

Technical Report

Mammalian Biodiversity Survey in Berbak National Park 2007-2012

Citra Novalina Panjaitan, Erwin A. Perbatakusuma, Laura D'arcy and Karen Mayers

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Introduction

The Berbak ecosystem in Jambi Province, Sumatra comprises 240,000 ha of peat swamp forest under 4 management categories: National Park (Berbak NP), Conservation Forest (TAHURA), Protection Forest (hutan lindung) and 2 selective logging concessions (HPT). The ecosystem supports important biodiversity, including the endangered Sumatran tiger and many other IUCN and CITES listed species.

The Zoological Society of London (ZSL), in partnership with Berbak NP, started rapid surveys of the area in 2007, primarily to assess the distribution, population density and habitat use of the Sumatran tiger and its prey and to identify the individual tigers captured by the camera traps.

Camera trap monitoring of the ecosystem between 2007 and 2012 has confirmed the presence of 29 mammal species and ZSL have identified 15 individual tigers although, tragically, 2 of these have since been found dead, 1 electrocuted by high-voltage fencing, 1 caught in a snare.

Between 2010 and 2011, in collaboration with Berbak NP, ZSL has also identified 177 bird species inhabiting this unique and biologically rich ecosystem, both resident and migratory.

Mammals in Berbak National Park

Camera trap effort between November 2007 and March 2012 totaled 7084 sampling days, with 108 cameras being rotated around 124 locations within the Berbak ecosystem to monitor primary and secondary forest, ex-burnt areas and swamp bush habitat. A complete list of the mammals captured, and their conservation status, is shown in Table 1 below.

Table 1: Mammals captured on Berbak camera traps

No.	Local name	English name	Scientific name	Conservation status		
				IUCN	CITES	Peraturan Pemerintah
1	Harimau sumatera	Sumatran tiger	<i>Panthera tigris sumatrae</i>	Critically endangered	Appendix I	PP No. 7 Tahun 1999
2	Tapir	Malayan tapir	<i>Tapirus indicus</i>	Endangered	Appendix I	PP No. 7

						Tahun 1999
3	Napu	Greater mousedeer	<i>Tragulus napu</i>	Least concern	-	PP No. 7 Tahun 1999
4	Kancil	Lesser mousedeer	<i>Tragulus javanicus</i>	Least concern	-	PP No. 7 Tahun 1999
5	Babi hutan	Wild pig	<i>Sus scrofa</i>	Least concern	-	-
6	Babi berjenggot	Bearded pig	<i>Sus barbatus</i>	Vulnerable	-	-
7	Rusa sambar	Sambar deer	<i>Cervus unicolor</i>	Vulnerable	Appendix I	PP No. 7 Tahun 1999
8	Kucing hutan	Leopard cat	<i>Prionailurus bengalensis</i>	Least concern	Appendix II	PP No. 7 Tahun 1999
9	Kucing tandang	Flat-headed cat	<i>Prionailurus planiceps</i>	Endangered	Appendix I	PP No. 7 Tahun 1999
10	Macan dahan	Clouded leopard	<i>Neofelis diardi</i>	Vulnerable	Appendix I	PP No. 7 Tahun 1999
11	Beruk	Pig-tailed macaque	<i>Macaca nemestrina</i>	Vulnerable	Appendix II	-
12	Monyet ekor panjang	Long-tailed macaque	<i>Macaca fascicularis</i>	Least concern	Appendix II	-
13	Lutung simpai merah bata	Banded langur	<i>Presbytis melalophos cruciger</i>	Least concern	Appendix II	PP No. 7 Tahun 1999
14	Beruang madu	Malayan sun bear	<i>Helarctos malayanus</i>	Vulnerable	Appendix I	PP No. 7 Tahun 1999
15	Musang belang	Banded palm civet	<i>Hemigalus derbyanus</i>	Vulnerable	Appendix II	-
16	Musang leher kuning	Yellow-throated marten	<i>Martes flavigula</i>	Least concern	Appendix III	-
17	Linsang	Banded linsang	<i>Prionodon linsang</i>	Least concern	Appendix II	PP No. 7 Tahun 1999
18	Musang luwak	Common palm civet	<i>Paradoxurus hermaphroditus</i>	Least concern	Appendix III	PP No. 7 Tahun 1999
19	Binturong	Bear cat	<i>Arctictis binturong</i>	Vulnerable	Appendix III	PP No. 7 Tahun 1999
20	Tupai	Common tree shrew	<i>Tupaia glis</i>	Least concern	-	-
21	Musang ekor pendek	Short-tailed mongoose	<i>Herpestes brachyurus</i>	Least concern	-	-
22	Musang air	Otter civet	<i>Cynogale bennettii</i>	Endangered	Appendix II	PP No. 7 Tahun 1999
23	Angkis ekor panjang	Long-tailed porcupine	<i>Trichys fasciculata</i>	Least concern	-	-
24	Rindil bulan	Moon rat	<i>Echinosorex gymnura</i>	Least concern	-	-

