

PRELIMINARY STUDY ON THE DISTRIBUTION AND CONSERVATION STATUS OF THE EAST SUMATRAN BANDED LANGUR *Presbytis femoralis percura* IN RIAU PROVINCE, SUMATRA, INDONESIA

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ABSTRACT

The East Sumatran Banded Langur *Presbytis femoralis percura* is a very little known colobine primate, endemic to Riau Province in Sumatra. Nothing much is known of its population size and distribution, except that it was confined in the area between Rokan and Siak rivers. We carried out an eight-day reconnaissance field trip and determined the presence of *P. f. percura* in seven locations in Riau Province, which extends south of the Siak River, beyond its previously reported range. We also obtained probably the first publicly available full-frontal coloured photos of the taxon in the wild, and photos of the Riau Pale-thighed Langur *P. siamensis cana*. Considering that the known populations of *P. f. percura* are restricted to small and isolated forest remnants, and that the remaining forests are rapidly being converted into oil palm plantations, we propose to change the listing of *P. f. percura* from Data Deficient to Endangered A2c. We recommend an immediate study on its population size and distribution in order to better understand its conservation needs and to protect this taxon. We further urge for more research and conservation attention on the non-human primates in Riau Province, Sumatra.

Keywords: Asian primates, colobine, Indonesia, IUCN Red List, Sumatra

INTRODUCTION

The Banded Langur *Presbytis femoralis* (Martin) is a colobine primate (Cercopithecidae: Colobinae) that is found on the Malay Peninsula and Sumatra (Groves, 2001; Fig. 1). Three subspecies are currently recognised, but the taxonomy is not resolved (Ang et al., 2016): Raffles' Banded Langur *P. f. femoralis* (Martin) in Singapore and southern Peninsular Malaysia; Robinson's Banded Langur *P. f. robinsoni* Thomas in north Malay Peninsula including Malaysia, Thailand, and Myanmar; and East Sumatran Banded Langur *P. f. percura* Lyon in Sumatra, Indonesia. At the Asian Primate Red List Assessment Workshop in Singapore, held from 19-24 November 2015, *Presbytis femoralis* was assessed as Vulnerable, with the nominate subspecies as Endangered due to small and isolated populations with low genetic variability

(Ang et al., 2012; Srivathsan et al., 2016), the more widely distributed *P. f. robinsoni* as Near Threatened, and the least known and studied *P. f. percura* as Data Deficient (Ang & Boonratana, in press).

The East Sumatran Banded Langur was formally described by M.W. Lyon, Jr. in 1908 based on specimens collected in eastern Sumatra (Lyon, 1908), specifically from near Siak Kecil River, Makapan, Kompei, Pulau Rupert, and Salat Rupert. Subsequently, field observations delineated the distribution of *P. f. percura* as bounded by the Rokan River in the north and the Kampar River in the south within Riau Province (Wilson & Wilson, 1977; Kawamura, 1984; Aimi & Bakar, 1992). However, Aimi and Bakar (1996) undertook more field surveys in later years and closely examined photographs taken by previous fieldwork and concluded that the southern boundary was in

