MAMMALIAN WILDLIFE TOURISM IN SOUTH-EAST ASIAN TROPICAL RAINFORESTS: THE CASE OF ENDAU ROMPIN NATIONAL PARK, MALAYSIA

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AIHARA Y, HOSAKA T, YASUDA M, HASHIM M & NUMATA S. 2016. Mammalian wildlife tourism in South-East Asian tropical rainforests: the case of Endau Rompin National Park, Malaysia. Wildlife tourism is for the purpose of watching and/or encountering wildlife. In South-east Asia, mammalian wildlife tourism is less popular than in Africa. This is because mammalian wildlife tourism in South-East Asia is generally targeted at terrestrial national parks with forest fauna, as it is difficult to observe mammals in dense rainforest. To assess the potential of a South-East Asian national park for mammalian wildlife tourism, a mixed methods approach was used, 1) mammalian wildlife-based tourist attractions and 2) park use and visitor attitudes towards wildlife in Endau Rompin National Park, Peninsular Malaysia. There are potentially 149 mammalian species, including 24 threatened species, in Endau Rompin National Park. Camera trap data indicated that small and medium sized mammals do occur in these areas frequented by tourists. Footprints, nests, scratches and disturbance traces of various mammals were also observed. However, most visitors did not have high expectations regarding wildlife encounters, nor did many actually see wildlife during their stay. These results implied that animal signs and devices for indirect observation of elusive and/or rare animals were important at sites of mammalian wildlife-based tourism. Additionally, Asian elephants could be a strong attraction for wildlife tourists, but there was concern about conflict between local people and elephants.

Keywords: Animal signs, camera trapping, mammalian fauna, rainforests, tourist perception

INTRODUCTION

Nature-based tourism is expected to be the leading foreign exchange earners in several countries (Eagles et al. 2001). An estimated 40–60% of international tourists are nature tourists, of which some 20–40% are wildlife-related tourists (Reynolds & Braithwaite 2001). Wildlife tourism is undertaken to view and/or encounter wildlife (Newsome et al. 2005). To be considered sustainable, wildlife tourism should satisfy conservation and development objectives, (Udaya-Sekhar 2003). However, tourism can also impact wildlife through stress and behavioural modification due to proximity, feeding, accidental fires, noise, traffic and harassment. Such pressure may cause sensitive species such as cheetahs to fail at hunting or abandon habitat frequented by tourists (Lilieholm & Romney 2000). Wildlife tourism would be sustainable only if it contributes to the conservation and survival of target species and their habitats, provides benefits for local communities and community development, offers good quality tourism in line with market expectations and is commercially viable (Tapper 2006).

Africa has a long history of mammalian wildlife (safari) tourism related to conspicuous mammals with high diversity, abundance and body size, which are easy to find and observe in open habitats (Higginbottom 2004). A group of large and charismatic mammalian species known as the 'big five' (elephants, buffalo, rhinoceros, lions and leopards) is the primary target of international tourists in African national parks (Goodwin et al. 1997, 2000). In contrast,

mammalian wildlife is not a popular attraction in South-East Asia, and only few studies have been conducted on South-East Asian mammalian wildlife tourism. In South-East Asia, mammalian wildlife tourism is favourable in national parks that are home to diverse forest fauna. As new areas and species are becoming accessible, wildlife tourism has significant future potential in some countries (Higginbottom 2004). However, it is challenging to find and observe wildlife in dense rainforests, with the exception of some large, diurnal mammals (Knight 2010, Hill & Gough 2014, Hill et al. 2014). For example, great ape watching in African rainforests is highly popular (Laurence et al. 2006). Most South-East Asian rainforest mammals are nocturnal, limiting the potential targets of wildlife tourism. Thus, visitors' attitudes towards wildlife viewing in South-East Asian rainforests, and the potential of South-East Asian rainforests to support wildlife tourism, need to be addressed as a means to developing sustainable tourism practices in the region.

Understanding what people value in wildlife viewing is important in developing sustainable tourism practices in protected areas such as national parks (Reynolds & Braithwaite 2001). Understanding tourist experiences and preferences is crucial to developing sustainable wildlife tourism practices in South-East Asian tropical rainforests. However, tourist satisfaction is highly variable and is influenced by itinerary, destination image, trip quality and perceived value (Chen & Tsai 2007). For example, Booth et al. (2011) showed that species rarity was a good predictor of visitor numbers for bird-watching in the UK. Lindsey et al. (2007) suggested differences in wildlife viewing preferences between countries and levels of experience. However, there is little information on fauna as a basis for tourist attractions, nor on visitor perceptions and experiences in tropical rainforests.

This study evaluated how national parks with tropical rainforests provided potential mammalian wildlife tourist attractions. First, to evaluate potential mammal habitats, we gathered information on mammal species that occurred in Endau Rompin National Park, Peninsular Malaysia. Second, we conducted camera trapping and animal sign surveys to assess potential wildlife-based tourism attractions. Third, we conducted an explanatory survey to evaluate visitors' motivations, expectations and experiences regarding mammal-viewing using a questionnaire.

MATERIALS AND METHODS

Study site

Endau Rompin National Park is located at the border of Johore and Pahang, in Peninsular Malaysia (Figure 1). The northern portion of the park is designated as Endau Rompin State Park and managed by Pahang state. On the Johor side, it has two tourist areas in Peta and Selai. The Peta area covers 19,562 ha, while the Selai area covers 29,343 ha. Our study was conducted in the Peta area of Johor state (2° 31' N, 103° 24' E, 40 m above sea level).

In 1972, the Malaysian federal government proposed establishing a national park to protect the Sumatran rhinoceros (*Dicerorhinus sumatrensis*). Based on the findings of Endau Rompin Scientific and Heritage Expedition (Kiew et al. 1987, Mohamed & Zakaria-Ismail 2005), the government of Johor state designated a 25,200 ha area in the upper Endau river site as a national park. Accordingly, 48,905 ha of mostly virgin lowland tropical rainforest was gazetted as Endau Rompin National Park in 1989. Endau Rompin National Park is managed by the Johore National Parks Corporation, established under the National Parks (Johore) Corporation Enactment in 1989.