25	Tikus duri merah	Red spiny rat	<i>Indomalayan maxomys</i>	Least concern	-	-
26	Lutung perak	Silvered leaf langur	<i>Presbytis cristata</i>	Near threatened	Appendix II	-
27	Landak	Malayan porcupine	<i>Hystrix brachyura</i>	Least concern	-	-
28	Bajing tanah moncong runcing	Shrew-faced squirrel	<i>Rhinosciurus laticaudatus</i>	Near threatened	-	-
29	Tikus raksasa ekor panjang	Long-tailed giant rat	<i>Leopoldamys sabanus</i>	Least concern	-	-

KEY:

IUCN (International Union for Conservation of Nature) RED LIST OF THREATENED SPECIES:

LC: Less Concern, NT: Near Threatened, VU: Vulnerable, CR: Critically Endangered, EN: Endangered, EW: Extinct in the Wild, EX: Extinct, DD: Data Deficient.

CITES (Convention on International Trade in Endangered Species of Wild Fauna and Flora):

Appendix I lists species that are the most endangered among CITES-listed animals and plants (see [Article II, paragraph 1](#) of the Convention). They are threatened with extinction and CITES prohibits international trade in specimens of these species except when the purpose of the import is not commercial (see [Article III](#)), for instance for scientific research. In these exceptional cases, trade may take place provided it is authorized by the granting of both an import permit and an export permit (or re-export certificate). [Article VII](#) of the Convention provides for a number of exemptions to this general prohibition.

Appendix II lists species that are not necessarily now threatened with extinction but that may become so unless trade is closely controlled. It also includes so-called "look-alike species", i.e. species of which the specimens in trade look like those of species listed for conservation reasons (see [Article II, paragraph 2](#) of the Convention). International trade in specimens of Appendix-II species may be authorized by the granting of an export permit or re-export certificate. No import permit is necessary for these species under CITES (although a permit is needed in some countries that have taken stricter measures than CITES requires). Permits or certificates should only be granted if the relevant authorities are satisfied that certain conditions are met, above all that trade will not be detrimental to the survival of the species in the wild. (See [Article IV](#) of the Convention)

Appendix III is a list of species included at the request of a Party that already regulates trade in the species and that needs the cooperation of other countries to prevent unsustainable or illegal exploitation (see [Article II, paragraph 3](#), of the Convention). International trade in specimens of species listed in this Appendix is allowed only on presentation of the appropriate permits or certificates. (See [Article V](#) of the Convention)

P: Protected by Indonesia Law (Government Regulation No. 7 / 1999)

Among the mammalian species found in this study, 14 are protected by Indonesian Government Regulation No. 7 Year 1999 concerning Flora and Fauna Species Conservation. These include the Sumatran tiger (*Panthera tigris Sumatrae*), Malayan tapir (*Tapirus indicus*), Greater mosedeer (*Tragulus napu*), Lesser mosedeer (*Tragulus javanicus*), Sambar deer (*Cervus unicolor*), Leopard cat (*Prionailurus bengalensis*), Flat-headed cat (*Prionailurus planiceps*) and Clouded leopard (*Neofelis diardi*).