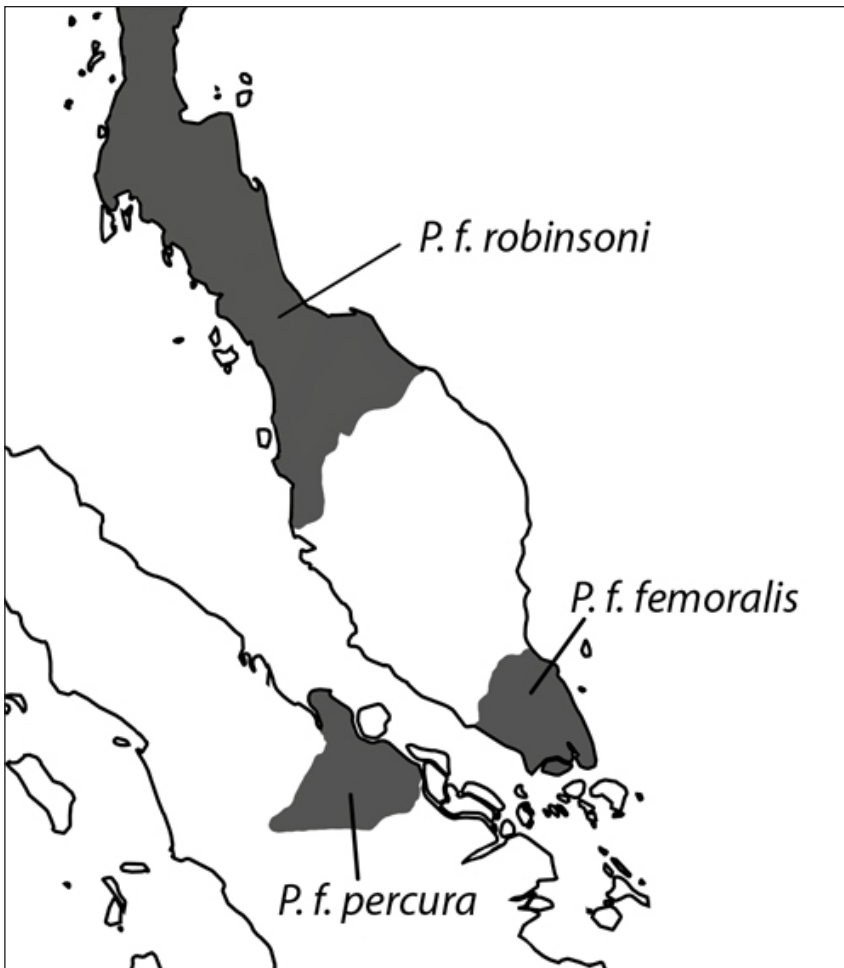


Fig. 1. Distribution of *Presbytis femoralis* (Ang et al., 2012).

fact the Siak River and not the Kampar River (Fig. 2), thus narrowing its known range. This distribution was adopted by Groves (2001)'s seminal primate taxonomy book and *P. f. percura*-related classifications that followed (e.g. Mittermeier et al., 2013; Roos et al., 2014).

With only field observations on its distribution in the 1990s and no data available on population size, *P. f. percura* has been consistently evaluated as Data Deficient for the last 18 years since the first IUCN Red List assessment in 2000 (Nijman et al., 2008; Ang et al., unpublished data from a Red List re-assessment in 2015). Most of the landscape that was previously inhabited by *P. f. percura* and other wildlife in Riau Province has undergone considerable land use changes; among all provinces in Sumatra, the most extensive forest loss occurred in Riau (Uryu et al., 2010). While Riau had the highest amount of natural

forest in Sumatra in 1985 (6.9 million ha; 28% of all-natural forest on the island), by 2008 it had lost 63% or 4.4 million ha of forest cover mostly to industrial oil palm and pulpwood plantations (Uryu et al., 2010). Furthermore, preliminary genetic data suggest that at least two of three subspecies of *P. femoralis* may be a unique species (Ang, 2010). If *P. f. femoralis* is indeed a different species to *P. f. robinsoni* and/or *P. f. percura*, then each of them will be an even more threatened taxon than currently recognised (Ang et al., 2016). Therefore, it is urgent and important to better understand the current distribution of *P. f. percura* and to more effectively assess its conservation status.

The objectives of this field reconnaissance were: 1) to provide an updated distribution of *P. f. percura* in Riau Province with notes on habitat characteristics in the area where they were observed; and 2) to assess its conservation status.

