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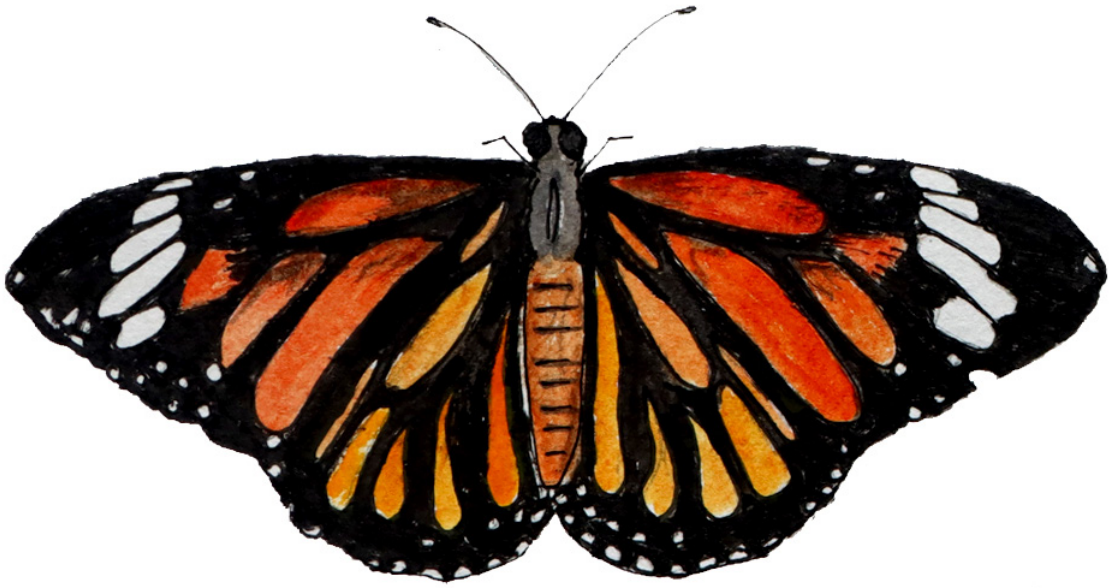

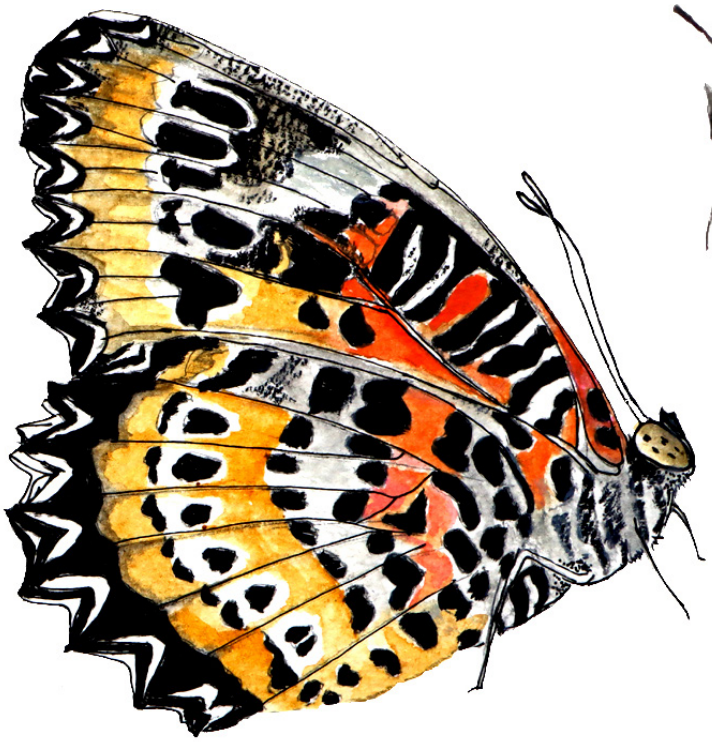

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Cover: Watercolour illustrations—Striped Tiger *Danaus genutia*, Common Silverline *Cigaritis vulcanus*, Tamil Lacewing *Cethosia mahratta*. © Mayur Nandikar.