In addition, all mammalian species recorded in Berbak are listed on the IUCN Red List and 17 are listed on CITES, including 6 species categorised as Appendix 1, 8 species as Appendix 2 and 3 species as Appendix 3.

Surveys reveal high species richness within Berbak, particularly within the secondary forest, although a sampling bias towards secondary forest in order to focus on known tiger trails and movement of tiger prey may have affected these data.

Samples of Large Mammals Captured by Camera Traps in Berbak NP

a) Sambar deer (*Cervus unicolor*)



The population of this deer species is thought to be low in Berbak NP. According to survey results and information gathered from local people, this animal prefers to live in open areas such as ex-burnt and in secondary forest near a water source.

b) Malayan Tapir (*Tapirus indicus*)



The tapir is one of the most often recorded species (pictures and signs) in primary and secondary forest, agricultural land and in/near settlements. Tapir traces are very often found near tiger trails.

c) Wild pig (*Sus scrofa*)



The main tiger prey in Berbak NP is the wild pig (*Sus scrofa*). Wild pigs are widely distributed throughout Berbak, found in primary and secondary forest, open areas and swamp bush.

d) **Malayan sun bear (*Helarctos malayanus*)**



During ZSL surveys, signs of this bear were never found in open areas or swamp bush, but were predominantly recorded in primary and secondary forest.

e) **Clouded leopard (*Neofelis diardi*)**



This picture of clouded leopard is a still taken from a 10 second video of a clouded leopard in Berbak secondary forest. The habitat is degraded due to illegal logging activity inside the park at Air Hitam Dalam.

This video was the first time ZSL recorded the clouded leopard, in November 2007 and is the only capture to date of this species.

f) **Leopard cat (*Prionailurus bengalensis*)**



The picture is of a leopard cat captured in 2010 in Berbak primary forest. In 2009, ZSL camera traps also recorded this native felid in Berbak secondary forest. No signs of this cat were found in open areas or swamp bush habitat.

g) **Flat-headed cat (*Prionailurus planiceps*)**



This animal is one the most rarely seen felids, both in pictures and from signs. The photo is a still from a 10 second video of a flat-headed cat which was recorded by a ZSL camera trap located in Berbak primary forest.

Taken in July 2010, this is the only time ZSL cameras have recorded a flat-headed cat to date.

h) **Pig-tailed macaque (*Macaca nemestrina*)**



The pig-tailed macaque is the most frequently captured primate, both in camera trap photos and videos and from signs. They occur in all land cover types throughout the Berbak ecosystem.

i) Yellow-throated marten (*Martes flavigula*)



The yellow-throated marten was first captured by ZSL camera trap in 2009 in Berbak primary forest, at Simpang Gajah. Then, in 2010, a ZSL camera trap captured this mongoose in primary forest at Lubuk Bundar.

j) Binturong (*Arctictis binturong*)



The binturong (also known as the bear cat) (*Arctictis binturong*) can be found in primary and secondary forest. However, in Berbak NP, this animal is rarely captured by camera traps, possibly because it is primarily arboreal. ZSL survey results showed that the ideal camera trap height to capture binturong is 25 – 35 cm above the ground. The featured photograph is the only record of binturong collected by the Berbak camera traps to date.

k) Moon rat (*Echinosorex gymnurus candidus*)



The fur of the moon rat (*Echinosorex gymnurus*) is generally white, with a sparse scattering of black hairs. However, in Berbak NP, camera traps captured a moonrat sub-species which tends to have a greater proportion of black hairs (*Echinosorex gymnurus candidus*).

Sumatran Tiger

During ZSL camera trap surveys conducted between November 2007 and March 2012 a total of 15 individual tigers have been identified in Berbak National Park: 6 females, 8 males and 1 of unknown sex. However, 2 of these identified individuals (1 male, 1 female) have since been found dead.

Sample Berbak Tiger Pictures

a) Male Tigers

Name: **Pandawa**

- Estimated age: 8 – 10 years old
- Locations captured on camera trap: Simpang Kubu, Simpang Kubu (Cell 26 Grid 1), Simpang Kubu 3, Sungai Jering 2, Sungai Jering 3, Parit 16 Awal, Parit 14-1, Simpang Piatu 3, Simpang Gajah Kiri, Simpang Gajah Kiri 2.