The forest comprises mixed dipterocarp forest of keruing–red meranti (*Dipterocarpus shorea*) and kapur (*Dryobalanpus*) types (Wong et al. 1987). During the 1970s and 1980s, selective logging occurred in portions of Endau Rompin National Park and there was a chance that further logging concessions would be awarded. However, logging last occurred in 1989 (Stecker 1996). The expedition found various endemic plant species (Soepadmo 1987). Annual rainfall in Endau Rompin National Park ranged from 2000 to 3600 mm.

Endau Rompin National Park has been open to public since September 1993. Approximately 4000 visitors entered Peta area each year (Numata, personal observation). There were about 7000 visitors in total in 2005, but this number decreased to 3,500 in 2007. Approximately 20–

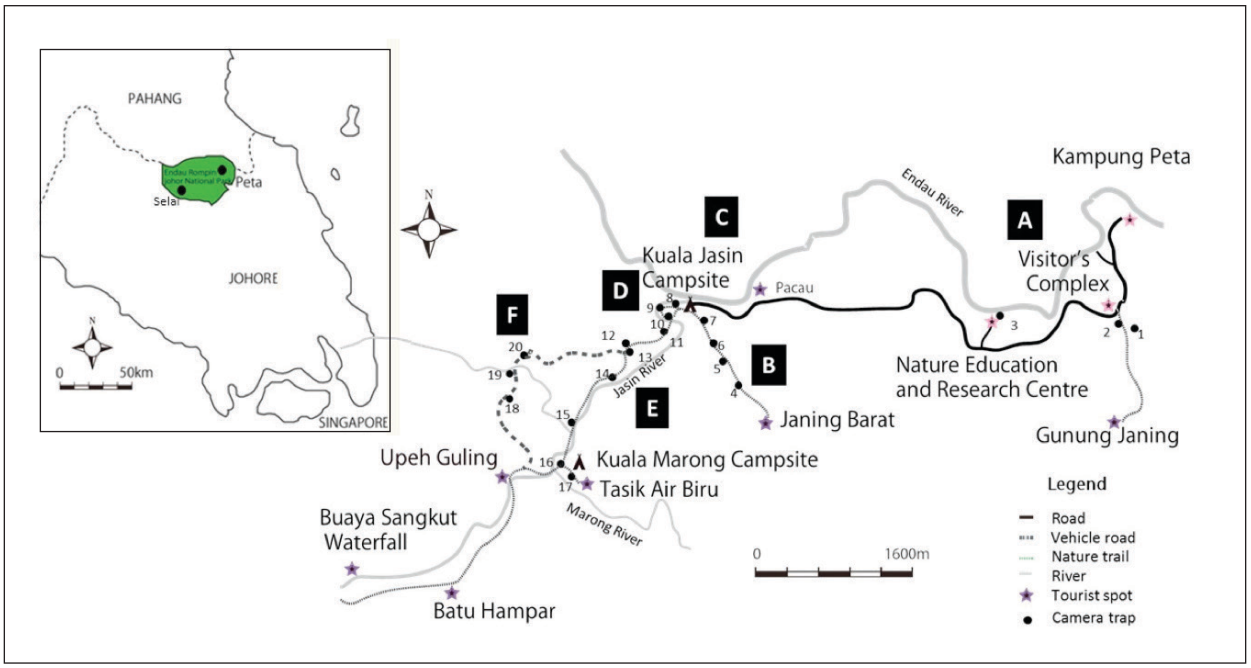

Figure 1 Map of Endau Rompin National Park and Peta area of the present study, A–F indicate different study zones, and numbers indicate the locations of cameras used in the study

30% of visitors came from western countries, while the rest were locals and Singaporeans. Many students came to Endau Rompin National Park for nature education and school events. Generally the month of May had the most number of visitors (500–700 per month), while December and January, at the height of the rainy season, had the fewest (< 100 per month). The park provided opportunities for various tourist activities, including camping, jungle trekking, night walking, swimming, canoeing, river rafting and nature education. In the Peta area, jungle trekking from Kuala Jasin campsite to Upeh Guling waterfall and swimming at Tasik Air Biru (water pond) were popular activities. There is a village, Kampung Peta, of local aborigines (orang asli) (300 people from 34 households), with a visitor complex. There are three campsites i.e at Kuala Jasin, Kuala Marong and Batu Hampar in the remote portions of the Peta area.

Potential mammalian fauna in Endau Rompin National Park

Published information was used to determine the composition of potential species at Endau Rompin National Park (Davison & Kiew 1987, DWNP 2010, IUCN 2014). Specimen-based records were also used to infer mammal distribution patterns (Medway 1983, Corbet & Hill 1992).

To evaluate qualitative and quantitative changes in mammalian fauna and human pressure on wildlife at the Park, the orang asli in Kampung Peta were interviewed on 11–12 September 2011. Among the residents of Kampung Peta, the village head and a handicraft maker, who made animal traps, were selected as key persons within the community. Interviews covered information about the past and current state of wildlife in and around Kampung Peta. The interview was conducted for approximately 1 hour each.

Camera trapping

Camera traps minimised human disturbances and provided an inexpensive and time-efficient means of observing wildlife in tropical rainforests (Numata et al. 2005). To understand the potential of wildlife as tourism resource in the visitors' area of Endau Rompin National Park, a camera trapping study was carried out using camera with built-in infrared motion sensor, built-in flash and automatic quartz time, from 8–22 September 2011. Each camera was wrapped

tightly in a thin, transparent polypropylene bag to protect it from water, and the wrapped cameras were placed inside plastic boxes open to the air. A total of 20 cameras were placed at a height of 0.5–1.0 m along nature trails, old logging roads and around tourist attractions in the study area (Figure 1). The sites were divided into six groups based on surrounding environment and trail use; zone A (near the visitor complex; camera 1–3), zone B (along the trail to Janing Barat; camera 4–7), zone C (along a trail popular for night walks; camera 8–10), zone D (along a wide trail; camera 11–13), zone E (along a natural trail to Kuala Marong; camera 14–17), and zone F (along an old logging road; camera 18–20). Logging roads in zones D and F were constructed when the park was established and are still open to vehicles. Nature trails were constructed for jungle trekking and are closed to vehicles. In general, the number of visitors on nature trails was greater in zones B–F (1760 visitors in 2011) than in zone A (239 visitors) (Numata, personal observation).

