



EXPEDITION REPORT

Expedition dates: 17 July – 12 August 2016

Report published: February 2017

**Forest flagship:
Monitoring & conserving critically
endangered Sumatran tigers in Bukit
Rimbang Bukit Baling Wildlife Reserve,
Sumatra, Indonesia**

in partnership with





**Batu Dinding
Community Group**

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Biosphere Expeditions**

Cover picture by Ida Vincent

Abstract

Biosphere Expeditions and WWF Indonesia ran their second joint expedition with volunteers in and around Bukit Rimbang Bukit Baling Wildlife Reserve (BRBBWR), Riau Province, Sumatra, Indonesia, from 17 July to 12 August 2016.

The expedition study was a follow-up of the previous study in 2015, with the tiger and its habitat as the focal point, including prey species and species that contribute to information on tiger habitat quality, or human disturbance of these. In an effort to support tiger conservation in BRBBWR, the objectives of this activity were (1) to conduct long-term tiger and habitat monitoring in locations of high human disturbance along the Subayang river and (2) to involve and engage with local communities in order to raise their awareness of and support for tiger and habitat conservation.

Surveys were conducted on foot or by boat, covering BRBBWR along the Subayang river, which served as a convenient travel route and access point for survey teams. The methods employed to record species (mammals and large birds) involved recording species presence-absence and frequency of individuals in a grid of 2x2 km cells by means such as signs, sightings and calls. Camera traps were also employed to record species presence.

The study was designed to compare the presence of species in cells with and without villages in order to investigate whether village presence had any influence on species distribution in the forest. Sixteen cells were surveyed, seven were non-village cells and nine were village cells. In total, thirteen wildlife species (including water buffalo) in four mammal genera were recorded, plus two large bird species. Except for the wild boar *Sus scrofa*, the sun bear *Helarctos malayanus* and the water buffalo, all species had very low scores (≤ 5 of presence in cells). This hampered any further analysis. The water buffalo and wild boar were found to be evenly distributed in village and non-village cells. The sun bear, considered Vulnerable (VU) by the IUCN (International Union for the Conservation of Nature), was the only species that displayed a noticeably higher presence value in non-village cells, suggesting a certain degree of avoidance of human presence. The number of independent pictures recorded by camera traps was ≥ 5 for humans (n=23), mouse deer *Tragulus* sp. (n=7), wild boars (n=6), pig-tailed macaque *Macaca nemestrina* (n=11) and common porcupine *Hystrix brachyura* (n=9). The pig-tailed macaque, listed as Vulnerable (VU) by the IUCN, was camera-trapped more often in village cells (n=8), than in non-village cells (n=3). The Endangered (EN) gibbon *Hylobates agilis* and the siamang *Symphalangus syndactylus* were present, but infrequently recorded. The presence of these species suggests that villagers have a relatively high tolerance towards them and also towards other species such as the crop-raiding wild boars and sun bears. Four recognised mammalian prey species for tiger were recorded during the expedition, namely the barking deer *Muntiacus muntjak*, the sambar deer *Rusa unicolor*, pig-tailed macaque and wild boar. The common porcupine and two birds, the crested partridge *Rollulus rouloul* and the great argus pheasant *Argusianus argus*, may occasionally be taken by tigers, and all of them were recorded at low rates. The presence of all these species, including known tiger prey, is thought to be beneficial to tiger presence, although none were recorded by the expedition.

However, a large proportion of villagers interviewed (n=16) have reportedly seen tigers (25%) and tiger tracks (38%) during their lifetimes. Most villagers were scared (72%) or slightly scared (14%) of tigers and as a result a majority (69%) had a negative opinion of tiger presence. However, most interviewees recognised the importance of tigers for the country (61%) and for tourism (81%), and understood that they should be protected (>80%). During the survey, snares installed for tiger prey were found in 14% of 16 grid cells sampled and shotguns were heard. Four schools (three elementary schools and one junior high school) were visited, involving 158 pupils in presentations as well as talks about tiger and general conservation.

Abstrak

Biosphere Expeditions dan WWF Indonesia menyelenggarakan ekspedisi kedua mereka bersama para sukarelawan di Suaka Margasatwa Bukit Rimbang Bukit Baling (SMBRBB), Provinsi Riau, Sumatera, Indonesia, dari tanggal 17 Juli hingga 12 Agustus 2016.

Studi ekspedisi ini adalah sebagai sebuah tindak lanjut dari studi sebelumnya di tahun 2015 dengan harimau dan habitatnya sebagai poin utama termasuk satwa mangsa dan satwa lain yang berkontribusi pada kualitas habitat harimau atau gangguan manusia. Dalam sebuah usaha untuk mendukung upaya konservasi harimau di SMBRBB, tujuan dari studi ini adalah (1) melakukan pemantauan jangka panjang untuk harimau dan habitatnya di lokasi – lokasi dengan gangguan manusia tinggi sepanjang sungai Subayang dan (2) melibatkan masyarakat lokal untuk meningkatkan kesadaran mereka dan mendukung upaya konservasi harimau dan habitatnya.

Beberapa survai dilakukan dengan berjalan kaki atau berperahu, mencakup sepanjang sungai Subayang yang dapat diakses secara mudah oleh tim – tim survai. Metode ini digunakan untuk merekam spesies (mamalia dan burung – burung besar) termasuk merekam kehadiran-ketidakhadiran (*presence-absence*) spesies dan frekuensi individu – individu spesies dalam grid sel pemantauan 2x2 km melalui perjumpaan langsung maupun tanda keberadaan seperti jejak, suara, dsb. Kamera penjebak jua digunakan untuk merekam keberadaan satwaliar.

Studi ini didesain untuk membandingkan keberadaan spesies di grid – grid dengan dan tanpa keberadaan desa untuk mengetahui apakah keberadaan desa memiliki pengaruh terhadap persebaran satwaliar. Enam belas grid sel tersurvei, tujuh dimana tanpa desa dan sembilan berdesa. Keseluruhan, tiga belas spesies satwaliar (termasuk kerbau) dalam empat genus mamalia dan aves terekam, ditambah dua spesies burung besar. Kecuali babi hutan *Sus scrofa*, beruang madu *Helarctos malayanus* dan kerbau, seluruh spesies memiliki skor kehadiran rendah (≤ 5 grid sel) pada grid sel tersurvei. Dengan data yang minim, menghambat analisis data. Kerbau dan babi hutan terekam pada seluruh sel baik berdesa maupun tanpa desa. Beruang madu dengan status *Vulnerable* (VU) berdasarkan IUCN, adalah spesies yang dapat terlihat jelas kehadirannya lebih tinggi di grid sel tanpa desa, kemungkinan menghindari keberadaan manusia. Jumlah dari gambar independen terekam kamera penjebak dengan jumlah ≥ 5 gambar independen untuk manusia (n=23), kancil *Trangulus* sp. (n=7), babi hutan (n=6), monyet beruk *Macaca nemestrina* (n=11) dan landak *Hystrix brachyura* (n=9). Monyet beruk, terdaftar sebagai *Vulnerable* (VU) di IUCN terekam kamera penjebak lebih sering di grid sel berdesa (n=8) daripada tanpa desa (n=3). Owa ungko *Hylobates agilis* terdaftar *Endangered* (EN) atau terancam oleh IUCN dan siamang *Symphalangus syndactylus* juga hadir selama survai, namun sangat jarang terekam. Kehadiran dari spesies – spesies memberikan kesan bahwa keberadaan desa – desa secara relatif bertoleransi tinggi terhadap mereka dan juga terhadap spesies lain seperti babi hutan dan beruang madu. Empat satwa dikenal sebagai mangsa harimau terekam selama ekspedisi ini yaitu kijang *Muntiacus muntjak*, rusa sambar *Rusa unicolor*, monyet beruk, dan babi hutan. Landak dan dua spesies burung besar, burungpuyuh sengayan *Rollulus rouloul* dan burung kua *Argusianus argus* mungkin secara terkadang termangsa oleh harimau dan semua spesies yang terekam dengan nilai rendah. Kehadiran dari spesies – spesies tersebut, termasuk satwa mangsa harimau, diperkirakan memberikan dampak baik pada kehadiran harimau meskipun beberapa diantara mereka tidak terekam selama ekspedisi ini.

Selain itu, dari jumlah masyarakat lolal terwawancara (n=16) memiliki laporan pernah melihat harimau (25%) dan jejak harimau (38%) seumur hidup mereka. Umumnya masyarakat mengalami ketakutan (72%) or sedikit takut (14%) dan sebagai hasil, mayoritas (69%) memiliki pendapat negatif terhadap keberadaan harimau. Akantetapi, umumnya, masyarakat lokal terwawancara mengetahui pentingnya keberadaan harimau untuk negara (61%) dan untuk kunjungan wisata (81%), dan seharusnya harimau dilindungi (>80%). Selama survai, jerat mangsa harimau ditemukan di 14% dari 16 grid tersurvei dan suara tembakan kemungkinan perburuan didengar. Empat sekolah (tiga sekolah tingkat dasar dan satu sekolah tingkat menengah pertama) dikunjungi dengan melibatkan 158 murid keseluruhan dalam presentasi – presentasi dan pengajaran tentang harimau dan konservasi secara umum.

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1. Expedition review

M. Hammer (editor)
Biosphere Expeditions

1.1. Background

Biosphere Expeditions runs wildlife conservation research expeditions to all corners of the Earth. Our projects are not tours, photographic safaris or excursions, but genuine research expeditions placing ordinary people with no research experience alongside scientists who are at the forefront of conservation work. Our expeditions are open to all and there are no special skills (biological or otherwise) required to join. Our expedition team members are people from all walks of life, of all ages, looking for an adventure with a conscience and a sense of purpose. More information about Biosphere Expeditions and its research expeditions can be found at www.biosphere-expeditions.org.

This project report deals with an expedition to the Bukiy Rimbang Bukit Baling Wildlife Reserve that ran from 17 July to 12 August 2016 with the aim of conducting a much-needed survey of critically endangered Sumatran tigers in one of the last remaining forest refuges left on one of Indonesia's largest islands. Tiger prey animals such as various species of deer, pig, bird and primate were recorded and general forest biodiversity studied. Working together with WWF Indonesia and the local community, the expedition also worked on mitigating the critical threat of poaching through education, capacity-building and incentive creation for local people. Data collected by this expedition will be crucial in identifying pockets of tiger habitat and viable strategies for tiger conservation and recovery, all of which are vital if the species is to survive.

As its name implies, the Sumatran tiger (*Panthera tigris sumatrae*) is endemic to Sumatra, one of the largest islands in the Indonesian archipelago. It is the smallest of all of the tiger subspecies and is distinguished by heavy black stripes on its orange coat. Listed in IUCN's Critically Endangered category, there are probably fewer than 400 individuals left in the wild. As a top predator, the tiger needs large joined-up forest blocks to thrive, and used to roam across the whole island. It now occurs in isolated populations, its habitats having been drastically reduced by clearing for agriculture, plantations and settlements. This habitat destruction also forces the tiger into settled areas in search of food, where it is more likely to come into contact – and conflict – with people. Next to habitat destruction, poaching is another very potent threat. Studies have estimated that up to 78% of Sumatran tiger deaths, consisting of about 40 animals per year, are as a result of poaching, either as retaliatory killings or to feed the demand for tiger parts. Despite increased efforts in tiger conservation – including law enforcement and anti-poaching capacity – a substantial market remains in Sumatra and the rest of Asia for tiger parts and products.

Today many wild Sumatran tigers are found in [Kerinci Seblat National Park](#), Sumatra's largest national park (791 km²), situated in central Sumatra, which has been identified as a 'Global Priority Tiger Conservation Landscape' because it harbours a globally important tiger population and includes other important facets of Asian biodiversity, including four other cat species (e.g. clouded leopard and golden cat). Bukit Rimbang Bukit Baling Wildlife Reserve, the expedition study site, forms one of the core tiger refuges inside this area that plays a vital role in maintaining connectivity among other key tiger landscapes in

central Sumatra. Although the outlook for tigers may often sound bleak, there are success stories too. In well-managed areas with effective tiger patrols and where local communities benefit from tiger presence, there are clear signs of recovery. It is therefore of critical importance that tiger populations are monitored regularly to effectively safeguard the populations that still exist and that local communities play a key role in, and benefit from, tiger conservation. WWF Indonesia has been at the forefront of these efforts since the end of the last millennium and has asked Biosphere Expeditions for assistance with tiger monitoring as well as to act as a showcase for how responsible, low-impact tiger tourism activities can generate local jobs and build capacity.