Right side of Pandawa



Left side of Pandawa

Name: **Jamantara**

- Estimated age: 7 – 8 years old
- Locations captured on camera trap: Parit 14-1, Simpang Malaka_Simpang Piatu, Simpang Kubu, Simpang Gajah (Cell 8 Grid 1)



Right side of Jamantara



Left side of Jamantara

b) Female Tigers

Name: **Mahadewi (deceased)**

- Estimated age: 6 – 7 years old
- Locations captured on camera trap: Parit 14-1, Simpang Malaka 5



Right side of Mahadewi



Left side of Mahadewi

Name: **Isabela**

- Estimated age: 6 -7 years old
- Locations captured on camera trap: Parit 14-1, Simpang Malaka 5



Right side of Isabela



Left side of Isabela

Berbak Tiger Distribution by Forest Type

See Appendix 1 for full map of tiger distribution in Berbak.

1. Tiger distribution in Berbak National Park PRIMARY peat swamp forest

Surveys from 2007 – 2012 showed that there were 3 locations of tiger distribution in the primary forest. The table below illustrates the distribution. (See Appendix 1 for full map of tiger distribution in Berbak.)

Table 2. Tiger distribution in Berbak NP primary peat swamp forest

Location	GPS_X	GPS_Y	Total individual of tiger	Sex	Age estimation (years)	Name / ID
Simpang gajah (Cell 8 Grid 1)	0422717	9845906	1	Male	7 - 8	<i>Jamantara</i>
Lubuk bundar 2	0418388	9854675	1	Male	8 - 10	<i>Julio</i>
Simpang raket	0412027	9841440	1	Female	6 - 7	<i>Susan</i>

2. **Tiger distribution in Berbak National Park SECONDARY peat swamp forest**

Surveys from 2007 – 2012 showed that there were 17 locations of tiger distribution in the secondary peat swamp forest. The table below illustrates the distribution.

Table 3. Tiger distribution in secondary peat swamp forest

Location	GPS_X	GPS_Y	Total individual of tiger	Sex	Age estimation (years / average)	Name / ID
Simpang Kubu	0422307	9838846	6	3 male, 3 female	4 - 10	<i>Pandawa, Satria, Susan, Kartini, Jamantara, Victoria</i>
Parit 14-1	0431968	9847827	5	3 male, 2 female	4 - 10	<i>Jamantara, Mahadewi, Isabela, King Arthur, Pandawa, Moga</i>
Parit 14-2	0431942	9847959	2	1 male, 1 female	6 – 8	<i>Mahadewi, Jamantara</i>
Simpang Gajah kiri	0426507	9838979	4	2 male, 2 female	6 – 10	<i>Satria, Pandawa, Kartini, Susan</i>
Simpang Gajah 1	0425792	9838969	1	Female	6 - 7	<i>Susan</i>
Simpang Gajah kiri 2	0425782	9838965	1	Male	8 - 10	<i>Pandawa</i>
Simpang Piatu 3	0428512	9843349	5	3 male, 2 female	4 - 10	<i>Pandawa, Satria, Susan, Raja Belang</i>
Simpang Malaka_Simpang Piatu	0429368	9844491	1	Male	7 - 8	<i>Jamantara</i>
Simpang Malaka 5	0429471	9846315	2	female	6 - 8	<i>Isabela, Mahadewi</i>
Simpang Malaka (Cell 11 Grid 1)	0429482	9846323	1	Male	7 - 8	<i>Jamantara</i>
Simpang Kubu 3	0421968	9836602	1	Male	8 - 10	<i>Pandawa</i>
Sungai Jering 3	0431459	9845158	2	Unknown sex	3 & 6	<i>Jantina</i>
Sungai Jering 5	0431444	9845325	1	Male	8 - 10	<i>Pandawa</i>
Sungai Jering 8	0432320	9844880	1	Male	8 - 10	<i>Pandawa</i>
Sungai Jering 7	0431454	9845226	1	Male	8 - 10	<i>Pandawa</i>
Parit 16 awal	0432910	9847929	1	Male	8 - 10	<i>Pandawa</i>
Simpang piatu 2007	0427386	9841534	1	Female	3 - 4	<i>Lestari</i>

3. Surveys from 2007 – 2012 showed that there was 1 location of tiger distribution in the swamp bush / ex-burnt forest. The table below illustrates the distribution.