The species compositions of the six zones were compared using the camera trap capture rates. The trapping rate was calculated for each camera as the number of photographs that captured mammals divided by time, in days, for which the camera was installed. Pictures taken from 6.01 am till 6.00 pm were regarded to fall during times of tourist activity (daytime), and those taken from 18:01 to 06:00 were regarded to fall during relative tourist inactivity (night time). Data was collected for 11 days for each camera. The study included a total of 220 camera-days.

Animal signs

To understand the abundance and distribution patterns of large and low density mammals, scratch, foot prints, feeding and faeces along trails were surveyed in the study region from 8–9 September 2011. Sign locations were determined by GPS (map 62S) and identified to species with the help of park rangers.

Visitor park use and attitude towards wildlife

Face-to-face questionnaire surveys were conducted in English or Malay with 51 respondents from 9–12 September 2011 to collect information on Endau Rompin National Park visitor activity and awareness of tropical rainforest mammals. The questionnaire was designed to collect information on motives, attitudes and experiences regarding natural resource activities and wildlife in Endau Rompin National Park. Visitors answered the questionnaire on the last day of their stay. The questions are shown in Table 1.

RESULTS

Mammals in Endau Rompin National Park

In total, 149 mammal species from 11 orders (Carnivora, Cetartiodactyla, Chiroptera, Dermoptera, Eulipotyphla, Perissodactyla, Pholidota, Primates, Proboscidea, Rodentia, and Scandentia) were residents of the park. Seven endangered species, i.e. tiger (*Panthera tigris*), flat-headed cat (*Prionailurus planiceps*), Sunda otter civet (*Cynogale bennettii*), Malayan tapir (*Tapirus indicus*), Sunda pangolin (*Manis javanica*), Lar gibbon (*Hylobates lar*) and Asian elephant (*Elephas maximus*) were listed as inhabitants (Table 2). Although the critically endangered Sumatran rhinoceros (*Dicerorhinus sumatrensis*) was listed, park rangers informed that there was no evidence of its presence in Endau Rompin National Park in the past 10 years.

The interviews showed that the orang asli, who have long lived in the forest, understand mammal behaviour because of their dependence on animals for food (although they no longer hunt for animals except in times of food insecurity). Ten years ago it was easy to find animals such as tapir and sambar in Kampung Peta but now only few, except for elephants, remain. Elephant population in Endau Rompin National Park has increased each year from 20 to 70 individuals due to translocation of rogue elephants as part of rescue operations. Their habitat outside the park in Johore state has been disturbed by deforestation, illegal logging, illegal hunting and development. Consequently, some elephants have entered Kampung Peta in search of food, causing human–elephant conflict.

Camera trapping in Endau Rompin National Park

A total of 34 photographs of nine mammal species were obtained from 7 of the 20 sites.

Table 1 Survey questions

	Question	Answer type
1	Where are you from?	Open-ended
2	How long did you stay?	Open-ended
3	What was your favourite feature of national parks generally?	Multiple selection
4	What is your reason for visiting Endau Rompin National Park?	Multiple selection
5	What activities were you interested in pursuing while in Endau Rompin National Park?	Multiple selection
6	What mammals were you hoping to see?	Multiple selection
7	What mammals did you see during your stay? Where did you see them?	Open-ended
8	What do you think is the best feature of Endau Rompin National Park?	Multiple selection
9	How satisfied are you with Endau Rompin National Park?	Five-point evaluation

They were five large species namely sambar (*Rusa unicolor*), wild boar (*Sus scrofa*), greater oriental chevrotain (*Tragulus napu*), crab-eating macaque (*Macaca fascicularis*) and Malayan porcupine (*Hystrix brachyura*), and four small species, namely short-tailed gymnure (*Hylomis suillus*), spiny rats (*Maxomys* spp.), three-striped ground squirrel (*Lariscus insigns*) and common treeshrew (*Tupaia glis*) (Figure 2a). Wild boars were recorded most frequently in 10 photographs.

Zone C saw the greatest number of mammals recorded (night trail, 0.36 camera/day), followed by zone F (old logging road; 0.24 camera/day) (Figure 2a). Five mammal species were confirmed in these zones.

There was no considerable difference in trapping rates between times of tourist activity and inactivity at the camera trapping sites (Figure 2b). Wild boars and common treeshrews were recorded regardless of time of the day. Wild boars were more common during the day, while treeshrews were more common before dawn. Crab-eating macaque and short-tailed gymnure were recorded only during the day, while sambar deer, greater oriental chevrotain, Malayan porcupine, spiny rats and three-striped ground squirrel were recorded only at night or before dawn.

Animal signs

We recorded signs of five large mammal species, i.e. nests and footprints of wild boar, footprints of tigers, footprints of Malayan tapirs, scratch from sun bear (*Helarctos malayanus*) and feeding and feces of the Asian elephant. Footprints and feeding and faeces of wild boar and Asian elephant were found throughout the study area (Figure 3), while those of tigers and Malay tapirs were found only along wide trails. The sun bear scratch was found along a nature trail (from Kuala Marong campsite to Tasik Air Biru) frequented by tourists. Many large mammal footprints occurred in open places in zones D and F, though they also occurred in confined places in zones B and E.

Visitor perceptions and experiences in Endau Rompin National Park

In total, 51 visitors answered the questionnaire. Of these, seven were international visitors and 44 were Malaysians. Of the seven international visitors, three were from the United Kingdom, two from Germany, one from Belgium and one from France. All non-Malaysians were young or middle-aged couples except one from United Kingdom. A total of 41 of 44 Malaysians were students camping as part of a nature education program at Endau Rompin National Park. The visitors stayed for 2 to 7 days, with an average of 2.9 ± 0.8 days.

