the termite mounds was covered with several relatively fresh digging signs (Figure 4). This evidence led us to believe that the Sunda pangolin might be present in the UMS Hill forest. There were other termite mounds with very old dents, probably due to diggings, but nothing conclusive can be drawn from the very old dents.

In November 2022, the camera trap successfully recorded two separate events of the Sunda pangolin. The first was on 11 November 2022 at 22:14 h (Figure 5). In addition, six still photos were recorded of the Sunda pangolin on the termite mound, apparently looking for food. The second recorded image was on 22 November 2022 at 01:45 h.

Other species of wildlife that were recorded around the termite mound during the survey were a group of long-tailed macaques (*Macaca fascicularis*), lesser mousedeer (*Tragulus kanchil*), and Asian water monitor lizard (*Varanus salvator*). The long-tailed macaques were the most frequent wildlife that visited the spot. The juvenile macaques have re-adjusted one of the camera traps, pointing it away from the mound.

For the questionnaire survey, we obtained two separate sightings of the Sunda pangolin on UMS campus. The first was from a citizen scientist who uploaded his sighting on TikTok (Zailan 2022). Citizen science is the public participation of a non-scientist in scientific research (Jones et al. 2018). Citizen science increases public environmental awareness (Johnson et al. 2014), eventually contributing to wildlife conservation. A single adult Sunda pangolin was spotted wandering around the mart at the residential college Tun Pengiran Ahmad Raffae (Figure 2). This residential college was known as *Kampung E* (Lim et al. 2019). The subject was spotted at 21:49 h on 7 October 2022. Zailan (2022) reported that it was docile and unafraid of human presence (Figure 6). After its excursion at the mart, the pangolin returned to the forested areas. It was raining heavily during the incident; the subject was drenched due to the rain, as seen in Figure 6.



**Figure 4.** A hole was dug in the termite mound. The rainy season has considerably eroded the digging mark

The second sighting was also derived from citizen science (Figure 7). A single juvenile Sunda pangolin was seen crossing the road inside SFERA@UMS at 06:55 h on 22 July 2022 (Siam V. 2022, pers. Comm.). The pangolin was already at the edge of the forest and was docile when it was approached. Fearing that the animal might end up a road kill, it was transported by the citizen scientist back into the UMS Hill forests.

This study shows that the Sunda pangolin exists in UMS forests, as evidently shown from the results obtained from the track and signs, camera trap images, and the reports from citizen science. There are at least two individuals reported so far. There was no published report on the presence of the Sunda pangolin before this. Only a few published articles on biodiversity studies around the UMS Hill forests are available. Majuakim et al. (2018) studied the floristic composition in UMS Hill forest. Lim and Mojiol (2019) reported 46 species and 23 families of avian communities found on UMS campus. Aquatic insects in the surrounding areas of the UMS forests have been studied by Arman et al. (2015). The study also shows how vital citizen science is in biodiversity conservation.



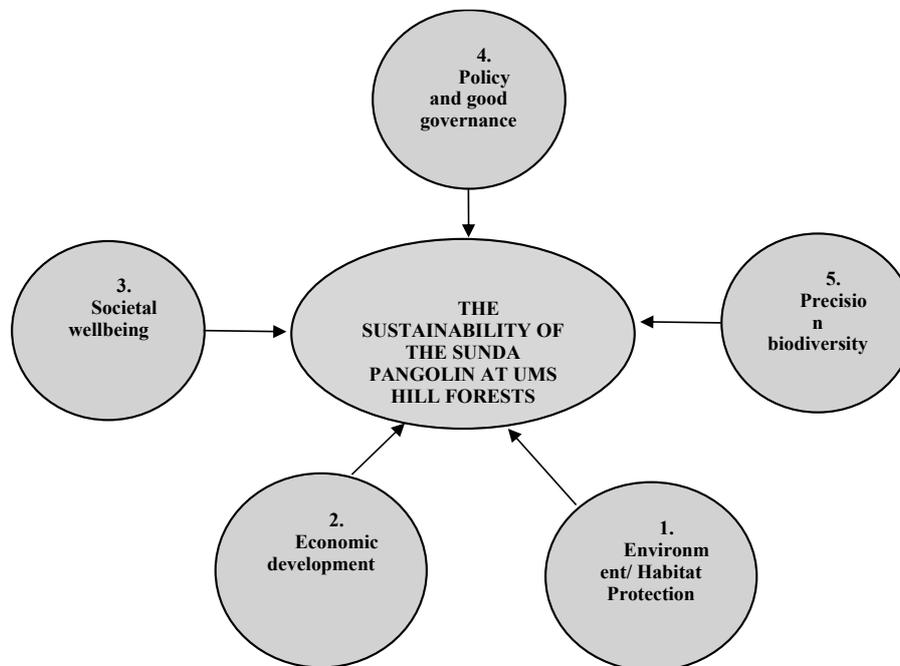
**Figure 5.** A single adult Sunda pangolin on the termite mound