Table 4. Tiger distribution in SWAMP BUSH / EX-BURNT forest.

Location	GPS_X	GPS_Y	Total individual of tiger	Sex	Age estimation (years / average)	Name / ID
Sungai Benu	0428757	9818507	1	Male	8 - 10	Adam

Berbak Tiger Density

From camera trap survey results for the time period 2007 – 2012, it was calculated that tiger density in Berbak National Park was 3 individual tigers per 100 km². This number was calculated using SPACECAP Software. To run this software and generate results, we input data such as survey area size, total number of individual tigers, and the capture frequency of each tiger at every camera station.

Habitat Use by Berbak Tigers

Camera trap survey results indicated that the preferred habitat of Berbak tigers is secondary peat swamp forest. Between 2007 and 2012, we set cameras mostly in secondary forest which is located near to the river. The cameras produced excellent results with many tiger pictures and videos being recorded. Based on these data, we were able to calculate the tiger population. Camera traps in Berbak primary peat swamp forest produced fewer tiger pictures and videos. Although we cannot conclude from this that Berbak tigers do not like primary forest as results were biased because most camera traps were located in secondary forest, all results to date indicate that the tiger has a preference for secondary forest.

The main prey species for Berbak tigers are wild pig (*Sus scrofa*) and Sambar deer (*Cervus unicolor*). Other prey could include small mammals such as long-tailed and pig-tailed macaques.

Another factor in the tigers' apparent preference for secondary forest might be because it is located near the river, the largest water source in Berbak forest. The tiger (*Panthera tigris*) is one of the two species of big cats who love water, the other being the jaguar (*Panthera onca*). Both are known to swim across rivers and to use water to soak their bodies.

In the ex-burned area and swamp bush, no tiger pictures or videos were recorded. However, during biodiversity surveys in these habitats, the ZSL team found tiger signs such as tiger footprints and, in Sungai Benu Resort, a southern area of the park consisting of an extensive area of swamp bush, the team found tiger footprints near the river and also in the vicinity of deer footprints.



Tiger footprint in ex-burned area



Tiger footprint in ex-burned area

In May 2009, during a day-off work, the field team went to Cemara beach. Cemara is one of the villages bordering Berbak National Park, and we went there to visit The World Conservation Society (WCS) monitoring site for migrant birds. On the way back home, we found tiger footprints on the beach and took some pictures them.



Cemara beach



Tiger footprints



Tiger footprints and Citra's footprints

Based on camera trapping results in Berbak National Park, most mammals including squirrels, civets, rats, and mice are active mainly at night. Large terrestrial mammals such as wild pigs and tapirs can be active at any time of day. In Berbak NP, small mammals and large mammals occurred in primary forest and secondary forest, except for sambar deers (*Cervus unicolor*) which were mostly recorded in open areas such as swamp bush or ex-burnt areas. During camera trap data analysis, we had difficulties in identifying some of the small mammals. It is not easy to identify small mammals from photographs and videos, therefore many of the small mammals need to be physically captured (by trap) for identification or study.

Camera trapping is still ongoing in Berbak NP, with cameras focused only on known tiger trails to monitor tigers that have already been identified and to identify new individuals entering the study area. 5 CuddeBack camera traps have been set up at 4 locations in Berbak NP, 1 of which has 2 camera traps (partner) to try and record both left and right side of the tigers to facilitate identification. We will start the tiger survey (capture-mark-recapture) by camera trapping in Berbak National Park in 2012 using grid survey comprises 20 km x 20 km, and will also hopefully continue to capture more mammal species to add to knowledge of species diversity in Berbak. This report was made possible by funding from the UK Darwin Initiative.

Appendix 1. Tiger distribution in Berbak National Park