1.2. Study site

Indonesia is an archipelago comprising approximately 17,000 islands, only 8,000 of which are inhabited. It encompasses 34 provinces with over 238 million people, making it the world's fourth most populous country. Sumatra is one of the biggest islands of the archipelago. Indonesia's size, tropical climate and archipelagic geography support the world's second highest level of biodiversity (after Brazil) and Indonesia is second only to Australia in terms of total endemic terrestrial species.



Figure 1.2a. Indonesia, Sumatra, the expedition study site and assembly point. An overview of Biosphere Expeditions' expedition sites, assembly points, base camp and office locations can be found at [Google Maps](#).

Bukit Rimbang Bukit Baling Wildlife Reserve, the expedition's study site, was established in 1984 and currently measures 1,360 km², comprising highland and mountain tropical rainforest ecosystems. There are various slopes between 25% and 100% and the highest elevation is 1,070 m. The reserve is a biodiversity hotspot and a known Sumatran tiger breeding area. As such it has been classified by WWF and others as an all-important global priority tiger conservation area.

1.3. Dates

The project ran from 17 - 29 July | 31 July - 12 August 2016, divided into two-week slots, each composed of a team of international scientific activity assistants, scientists and an expedition leader.

Team members could join for multiple slots (within the periods specified). Dates are chosen to be in the dry season for ease of working.

1.4. Local conditions & support

The study was a collaboration between the organisations Biosphere Expeditions, WWF Indonesia and Batu Dinding Community Group.

Expedition base

The expedition was based at WWF Indonesia's Subayang Field Station, a large wooden house on the banks of the Subayang River in a remote part of the forest about 30 minutes by boat from the end of the road and nearest village. The field station has a single large 20 x 20 m common room, a kitchen, toilets and showers. Electricity at 110/220 V was provided by a generator. Expedition participants slept either in the large common room, dome tents or hammocks, all dotted around the site. All meals were prepared by the expedition cook.

Weather

The weather during the expedition was generally warm and humid as the expedition period fell between the rainy season and dry season. Temperatures ranged from a low of 22°C to a high of 35°C with high humidity. River water levels were medium to start with, but low towards the end of the expedition, causing some problems with the ability to move around the study site in boats.

Field communications

There was no mobile or radio coverage at base or around the study site. The expedition leader had a satellite phone, as did WWF staff, and all survey groups carried an Emergency Position Indicating Radiobeacon (EPIRB) into the field on their surveys. The expedition leader posted a [diary with multimedia content on Wordpress](#) and excerpts of this were mirrored on Biosphere Expeditions' social media sites such as [Facebook](#) and [Google+](#).

Transport & vehicles

Team members made their own way to the Pekanbaru assembly point in time. From there onwards and back to the assembly point all transport, vehicles and boats were provided for the expedition team, for expedition support and emergency evacuations.

Medical support and incidents

The expedition leader was a trained first aider and the expedition carried a comprehensive medical kit. Further medical support was provided by a small hospital in Gema village (about 4 km from the expedition base) and EKA hospital in Pekanbaru town (about 100 km from the expedition base). Safety and emergency procedures were in place and had to be invoked for one medical incident involving a slip and dislocated finger, which required a transfer to EKA hospital Pekanbaru. Another incident involved a boat accident, when the expedition leader dealt with minor resulting injuries. There was also a swimming incident where the expedition leader and participants worked together to rescue a recreational river swimmer with a cramp. Other minor incidents included mild heat exhaustion and stomach upset, as well as minor skin infections. These were all dealt with on site using the medical kit. All members were required to carry adequate insurance.

1.5. Local scientist

Febri A. Widodo is WWF's tiger research programme coordinator. His BSc, majoring in nature forest conservation, is from Gadjah Mada University in his native Indonesia. As WWF Indonesia's tiger research coordinator, he organises tiger research mainly by capture-mark-recapture methods in various landscapes throughout Sumatra. He is a member of the HarimauKita Sumatran tiger conservation group and has experience in jungle survival, search and rescue and ecotourism.

1.6. Expedition leader

Ida Vincent grew up in Sweden and lived in Australia for ten years before moving to Seattle in the USA. Ida studied Marine Biology at the University of Queensland and Environmental Science at Murdoch University (both in Australia), finishing with BSc and Masters degrees respectively. Ida has worked as a marine scientist and aquatic ecologist in Madagascar, Papua New Guinea, the Philippines, Australia and the Pacific Northwest in the USA. She is also a qualified PADI divemaster, Reef Check trainer, as well as a climbing leader and instructor with the North Cascade Mountains as her backyard. Ida also enjoys photography, painting and writing. She has published both scientific and magazine articles, as well as a novel.

1.7. Expedition team

The expedition team was recruited by Biosphere Expeditions and consisted of a mixture of all ages, nationalities and backgrounds. They were (in alphabetical order and with country of residence):

17 – 29 July 2016: Giovani Gabreli (Indonesia)*, Joerg, Jasper & Judith Gerigk (Germany), Stephen Harris (UK), John Matthews (UK), Imam Muhadi (Indonesia)*. Also present: Lukas & Matthias Hammer (Germany), Biosphere Expeditions.

31 July – 12 August 2016: Hendrik Clasmeier (Germany), Bob Curry (USA), Flora Haentzler (France), Horry Kerrison (USA), Peter Laufmann (Germany), Brodie Mackie (Ireland), Katherine Moss (UK), Ulva Nofriza (Indonesia)*, Mohamad Ridwan Syah (Indonesia)*, Penny & John Smith (Australia).

*Placement kindly supported by the [Friends of Biosphere Expeditions](#) and a GlobalGiving crowdfunding campaign. The [Biosphere Expeditions placement programme](#) seeks to identify, train and encourage the next generation of local conservationists.

1.8. Expedition budget

Each team member paid towards expedition costs a contribution of £1,980 per person per two-week slot. The contribution covered accommodation and meals, supervision and induction, special tiger habitat monitoring equipment and all transport from and to the team assembly point. It did not cover excess luggage charges, travel insurance, personal expenses such as telephone bills, souvenirs etc., or visa and other travel expenses to and from the assembly point (e.g. international flights). Details on how this contribution was spent are given below.

Income	£
Expedition contributions	33,860
 Expenditure	
Expedition base includes all board & lodging, and extra food & meals	4,419
Transport includes team transfers, boat rides, fuel	1,574
Equipment and hardware includes study materials & gear etc. purchased in Indonesia & elsewhere	1,758
Staff includes local community & Biosphere Expeditions staff salaries, travel expenses	8,380
Administration includes miscellaneous fees, permits & sundries	774
Team recruitment Sumatra as estimated % of annual PR costs for Biosphere Expeditions	6,430
 Income – Expenditure	 10,525
 Total percentage spent directly on project	 69%

1.9. Acknowledgements

We are grateful to the volunteers, who not only dedicated their spare time to helping, but also, through their expedition contributions, funded the expedition. Thank you also to Indonesian Ministry of Environment and Forestry, especially the staff of BBKSDA (Natural Resource Agency) of Riau in Pekanbaru (Mahfudz). Thanks also to the head of the BBKSDA Riau - Fifi Arfiana Jogasara, Isbanu, Eko Hery Satriyo Utomo, and to the local people in and around Rimbang Baling. We are also grateful to WWF Indonesia (Wishnu Sukmanto, Nurchalis Fadhli, Gianini Souvenile, Elmadia Achmad, Sunarto, Heri Irawan, Rianto, Riza Sukriana, Zulfahmi, Eka Septayuda, Efendi Panjaitan, Kusdianto, Rahmad Adi, Tugio, Syamsidar, Suparman, Fendi, T. Budi Aulia, Adi Purwoko). Many thanks to Batu Dinding Community Group (Ian, Masrizal, Amrin, Sapri, Anto, Elsi Susanti and friends), science volunteer Irfan Nur Arifin, placement volunteers and to all those other people who provided assistance and information for this expedition. Biosphere Expeditions would also like to thank members of the Friends of Biosphere Expeditions and donors for their sponsorship. Finally, thank you to Batu Dinding Community Group, Tanjung Belit and Aur Kuning villagers for being such excellent hosts and making us feel at home in the field as well as at WWF's Subayang Field Station.

1.10. Further information & enquiries

More background information on Biosphere Expeditions in general and on this expedition in particular including pictures, diary excerpts and a copy of this report can be found on the Biosphere Expeditions website www.biosphere-expeditions.org.

Enquires should be addressed to Biosphere Expeditions at the address given on the website.

2. Tiger habitat along human boundaries: A second report of the Sumatran tiger habitat monitoring in the Bukit Rimbang Bukit Baling Landscape, Riau, Sumatra

Febri Anggriawan Widodo
WWF Indonesia

Marcelo Mazzolli (editor)
Projeto Puma

Matthias Hammer (editor)
Biosphere Expeditions

2.1. Introduction

The conservation success of the critically endangered Sumatran tiger can be enhanced through monitoring, which needs to be implemented in important habitats such as in the twelve Tiger Conservation Landscapes (TCL), mapped in 2006 to support global tiger recovery (Dinerstein et al. 2006, Linkie et al. 2008, Global Tiger Initiative 2010). Bukit Rimbang Bukit Baling Landscape, which includes Bukit Rimbang Bukit Baling Wildlife Reserve (BRBBWR), is part of a TCL categorised as a long-term priority tiger landscape. It requires a sustained long-term effort to restore habitat and to minimise moderate levels of threat with effective conservation measures in place (Dinerstein et al. 2006, WWF - Tigers Alive Initiative 2012). The population of tigers is decreasing due to human pressure and disturbance: converting habitat to small (mainly rubber) plantations, poaching for domestic and international markets of tigers, and competition for prey species (Linkie et al. 2003, Kinnaird et al. 2003, Indonesian Ministry of Forestry 2007, Widodo et al. 2016). Rimbang Baling landscape as one of the most important tiger habitats and also as a Tx2¹ site should be monitored and protected.

WWF Indonesia and its conservation networks have been conducting conservation activities focused on tigers and their habitat since 2004, including recording ecological information about tigers, other predators and prey species. Tiger density estimates of 0.86 individuals/100km² (SE 0.50) have been reported, with occupancy rates of more than 90% across the landscape (Sunarto et al. 2013 & 2015). More tiger density and prey abundance baseline papers to assist effective reserve management efforts have been submitted (e.g. Widodo et al. 2016).

The WWF and Biosphere Expeditions citizen science collaboration concentrates on tiger and habitat studies, including monitoring of prey species, as well as other threatened species of interest, such as four other cat species, Malayan tapir, sun bear, etc. A second focus is on people perception and community engagement in the conservation of several species and their habitat in BRBBWR, something that could not be implemented solely by WWF. In doing so, the specific objectives of this activity were (1) to conduct long-term tiger and habitat monitoring in high human disturbance locations along the Subayang river BRBBWR, and (2) to involve and engage local communities to raise their awareness of, and support for, tiger and habitat conservation in their daily activities.

¹ [Tiger times two](#), a WWF initiative to double the number of tigers by 2022 (WWF - Tigers Alive Initiative 2012).

Study area

This expedition's study site was Bukit Rimbang Bukit Baling Landscape (BRBBWR and surrounding areas) (Figs. 2.1a & b). The reserve was established in 1984 and initially measured 136,000 hectares. In 2014 the Indonesia Ministry of Environment and Forestry (MoEF), based on Forestry Minister Decree No. SK.3977/Menhut-VII/KUH/2014 increased the size to 141,226 hectares. In 2016, to improve management of the area, the Ministry of Environment and Forestry declared BRBBWR as a Conservation Forest Management Unit (CFMU, based on Environment and Forestry Minister Decision Letter No. SK.468/Menlhk/Setjen/PLA.0/6/2016), which allows this area to be managed within a specific management unit and as an organisation that has authority and their own budget support from the Ministry of Environment and Forestry. It is managed by by BBKSDA Riau (Nature Resource Conservation Agency of Riau).