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COMMUNICATION

Occurrence of a female melanistic leopard *Panthera pardus delacouri* (Linnaeus, 1758) (Mammalia: Carnivora: Felidae) in Ulu Sat Permanent Forest Reserve, Machang, Kelantan, Peninsular Malaysia from camera traps reconnaissance survey 2023

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Abstract: The Indochinese leopard, *Panthera pardus delacouri* is classified as Critically Endangered in the Red List of Threatened Species by the International Union for Conservation of Nature (IUCN). The subspecies has been recorded for the first time in Ulu Sat Permanent Forest Reserve (USPFR). Camera trap records show the presence of a female melanistic leopard, which is of additional biological interest. It is hoped that these observations will stimulate long-term studies on leopards of USPFR and promote conservation efforts in the area.

Keywords: Biodiversity, camera trapping, carnivores, conservation, ecosystem, endangered species, felid conservation, forest ecology, habitat, monitoring, predators, wildlife.

Malay abstrak: Harimau bintang Indochina, *Panthera pardus delacouri* diklasifikasikan sebagai Terancam Teruk dalam Senarai Merah Spesies Terancam oleh Kesatuan Antarabangsa bagi Pemuliharaan Alam Semula Jadi (IUCN). Subspesies ini telah direkodkan buat kali pertama di Hutan Simpan Kekal Ulu Sat (HSKUS). Rekod perangkap kamera menunjukkan kehadiran harimau bintang melanistik betina, yang mempunyai kepentingan biologi tambahan. Pemerhatian ini diharapkan dapat merangsang kajian jangka panjang mengenai harimau bintang di HSKUS dan menggalakkan usaha pemuliharaan di kawasan tersebut.

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Author contributions: WHIWMH, MHSAR and HH collected data, analysed and wrote the initial draft of the manuscript. AA and KH read and revised the final manuscript.

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INTRODUCTION

The leopard is one of the most adaptable large carnivores on the planet (Sunquist & Sunquist 2002). It is present in a wide range of habitats, from deserts to rainforests, from humid tropics to temperate zones (Jacobson et al. 2016; da Silva et al. 2017). The natural habitat for leopards in Malaysia had decreased substantially when 14% of Malaysia's forest cover had been lost from years 2000 to 2012 (Hedges et al. 2015). Paved roads have been constructed in the remaining forest blocks in the Peninsula Malaysia (Hedges et al. 2015). The leopard's geographic range extends from Africa, central Asia, and the Indian subcontinent, including Sri Lanka, to much of eastern Asia, and the Russian Far East (Chew 2019). In Southeast Asia, it occurs from Myanmar to Thailand and Vietnam, south to Peninsular Malaysia, and the Indonesian island of Java (Stein et al. 2016).

Indochinese leopard (*P. p. delacouri*) might be extinct in Lao PDR, Vietnam, and Singapore and may occur in small fragmented populations in Cambodia, southeastern China, Malaysia, Myanmar, and Thailand. The Indochinese Leopard is classified as 'Critically Endangered'. At present, this species is at high risk of extinction due to poaching and high deforestation rates in southeastern Asia (Rostro-García et al. 2016). Due to prey depletion, the leopard is restricted to a few small fragmented areas and protected areas (Forbes 2024).

Melanistic leopards can be distinguished by their intense black pigments which almost obscure the rosettes. Melanistic leopards or black panthers can be found mostly in the southern part of Isthmus Kra encompassing Peninsular Malaysia and southern Thailand (Kawanishi et al. 2010; Hedges et al. 2015).

Ulu Sat Forest Reserve is one of the 12,000 ha of permanent forest reserve (PFR) in Kelantan and is under the management of the Forestry Department of Peninsula Malaysia which had been protected and reserved from any illegal logging activities. In this article, the presence of a melanistic leopard was reported in Ulu Sat Permanent Forest Reserve, Machang District, Kelantan, Peninsular Malaysia. The leopard was recorded by a camera trap installed between 9 April 2023 and 26 May 2023. Camera traps were placed in the area for reconnaissance survey prior to an extensive camera trapping survey targeting wild felids in the study area and also Chabang Tongkat Forest Reserve.