Visitors' reasons for visiting and expectations regarding wildlife in Endau Rompin National Park

The most common reasons for visiting Endau Rompin National Park were jungle trekking and camping (72.5% of respondents). Wildlife-

Table 2 Mammal species observed in Endau Rompin National Park

Order	Family	Scientific name	English name	IUCN Red List 2014.1	Peninsular Malaysia Red List 2010
Carnivora	Felidae	*Catopuma temminckii*	Asiatic golden cat	NT	
Carnivora	Felidae	*Panthera pardus*	Leopard	NT	EN
Carnivora	Felidae	*Panthera tigris*	Tiger	EN	EN
Carnivora	Felidae	*Pardofelis marmorata*	Marbled cat	VU	
Carnivora	Felidae	*Prionailurus bengalensis*	Leopard cat	LC	
Carnivora	Felidae	*Prionailurus planiceps*	Flat-headed cat	EN	NT
Carnivora	Herpestidae	*Herpestes brachyurus*	Short-tailed mongoose	LC	
Carnivora	Herpestidae	*Herpestes javanicus*	Small Asian mongoose	LC	
Carnivora	Mustelidae	*Aonyx cinerea*	Asian small-clawed otter	VU	
Carnivora	Mustelidae	*Lutrogale perspicillata*	Smooth-coated otter	VU	
Carnivora	Mustelidae	*Martes flavigula*	Yellow-throated marten	LC	NT
Carnivora	Mustelidae	*Mustela nudipes*	Malay weasel	LC	NT
Carnivora	Mustelidae	*Prionodon linsang*	Banded linsang	LC	NT
Carnivora	Ursidae	*Helarctos malayanus*	Sun bear	VU	VU
Carnivora	Viverridae	*Arctictis binturong*	Binturong	VU	
Carnivora	Viverridae	*Arctogalidia trivirgata*	Small-toothed palm civet	LC	
Carnivora	Viverridae	*Cynogale bennettii*	Sunda otter civet	EN	
Carnivora	Viverridae	*Hemigalus derbyanus*	Banded civet	VU	
Carnivora	Viverridae	*Paguma larvata*	Masked palm civet	LC	
Carnivora	Viverridae	*Paradoxurus hermaphroditus*	Common palm civet	LC	
Carnivora	Viverridae	*Viverra megaspila*	Large-spotted civet	VU	EN
Carnivora	Viverridae	*Viverra tangalunga*	Malay civet	LC	
Carnivora	Viverridae	*Viverra zibetha*	Large Indian civet	NT	NT
Carnivora	Viverridae	*Viverricula indica*	Small Indian civet	LC	NT
Cetartiodactyla	Cervidae	*Muntiacus muntjak*	Southern red muntjac	LC	NT
Cetartiodactyla	Cervidae	*Rusa unicolor*	Sambar deer	VU	VU
Cetartiodactyla	Suidae	*Sus barbatus*	Bearded pig	VU	NT
Cetartiodactyla	Suidae	*Sus scrofa*	Wild boar	LC	
Cetartiodactyla	Tragulidae	*Tragulus kanchil*	Lesser oriental chevrotain	LC	
Cetartiodactyla	Tragulidae	*Tragulus napu*	Greater oriental chevrotain	LC	
Chiroptera	Emballonuridae	*Emballonura monticola*	Lesser sheath-tailed bat	LC	
Chiroptera	Emballonuridae	*Saccolaimus saccolaimus*	Bare-rumped sheathtail-bat	LC	
Chiroptera	Emballonuridae	*Taphozous melanopogon*	Black-bearded tomb bat	LC	
Chiroptera	Hipposideridae	*Coelops frithii*	Tail-less leaf-nosed Bat	LC	EN
Chiroptera	Hipposideridae	*Hipposideros armiger*	Great Himalayan leaf-nosed bat	LC	
Chiroptera	Hipposideridae	*Hipposideros ater*	Dusky leaf-nosed bat	LC	
Chiroptera	Hipposideridae	*Hipposideros bicolor*	Bicolored leaf-nosed bat	LC	
Chiroptera	Hipposideridae	*Hipposideros cervinus*	Fawn-colored leaf-nosed bat	LC	

(continued)

Table 2 (continued)

Order	Family	Scientific name	English name	IUCN Red List 2014.1	Peninsular Malaysia Red List 2010
Chiroptera	Hipposideridae	*Hipposideros cineraceus*	Least leaf-nosed bat	LC	
Chiroptera	Hipposideridae	*Hipposideros diadema*	Diadem leaf-nosed bat	LC	
Chiroptera	Hipposideridae	*Hipposideros doriae*	Bornean leaf-nosed Bat	NT	VU
Chiroptera	Hipposideridae	*Hipposideros galeritus*	Cantor's leaf-nosed bat	LC	
Chiroptera	Hipposideridae	*Hipposideros larvatus*	Horsfield's leaf-nosed bat	LC	
Chiroptera	Hipposideridae	*Hipposideros ridleyi*	Ridley's leaf-nosed bat	VU	
Chiroptera	Megadermatidae	*Megaderma lyra*	Greater false vampire	LC	
Chiroptera	Megadermatidae	*Megaderma spasma*	Lesser false vampire	LC	
Chiroptera	Molossidae	*Cheiromeles torquatus*	Greater naked bat	LC	
Chiroptera	Molossidae	*Tadarida johorensis*	Northern free-tailed bat	VU	
Chiroptera	Molossidae	*Tadarida plicata*	Wrinkle-lipped free-tailed bat	LC	
Chiroptera	Nycteridae	*Nycteris tragata*	Malayan slit-faced bat	NT	
Chiroptera	Pteropodidae	*Aethalops alecto*	Pygmy fruit bat	LC	VU
Chiroptera	Pteropodidae	*Balionycteris maculata*	Spotted-winged fruit bat	LC	
Chiroptera	Pteropodidae	*Chironax melanocephalus*	Black-capped fruit bat	LC	
Chiroptera	Pteropodidae	*Cynopterus brachyotis*	Lesser dog-faced fruit bat	LC	
Chiroptera	Pteropodidae	*Cynopterus horsfieldii*	Horsfield's fruit bat	LC	
Chiroptera	Pteropodidae	*Macroglossus minimus*	Dagger-toothed long-nosed fruit bat	LC	
Chiroptera	Pteropodidae	*Macroglossus sobrinus*	Hill long-tongued fruit bat	LC	
Chiroptera	Pteropodidae	*Megaerops ecaudatus*	Temminck's tailless fruit bat	LC	
Chiroptera	Pteropodidae	*Megaerops wetmorei*	White-collared fruit bat	VU	EN
Chiroptera	Pteropodidae	*Penthetor lucasi*	Lucas's short-nosed fruit bat	LC	
Chiroptera	Pteropodidae	*Pteropus vampyrus*	Large flying-fox	NT	
Chiroptera	Pteropodidae	*Rousettus amplexicaudatus*	Geoffroy's rousette	LC	
Chiroptera	Rhinolophidae	*Rhinolophus acuminatus*	Acuminate horseshoe bat	LC	
Chiroptera	Rhinolophidae	*Rhinolophus affinis*	Intermediate horseshoe bat	LC	
Chiroptera	Rhinolophidae	*Rhinolophus lepidus*	Blyth's horseshoe bat	LC	
Chiroptera	Rhinolophidae	*Rhinolophus luctus*	Great woolly horsehoe bat	LC	
Chiroptera	Rhinolophidae	*Rhinolophus pusillus*	Least horseshoe bat	LC	
Chiroptera	Rhinolophidae	*Rhinolophus sedulus*	Lesser woolly horseshoe bat	NT	
Chiroptera	Rhinolophidae	*Rhinolophus stheno*	Lesser brown horseshoe bat	LC	
Chiroptera	Rhinolophidae	*Rhinolophus trifoliatus*	Trefoil horseshoe bat	LC	
Chiroptera	Vespertilionidae	*Glischropus tylopus*	Common thick-thumbed bat	LC	
Chiroptera	Vespertilionidae	*Hesperoptenus blanfordi*	Blanford's bat	LC	VU