Figure 2.1a. View of the study site showing evidence of illegal logging (logs on the river).

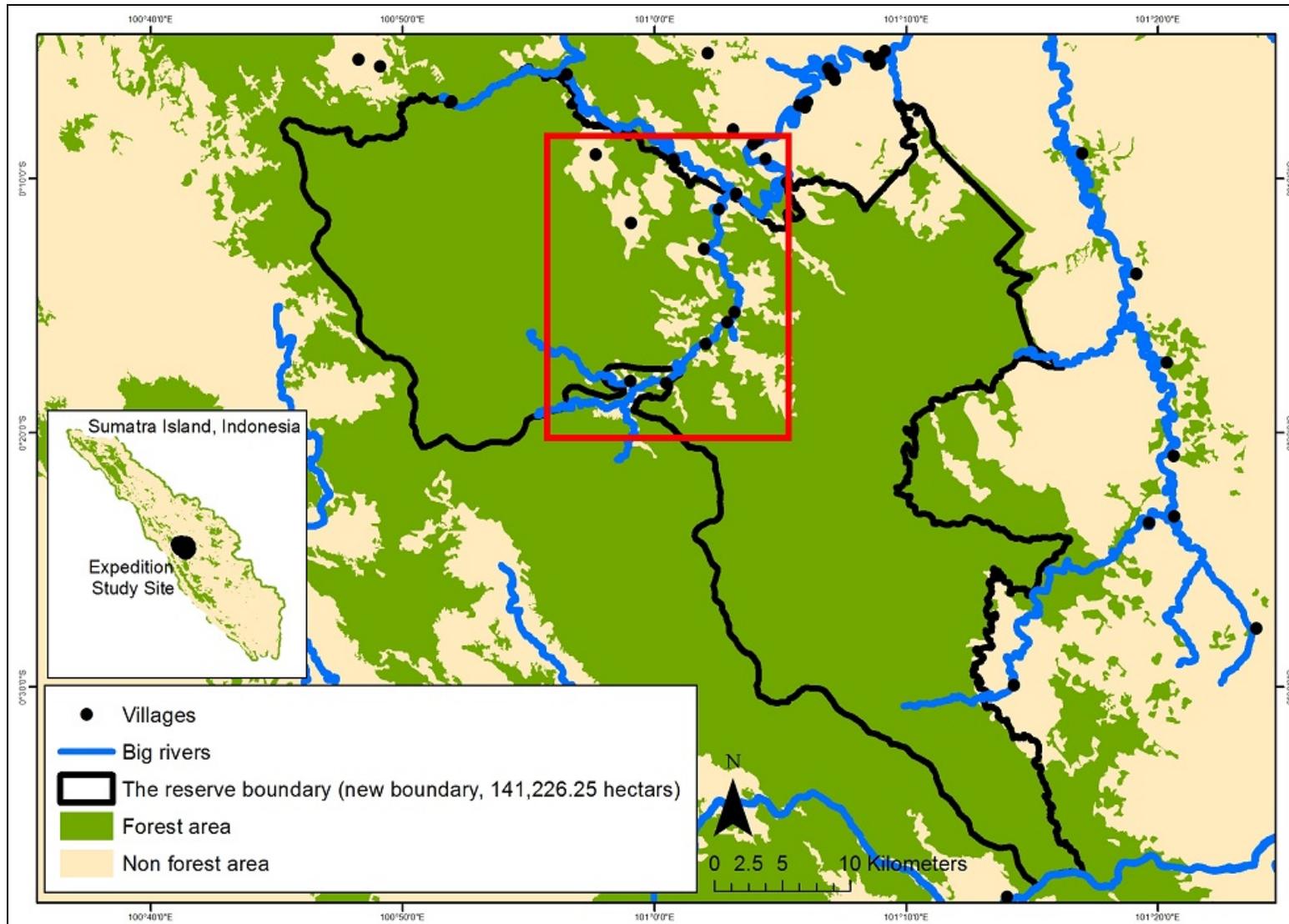


Figure 2.1b. Bukit Rimbang Bukit Baling Wildlife Reserve and surrounding area. The red polygon shows the area surveyed by the expedition.

The reserve is dominated by hills with slopes mainly ranging from 25% to 100% and the highest elevation measuring 1070 m. It is surrounded by acacia, rubber and palm oil plantations, coal mining, and community lands. BRBBWR is also a water catchment area for lower areas in central Sumatra.

There are 12 villages inside the reserve, inhabited by about 3,000 people, whose livelihoods are mostly dominated by rubber plantations and other natural resource extractions, such as non-wood forest products.

2.2. Materials and methods

This study was a follow-up of the previous study in 2015 (Widodo et al. 2016) with tigers as the focal species, but also recording prey species and species that can contribute additional information on habitat quality or human disturbance.

Surveys and site selection

Surveys were conducted on foot or by boat, covering Bukit Rimbang Bukit Baling along the Subayang River (Figs. 2.1b and 2. 2a). Species (mammals and large birds) were recorded for presence-absence in a grid of 2x2 km cells covering a total area of 68 km². Camera traps were also deployed to capture photos and videos of animals that could not otherwise be captured by direct observation. Cells were defined as containing or not containing villages, to investigate whether the presence or absence of villages had any effect on the presence of species.

Camera trapping

Camera traps were a primary tool of this study, but in Bukit Rimbang Bukit Baling with high human disturbance along the main river, hilly and rugged terrain environment and other difficult slope conditions, placing camera traps is not easy. Seventeen single station camera traps were deployed randomly in 16 cells, in seven non-village cells and in nine village cells along the Subayang River (Fig. 2.2a). Biosphere Expeditions provided 18 Bushnell camera traps (model Trophy Cam HD) and WWF provided 10 Bushnell camera traps (model Nature View HD) and five Reconyx (model PC800). Not all camera traps were deployed due to time/labour limitations and one cell (X131) contained two stations.

GIS and mapping

Topographic survey maps of WWF Indonesia (datum WGS 84), showing WWF Indonesia's standard tiger monitoring grid cells of 2x2 km, were used for planning and analysis of the study. The entire Bukit Rimbang Bukit Baling landscape (see Fig. 2.1b) is covered by 416 such 2x2 km cells. The expedition focused on 16 cells along the Subayang river, with a roughly balanced amount of village (n=7) and non-village cells (n=9). Forest cover maps 2011 and 2012, available from WWF Indonesia (Setiabudi 2015, published at <http://maps.eyesontheforest.or.id>), were also used.

The program [TrackMaker](#)® (Geo Studio Tech, MG) was used to upload grid cells with their respective codes to GPS units (eight Garmin® eTrex 20 and one Garmin 78s) to help with navigation and data collection, and also to download GPS features collected in the field. Arc-GIS (ESRI) was used to prepare survey maps and to analyse as well as to produce the final mapping results.

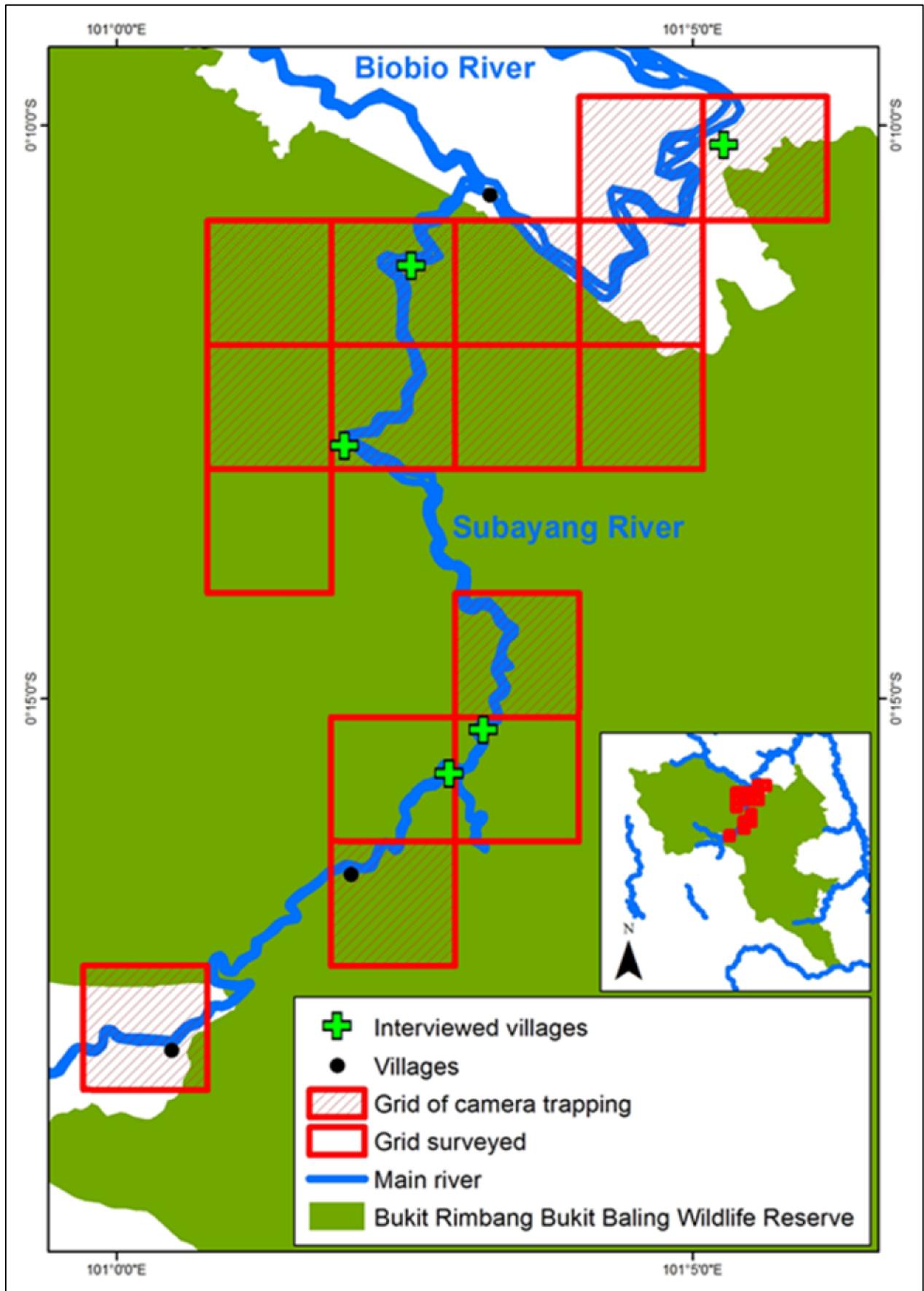


Figure 2.2a. Study cells of the expedition with seven village and nine non-village cells.

Data analysis

Animal sightings, signs and calls combined with camera trapping data were used to describe species distribution (cell presence-absence) following the Biosphere Expeditions methodology described in Mazzolli and Hammer (2013). Data and images from camera traps were stored in an unnamed [database software](#) described in Sanderson and Harris (2013).

A relative abundance index (RAI) was used to describe trap success rate of animals from camera traps. This was calculated as the number of independent records for each species multiplied by 100 and divided by the total number of camera trap nights. We followed the definition of independent pictures as (1) consecutive photographs of different individuals of the same or different species, (2) consecutive photographs of individuals of the same species taken more than 0.5 hours apart, (3) nonconsecutive photos of individuals of the same species (O'Brien et al. 2003). Following Sunarto et al. 2013, camera-trapping effort was calculated as the number of nights of sampling multiplied by the number of camera stations, minus any days when both cameras at a station malfunctioned. We also used RAI of people to describe the level of human activity in grid cells of camera trapping. We compared village and non-village grid cells records to understand the human impact on surveyed species.

Training of participants

The first 1.5 days of each expedition group were spent training participants. Lectures were given to introduce the tiger and habitat, conservation activities and issues, as well as problems and challenges in Bukit Rimbang Bukit Baling landscape. Participants were also briefed about safety aspects such as rescue, using personal locator beacon (PLB), etc.

In practical sessions (see Fig. 2.2b), participants were shown how to use standardised maps and a compass, recognise animals by their tracks, calls (mainly for primates) and other signs, deploy and install camera traps and transfer information to standardised datasheets with accurate coordinates taken from GPS units.