Study area

The study area is located in Ulu Sat Permanent Forest Reserve (USPFR) (5.717 ^{0}N & 102.317 ^{0}E), an approximately 148 km² protected area located in Machang District, eastern Kelantan, Peninsular Malaysia (Image 1). This site is an ecologically important forest habitat for water catchments in producing, maintaining, and reserving water for natural and human consumption. It makes the area very significant for the nearby local community (Samsudin et al. 2020; Abas et al. 2021). Ulu Sat Forest Reserve's natural vegetation is still intact and covered with approximately over 0.65 p/pet and the forest is classed as tropical wet with a tropical moist forest biozone (Abas et al. 2021). Ulu Sat Forest Reserve and Chabang Tongkat Forest Reserve together with Temangan Forest Reserve are put under secondary linkage (D-SL 3: Chabang Tongkat FR–Ulu Sat FR–Temangan FR). The types of forest in the USPFR are lowland and the hill is of dipterocarp forest. The area is undulating, and the full elevation range of USPFR is 60–600 m.

MATERIALS AND METHODS

In this study, two camera trap units (Reconyx Hyperfire) were installed at two random locations in USPFR. The main purpose of the study was to have prior information on the presence of wild felid species. Camera traps were mounted on the trees bordering forest trails at a height of about 0.5 m above the ground to permit the detection of medium and large-sized mammals without using any bait (Jansen et al. 2014). The camera traps were programmed at a one-second interval between three series of images to maximize the chance to capture wildlife photos. The location of each camera was recorded with a global positioning system (Garmin GPSMAP 64s) to record their local information such as date of installation, the coordinates, and elevation range. The GPS units also made it easy for colleagues to return to the area to retrieve the cameras. Precautions were taken to minimize the risk of letting the cameras be stolen or damaged by wildlife. The reconnaissance survey lasted from 9 April 2023 until 26 May 2023. The surveyors visited the camera traps only twice, during their setting up and retrieval. All images have been extracted, sorted, and identified accordingly. Images that phantom or remain unidentified due to blurry images were excluded from the results. The cameras and memory card were tagged and identified with unique camera trap numbers for reference.

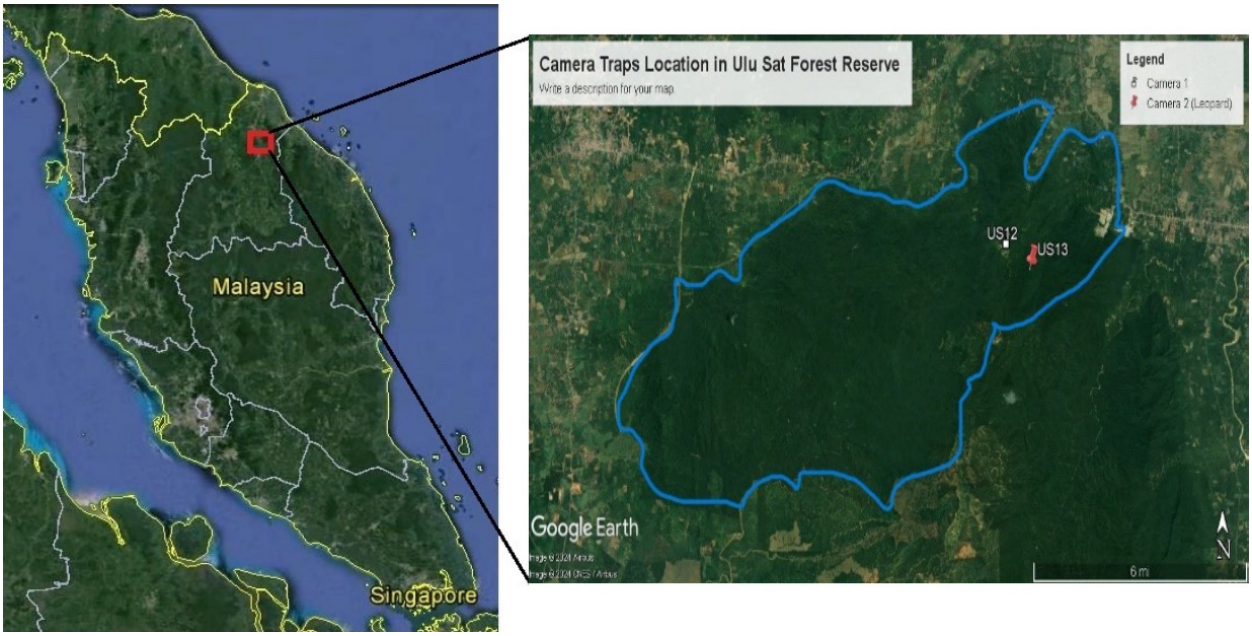

Image 1. Map of the study area, camera traps location and camera detected leopard.