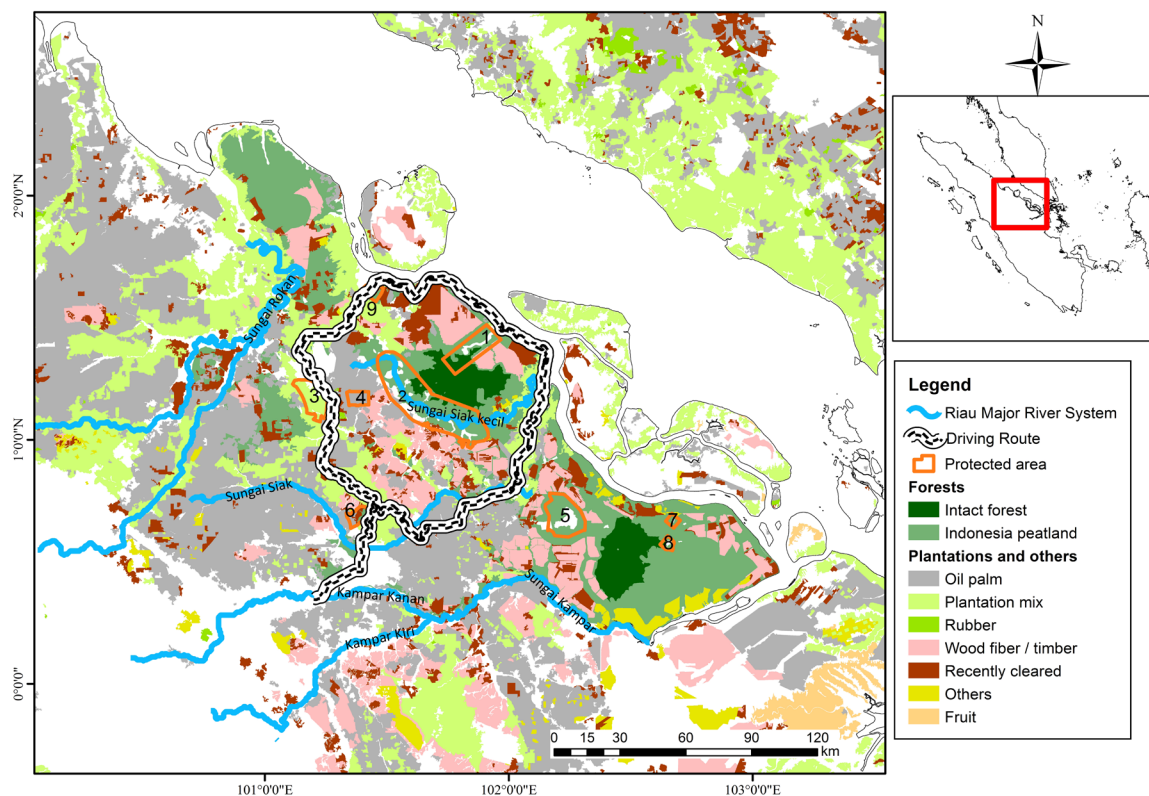


Fig. 2. Landscape map within Riau Province, Sumatra, Indonesia. Major rivers and our driving routes (from west to east, and in clockwise direction) are shown.

METHODS

Study Area

Riau Province is located in the central eastern coast of Sumatra ($0^{\circ}17'36''$ N and $101^{\circ}42'24''$ E; Fig. 2) and is administratively divided into nine regencies (Bengkalis, Indragiri Hilir, Kampar, Kuantan, Singingi, Pelalawan, Rokan Hilir, Rokan Hulu, and Siak) and two cities (Dumai and Pekanbaru). This region has a wet tropical climate with average annual rainfall of 2,000 to 3,000 mm and average temperature of 25°C (daily range of $23 - 32^{\circ}\text{C}$). The rainy season typically falls from September to January and the dry season from February to August (www.bmkg.go.id; accessed on 18 July 2018). Originally, most of the vegetation cover in Riau Province consisted of tropical lowland and montane rainforests, peatland and swamp forests; extensive forest loss and fragmentation has occurred due to industrial oil palm and pulpwood plantations, timber logging, clearing for agriculture, roads, and wild fires (see Subiakto et al., 2017).