(continued)

Table 2 (continued)

Order	Family	Scientific name	English name	IUCN Red List 2014.1	Peninsular Malaysia Red List 2010
Chiroptera	Vespertilionidae	*Kerivoula hardwickii*	Hardwicke's woolly bat	LC	
Chiroptera	Vespertilionidae	*Kerivoula intermedia*	Small woolly bat	NT	VU
Chiroptera	Vespertilionidae	*Kerivoula minuta*	Least woolly bat	NT	
Chiroptera	Vespertilionidae	*Kerivoula papillosa*	Papillose woolly bat	LC	
Chiroptera	Vespertilionidae	*Kerivoula pellucida*	Clear-winged woolly bat	NT	
Chiroptera	Vespertilionidae	*Kerivoula picta*	Painted Woolly Bat	LC	VU
Chiroptera	Vespertilionidae	*Miniopterus fuliginosus*	Eastern bent-winged bat	LC	
Chiroptera	Vespertilionidae	*Miniopterus medius*	Medium bent-winged bat	LC	
Chiroptera	Vespertilionidae	*Murina cyclotis*	Round-eared tube-nosed bat	LC	
Chiroptera	Vespertilionidae	*Murina suilla*	Brown tube-nosed bat	LC	
Chiroptera	Vespertilionidae	*Myotis adversus*	Large-footed myotis	LC	
Chiroptera	Vespertilionidae	*Myotis horsfieldii*	Horsfield's myotis	LC	
Chiroptera	Vespertilionidae	*Myotis muricola*	Nepalese whiskered myotis	LC	
Chiroptera	Vespertilionidae	*Myotis ridleyi*	Ridley's myotis	NT	
Chiroptera	Vespertilionidae	*Philetor brachypterus*	Short-winged pipistrelle	LC	
Chiroptera	Vespertilionidae	*Phoniscus atrox*	Groove-toothed trumpet-eared bat	NT	VU
Chiroptera	Vespertilionidae	*Pipistrellus javanicus*	Javan pipistrelle	LC	
Chiroptera	Vespertilionidae	*Pipistrellus stenopterus*	Narrow-winged pipistrelle	LC	
Chiroptera	Vespertilionidae	*Pipistrellus tenuis*	Least pipistrelle	LC	
Chiroptera	Vespertilionidae	*Scotophilus kuhlii*	Lesser Asiatic yellow house bat	LC	
Chiroptera	Vespertilionidae	*Tylonycteris pachypus*	Lesser bamboo bat	LC	
Chiroptera	Vespertilionidae	*Tylonycteris robustula*	Greater flat-headed bat	LC	
Dermoptera	Cynocephalidae	*Galeopterus variegatus*	Sunda flying lemur	LC	
Eulipotyphla	Erinaceidae	*Echinosorex gymnura*	Moonrat	LC	VU
Eulipotyphla	Erinaceidae	*Hylomys suillus*	Short-tailed gymnure	LC	
Eulipotyphla	Soricidae	*Crocidura malayana*	Malayan shrew	LC	
Eulipotyphla	Soricidae	*Crocidura negligens*	Peninsular shrew	LC	EN
Eulipotyphla	Soricidae	*Suncus murinus*	House shrew	LC	
Perissodactyla	Rhinocerotidae	*Dicerorhinus sumatrensis*	Sumatran rhinoceros	CR	CR
Perissodactyla	Tapiridae	*Tapirus indicus*	Malayan tapir	EN	NT
Pholidota	Manidae	*Manis javanica*	Sunda pangolin	EN	VU
Primates	Cercopithecidae	*Macaca fascicularis*	Crab-eating macaque	LC	
Primates	Cercopithecidae	*Macaca nemestrina*	Southern pig-tailed macaque	LC	
Primates	Cercopithecidae	*Presbytis femoralis*	Banded surili	NT	
Primates	Cercopithecidae	*Presbytis siamensis*	White-thighed surili	NT	VU
Primates	Cercopithecidae	*Trachypithecus obscurus*	Dusky leaf monkey	NT	
Primates	Hylobatidae	*Hylobates lar*	Lar gibbon	EN	
Primates	Lorisidae	*Nycticebus coucang*	Slow loris	VU	
Proboscidea	Elephantidae	*Elephas maximus*	Asian elephant	EN	VU

(continued)

Table 2 (continued)

