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SHORT COMMUNICATION

SIGHTING OF *PETAURISTA PETAURISTA* (PALLAS, 1766) (MAMMALIA: RODENTIA: SCIURIDAE) ON LIMESTONE HILLS IN MERAPOH, MALAYSIA

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Sighting of *Petaurista petaurista* (Pallas, 1766) (Mammalia: Rodentia: Sciuridae) on limestone hills in Merapoh, Malaysia

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Abstract: Flying squirrels are poorly studied nocturnal mammals as their elusive and nocturnal behaviour makes it hard to observe them in the wild. Here, we describe sightings of *Petaurista petaurista* on a limestone hill and its foot at Merapoh, Pahang, Malaysia. This is the first report as the species is usually known to inhabit forest habitat. We observed the first squirrel resting on a steep limestone wall at night. During subsequent nights, three individuals were observed feeding on *Ficus hispida* and *Terminalia catappa* fruits on the foot of the hill in nearby trees. These sightings suggest that *P. petaurista* may use limestone hill habitat.

Keywords: Ecology, flying squirrels, limestone, nocturnal.

Flying squirrels (hereafter referred to as gliding squirrels) are a group of understudied rodents in the family Sciuridae (Thorington et al. 2012) that belong to 15 different genera in two subtribes—(i) subtribe Glaucomyina: *Eoglaucmys*, *Glaucmys*, *Hylopetes*, *Iomys*, *Petaurillus*, *Petinomys*; (ii) subtribe Peromyina: *Aeretes*, *Aeromys*, *Belomys*, *Biswamoyopterus*, *Eupetaurus*, *Petaurista*, *Pteromys*, *Pteromyscus*, *Trogopterus* (Thorington & Hoffmann 2005). They are primarily nocturnal mammals with varying body sizes from small (80–225 mm head to anus length) to large

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(520–338 mm; Francis 2008). They are popularly known as “flying squirrels” (Prater 2005) because they have a “flying membrane” or patagium that spreads between their extremities to glide between their extremities that enables them to glide over long distances (ca. 90m) between tress.

The Red Giant Gliding Squirrel *Petaurista petaurista* has a wide range from Afghanistan to Borneo (Thorington et al. 2012). There are known subspecies within this geographical range, including those described in southeastern Asia (Corbet & Hill 1992; Silva & Downing 1995; Thorington & Hoffmann 2005; Sanamxay et al. 2015). *Petaurista petaurista* is known to occur in wet tropical lowlands, mountainous temperate forests, coniferous forests, evergreen broadleaf forests, hardwood forests, plantations, and orchards (Molur et al. 2005; Thorington et al. 2012; Smith & Xie 2013). They are predominantly herbivores, feeding on leaves, flowers, and fruits (Muul & Lim 1978; Kuo & Lee 2003). During the day, these squirrels usually stay in their nest in tree cavities (Muul & Lim 1978; Lee et al. 1993) or in epiphytes such as the bird’s nest fern; *Asplenium nidus* (P. Miard pers. obs.). *Petaurista petaurista* is listed as Least Concern in the IUCN Red List due to their broad geographic range (Duckworth 2016). This paper reports the first sighting of the little studied *P. petaurista* from limestone hills in Merapoh, Pahang, Malaysia.

MATERIALS AND METHODS

Study site

The survey area consists of mixed fruit orchards that fringe forested areas within the Merapoh District of Pahang, peninsular Malaysia (4.696°N, 102.000°E). These orchards are planted primarily with durian *Durio* spp., Rambutan *Nephelium lappaceum*, Cocoa *Theobroma cacao*, and other native trees such as figs *Ficus variegata* that also grow in the area naturally. The small township of Merapoh is surrounded by forested areas, including the virgin primary lowland rainforest of Taman Negara Pahang national park at Sungai Relau and several other production forest reserves (i.e., Sungai Yu Forest Reserve, Tanum Forest Reserve, and Persit Forest Reserve), which are situated nearby.

The unique landscape of this area comprises more than 85 characteristic limestone hills and numerous caves, which have been estimated to be between 230 million and 350 million years old (UNESCO 2014; Joeharry et al. 2018). The primary forest covers an area of ca. 4,343km² and is estimated to be 130 million years old, making it one of the oldest rainforests in the world (UNESCO 2007). The fauna and flora of the

area is diverse with charismatic megafauna such as the Malayan Tiger *Panthera tigris jacksoni* (Kawanishi & Sunquist 2004), Leopard *Panthera pardus* (Asrulsani et al. 2017), Asian Elephant *Elephas maximus* (Kawanishi et al. 2003), Malayan Tapir *Tapirus indicus* (Kawanishi et al. 2003), Malayan Sun Bear *Helarctos malayanus* (Kawanishi & Sunquist 2008), Barking Deer *Muntiacus muntjac* (Kawanishi et al. 2003), Sambar Deer *Rusa unicolor* (Kawanishi et al. 2003), and Serow *Capricornis sumatrensis* (I. Mukri pers. obs.). Over 250 species of birds, including 69 threatened species, have been recorded within Taman Negara Pahang and Merapoh (BirdLife International 2019).