RESULTS

From this study, a total of 603 photos of terrestrial vertebrates were captured during the sampling period. The camera traps operated between 9 April to 26 May 2023 and the images were obtained from a total of 94 trap nights. The 603 photos yielded 41 independent photos of wildlife, and 13 phantom images were discarded. The image of the melanistic leopard clearly shows it to be a female, with traces of torn skin on the back of the body. The image was recorded on 11 May 2023 at 0701 h (Image 2). This leopard was detected at the old logging road built on the ridge at 0701 h at 428 m elevation. This discovery is expected to arouse interest in leopards in Malaysia and their habitat in the Ulu Sat Permanent Forest Reserve.

Besides melanistic leopard, other wildlife which were detected consisted of wild boar *Sus scrofa*, Asiatic Brush-tailed Porcupine *Atherurus macrourus*, Barking Deer *Muntiacus muntjak*, Malayan Tapir *Tapirus indicus*, Asiatic Leopard Cat *Prionailurus bengalensis*, Malayan Porcupine *Hystrix brachyura*, Southern Serow *Capricornis sumatraensis*, Malayan Sunbear *Helarctos malayanus*, Yellow-throated Marten *Martes flagivula*, White-thighed Surili *Presbytis siamensis*, and Crestless Fireback *Lophura erythrophthalma*.

DISCUSSION

In 2018, a Biological Diversity Scientific Expedition program in the Ulu Sat Forest Reserve was organized by the Kelantan State Forestry Department in collaboration with Universiti Malaysia Kelantan. On the expedition, a preliminary study of the installation of camera traps was carried out to assess the presence of terrestrial vertebrates. The results of the study have recorded eight species of terrestrial vertebrates, namely Wild Boar *Sus scrofa*, Malayan Sun Bear *Helarctos malayanus*, Malayan Tapir *Tapirus indicus*, Southern Red Muntjac *Muntiacus muntjak*, Clouded Leopard *Neofelis nebulosa*, Leopard Cat *Prionailurus bengalensis*, Dhole *Cuon alpinus*, and Asiatic Golden Cat *Catopuma temminckii* (Hazizi et al. 2020). The study was not intensive on the Ulu Sat Forest Reserve. Apart from the eight species above, a rare felid species was also recorded for the first time, the Marbled Cat *Pardofelis marmorata* on the same expedition but in a different location (Hambali et al. 2019).

The present research has been able to make a first-time record of the remarkable morphological variation, the melanistic leopard *Panthera pardus delacouri* in USPFR. Previously in Malaysia, leopards were recorded in Belum-Temengor, Taman Negara, Endau Rompin, Krau Wildlife Reserve, Pasoh, Ayer Hitam Forest Reserves (Chew 2019), Jeli and Ulu Muda (Hambali et al. 2021). This discovery is considered important as the leopard subspecies is classified as 'Critically Endangered' in the