For track identification, van Strien's (1983) guide with tracks in natural size was used. Sun bear *Helarctos malayanus* can confidently be identified by its claw marks on trees (Steinmetz and Garshelis 2008 & 2010), particularly when other bears do not overlap in range, as is the case in Sumatra. Regarding the different species of deer, hooves of the mouse deer *Tragulus* sp. (two species) are half the size of those of barking deer *Muntiacus muntjac*, which in turn are a little over half the size of those of sambar *Rusa unicolor* (see van Strien 1983). This makes it relatively easy to distinguish species by their tracks. Also, according to one of the authors (F.A.W.), some animals can be detected by their burrows (common porcupine *Hystrix brachyura*) and by wallows and diggings such as the wild boar *Sus scrofa* and water buffalo *Bubalus bubalis*.



Figure 2.2b. Practical training session in the field.

Outreach and interviews

School visits with delivery of materials including videos of animals and flyers with conservation content were undertaken at four schools (elementary and junior-high school) to raise youth awareness towards wildlife, especially tigers, and habitat conservation in Bukit Rimbang Bukit Baling Landscape.

For people behaviour and perception toward tigers, participants were trained on how to collect social information using standardised interview datasheets with the help of native speakers such as the expedition scientist and placement volunteers. Interview datasheets were designed to collect information related to tigers, habitat and threats. Threat observation mainly focused on tiger poaching (snare and gunshots), as well as prey species poaching and the logging of forest trees along the main river.

Semi-structured interview surveys were carried out in villages and plantations along the Subayang river within the survey area. These were designed to understand how villagers perceive and react to the presence of tigers and other wildlife, to know the extent of human-tiger interaction, and to gather information on recent tiger sightings or signs to improve the expedition's ability to record them and for other conservation purposes.

2.3. Results

Sixteen cells and five villages were surveyed (Fig 2.2a). Seventeen camera trap stations with a single camera trap in each station were deployed in seven non-villages cells (87 trap nights) and in nine village cells (116 trap nights). The total area covered was 68 km² (defined by total grid cells size) on foot or by boat and 69 km² for effective trapping area (ETA), defined by a minimum-convex polygon of camera trap stations. During 203 camera trap nights of total trapping effort, 3707 images were captured, yielding 124 independent images of wildlife, including fourteen mammal species (including cattle, goat and water buffalo) from two mammal genera, plus two large bird species (Table 2.3.).

Five villages inside the reserve and its boundaries were surveyed, with 16 villagers interviewed (13 males, 3 females), resulting in the expression of different view towards tigers and their conservation, especially in Bukit Rimbang Bukit Baling Wildlife Reserve and surrounding areas. Four school visits were conducted. Some threats were recorded during the study such as illegal logging, snares, etc.

Species occurrence

Of the 16 grid cells surveyed, the wild boar *Sus scrofa* had the largest distribution of all species sampled, recorded in all grid cells. Water buffalo *Bubalus bubalis*, a livestock species, was recorded mostly by the main river where it was found in half of all cells surveyed, detected by direct sightings and by tracks (Table 2.3a).

Four primate species were recorded. They were the agile gibbon *Hylobates agilis*, long-tailed macaque *Macaca fascicularis*, pig-tailed macaque *Macaca nemestrina* and siamang *Symphalangus syndactylus*. All were recorded in six cells or fewer. Pig-tailed macaque had the highest score (six cells) and was the only species recorded by camera trap.

Two large birds were found in two or fewer cells, including the great argus pheasant *Argusianus argus*, which is considered as tiger prey species (O'Brien et al. 2004)..

The Malayan sun bear *Helarctos malayanus* was the only wild carnivore recorded, exclusively by claw marks (n=19) in 12 cells. Common porcupine *Hystrix brachyura* was captured by camera traps with RAI 6.9 in village cells and RAI 18.9 in non-village cells, and only one burrow was recorded on a foot survey.

Village and non-village cell scores of species presence

Except for the wild boar, sun bear and water buffalo, all other species had very low scores (≤ 5) for presence in cells, which hampered any further analysis. High scores above camera stations/presence in cells occurred for wild boar, mouse deer, pig-tailed macaque and common porcupine. Total species RAI in villages cells (62) was higher than total species RAI in non-village cells (54). People RAI in village cells (24) was lower than people RAI in non-village cells (43).

By camera trapping cells, both wild boar and sun bear had higher presence scores in non-village cells, although only the sun bear values differed by a substantial margin. The RAI for wild boar was controversially higher in village cells, but the sample size was less than half of that for presence in cells (n=6) and thus inconclusive. Water buffalo were recorded equally in village and non-village cells.

Table 2.3a. Mammal and human disturbance data recorded along the Subayang river in Bukit Rimbang Bukit Baling.

Taxon	Global status ¹	Regional status ²	Cell presence								RAI ⁵	
			Cam. traps	Sighting	Track	Scat	Other ³	Total ⁴	Village	Non-village	Village (n)	Non-village (n)
Human disturbance												
People ⁶	-	-	6	-	-	-	-	6	3	3	24.1 (7)	43.2 (16)
Cattle	-	-	0	2	0	0	0	1	1	0	0	0
Domestic dog	-	-	0	2	0	0	0	1	1	0	0	0
Goat	-	-	0	2	1	1	0	3	2	1	0	0
Total	-	-	6	6	1	1	0	21	7	4	(7)	(16)
Artiodactyla												
Mouse deer <i>Tragulus</i> sp.	LC	P	4	0	0	0	0	4	2	2	6.9 (2)	13.5 (5)
Barking deer <i>Muntiacus</i> sp.	LC	P	1	0	0	0	0	1	1	0	3.4 (1)	0
Sambar deer <i>Rusa unicolor</i>	VU	P	0	0	1	0	0	1	1	0	0	0
Water buffalo <i>Bubalus bubalis</i>	-	-	0	6	4	0	1	8	4	4	0	0
Wild boar <i>Sus scrofa</i>	LC	NP	5	1	13	0	14	16	7	9	13.8 (4)	5.4 (2)
Aves												
Crested patridge <i>Rollulus rouloul</i>	NT	P	1	0	0	0	0	1	0	1	0	5.4 (2)
Great argus pheasant <i>Argusianus argus</i>	NT	P	2	0	0	0	0	2	1	1	3.4 (1)	2.7 (1)
Carnivora												
Malayan sun bear <i>Helarctos malayanus</i>	VU	P	0	0	0	0	12	12	4	8	0	0
Primata												
Agile gibbon <i>Hylobates agilis</i>	EN	P	0	0	0	0	5	5	2	3	0	0
Long-tailed macaque <i>Macaca fascicularis</i>	LC	NP	0	3	0	1	3	5	2	3	0	0
Pig-tailed macaque <i>Macaca nemestrina</i>	VU	NP	4	0	0	0	0	4	1	3	27.6 (8)	8.1 (3)
Siamang <i>Symphalangus syndactylus</i>	EN	NP	0	0	0	0	3	3	2	1	0	0
Rodentia												
Common porcupine <i>Hystrix brachyura</i>	LC	P	3	0	0	0	1	3	2	1	6.9 (2)	18.9 (7)
Total			20	10	18	1	39	65	29	36	49 (18)	46 (20)

¹ IUCN Red List, ² Indonesian Law (PP No. 7/1999) P = protected, NP = not protected, ³ Scats, burrows (porcupine), diggings (buffalo and wild boar), claw marks (bear), calls (primates), ⁴ number of cells recorded, ⁵ RAI (Relative Abundance Index) as trap success rate of animals of camera trapping and number of pictures, number of independent photos x 100 / total number of camera trap nights; figure in brackets are number of independent pictures, ⁶ by camera trap only.

RAI was considerably higher in non-village cells for mouse deer and porcupine (keeping in mind that the values are still considered low in general) and lower for pig-tailed macaque, suggesting some type of adaptation to human presence and areas such as rubber plantations by this primate.

Regarding human presence, evidence of people’s presence was found in all cells, including rubber tapping and garbage, but only camera trap records were accounted for in order to capture only the most recent activity. This resulted in only 6 cells with presence of people, equally divided in village and non-village cells, but with a controversially higher frequency (RAI) in non-village cells.

Species activity patterns

Species activity patterns were derived from camera trap data. Barking deer was found to be mostly diurnal, as was pig-tailed macaque. Wild boar was both diurnal and nocturnal. People were recorded exclusively during the day (Fig. 2.3b).

Community perception

Interviews (n=16) were conducted in five villages (from north to south: Tanjung Belit, Batusanggan, Tanjung Beringin, Gajah Betalut, Aur Kuning) of eight villages along the Subayang river (Fig 2.2a), primarily to collect information about tigers (conflict with humans, poaching and other threats) and local people’s perception about tiger protection and conservation, as well as benefits derived from tiger presence. The five ‘interview villages’ were chosen out of the eight villages available, because of time limitation.

When asked about tiger encounters, respondents replied as follows (see Fig. 2.3a).

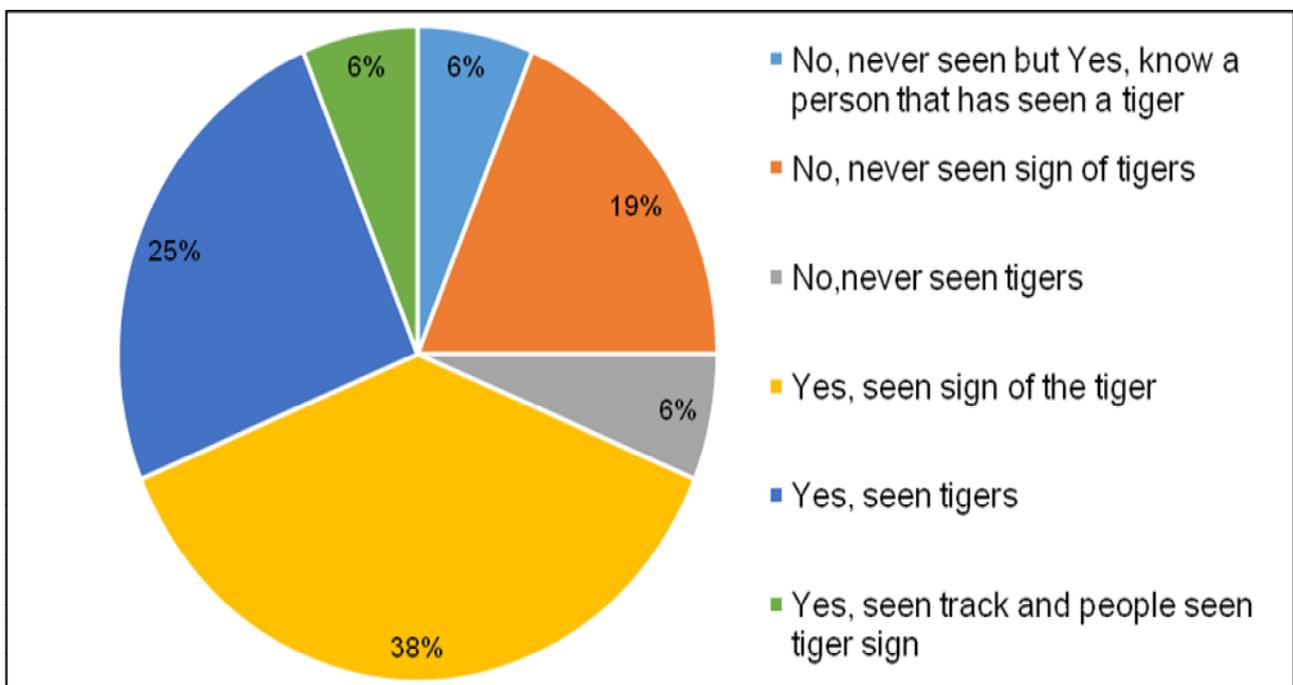


Figure 2.3a. Summary of tiger encounters.