Land Use Map of Riau Province

We generated a land use map of Riau Province (scale:

4.5 cm – 100 km) based on the latest available dataset from Global Forest Watch (GFW) using ArcMap version 10.5. From the GFW dataset, three land use types were relevant for analyses: “types of plantations” as of 2014 (Petersen et al., 2016); “intact forest landscape” as of 2016 (Potapov et al., 2017); and “Indonesia peatland” as of 2002 (Wahyunto, 2003). “Types of plantations” included monocultures (fruit; oil palm; rubber; wood fiber/timber), mixed agroforest-plantations (fruit mix; oil palm mix; rubber mix; wood fiber/timber mix; others mix), unidentifiable plantations, and bare land (recently cleared; Petersen et al., 2016). “Intact forest landscape” consisted of forest and associated natural landscape with a minimum area of 500 km^2 and no remotely detected signs of human activity (Potapov et al., 2017). As the dataset for “Indonesia peatland” was outdated, we assumed and also cross-checked using high-resolution imagery from Google Earth that some of it had been anthropogenically modified (e.g. into plantations, agroforests, secondary/degraded forests and buildings). The white (blank) areas in the map were likely anthropogenic-related land uses such as roads, residential areas, buildings etc. and also water

bodies including lakes and estuaries. The dataset of major river systems in Riau particularly Rokan River, Siak River, and Kampar River was extracted from the river network of HydroSHEDS (Lehner et al., 2006) and validated through Google Earth.

Primates of Riau Province

Based on existing records (Nekaris & Jaffe, 2007; Mittermeier et al., 2013), it is believed that 10 primate taxa occur in Riau Province: Sunda Slow Loris *Nycticebus coucang* (Boddaert), Sumatran Slow Loris *N. hilleri* (Stone & Rehn), Long-tailed Macaque *Macaca fascicularis fascicularis* (Raffles), Southern Pig-tailed Macaque *M. nemestrina* (Linnaeus), Black-and-white Langur *P. bicolor* Aimi & Bakar, East Sumatran Banded Langur *P. f. percura*, Riau Pale-thighed Langur *P. siamensis cana* Miller, Silvered Langur *Trachypithecus cristatus cristatus* (Raffles), Agile Gibbon *Hylobates agilis* Cuvier, and Siamang *Symphalangus syndactylus* (Raffles). *Presbytis melalophos* (Raffles) may possibly be found in Riau Province, but its taxonomy remains unclear and the different colour variants of the species make it difficult to determine the boundaries of its ranges (Groves & Roos, 2013a).

Field Observations

We carried out an eight-day (25 April - 2 May 2018) reconnaissance survey by driving from West Sumatra to Riau Province (Fig. 2). Whenever we came across a habitat appearing suitable for *P. femoralis* (primary and secondary forests, swamp forest, mangrove forest, and rubber forests; Groves & Roos, 2013b), we stopped the vehicle and checked for permission to enter, whether it was a nature reserve, forest park, community forest, coastal forest, forest remnant, or plantation. We carried out field observations along existing trails and along roads that were accessible. Five surveyors were split into two teams of two and three, with the second team heading out approximately 10 minutes after the first team, walking and surveying the same route if there was only one visible trail. The two teams surveyed different routes at the same time if there was more than one trail. We walked each route at the same speed and gathered standard line transect data (Marshall et al., 2014) for all non-human primates (primates hereafter) encountered, e.g., date and time of observation, species observed, observed group size, age and sex composition of the group, GPS coordinates (after the primates left, we went to the location where they were observed), and the forest types. Photographs of the primates were taken whenever possible. During the drive, we also looked out for primates along the roadside and forest edges.