Order	Family	Scientific name	English name	IUCN Red List 2014.1	Peninsular Malaysia Red List 2010
Rodentia	Hystricidae	*Atherurus macrourus*	Asiatic brush-tailed porcupine	LC	
Rodentia	Hystricidae	*Hystrix brachyura*	Malayan porcupine	LC	
Rodentia	Muridae	*Berylmys bowersi*	Bower's white-toothed rat	LC	EN
Rodentia	Muridae	*Chiropodomys gliroides*	Pencil-tailed tree mouse	LC	
Rodentia	Muridae	*Lenothrix canus*	Sundaic lenothrix	LC	
Rodentia	Muridae	*Leopoldamys sabanus*	Long-tailed giant rat	LC	
Rodentia	Muridae	*Maxomys rajah*	Rajah Sundaic maxomys	VU	
Rodentia	Muridae	*Maxomys surifer*	Indomalayan maxomys	LC	
Rodentia	Muridae	*Maxomys whiteheadi*	Whitehead's Sundaic maxomys	VU	
Rodentia	Muridae	*Mus musculus*	House mouse	LC	
Rodentia	Muridae	*Niviventer cremoriventer*	Sundaic arboreal niviventer	VU	
Rodentia	Muridae	*Pithecheir parvus*	Malay peninsula pithecheir	DD	
Rodentia	Muridae	*Rattus annandalei*	Annandale's sundaic rat	LC	
Rodentia	Muridae	*Rattus argentiventer*	Ricefield rat	LC	
Rodentia	Muridae	*Rattus exulans*	Polynesian rat	LC	
Rodentia	Muridae	*Rattus rattus*	House rat	LC	
Rodentia	Muridae	*Rattus tiomanicus*	Malayan field rat	LC	
Rodentia	Muridae	*Rhizomys sumatrensis*	Indomalayan bamboo rat	LC	
Rodentia	Muridae	*Sundamys muelleri*	Mueller's sundamys	LC	
Rodentia	Sciuridae	*Aeromys tephromelas*	Black flying squirrel	DD	
Rodentia	Sciuridae	*Callosciurus nigrovittatus*	Black-striped squirrel	NT	
Rodentia	Sciuridae	*Callosciurus notatus*	Plantain squirrel	LC	
Rodentia	Sciuridae	*Callosciurus prevostii*	Prevost's squirrel	LC	
Rodentia	Sciuridae	*Hylopetes platyurus*	Jentink's flying squirrel	DD	
Rodentia	Sciuridae	*Hylopetes spadiceus*	Red-cheeked flying squirrel	LC	
Rodentia	Sciuridae	*Iomys horsfieldii*	Javanese flying squirrel	LC	
Rodentia	Sciuridae	*Lariscus insignis*	Three-striped ground squirrel	LC	
Rodentia	Sciuridae	*Petaurista elegans*	Spotted giant flying squirrel	LC	
Rodentia	Sciuridae	*Petaurista petaurista*	Common giant flying squirrel	LC	
Rodentia	Sciuridae	*Ratufa affinis*	Pale giant squirrel	NT	
Rodentia	Sciuridae	*Ratufa bicolor*	Black giant squirrel	NT	
Rodentia	Sciuridae	*Rhinosciurus laticaudatus*	Shrew-faced squirrel	NT	
Rodentia	Sciuridae	*Sundasciurus hippurus*	Horse-tailed squirrel	NT	
Rodentia	Sciuridae	*Sundasciurus lowii*	Low's squirrel	LC	
Rodentia	Sciuridae	*Sundasciurus tenuis*	Slender squirrel	LC	

(continued)

Table 2 (continued)

Order	Family	Scientific name	English name	IUCN Red List 2014.1	Peninsular Malaysia Red List 2010
Scandentia	Ptilocercidae	*Ptilocercus lowii*	Pen-tailed treeshrew	LC	VU
Scandentia	Tupaiidae	*Tupaia glis*	Common treeshrew	LC	
Scandentia	Tupaiidae	*Tupaia minor*	Lesser treeshrew	LC	VU

The red category status follows the IUCN Red List of Threatened Species (2014). Peninsular Malaysia red category status follows DWNP (2010); NT = near threatened, EN = endangered, VU = vulnerable, LC: least concern, CR: critically endangered, DD: data deficient

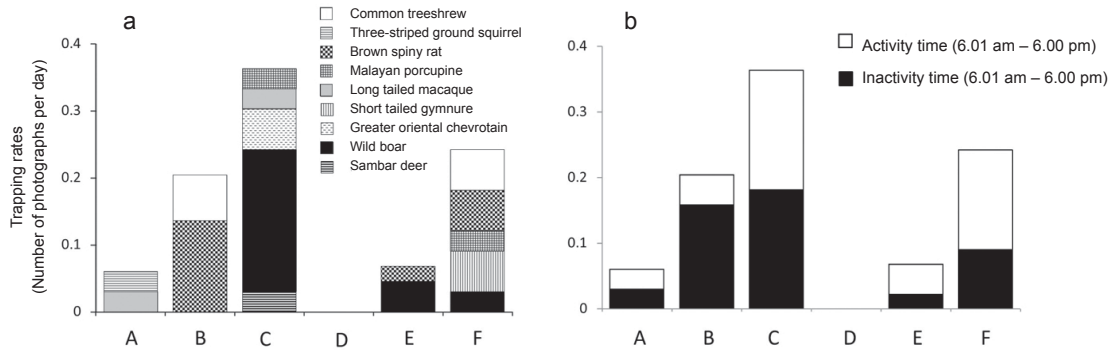

Figure 2 Results from camera traps in the Peta area of Endau Rompin National Park, A–F indicate zones of data collection, trapping rates (number of photographs per day) are shown in graph a and activity time is shown in b