The biodiversity of limestone hills is often understudied due to the difficulty to access the caves and forests on the top (Clements et al. 2006). The area around Merapoh Town is mostly used for farming, orchards and rubber plantations (Milow et al. 2010). The Merapoh Caves have been intensively surveyed for fossils (Baad 2017). One of the caves called Gua Seribu Cerita contains ancient drawings on the walls suggesting its use by prehistoric peoples (Baad 2017).

Survey method

The survey was conducted for three nights (8–10 December 2018) from 21.00 to 01.00 h along an existing 2km long forest trail and also in an orchard nearby. The trail and the orchard were surveyed on foot by a team of 2–5 people, and animals were sighted using a head torch with a red filter (Clulite HL13). Nocturnal mammals have a bright reflective eye layer, the tapetum lucidum, allowing observers to detect them by eye shine. Sighted mammals were photographed whenever possible for species identification, and data on location, tree species, tree height, and estimated height of sighted mammals in the tree were recorded.

RESULTS

We observed one Red Giant Gliding Squirrel *P. petaurista* directly on a steep limestone hill wall approximately 70m above ground on 8 December 2018 at 22.56h. The individual was resting while occasionally moving its head (Image 1).

During subsequent visits, we recorded two more squirrels (at 00.40h) on 9 December 2018, and one (at 01.12h) on 10 December 2018. The two individuals were feeding on a *Ficus hispida*, known as Hairy Fig (or locally Ara Bumbong, Senia; Aziz et al. 2014) at a height of ca. 20m, while one individual was feeding on *Terminalia catappa*, known as Tropical Almond (family Combretaceae; Nwosu et al. 2008).



Image 1. *Petaurista petaurista* spotted on a limestone hill near Merapoh, Malaysia on the 8 December 2018 at 22.56h.

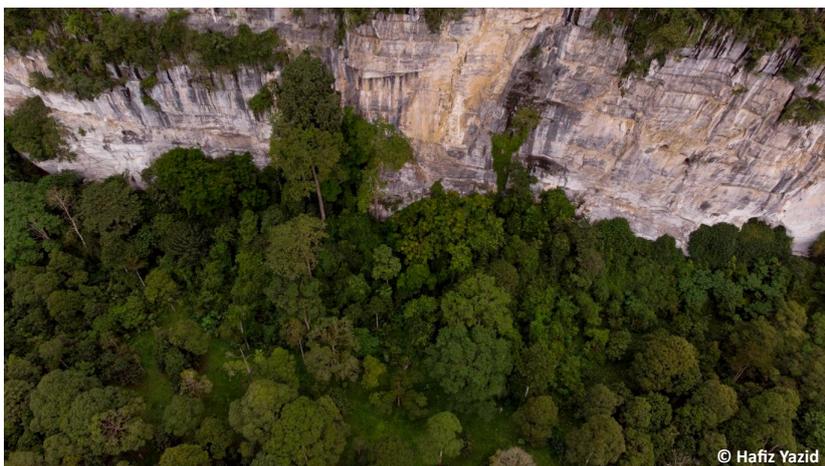


Image 2. Drone image of the forest below the limestone hill where *Petaurista petaurista* was sighted.

The aerial image (Image 2) shows that these trees are growing just by the foothills making it accessible for wildlife to connect from the forest habitat to the limestones.

DISCUSSION

The taxonomy of *Petaurista* spp. is still under debate (Sanamxay et al. 2015). The subspecies observed in Merapoh, however, might be *P. petaurista melanotus* according to its location (Corbet & Hill 1992). Generally, gliding squirrels use different types of nests such as tree cavities or leaf nests, while subterranean nests are the least common (Holloway & Malcolm 2007; Diggins et al. 2015). *Petaurista petaurista* is known to nest in tree holes that are usually 10–35 m high (Krishna et al. 2019) but also in epiphytes such as bird’s nest ferns (*Asplenium*

nidus; P. Miard pers. obs. 2017).

Although *P. petaurista* is an extremely agile glider (Krishna et al. 2016), it can also easily climb steep slopes (Scholey 1986). Muul & Lim (1978) sighted *Petaurista* sp. gliding from a limestone hill to trees 300m in distance and 125m down (Thorington & Heaney 1981). Hence, the sightings reported here could indicate that *P. petaurista* may be using these hills more frequently.

The use of limestone hills has also been observed in the Woolly Gliding Squirrel *Eupetaurus cinereus*. Their habitat is described as mountainous conifer forest associated with steep slopes and caves (Zahler 2010).

Use of mineral licks by gliding squirrels has rarely been observed but has been reported from China where up to 20 individuals per night at one mineral lick spot (Xian & Harding 2013). Our sightings may indicate that

P. petaurista may also use limestone hill habitat as a possible source of minerals by licking its surface and/ or as a shelter in its cavities, and further research on the ecology and behaviour of this elusive species is needed to draw a more comprehensive picture on limestone use behaviour.