Extent of Occurrence

Based on the information collected during the field survey, we carried out an exercise to assess the conservation status of *P. f. percura*. According to the IUCN Red List, the conservation status of a species can be evaluated using a number of criteria (IUCN, 2017: ver. 13): A. population reduction; B. extent of occurrence (EOO) and/or area of occupancy (AOO); C. small population and decline; D. restricted population and number of locations; E. quantitative analysis (e.g. PVA). With poorly known primate taxa, especially those that are evaluated as Data Deficient (DD) due to a lack of knowledge particularly on population size and distribution, an estimated EOO is one of the most easily quantifiable aspects that can be used to begin preliminary assessment of their conservation status (Gursky et al., 2008). Given that *P. f. percura* was evaluated as DD for at least the last 18 years since its Red List assessment in 2000, we calculated an estimated EOO of *P. f. percura* in Riau Province and also assessed threats based on direct observations and inferences to carry out an assessment of its current conservation status.

Distribution size is classified within one of the four categories (1–100 km², 100–5,000 km², 5,000–20,000 km², and >20,000 km²). Therefore, following IUCN Red List guidelines, and given that all other necessary conditions are met, the following assessments are recommended:

“Critically Endangered” for EOO: 1–100 km²

“Endangered” for EOO: 100–5,000 km²

“Vulnerable” for EOO: 5,000–20,000 km²

“Near Threatened/Least Concern” for EOO: >20,000 km²

RESULTS

We located *P. f. percura* in seven of the 25 sites that were surveyed (Table 1; exact locations were withheld due to threats from poaching), covering a total of 58.1 km for the survey period of 1,830 minutes (30.5 hours). The mean distance surveyed and mean amount of time spent per site were 2.32±1.62 km and 73.2±56.5 minutes respectively. We observed nine groups and 75 individuals of *P. f. percura*, with group size ranging from two to 15. Two dependent infants and a few juveniles were seen. They were found in rubber forests, secondary forests, and swamp forest surrounded by oil palm plantations, settlements, and roads; they were never seen in oil palm plantations during our survey. Six groups were seen within rubber forests feeding

Table 1. Survey sites, habitat characteristics, distance covered, time spent, and number of groups and individuals of *Presbytis femoralis percura* observed in Riau Province.

Site #	Location	Habitat	Survey distance (km)	Duration (mins)	# of groups	Group size
1	Bangkinang, Kampar	Oil palm plantation + secondary forest	2.8	48	-	
2	East Kampar, Kampar	Rubber plantation + secondary forest	4.5	133	-	
3	Tambang, Kampar	Rubber plantation	3.5	152	3	10,15,5
4	Minas, Siak	Secondary forest	5.6	196	-	
5	Duri, Bengkalis	Rubber plantation + secondary forest	2.0	134	1	11
6	Duri, Bengkalis	Oil palm plantation + secondary forest	4.0	68	-	
7	Duri, Bengkalis	Oil palm plantation + secondary forest	1.8	44	-	
8	Dumai, Bengkalis	Oil palm plantation + rubber plantation + secondary forest	3.1	60	-	
9	Dumai, Bengkalis	Rubber plantation + swamp forest	5.7	202	1	12
10	Dumai, Bengkalis	Mangroves	1.1	27	-	
11	Dumai, Bengkalis	Secondary forest	0.6	22	-	
12	Bukit Batu, Bengkalis	Secondary forest	0.8	31	-	
13	Bukit Batu, Bengkalis	Secondary forest	2.1	56	-	
14	Bukit Batu, Bengkalis	Secondary forest	1.4	38	-	
15	Bukit Batu, Bengkalis	Rubber plantation + secondary forest	3.0	69	1	7
16	Bukit Batu, Bengkalis	Rubber plantation	2.1	48	-	
17	Bukit Batu, Bengkalis	Secondary forest	0.5	21	-	
18	Bukit Batu, Bengkalis	Secondary forest	1.8	49	1	6
19	Bukit Batu, Bengkalis	Secondary forest	3.3	67	-	
20	Siak, Siak	Oil palm plantation	0.7	16	-	
21	Siak, Siak	Mangroves + rubber plantation	4.6	166	-	
22	Siak, Siak	Oil palm plantation + secondary forest	2.4	111	-	
23	Siak, Siak	Secondary forest	0.3	12	-	
24	Kualang, Perawang	Secondary forest	0.2	38	1	2
25	Tambang, Kampar	Secondary forest	0.2	22	1	7