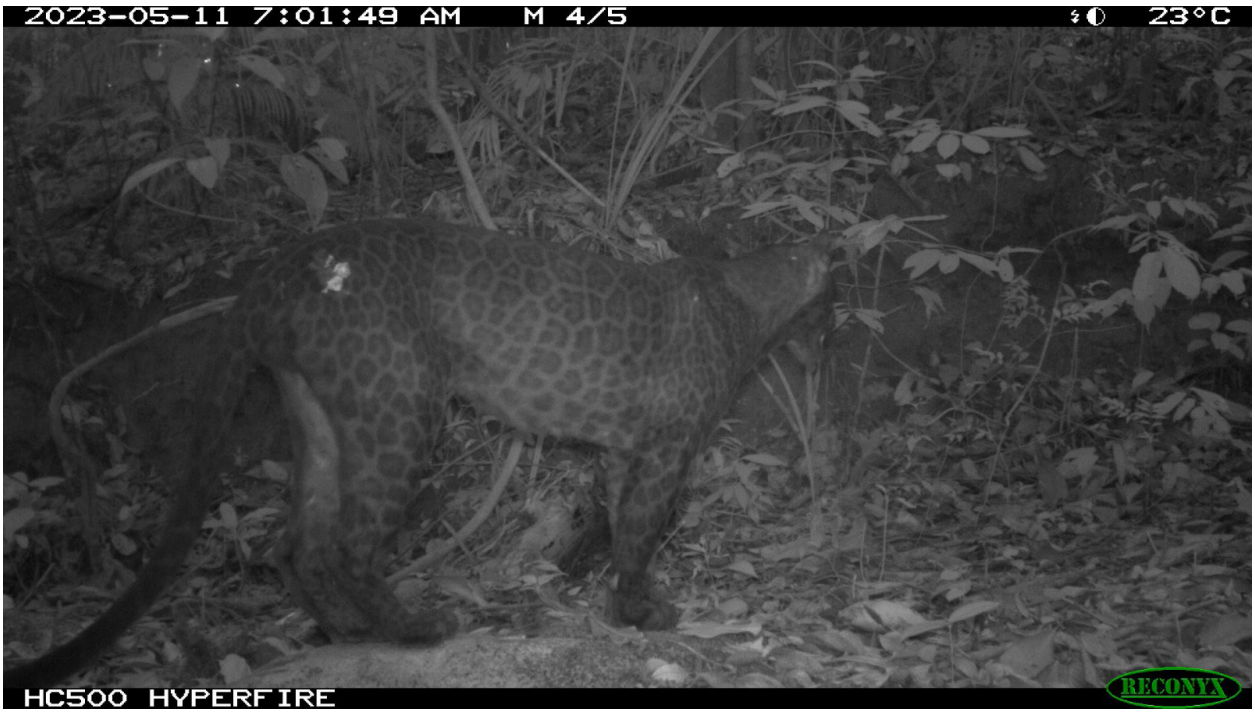

Image 2. A female melanistic leopard was photographed at 0701 h on 11 May 2023.

IUCN Red List of Threatened Species (Rostro-García et al. 2019). According to the Red List of Mammals for Peninsular Malaysia Version 2.0, this animal species is categorized as endangered (PERHILITAN 2017). *Panthera pardus* has been placed in Schedule 2 where it is a protected animal (Wildlife Conservation Act 2010). This protected animal requires a special permit to carry out any activity against it and if there are no special permits strict measures such as summons, and imprisonment can be imposed.

The Indochinese leopard faces multiple threats that contribute to its dwindling and endangered status. These threats include habitat loss, fragmentation, and degradation due to factors such as agriculture (Sodhi et al. 2010; Miettinen et al. 2011; Wilcove et al. 2013) and infrastructure development especially roads (Clements et al. 2014). As the human population expands and exploits natural resources, the leopard's habitat is encroached upon and diminished. From 2011 to 2018 a total of 54,224 human-wildlife negative interaction cases were recorded. In these, a total of 207 cases of human leopard conflicts occurred from 2011 to 2018 (Xin et al. 2024). From the total of leopard cases, it was stated that 104 cases come from black panthers and the rest from non-melanistic leopards (Xin et al. 2024).

Ulu Sat is known for its rich biodiversity and dense tropical rainforest. Preserving the integrity of USPFR is essential for safeguarding its unique biodiversity of flora including rafflesia, araceae (*A. cochinchinense* and *A. puber*), and fauna such as the leopard, Malayan tapir, and Sumatran serow in supporting sustainable ecosystem services in the area (Meisery et al. 2020). The discovery of a melanistic leopard within the boundaries of Ulu Sat Forest Reserve highlights the importance of this protected area in safeguarding rare and elusive wildlife species amidst the challenges posed by deforestation and illegal wildlife trade in southeastern Asia. The melanistic leopard found in the present study shows that further study is needed to determine their population, their basic ecology, activity pattern, and distribution. In the future, it is expected that conservation actions for leopards in the study area and the state of Kelantan can be developed. To protect the leopard population in Malaysia, collaboration and cooperation between governmental and non-governmental organizations will be imperative. Also, by integrating conservation education into the curriculums and research programs of local schools and universities, larger audiences can be reached to strengthen conservation efforts for leopards in Malaysia and their habitat which is the Ulu Sat Permanent Forest Reserve. Residents living around the study area need to be given exposure and awareness about the species and the importance of conserving them in their natural habitat.

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