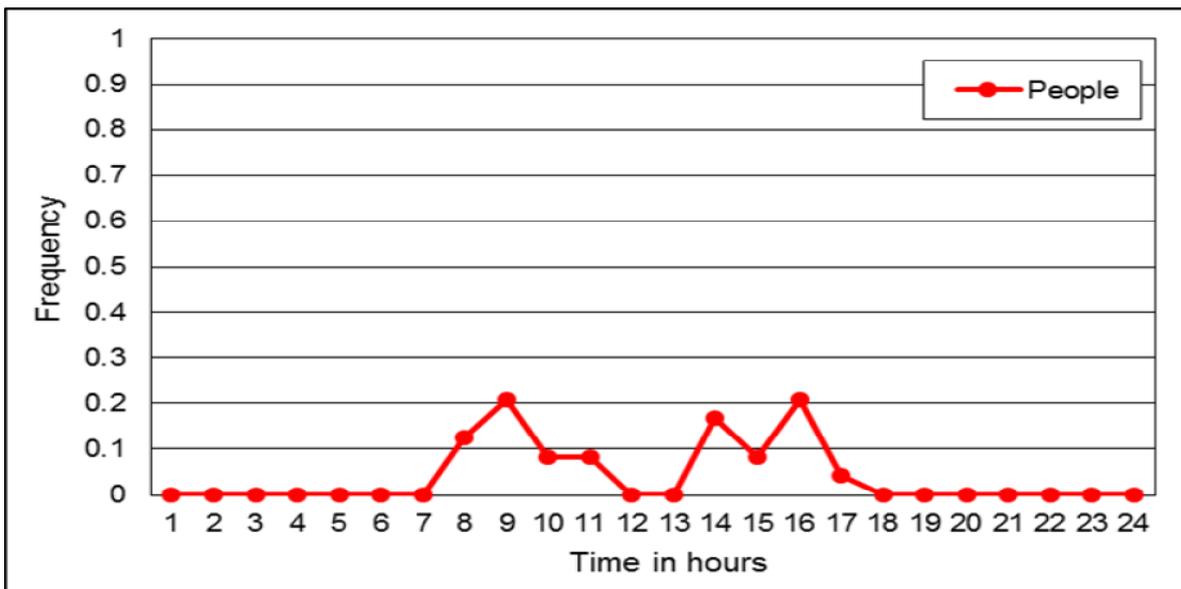
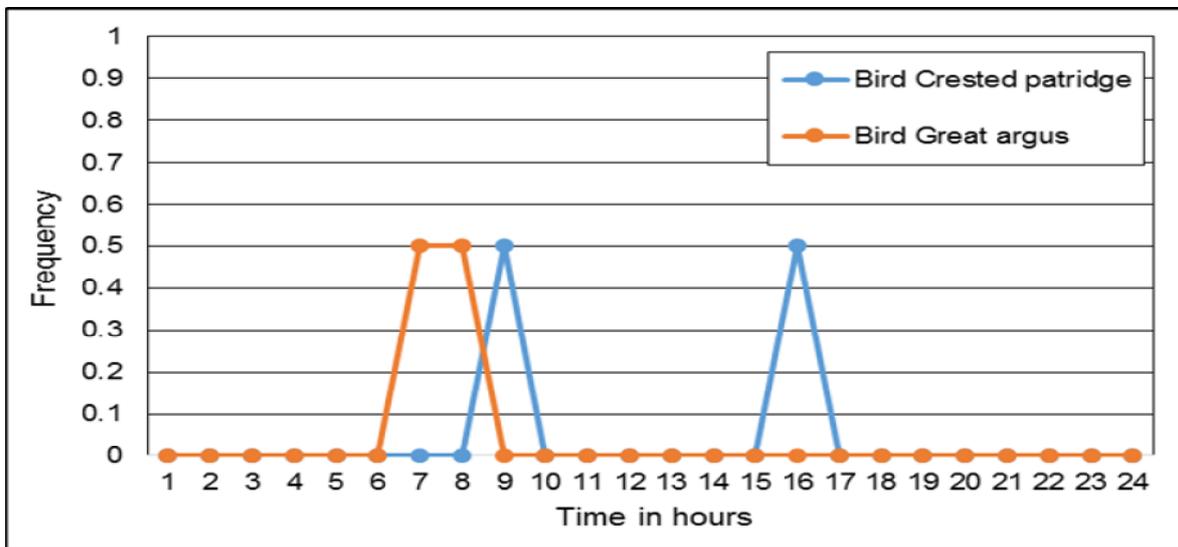
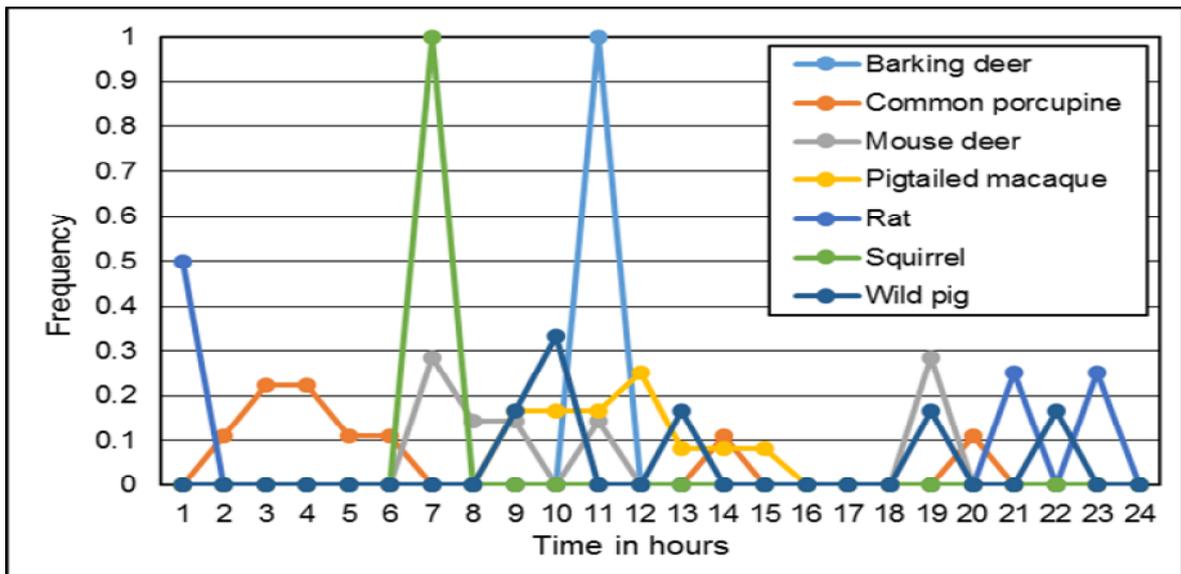


Figure 2.3b. Species activity patterns based on camera trap results.

When respondents were asked how they felt about the tiger, they mostly reported feeling scared (72%, Fig. 2.3d). When asked about the tiger's impact on the area, most people felt neutral, with 19% responding that the tiger was beneficial to the area (Fig. 2.3c). From these results, it is clear that more awareness-raising is needed to improve the tiger's image.

However, 61% of respondents thought the tiger was good for the country, but only 33% liked the tiger itself, with almost half being neutral (Fig. 2.3d).

When asked about legal protection, 81% knew that the tiger was a legally protected species and 88% agreed that it should be (Fig. 2.3d).

53% of respondents said that tigers attack domestic animals, but that this happened a long time ago, when tigers were thought to prey on goat, buffalo and cattle. Despite the fact that most respondents did not like and were scared of tigers, a large majority (81%) nevertheless thought that their presence was a good thing if tigers attracted tourism and therefore alternative means of income to the area (Fig. 2.3d).

Threats

Bukit Rimbang Bukit Baling is a relatively accessible place, especially along the Subayang River and as such it is threatened by some illegal activities that can influence tigers and other wildlife, as well as their habitat. We collected information related to poaching (tigers and prey species) and logging activities. Logging was recorded in 68% of all cells surveyed and chainsaws were frequently heard.

Snares were found in 14% of cells sampled. Snares were specifically for tiger prey species, instead of wire snares that can also potentially trap tigers. During the survey, some participants heard gunshots indicating that there was hunting activity in the area.

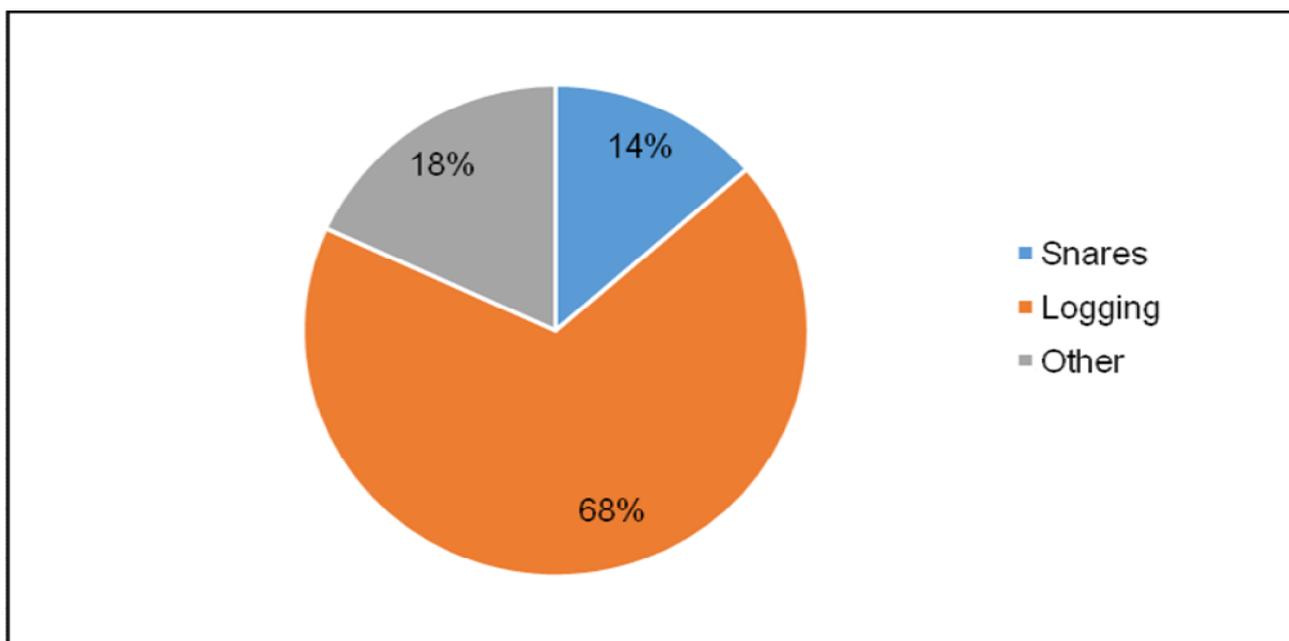
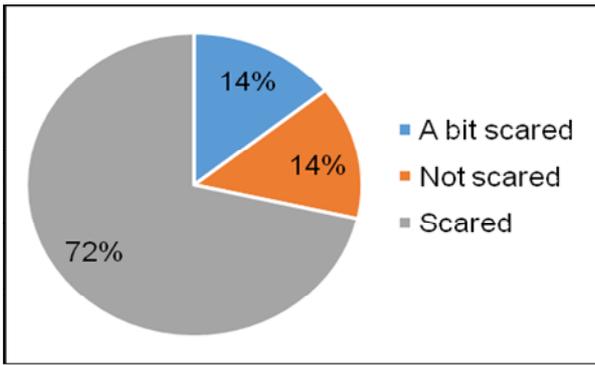
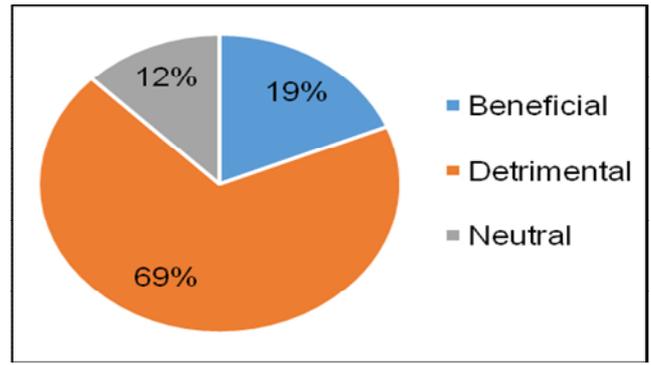


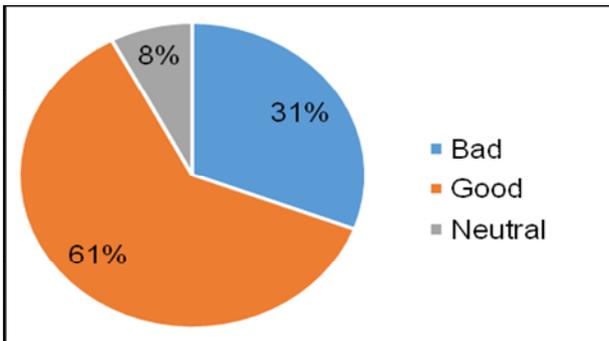
Figure 2.3c. Threat type in cells surveyed.