Fig. 3a. An adult male *P. f. percura* with rubber fruit in the mouth. © Andie Ang



Fig. 3b. An adult male *P. f. percura* after feeding on rubber leaves, leaving latex on the lips. © Andie Ang

on both seeds (Fig. 3a) and leaves (Fig. 3b) of Pará Rubber Tree *Hevea brasiliensis* (Willd. ex A.Juss) Müll. Arg. One adult male was observed to spend 6 min 58 s to extract the seeds from the outer covering (from the moment he obtained the fruit in his hands to the point

when he dropped the remainder of the emptied shell). All sighting locations of *P. f. percura* were bounded by the Rokan River in the north and the Kampar River in the south.

We calculated the EOO of *P. f. percura* which was

Table 2. Conservation status of *Presbytis* langurs in Sumatra.

Taxon	Distribution	IUCN Red List Threatened Status*	Menteri LHK RI, 2018**
<i>P. bicolor</i>	EC Sumatra	Data Deficient as <i>P. melalophos bicolor</i>	Not included
<i>P. f. percura</i>	CE Sumatra	Data Deficient	Not included
<i>P. melalophos</i>	W Sumatra	Near Threatened as <i>P. melalophos melalophos</i>	Included
<i>P. mitrata</i>	SE Sumatra	Endangered as <i>P. melalophos mitrata</i>	Not included
<i>P. thomasi</i>	N Sumatra	Vulnerable	Included
<i>P. s. cana</i>	CE Sumatra	Vulnerable	Not included
<i>P. sumatrana</i>	W and NC Sumatra	Endangered as <i>P. melalophos sumatranus</i>	Not included

*IUCN SSC PSG Asian Primate Red List Assessment Workshop, November 2015.