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Review

Ramifications of reproductive diseases on the recovery of the Sumatran Rhinoceros *Dicerorhinus sumatrensis* (Mammalia: Perissodactyla: Rhinocerotidae)

– Nan E. Schaffer, Muhammad Agil & Zainal Z. Zainuddin, Pp. 15279–15288

Communications

Diet ecology of tigers and leopards in Chhattisgarh, central India

– Krishnendu Basak, Moiz Ahmed, M. Suraj, B.V. Reddy, O.P. Yadav & Krishnendu Mondal, Pp. 15289–15300

Building walls around open wells prevent Asiatic Lion *Panthera leo persica* (Mammalia: Carnivora: Felidae) mortality in the Gir Lion Landscape, Gujarat, India

– Tithi Kagathara & Erach Bharucha, Pp. 15301–15310

Taxonomic and ecological notes on some poorly known bats (Mammalia: Chiroptera) from Meghalaya, India

– Uttam Saikia, AdoraThabab & Manuel Ruedi, Pp. 15311–15325

Angiosperm diversity in Bhadrak region of Odisha, India

– Taranisen Panda, Bikram Kumar Pradhan, Rabindra Kumar Mishra, Srusti Dhar Rout & Raj Ballav Mohanty, Pp. 15326–15354

Short Communications

Sighting of *Petaurista petaurista* (Pallas, 1766) (Mammalia: Rodentia: Sciuridae) on limestone hills in Merapoh, Malaysia

– Priscillia Miard, Mohd Nur Arifuddin, Izereen Mukri, Siti Syuhada Sapno, Hafiz Yazid, Nadine Ruppert & Jayaraj Vijaya Kumaran, Pp. 15355–15358

Molecular detection of *Murshidia linstowi* in a free-ranging dead elephant calf

– Sourabh Ranjan Hota, Sonali Sahoo, Manojita Dash, Avisek Pahari, Bijayendranath Mohanty & Niranjana Sahoo, Pp. 15359–15363

Parasite commonality at Swamp Deer (Mammalia: Artiodactyla: Cervidae: *Rucervus duvaucelii duvaucelii*) and livestock interface

– Animesh Talukdar, Bivash Pandav & Parag Nigam, Pp. 15364–15369

Prevalence and seasonal variation of gastrointestinal parasites among captive Northern Pig-tailed Macaque *Macaca leonina* (Mammalia: Primates: Cercopithecidae)

– Phoebe Lalremruati & G.S. Solanki, Pp. 15370–15374

New record of *Tulostoma squamosum* (Agaricales: Basidiomycota) from India based on morphological features and phylogenetic analysis

– Arun Kumar Dutta, Soumitra Paloi & Krishnendu Acharya, Pp. 15375–15381

Notes

An account of a first record of the Common Goldeneye

***Bucephala clangula* Linnaeus, 1758 (Aves: Anseriformes: Anatidae) in Bhutan**

– Sangay Nidup, Gyeltshen & Tshering Tobgay, Pp. 15382–15384

First record of the hawkmoth *Theretra lyctetus* (Cramer, 1775) (Sphingidae: Macroglossinae) from Bhutan

– Sangay Nidup & Jatishwor Singh Irungbam, Pp. 15385–15386

Occurrence and association of the Scarce Lilacfork

***Lethe dura gammiei* (Moore, [1892]) (Lepidoptera: Nymphalidae: Satyrinae) with Woolly-leaved Oak *Quercus lanata* Smith, 1819 (Fabaceae) forest in the Kumaon region of the Indian Himalaya**

– Arun P. Singh & Tribhuwan Singh, Pp. 15387–15390

Additions to the Odonata (Insecta) fauna of Asansol-Durgapur Industrial Area, West Bengal, India

– Amar Kumar Nayak, Pp. 15391–15394

***Gynochthodes cochinchinensis* (DC.) Razafim. & B. Bremer (Morindeae: Rubioideae: Rubiaceae): an addition to the woody climbers of India**

– Pradeep Kumar Kamila, Prabhat Kumar Das, Madhusmita Mallia, Chinnamadasamy Kalidass, Jagayandatt Pati & Pratap Chandra Panda, Pp. 15395–15399

Record of *Oldenlandia hygrophila Bremek.* (Spermacoaceae: Rubiaceae), a lesser known herb from Palghat Gap of Western Ghats, Kerala, India

– Vadakkeveedu Jagadesh Aswani, Vasudevan Ambat Rekha, Pathiyil Arabhi, Manjakulam Khadhersha Jabeena, Kunnamkumarath Jisha & Maya Chandrashekar Nair, Pp. 15400–15404

Book Review

The State of Wildlife and Protected Areas in Maharashtra: News and Information from the Protected Area Update 1996-2015

– Reviewed by L.A.K. Singh, Pp. 15405–15406

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