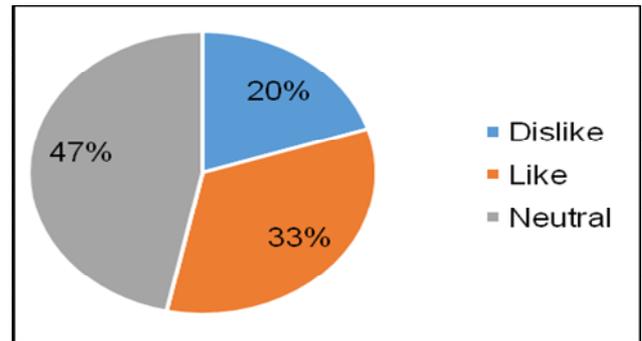
"How do you feel about tigers?"



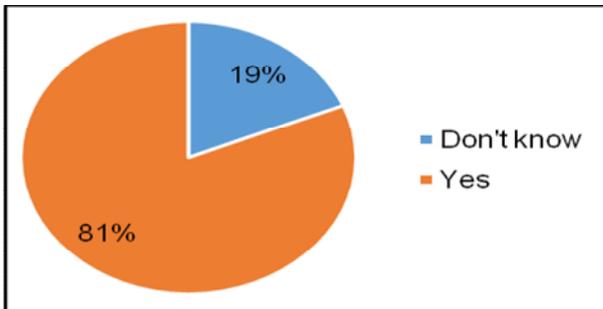
"Are tigers beneficial to the area?"



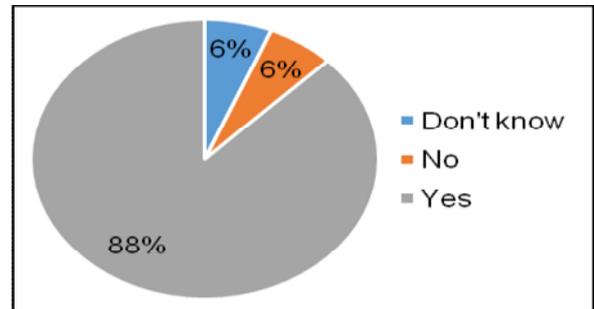
"Are tigers good for the country?"



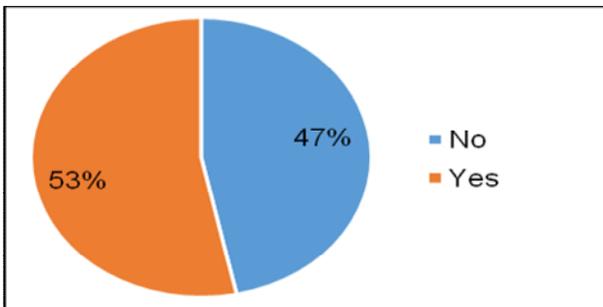
"Do you like tigers?"



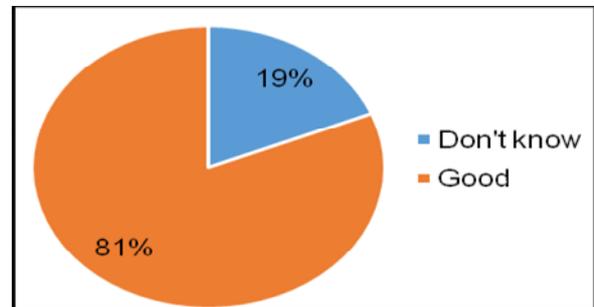
"Are tigers protected by the Indonesian government?"



"Should tigers be legally protected?"



"Do tigers prey on domestic animals?"



"Would it be good if tigers attracted tourism into the area?"

Figure 2.3d. Results of interviews.

School visits and community engagement

The expedition hosted four local people as part of the [Biosphere Expeditions placement programme](#). Placements were chosen by WWF Indonesia and Biosphere Expeditions through an application process that involved a written application, as well as an interview phase. Four local young people (see chapter 1.7. above) were chosen based on their interest or budding careers in conservation, and are required, as part of the placement programme, to act as multipliers, by talking about their experiences to the public and their peer groups. One placement volunteer, who was also hosted on the 2015 expedition, returned in 2016 and is now planning to work more with the local community on tiger awareness and other self-instigated projects.

Four schools (three elementary schools and one junior high school) were visited by the expedition, involving 158 pupils in total, and environmental education about tigers and habitat conservation were discussed with them.

Many children expressed concern about tigers, wildlife and conservation, and wished to make a positive impact. Teachers and school staff were also involved and it is hoped that conservation will be integrated into the curriculum more in the future. The expedition was invited to return to the schools each year.

Table 2.3b. Schools visited during the expedition (also see photos in Appendix III).

Name of school	Type of school	Location of school	Date of visit	Pupils engaged
SD Tanjung Belit 002	Elementary school	Tanjung Belit Village	23-Jul-16	80
SD Batusanggan	Elementary school	Batusanggan Village	28-Jul-17	45
SMP Satu Atap Batusanggan	Junior High School	Batusanggan Village	28-Jul-17	25
SD 12 Batusanggan-Muarabio	Elementary school	Muarabio Village	10-Aug-17	8
			Total	158

2.4. Discussion and conclusions

Tiger presence/absence

Tigers were not detected during the study, not because they are absent from the surveyed sites, but due to their general low density in BRBBWR, especially in proximity to human disturbance and also due to the relatively low sampling effort employed. Fig. 2.2a and Table 2.3a show this clearly. Sampling efforts of a citizen science expedition must necessarily be concentrated around more accessible parts of the site. These sites correlate with human occupation and disturbance, whereas the more remote and less disturbed sites with the thickest forest cover lie outside the scope of a citizen science expedition such as this.

Having said this, tigers have been detected previously near villages and have also been recorded in other studies. Between 2012-2015, WWF Indonesia recorded a total of 14 tigers in three different sampling blocks in BRBBWR including three cubs (WWF Indonesia report, as yet unpublished). In accordance with the low density of tigers in the study site, when compared to other Sumatran landscapes, it would take an average of 250 camera trap nights to record a tiger (Sunarto et al. 2013; Widodo et al. 2016). The current effort of 203 camera trap nights did not reach this threshold. This does not mean that a tiger could never be recorded, even with the current effort, but it is statistically unlikely. A camera trap is a static piece of equipment and the target species may well pass just behind or a few meters beyond the trigger beam of the camera trap without being recorded. High camera trap recording rates depend on the density of tigers, but also on previous knowledge of trails used by the species. Studies with high recording rates have camera traps installed where tigers are first detected by tracks, sightings and interviews (Karanth and Nichols 2002). As tigers usually use the same paths over and over, this procedure is very effective in recording tigers at high rates. This places such studies at a significant advantage over random deployment of camera traps as was done during this expedition (because of a lack of other tiger signs). With rugged forested terrain and very few distinctive trails, signs such as tracks, or clear viewings, hampers previous detection prior to installation of camera traps.

Study design to evaluate threats

Due to the high presence of species recorded in village cells during the last expedition (Widodo et al. 2015), the current study laid out a formal sample design to compare species presence values in village and non-village cells.

Habitats for tigers are usually evaluated on the basis of the presence or absence of human disturbance, percentage of forest cover, and prey density or availability, while the presence of other species is not usually taken into account. In our tiger habitat monitoring work on the other hand, we consider that the diversity of species is informative of the general habitat quality and of the threats that species are subjected to. For example, the absence of endangered species may indicate the reserve's vulnerability to poachers, which in turn may also affect tiger protection. However, it is possible that groups that target tigers are different from those, for example, that hunt for food or to retaliate against crop-damaging species (e.g. Luskin et al. 2014).

Such differences between groups also exist in the tiger trade. In a report of tiger smuggling around Sumatra's Kerinci Seblat National Park, it was found that the tiger trader is usually Malay, whereas the tiger exporter is almost always ethnic Chinese and frequently speaks the Hokkien dialect (Ng & Nemora 2007, Risdianto, et al. 2016).

Differences are also apparent in threats by region and remain mainly anecdotal due to a lack of similar comparisons, mainly due to scientists concentrating all efforts on a single parameter; tiger density. In Kerinci Seblat National Park in Jambi Province, Dian Risianto, a section head for the National Park, stated that "most of the (tiger) snares we found in production forests, village forests, or community gardens. These areas tend to be flat when compared with the National Park, and prey species such as deer and pig prefer these places over the Park. These conditions mean that the tigers are often found outside of the Park's protected area" (Rambi 2015). In Rimbang Baling, however, tiger snares are usually found deep inside the reserve and there is no uncontested evidence to suggest that prey is more abundant outside its limits. In fact, local communities may have a huge impact on wildlife poached in retaliation for damaging of crops and livestock (e.g. Madhusudan 2003, Linkie et al. 2007), or for meat and for international trade (Lawson & Vines 2014, Lee et al. 2014).

Positive interactions nonetheless exist, such as when wildlife attracts tourism thus increasing villagers' revenues, when crop raiding species are beneficial to harvesters, or by their position in local folklore (e.g. Riley & Priston 2010). Perceptions and attitudes towards wildlife are also noticeable at large spatial scales. Tigers, for instance, were once distributed across most of the vast territory of China and yet have survived in just a couple of relic populations in that country (Kang et al. 2010), whereas they still persist in relatively substantial numbers in India, a country nearly one third smaller and harbouring twice the density of people. In Sumatra the resilience of the tiger is even more surprising, the island being nearly 20 times smaller than China and 7 times smaller than India.

Only three species studied by the expedition yielded enough data to allow comparison of presence values between village and non-village cells. They are the water buffalo (n=8), wild boar (n=16) and sun bear (n=12). The remaining species yielded values too low for any further comparative analysis.

The water buffalo, recorded mainly by sight and by tracks, seems to be equally distributed in village and non-village cells. As a semi-domestic species, it still retains its wild behavior and can survive away from human care. Yang et al. (2008) have distinguished two lineages of water buffalo, the swamp buffalo that evolved in China, and the river buffalo from India. The Indonesian buffalo probably descends from the latter due to geographical proximity to India. The water buffalo is considered one of the main preys of tigers in India, as well as other ungulates that are regionally abundant (Karanth & Nichols 1998), but they do not seem to have been predated on recently by tigers in Rimbang Baling.

The wild boar was recorded mainly by tracks and by the presence of shallow wallows, in nearly equal measure. Wild boars use wallows because of the need to cool themselves and to gain relief from external parasites and biting insects. Wallows are typically shallow, muddy depressions that are oval to oblong in shape. Wild boars were recorded slightly more in cells with villages; the values nonetheless are so similar that it is not possible to discern any substantial difference.

As such there seems to be no difference in habitats for wild boars between village and non-village cells, and it appears that they probably do not perceive the proximity of humans as a disturbance. It should be noted, however, that the frequency of wild boars as recorded by camera traps (RAI, n=6) was larger in cells containing villages. The wild boar, being an ungulate and largely available in Rimbang Baling, is a strong candidate for being one of the main prey animals for tigers in the reserve, and despite being considered as one of the main crop raider species of Indonesia (Wong et al. 2015), it is surprisingly abundant not only in non-village areas, but also near villages.

The sun bear, considered Vulnerable (VU) by the IUCN, was the only species that has a noticeably higher presence value in non-village cells, suggesting a certain degree of avoidance of human presence. It is certainly a focal species to determine habitat conditions and human (and community) attitudes toward wildlife. Under some circumstances, particularly when crops are maturing and ripening (corn and sugarcane, Wong et al. 2015), sun bears may seek plantations for additional feeding resources, which may result in conflicts with local villagers. Fredriksson (2005) describes damage caused by bears to stands of old coconut trees in Borneo, which were successfully solved by wrapping tree trunks with metal sheeting. It should be noted that the method by which species are detected bring valuable insights into its presence and density. Signs that last for a long while such as claw marks in tree trunks, by which sun bears were detected exclusively by the expedition, cannot be directly compared to detection during more recent events such as those indicated by camera trap records and tracks. Lasting signs mean that they may have been made months before, in other words, the sampling effort was much greater than tracks or camera trap pictures taken during a survey. This translates into the likelihood that bears may not be as common as the relatively high values of cell presence suggest at first glance.