**A list of protected plants and animals released by the Ministry of Environment and Forestry of Indonesia.

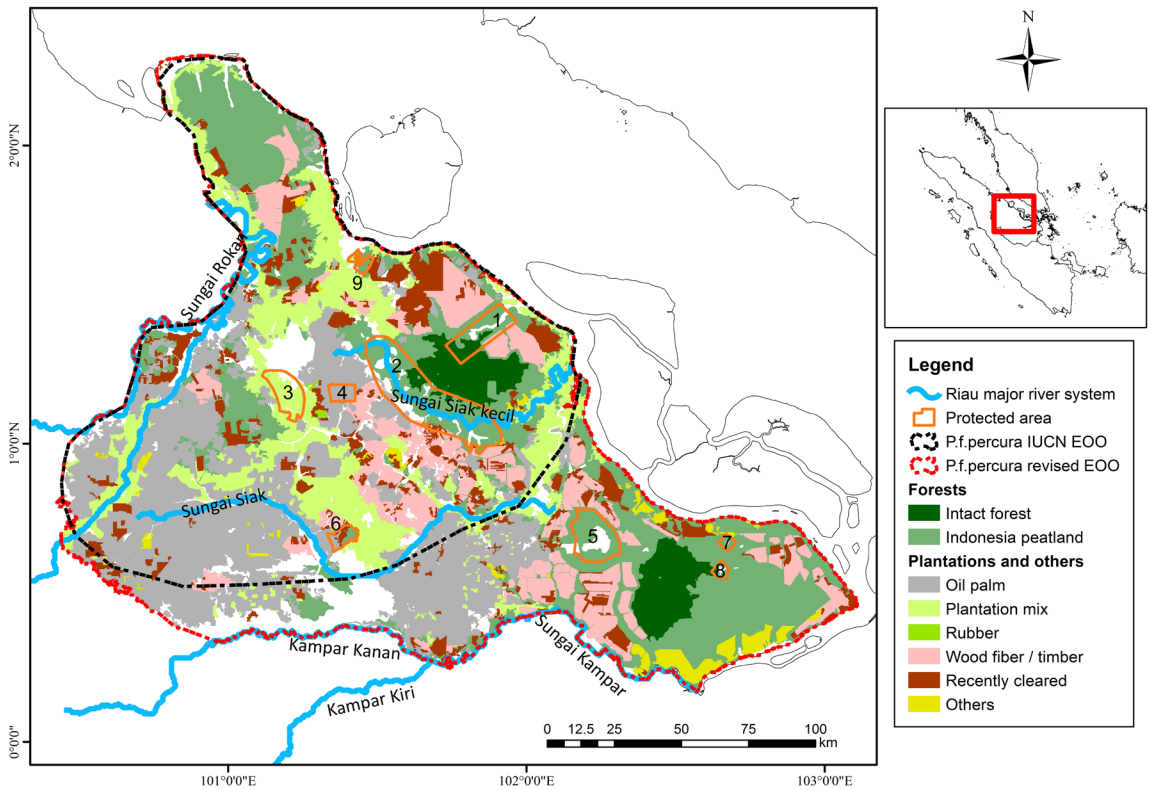


Fig. 4. Revised extent of occurrence (EOO) of East Sumatran Banded Langur *P. f. percura* based on sighting records.



Fig. 5a. An adult Riau Pale-thighed Langur *P. siamensis cana*. © Andie Ang



Fig. 5b. A juvenile *P. siamensis cana*. © Andie Ang

the entire area of Riau Province delimited by the Rokan River and the Kampar River, including forests, oil palm plantations, plantation mixes, recently cleared land, and others (Fig. 4), resulting in an EOO of 28,235.45 km² (Table S1). However, we noted that the area of suitable habitat, which excludes monoculture oil palm plantations and recently cleared (bare) land was at most 17,712.84 km² (Table S1). See Bernard et al. (2016) on the adverse effects of oil palm plantations on the primate community.

Previously, known photos of *P. f. percura* came from camera trap images (Fujita et al., 2012) and a rescued individual (Asferi Ardiyanto, pers. comm., 2018). Here, we provide coloured photographs of wild *P. f. percura* (Figs. 3a & 3b), probably the first publicly available full-frontal coloured photos of the subspecies, and also one of the first photographs of wild *P. s. cana* (Fig. 5a & 5b) from Riau Province, Sumatra.

DISCUSSION

The East Sumatran Banded Langur (*P. f. percura*) is endemic to Riau Province and its distribution was reported to be bounded by the Rokan River in the north and the Siak River in the south, with the Riau Pale-thighed Langur (*P. s. cana*) being found between Siak River and Kampar River in the south (Aimi & Bakar, 1996). Our preliminary field data demonstrated that the southern limit of *P. f. percura* is at least until Kampar River and not Siak River, supporting earlier reports of a larger distribution (Wilson & Wilson, 1977; Kawamura, 1984; Aimi & Bakar, 1992). We did not find *P. s. cana* north of Kampar River; instead we observed them south of Kampar River. However, due to the preliminary nature of this field survey, we were unable to confirm whether the Kampar River serves as a geographic boundary between *P. f. percura* and *P. s. cana*. Nonetheless, we documented that both taxa occurred further south than previously recorded.