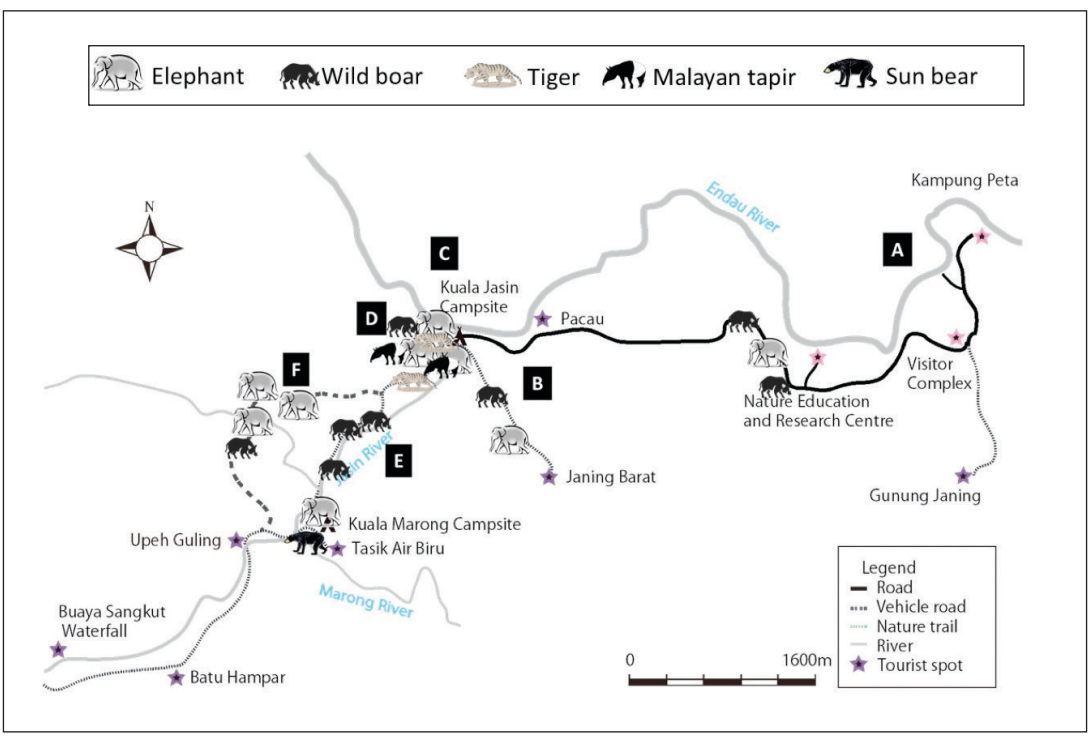

Figure 3 Animal signs in the Peta area of Endau Rompin National Park, the animal sign survey was conducted along the trail at the visitors' area

related reasons including learning animals (49.0%), taking photographs of animals (33.3%) and experiencing wildlife (21.6%) were all relatively highly ranked (Figure 4a). Regarding the expectation of wildlife in Endau Rompin National Park, many visitors wanted to see, in descending order (Figure 4b) endangered species, rare mammals, anything they can see and mammals living in nature. . Specific mammals that the visitors most hoped to see were elephants (n = 13), tigers (n = 8), sun bears (n = 1), deer (n = 1) and tapir (n = 1).

Visitors' experiences in Endau Rompin National Park

The favourite attractions in Endau Rompin National Park, in descending order were rivers and waterfalls, scenic nature and rainforest (Figure 5). Approximately 30% of the visitors scored animals as most attractive. Average visitor satisfaction (1–5 scale: 1 = worst, 5 = best) in Endau Rompin National Park was 3.8 ± 0.7.

Tourist experiences regarding wildlife encounters were poor. Only 33.3% of respondents had seen animals during their stay. Furthermore, observed species were limited to otters (family Mustelidae; n = 1), primates [crab-eating macaque (*Macaca fascicularis*) and Dusky leaf monkey (*Trachypithecus obscurus*); n = 7] and wild boar (n = 1). Besides mammals, birds (n = 1), monitor lizards (n = 1) and snakes (n = 1) were also observed (n = number of respondents).

DISCUSSION

Rich mammalian fauna, including threatened and rare species in the tropical rainforests of Endau Rompin National Park can attract wildlife tourists. At least 286 mammalian species occur in Peninsular and East Malaysia (Groombridge & Jenkins 1994), approximately 52% of which inhabit Endau Rompin National Park. However, with the exceptions of wild boars and sambar deer, most species recorded by our camera traps were elusive small mammals. Since small mammals are generally difficult to locate, they will likely not be significant tourist attractions in this situation. However, one of the species trapped, treeshrew, is very common in Malaysia and endemic to Thailand, Malaysia and Indonesia. Therefore, viewing and interpretation of common mammals may contribute to satisfaction of international tourists, as 31% of visitors were willing to see any kind of animals (Figure 4b). On the other hand, the low abundance of animal signs and the low camera trapping rate in zone A (near the village and visitor complex) suggest a negative relationship between tourist activity and wildlife encounters. Zhou et al. (2013) showed that small mammalian species were affected by indirect pressures associated with site development to facilitate tourism. Therefore, future tourism development should be conducted with the consideration of resident mammals that may be affected when exposed to tourism.

Interviews with key persons of the orang asli community suggested that the number of wild animals has declined in the last few decades. Since most visitors do not observe large and rare mammals, observations of animal signs may play important roles in wildlife-based tourism in South-East Asian rainforest. Although visitors hoped to see rare and endangered mammals, 20% of the visitors were also interested in animal tracks (Figure 4b). The dense forests of many west and central African nations may teem with wildlife, but limited visibility can disappoint visitors. However, forested parks can offer unique experiences, such as the sights, sounds and smells of a dense tropical forest (Lilieholm & Romney 2000, Hill et al. 2014). In the present study, animal signs were found even in the tourist area in Endau Rompin National Park, and this area may therefore be more convenient for mammalian wildlife-based tourism if animal signs are guided. With this is mind, wildlife training provided to park rangers, guides and tour operators could improve visitor satisfaction by channeling visitors to areas with better chances of successful animal viewing (Lilieholm & Romney 2000). Using information technology devices for indirect observation of small and/or nocturnal animals may also be effective (Allison & DeStefano 2006). Besides scientific data, archives of wildlife films and photographs recorded in Endau Rompin National Park may enrich wildlife-based tourism.

Charismatic mammalian species play a key role in attracting visitors to parks (Lindsey et al. 2007). In Africa, tourists are focused on the "big five" (Goodwin et al. 2000). Similarly, tourists visiting rainforests in Malaysia were interested in seeing large and rare mammals. As Endau Rompin National Park is rich in