Primates had presence scores in fewer than five cells, thus impairing comparative analysis of presence in village and non-village cells. The pig-tailed macaque, listed as Vulnerable (VU) by the IUCN, was the only primate recorded by camera traps (n=11), with a higher frequency in village cells (n=8) than in non-village cells (n=3). The pig-tailed macaque is considered an important food source for tigers in some areas of its range (Tilson and Nyhus 2010), due to its habit to forage on the ground. Despite their low recorded numbers, the presence of two primates of Endangered (EN) status, the gibbon and the siamang, are highly significant to understanding attitudes of villagers towards these species. Their threat status is primarily due to a loss of habitat, but also due to illegal hunting and trade (Nijman 2009). Their presence in Rimbang Baling may thus be interpreted as the availability of suitable high-quality habitat and low hunting and trade pressure. Although both species also occur in Peninsular Malaysia, over 90% of their populations are found in Sumatra (Nijman 2009). Long-tailed macaques were recorded in five cells, mostly by sight and from calls. It was the third most widespread species identified during the previous expedition, behind the wild boar and the water buffalo. It has the second largest distribution of all wild monkeys, second only to rhesus macaques. Long-tailed macaques thrive on all kinds of habitats and are able to persist across wide-ranging environmental variations, including occupying temples (Gursky-Doyen & Supriatna 2010), so their presence in Rimbang Baling is unsurprising and not particularly indicative of habitat quality.

Status of prey species

As with any other wild felid, tigers are likely to prey on whatever is available to maintain its energy requirements. Thus prey preferences are largely the result of which species is most (easily) available. In Thailand, for instance, it was found that tigers preyed mainly on the barking deer, whereas larger prey such as sambar and wild boars contributed little to tiger diet (Tilson & Nyhus 2010). In the Way Kambas National Park in Sumatra on the other hand, the wild boar was the predominant prey species, with high occurrence of sambar, pig tailed macaque and barking deer, in this order of importance (Tilson & Nyhus 2010). According to these authors, wild boars are the prey that is most likely maintaining tigers in most of Sumatra and Peninsular Malaysia. It is expected that this must be related to its high reproductive rate and certainly also to its adaptation to disturbed environments, as has also been found by the current expedition.

In addition to habitat loss and fragmentation, studies suggest that prey depletion is also responsible for the current decline of tiger population in the wild (Karanth & Stith 1999, Wibisono & Pusparini 2010). Four recognised mammalian prey species for tiger (Sriyanto 2003) were recorded during the expedition, namely barking and sambar deer, pig-tailed macaque, as well as wild boar. The common porcupine and the great argus pheasant, both of which were recorded at low rates by the expedition, may occasionally be taken by tigers. Two other main tiger prey species, albeit not recorded by the expedition, exist in Rimbang Baling in low numbers: the bearded pig *Sus barbatus*, recorded by the previous expedition (Widodo et al. 2016), and the serow *Capricornis sumatraensis*, recorded by WWF during previous field studies (WWF Indonesia, unpublished data, Duckworth et al. 2008, Widodo et al. 2015).

In terms of prey for tigers, only the wild boar displayed relatively high scores overall - and showed no strong indication that its presence is influenced by the presence of villages, reinforcing what had been found during the previous expedition (Widodo et al. 2016). Although poaching and snaring occur, these threats appear to be at a level that allows the maintenance of the wild boar population and that of other species. The wild boar is not hunted for food, but it is persecuted for sport hunting and for damaging crops including rubber (seedlings) and cassava plantations such as the ones found in Rimbang Baling.

Little is known of the Sumatran tiger preference for prey, as there is only a single study on it, as commented on in the previous report (Widodo et al. 2016). However, prey preference is likely to follow the general rule of tigers preying on whatever is available at higher densities. Linkie and Ridout (2011) determined prey preferences in the Kerinci Seblat National Park in west-central Sumatra and found that camera trap pictures of tigers matched temporally those of barking and sambar deer, despite the latter occurring at very low densities in their study area. It is not known whether the lower presence of sambar in Rimbang Baling is a function of human impact or whether Rimbang Baling is simply not a very suitable habitat for the species. Despite that, sambar deer are commonly hunted for consumption by local people, not only in Sumatra, but also other countries such as India (Biswas & Sankar, 2002). In fact, local people reported that the species is hunted for food in Rimbang Baling and there are indications (Risdianto et al. 2016) that barking deer are also hunted in Sumatra (but it is not known whether this includes Rimbang Baling).

Local communities not only hunt for food, but as stated earlier, wildlife is poached in retaliation for damaging crops and livestock, and for the international trade in animals.

The barking deer seems to be present at nearly equal rates to the sambar in Rimbang Baling, being recorded only once by a camera trap during the current expedition, and in ten cells during the previous expedition (Widodo et al. 2016). There are two species in Sumatra, the southern red muntjac *Muntiacus muntjak*, which is common and easily adapts to disturbances and habitat modification, and the Sumatran mountain muntjac *Mutiacus montanus*, which is listed as Data Deficient (DD) by the IUCN and of which very little is known (Timmins et al. 2016).

Sumatra harbours two species of mouse deer. Both the lesser mouse deer *Tragulus kanchil* and the greater mouse deer *Tragulus napu* are common and widespread, tolerating both habitat modification and hunting (Timmins & Duckworth 2015). It was recorded by camera trap only in four cells, and despite its tolerance to human disturbance, was more frequent in non-village cells (n=5) than in village cells (n=2).

Human activity and threats

BRBBWR and surrounding areas are an important habitat for tigers, and are also occupied by local communities. These communities make a living from rubber from semi-wild rubber plantations, from timber and fish, and from hunting animals for food. Some of them have semi-wild animal livestock. Conflict between tigers and humans in the area appears to be low, which may be in part due to tigers becoming rarer in the vicinity of humans, as reported by interviewees. In addition, human activity may be detrimental to tiger presence by negatively influencing the suitability of habitat for tigers. Linkie et al. (2003) have shown that primary forest with low human activity is important for tigers as is the importance of maintaining such habitats as tiger refuges.

WWF Indonesia has found that tigers in BRBBWR are mostly found deeper in the forest and avoid human disturbance where possible (WWF Indonesia, unpublished report). As such, and because of the sampling effort issues described above, it is not surprising that the expedition, for the second year running, did not find any direct evidence of tigers, although interviewees reported seeing them in their rubber plantations, which appear to be able to support tigers.

The expedition did not find any evidence of tiger poaching, tiger wire snares or shooting parties, or evidence of the shooting of tigers. Combined with the low human-tiger conflict reported here, this is encouraging. However, investigations by WWF Indonesia have found that some tiger poachers live inside the areas surrounding BRBBWR (WWF Indonesia, unpublished report). The expedition did find evidence of tiger prey poaching or game hunting, both of which have the potential to diminish tiger prey abundance, which will in turn affect tiger density in BRBBWR, since tiger density is related to prey abundance (Karanth & Stith, 1999, Karanth et al. 2004, Sunarto et al. 2013, Risdianto et al. 2016).

Illegal logging continues to be an issue and was widespread, because there appears to be no law enforcement by the reserve authorities. Logging activity has a negative effect on animal abundance (Risdiyanto et al. 2016), so enforcement of anti-logging laws is important.

Human-tiger conflict

As part of their way of life and livelihood, local people often access forest that is also occupied by tigers and other wildlife. They also let livestock roam freely in semi-wild plantations and wild forest areas. Such animal husbandry practices could attract tigers to prey on livestock, thereby causing human-tiger conflict (or livestock could possibly infect wildlife with domestic animal diseases). Depredation on domestic animals is the most common type of human-tiger conflict as tigers readily kill livestock and dogs in areas where wild prey are depleted - usually due to hunting, habitat degradation and competition with livestock (Goodrich 2010).

This said, the expedition did not capture livestock species on its camera traps, which makes it likely that livestock, despite roaming freely, restricts its movements to river lines and the vicinity of human trails inside the forest. Cattle were recorded by direct sightings only in villages, with only buffalo recorded in plantation areas and secondary forest along the main river.

An effective way to deal with human-tiger conflict is to conduct awareness programmes related to human-tiger conflict mitigation, especially in places where a high potential of conflict has been identified. The expedition's work encompassing interviews and school visits is an important aspect of this.

People perception and acceptance

The null hypothesis of this study was that there was coexistence between tigers and people, with no recent human-tiger conflict. In other words, people can live in harmony with tigers in areas where tigers by and large avoid human activity areas. In order to elucidate this issue, the expedition recorded information about people encountering tigers or their signs directly (by seeing these themselves) or indirectly (having heard about other people seeing these). In general, people's perception of tigers does not appear to be negative towards or resistant to tiger presence, despite the fact that many people are scared of tigers and believed that their presence was detrimental. However, as one does not follow from the other, this may be an effect of interviewees trying to tell interviewers what they would like to hear. Support for this theory might be the fact that local people along the Subayang river were very friendly, welcoming the expedition wherever it went and willingly participated in all study and interview activities.

Local people are mostly aware that the tiger is a protected animal by law. However, there are obvious limits to tiger awareness. In order to mitigate this, the expedition conducted awareness-raising activities through community involvement and school visits.

Local tiger folklore appears to be thriving and well-established. Local people call tigers 'datuk' in Malay language and 'inyiak' in Minangkabau language, which signifies that they are seen as symbolism of ancestors in Sumatra (McNeely & Sochaczewski 1988, Boomgard 2001)

Concluding remarks

This study was part of a long-term tiger habitat monitoring study conducted through a collaboration of WWF Indonesia and Biosphere Expeditions. Although the expedition did not record any direct tiger evidence, it nevertheless strengthened and corroborated other studies by WWF Indonesia. These earlier studies captured tiger photos and signs and derived from this an estimate of about 0.86 individuals/100 km² (SE 0.5) (Sunarto et al. 2013). They also monitored tiger density and prey abundance and this information will be useful for reserve management (WWF Indonesia, paper submitted, Widodo et al. 2016).

Even without direct tiger records, the expedition recorded good information about tiger habitat quality. Unlike most other areas of Sumatra, BRBBWR still boasts large, remote forested areas, well away from human impact. This is mainly because of its very steep and therefore hitherto inaccessible topography, unsuitable for palm oil plantation conversion. However, with modern technology it is now becoming possible to convert hilly areas, so protection of BRBBWR is becoming ever more important in the face of this new threat. In addition, local communities, despite depending on the forest for their livelihoods, reported low human-tiger conflict, as well as a good level of tiger acceptance and in many cases even reverence for the tiger as a symbol of local folklore representing their ancestors.

All in all this gives hope to the notion that BRBBWR may be a home for tigers for a long time to come. This is corroborated by some studies, as well as global (long-term priority landscape of TCL) and national documents (Dinerstein et al. 2006, Indonesian Ministry of Forestry 2007, WWF - Tigers Alive Initiative 2012, Sunarto et al. 2013).

Still, real threats exist and cannot be ignored. These include forest resource extraction and tiger poaching. Forest resource extraction includes illegal logging first and foremost, but also prey animal poaching, rubber tree plantations, some existing oil palm plantations by the riverside, and the threat of new hillside palm oil plantations. Tiger poaching was not detected by the expedition, but has been confirmed by investigations of WWF Indonesia's Tiger Protection and Wildlife Crime Units).

This expedition, next to its tiger habitat monitoring activities, also included awareness-raising and education, which is a very meaningful addition to support tiger conservation in the area.