Presbytis f. percura faces a high risk of extinction in the wild. Compared to other provinces in Sumatra, Riau experienced the highest rate of deforestation, and similarly produced more palm oil and paper pulp (Uryu et al., 2010). These land use changes have resulted in highly fragmented forest remnants and degraded habitats that are surrounded by oil palm, rubber, and timber plantations (e.g., *Acacia* and *Eucalyptus*) within the range of *P. f. percura*. Additionally, forest fires due to hot weather conditions and open burning for agricultural purposes destroy millions of hectares of land in Indonesia on an annual basis, and Riau is often one of the worst impacted areas, owing in part

to its high concentration of peatland (World Bank, 2016). Based on large scale forest loss which has not ceased (63% of natural forest were lost between 1985 and 2008; Uryu et al., 2010), we inferred that the area of occupancy, extent of occurrence and quality of habitat of *P. f. percura* have declined such that their population size has reduced by $\geq 50\%$ over the last three generations since 1989 (30 years approximately; see Nijman & Manullang, 2008 for the closely-related *P. melalophos*), fulfilling the IUCN criteria for Endangered A2c. Even though the extent of occurrence of *P. f. percura* is estimated at 28,235.45 km² ($>20,000$ km², i.e. Near Threatened/Least Concern; this study) at the moment, EOO alone might not be a good indicator of its conservation status. Moreover, one or more of the three subspecies of *P. femoralis* may be a unique species based on preliminary genetic information; i.e. each of them might potentially be more threatened than currently recognised (Ang et al., 2016). Hence, we recommend changing the listing of *P. f. percura* from Data Deficient to Endangered A2c. This assessment will be communicated to the Red List Authority for consideration.

It is interesting to note that *P. f. percura* has adapted to feed on non-native rubber trees (*H. brasiliensis*) which were introduced into their habitat nearly 100 years ago. Plantations of fast-growing rubber were first introduced in Jambi, Sumatra in 1904 and subsequently expanded rapidly as a cash crop in the eastern coast from the 1920s (Stoler, 1995). Today, rubber plantations in Sumatra continue to grow in the forms of rubber forest and rubber monoculture. Six out of nine groups of *P. f. percura* were observed in rubber forests and individuals were feeding on rubber seeds and leaves. We recorded one individual spending almost seven minutes to extract the seeds from within the hard woody, 3-lobed capsulated fruit before going for the next rubber fruit, which was a large amount of time spent feeding on a single food item. A rubber seed contains approximately 11.5% crude protein (Narahari & Kothandaraman, 1984). We did not observe another food plant being consumed by *P. f. percura* during our short survey but we would like to put into context their decision to feed on rubber plant. *Parkia speciosa* Hassk. is a native tree in Sumatra and its seeds are a food item of another subspecies, the Raffles' Banded Langur *P. f. femoralis* in Singapore (Ang, 2018). Crude protein in a seed of *P. speciosa* can be up to 27.5% (Kamisah et al., 2013). Note that the same plant food item can contain different nutrient content over different spatial scales and timescales (Lambert & Rothman, 2015) and the amount of secondary compounds such

as tannins affects food choice in primates.

In conclusion, we strongly recommend field studies on primates in Riau Province and surrounding areas in Sumatra, especially on *Presbytis* spp. given their high species diversity (*P. bicolor*, *P. f. percura*, *P. melalophos*, *P. mitrata*, *P. s. cana*, *P. sumatrana*, and *P. thomasi*). In the latest list of protected plants and animals released by the Indonesian government, only *P. melalophos* and *P. thomasi* are included (Menteri LHK RI, 2018; see Table 2). No explanation was given in the document on how the list was generated, but we assumed that the other five taxa were not included as an outdated taxonomy was followed (with the exception of *P. femoralis*, the other four taxa were considered subspecies of *P. melalophos* until recently; see Mittermeier et al., 2013). More data on the distribution, population trends, ecology, and population genetics of these taxa are urgently needed to achieve a better understanding of their taxonomy and conservation status in Sumatra. In addition, the Indonesian government's list of protected plants and animals should be updated to include the missing primate taxa.

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