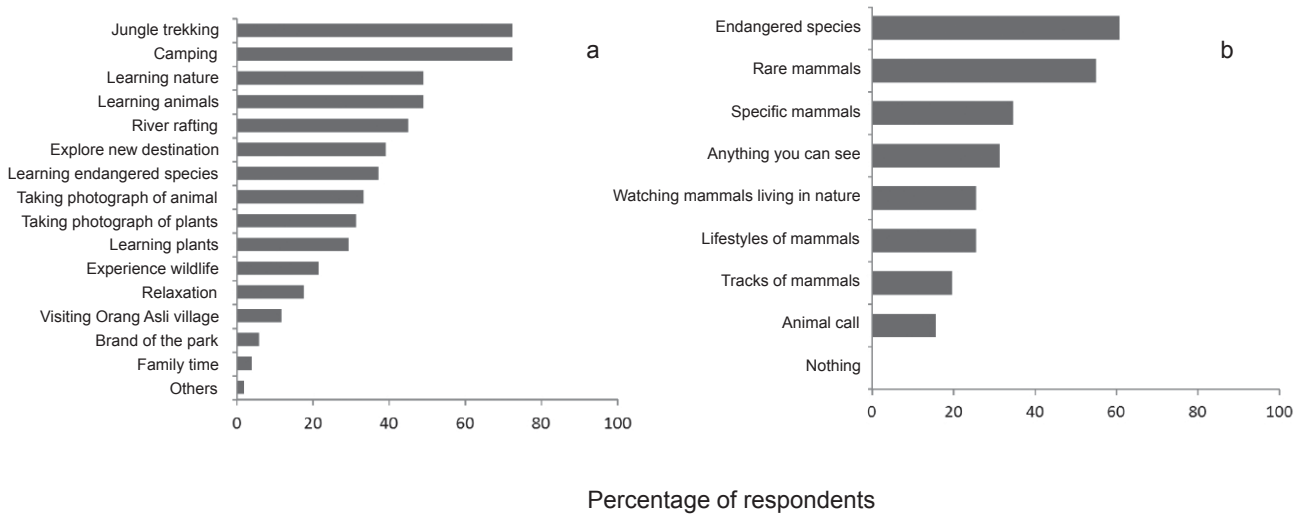

Figure 4 Reasons for visiting Endau Rompin National Park, (a) preference for viewing wildlife, (b) questionnaire responses

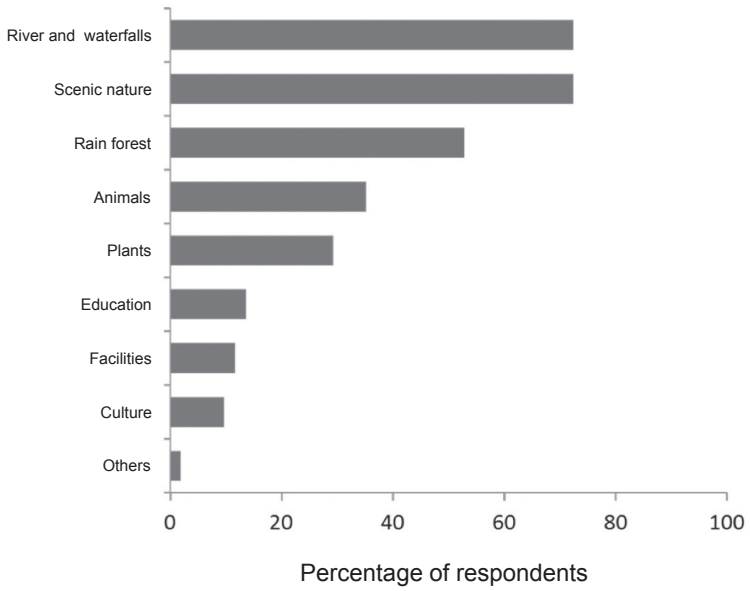

Figure 5 Visitors' favourite feature of Endau Rompin National Park

mammalian fauna and charismatic species, the wild mammals in the area will be attractive to visitors. In this area, Asian elephants were relatively abundant and their signs were easily found and therefore, Asian elephants could become a tourist attraction. However, we need to pay attention to human–wildlife conflict in Kanpung Peta when Asian elephants are treated as an attraction for tourists. Asian elephants are the principal source of conflict in much of Asia (Oswin–Perera 2009). In Johore, the number of elephants showed 50% increase till 1981 till 1983 (70 to 105). Elephants damage crops, and some were killed to prevent serious crop loss (Othman 1986). More than 500 elephants from seven states of Peninsular Malaysia have been captured and translocated to the Royal Belum State Park, Endau Rompin and Taman Negara National

Parks (Saaban et al. 2011). Interviews with the local orang asli community suggested that elephants outside national parks may seriously impact the livelihoods of locals. Therefore, efforts must be made to reduce conflicts between elephants and the local community, and also to avoid personal injuries and accidents of local people as well as tourists. Additionally, with the development of tourism, tigers and other animals are threatened by poaching (Noordin 1998). Human–wildlife conflicts should thus be managed in various ways.

In Africa, 70.5% of respondents reported that they had not seen enough wildlife, and that they were disappointed in learning how challenging was to observe large and rare species (Goodwin et al. 1997). In Endau Rompin National Park, visitors most often partook in jungle trekking, during which animals were not the main attraction because of the expectation of scenic nature, adventures and activities (Figures 4a and 4b). Therefore, visitors in Endau Rompin National Park might not expect as much wildlife as those in Africa. However, provision of rainforest biodiversity information to tourists may impact on their emotive and cognitive encounters with rainforests (Hill & Gough 2014). Therefore, effective provision of wildlife information may make tourism in Endau Rompin National Park more attractive. Besides experiences with wildlife in nature, careful tourism management can increase visitor satisfaction and environmental education. Understanding of tourist satisfaction is important for tourism management. However, in general, visitor nationality influences satisfaction (Akama 1996, Okello & Yerian 2009, Mustika et al. 2013). Malaysian tourists in Malaysian national parks are most interested in enjoying themselves and being active, while most western tourists are interested in seeing the flora and fauna (Backhaus 2005). Most visitors to Endau Rompin National Park were en route from Kuala Lumpur to Tioman Island, which is located near the east coast of Peninsular Malaysia. They were interested in experiencing rainforests and tropical animals along their journey. To increase the level of satisfaction of western and local visitors in Endau Rompin National Park, provision of various wildlife information is important. Due to a lack of samples, differences in the perceptions of wildlife among visitors from different South-East Asian countries were not examined. Understanding of how wildlife tourism could contribute to conservation of rainforest ecosystems for sustainable use is important.

CONCLUSIONS

Endau Rompin National Park has a rich mammalian fauna, including threatened and rare species of the tropical rainforests. Elusive small mammals were not significant tourist attractions, but animal signs and devices for indirect observation of elusive and/or rare animals could become attractions for mammalian wildlife-based tourism. However, extensive evaluation of visitors' awareness, experience and satisfaction are required to assess the potential of a South-East Asian national park for mammalian wildlife tourism. Asian elephants could be a strong tourist attraction for wildlife tourists, but efforts must be made to reduce potential causes of conflict between elephants and the local community. Further study on the appropriate balance between tourism management, livelihood of local people and wildlife conservation is strongly recommended.

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