**Figure 6.** A Sunda pangolin roaming around a mart at UMS students' residential area. Photo credit: Zailan Firdaus



**Figure 7.** The juvenile Sunda pangolin was transported back into the UMS Hill forests. The citizen scientist believes it is male



**Figure 8.** A holistic conceptual framework for the conservation of the Sunda pangolin at UMS

This new distribution of Sunda pangolin in Sabah presents an urgent need for conservation work for this Critically Endangered species. The followings are the recommendations to be implemented to conserve the Sunda pangolin in UMS Hill forest. These recommendations are based on the sustainable development approach. The inception of sustainable development was from the Brundtland Report in 1987. This term refers to "development that meets the needs of the present generations without compromising the ability of the future generations to meet their own needs." The three bottom-line of sustainable development are environmental, social, and economic (Gimenez et al. 2012; Alhaddi 2015). The conceptual framework we propose (Figure 8) was adapted from Abdullah MT pers. Comm. 2022.

The first line is the environment that translates into habitat protection, which UMS is already implementing but can be improved if the adjacent state land is gazetted under the management of UMS. By doing so, the whole forest island habitat can be protected for the Sunda pangolin and all the existing biodiversity there. The population and habitat connected with adjacent forests should be investigated to protect the remaining Sunda pangolins. The second line is the economic development that translates into edutourism that generates income and raises awareness from the public on the Sunda pangolin. This activity requires wise deliberation of zoning the UMS hill into tourism usage and conservation zone for the Sunda pangolin. The third line is the societal well-being that translates into providing the surrounding society to

appreciate the aesthetic value of the animal by getting close to it. Awareness and participation from the public are vital components of wildlife conservation (Vincenot et al. 2015; Jiménez et al. 2015; Manfredo et al. 2020).

The fourth line is policy and good governance. The discovery of an extant population of Sunda pangolin on UMS campus presents a unique situation. UMS is the only university currently known in Malaysia with Sunda pangolin in the wild that resides within the campus. The University management should capitalize on this situation. UMS management can adopt the Sunda pangolin as the University icon and mascot. Public awareness of biodiversity conservation can be raised by adopting a wildlife mascot (Darapuri 2014; Melo et al. 2014; Good et al. 2017). Many higher learning institutions worldwide use wildlife mascots as the institution's symbol (Patterson et al. 2021), which can benefit wildlife conservation (Brown 2014; Hayden and Dills 2015; Brackowski et al. 2021). For example, the National Pingtung Science and Technology, Taiwan, uses the endangered black bear as its University mascot to increase public awareness. The National Chi Nan University, Taiwan, has adopted the Critically Endangered Formosan pangolin as its icon and mascot. The university also produces souvenirs and products to sell to tourists and students to help increase public awareness of Formosan pangolin species conservation. This move also can be adopted by UMS. In addition, good governance should be exercised to ensure that no built environment encroachment into the UMS hill forest is done in the future to protect the habitat of this Critically Endangered species.

Last but not least, the fifth line is precision biodiversity using high-technology instruments to monitor the population and quality of habitats. Research using high technology provides precision to manage better and conserve the species sustainably. Ten et al. (2021) reported the Malayan tiger (*Panthera tigris jacksoni*) looming extinction in Malaysia also recommended using precision biodiversity based on biosensors to mitigate the population crash of this Critically Endangered carnivore. The Sunda pangolin satellite tracking study can be employed to understand the ecology of the species and the quality of habitats used by the species. The usage of drones can also be employed to monitor the population remotely, which can be employed as surveillance and facilitating tracking of the animal. There is no rescue center for the Sunda pangolin in Sabah yet. UMS being a higher learning institution and conducting research activities, is ideal for establishing a rescue center for this species. The UMS Hill forest can provide a habitat for them. The habitat is just at the fringe of the Kota Kinabalu capital, allowing for the ease of monitoring of rescued individuals and ecological research for the species.

More comprehensive information on the distribution of the Sunda pangolin is needed to pave ahead with the species conservation and law enforcement to curb poaching and its illegal trade. The immediate future of the Sunda pangolin at the UMS forest is very dependent on UMS's higher management policymakers and the public. More efforts need to be made by our community to encourage

more citizen science because the Earth's precious biodiversity that needs to be conserved is everyone's business.

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