Recommendations for further expedition work

Based on all of the above, the expedition in future will

1. Continue to conduct tiger habitat monitoring along the Subayang River, whilst WWF Indonesia conducts monitoring in the remoter areas in BRBBWR so that we can combine the result together.
2. Given suitable time and human resources on expedition, push into remoter areas of BRBBWR with suitable expedition teams to supplement WWF Indonesia data.
3. If possible, increase the study effort to gain more data about tiger and habitat along the Subayang River.
4. Involve local communities, local universities and reserve authorities in all expedition and community activities to continue to educate local people and build local capacity with a view to local people helping with or taking over tiger conservation activities in the medium- and long-term.
5. Continue and extend school visits, cooperation with rangers, and the involvement of local authorities and local people, with the expedition serving as a showcase and focal point for such activities.

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Appendix I. Summary of expedition camera trapping effort in Bukit Rimbang Bukit Baling 2016.

Station code	Cell ID	Status	Latitude*	Longitude*	Date installed**	Date removed**	Trap nights
BE02	AA132	Non-village	11251086	-22333	19/07/2016	2/8/2016	16
BE03	X132	Non-village	11247109	-23430	19/07/2016	22/07/2016	9
BE04	AA131	Non-village	11250996	-21316	19/07/2016	2/8/2016	13
BE05	Y131	Village	11248312	-21034	20/07/2016	6/8/2016	1
BE06	Y132	Village	11248652	-23322	20/07/2016	3/8/2016	15
BE07	Y131	Village	11247060	-20493	20/07/2016	3/8/2016	15
BE08	AB130	Village	11253921	-19602	20/07/2016	2/8/2016	14
BE09	Y136	Village	11248634	-30325	21/07/2016	7/8/2016	14
BE10	AB130	Non-village	11253745	-19661	21/07/2016	4/8/2016	Inactive
BE11	Z132	Non-village	11249147	-22272	24/07/2016	8/8/2016	14
BE12	Z131	Non-village	11249867	-20828	24/07/2016	6/8/2016	18
BE14	Z134	Village	11250019	-27567	24/07/2016	6/8/2016	14
BE15	W137	Village	11243027	-32580	25/07/2016	8/8/2016	15
BE16	AA130	Non-village	11252081	-19584	25/07/2016	7/8/2016	15
BE17	X131	Village	11246559	-20963	26/07/2016	8/8/2016	14
BE18	X131	Village	11246478	-20948	27/07/2016	9/8/2016	14
BE19	AA130	Non-village	11251682	-19074	27/07/2016	8/8/2016	2

* UTM Datum WGS 84, **day/month/year

Appendix II. Species captured by camera traps.



Pig-tailed macaque



Great argus bird



Bushnell  BE7 75°F23°C 

07-20-2016 21:10:07

Wild boar.

Appendix III. School visit pictures.



SD Tanjung Belit 002



SD Batusanggan and SMP Satu Atap Batusanggan



SD 12 Batusanggan-Muarabio

Appendix IV. Database of species occurrence by presence survey on foot and by boat in Bukit Rimbang Bukit Baling 2016.

No	Slot	Grid	Elevat. (m)	Species	Day	Month	Year	Sighting	Track	Scat	Other	Remark
1	1	AA130	107	Agile gibbon	19	7	2016	0	0	0	1	Calling
2	1	AA130	149	Wild boar	19	7	2016	0	1	0	0	
3	1	AA130	156	Sun bear	19	7	2016	0	0	0	1	Claw
4	1	AA130	-	Long-tailed macaque	19	7	2016	1	0	0	0	Feeding in the fig tree
5	1	AA130	-	Water buffalo	19	7	2016	0	1	0	0	On the path
6	1	AA130	85	Goat	19	7	2016	0	1	1	0	On the path
7	1	AB130	50	Wild boar	19	7	2016	0	1	0	0	Digging for food
8	1	AB130	79	Cow	19	7	2016	1	0	0	0	
9	1	Z131	47	Wild boar	20	7	2016	0	1	0	0	
10	1	Z131	197	Sun bear	20	7	2016	0	0	0	1	Claw
11	1	Z131	57	Water buffalo	20	7	2016	0	1	0	0	
12	1	Y131	53	Water buffalo	20	7	2016	1	0	0	0	In the water in the river
13	1	Y131		Wild boar	20	7	2016	0	1	0	1	Wallow
14	1	Y131		Agile gibbon	20	7	2016	0	0	0	1	In the forest creek of river bank
15	1	AB130	67	Wild boar	20	7	2016	0	1	0	0	
16	1	X132	189	Sun bear	21	7	2016	0	0	0	1	Claw
17	1	X132	174	Wild boar	21	7	2016	0	1	1	0	Wallow
18	1	Y132		Long-tailed macaque	21	7	2016	1	0	0	0	Near Subayang river
19	1	Y132		Wild boar	21	7	2016	0	1	0	1	Wallow
20	1	Y132	86	Sun bear	21	7	2016	0	0	0	1	Claw
21	1	Y132		Goat	21	7	2016	1	0	0	0	Tanjung Beringin Village
22	1	Y132		Bat	21	7	2016	1	0	0	0	Small cave near the creek
23	1	AA131	58	Wild boar	24	7	2016	0	1	0	0	At a wild puddle
24	1	AA131	119	Sun bear	24	7	2016	0	0	0	1	On the tree
25	1	AA132	231	Wild boar	24	7	2016	0	1	0	1	Mud hole
26	1	AA132	279	Sun bear	24	7	2016	0	0	0	1	Tree
27	1	AA132	279	Siamang	24	7	2016	0	0	0	1	Distant

No	Slot	Grid	Elev (masl)	Species	Day	Month	Year	Sighting	Track	Scat	Other	Remark
28	1	X131	113	Agile gibbon	24	7	2016	0	0	0	1	Call
29	1	X131	133	Sun bear	24	7	2016	0	0	0	1	Mark on the tree
30	1	X131	111	Wild boar	24	7	2016	0	1	0	1	Pig wallow near the creek digging for the worm, track
31	1	W137	131	Wild boar	25	7	2016	0	1	0	0	One animal track in mud
32	1	W137	330	Sun bear	25	7	2016	0	0	0	1	On lots of tree and very new, may be a cub as well
33	1	W137	322	Long-tailed macaque	25	7	2016	0	0	0	1	Not far
34	1	W137	115	Deer	25	7	2016	0	0	0	1	Small green twigs were eaten
35	1	Z134	76	Wild boar	25	7	2016	0	1	0	1	Pig wallow digging for worm, track
36	1	Z134	76	Snake skin	25	7	2016	0	0	0	1	Snake skin on the river
37	1	Y136	105	Wild boar	26	7	2016	0	1	0	1	Wallow near the creek
38	1	Y136	245	Sun bear	26	7	2016	0	0	0	1	Claw mark, old and new mark on the some tree and many tree have mark
39	1	Y136	260	Agile gibbon	26	7	2016	0	0	0	1	Call in the valley far away
40	1	X133	98	Sun bear	26	7	2016	0	0	0	1	Marking on the tree
41	1	X133	78	Wild boar	26	7	2016	0	0	0	1	Pig wallow
42	1	X132	95	Sun bear	26	7	2016	0	0	0	1	Claw mark
43	1	X132	50	Wild boar	26	7	2016	0	0	0	1	Pig wallow
44	1	AA131	65	Agile gibbon	27	7	2016	0	0	0	1	Calling
45	1	AA131	60	Sambar deer	27	7	2016	0	1	0	0	Track in the forest
46	1	AA131	58	Wild boar	27	7	2016	0	0	0	1	Wallow
47	1	AA131	58	Water buffalo	27	7	2016	0	1	0	0	
48	1	Z132	111	Wild boar	27	7	2016	0	0	0	1	Wallow
49	1	Z132	116	Common porcupine	27	7	2016	0	0	0	1	Burrow
50	1	Z132	120	Sun bear	27	7	2016	0	0	0	1	Claw mark
51	2	AA130	219	Wild boar	2	8	2016	0	0	0	1	Wallow
52	2	AA130	159	Sun bear	2	8	2016	0	0	0	1	Claw mark
53	2	AA130	188	Agile gibbon	2	8	2016	0	0	0	1	Calling
54	2	AA130	211	Long-tailed macaque	2	8	2016	1	0	0	0	
55	2	AB130	51	Cow	2	8	2016	1	0	0	0	In the village

No	Slot	Grid	Elev (masl)	Species	Day	Month	Year	Sighting	Track	Scat	Other	Remark
56	2	AB130	51	Domestic dog	2	8	2016	1	0	0	0	In the village
57	2	AB130	51	Domestic dog	2	8	2016	1	0	0	0	In the village
58	2	AB130	43	Siamang	2	8	2016	0	0	0	1	Calling
59	2	AB130	43	Goat	2	8	2016	1	0	0	0	In the village
60	2	AB130	70	Wild boar	2	8	2016	0	1	0	1	Wallow
61	2	AB130	43	Water buffalo	2	8	2016	1	0	0	0	
62	2	Y131	51	Water buffalo	3	8	2016	1	0	0	0	On river banks
63	2	Y131	86	Wild boar	3	8	2016	0	1	0	1	Wallow
64	2	Y131	51	Siamang	3	8	2016	0	0	0	1	Calling
65	2	Y131	97	Sun bear	3	8	2016	0	0	0	1	Claw mark
66	2	Z135	121	Wild boar	3	8	2016	0	1	0	0	
67	2	Y135		Wild boar	4	8	2016	0	0	0	1	
68	2	Y132	53	Wild boar	4	8	2016	0	1	0	0	
69	2	Y132	53	Water buffalo	4	8	2016	0	1	0	1	Wallow
70	2	Y132	75	Long-tailed macaque	4	8	2016	0	0	1	0	
71	2	Y132	121	Sun bear	4	8	2016	0	0	0	1	Claw mark
72	2	Z131	45	Wild boar	6	8	2016	0	1	0	0	
73	2	Z131	110	Long-tailed macaque	6	8	2016	0	0	0	1	Claw mark
74	2	Z131	144	Sun bear	6	8	2016	0	0	0	1	Claw mark
75	2	X131	208	Sun bear	6	8	2016	0	0	0	1	Claw mark
76	2	X131		Wild boar	6	8	2016	0	1	0	1	Wallow
77	2	X132	235	Wild boar	7	8	2016	1	0	0	0	
78	2	X132	273	Sun bear	7	8	2016	0	0	0	1	Claw mark
79	2	X132	197	Long-tailed macaque	7	8	2016	0	0	0	1	Claw mark
80	2	Z134	63	Water buffalo	7	8	2016	1	0	0	0	
81	2	Z134	110	Wild boar	7	8	2016	0	0	0	1	Wallow
82	2	AA131	42	Water buffalo	8	8	2016	1	0	0	0	
83	2	AA131	58	Wild boar	8	8	2016	0	1	0	0	

No	Slot	Grid	Elev (masl)	Species	Day	Month	Year	Sighting	Track	Scat	Other	Remark
84	2	AA131	60	Agile gibbon	8	8	2016	0	0	0	1	Calling
85	2	AA132	163	Sun bear	8	8	2016	0	0	0	1	Claw mark
86	2	W137	107	Water buffalo	8	8	2016	1	0	0	0	
87	2	W137	260	Wild boar	8	8	2016	0	0	0	1	
88	2	Y136	140	Wild boar	8	8	2016	0	0	0	1	Hearing call

Appendix V. Database of habitat threats by presence survey on foot and by boat in Bukit Rimbang Bukit Baling 2016.

No	Slot	Grid	Elev(masl)	Day	Month	Year	Snare	People with gun	Gun cartridges	Logging	Logger's camp	Other	Logging describe	Other describe
1	1	AA130	154	19	7	2016	0	0	0	1	0	0	Old logging already rolling wood 1-2 years old	
2	1	AA131	-	19	7	2016	0	0	0	1	0	0	Logs in the river	
3	1	AB131	84	19	7	2016	0	0	0	1	0	0	Logs in the river	
4	1	AB131	84	19	7	2016	0	0	0	1	0	0	Abandoned logs	
5	1	AB130	79	19	7	2016	0	0	0	1	0	0	Sound of chain saws	
6	1	Z131	70	20	7	2016	0	0	0	1	0	0	Old logging, using the river as transport	
7	1	AB130	67	20	7	2016	0	0	0	0	0	1	Gunshot	
8	1	Y132		21	7	2016	0	0	0	1	0	0	Dam, traditional logging railway	
9	1	Y132	167	21	7	2016	0	0	0	1	0	0	Sound of machete	
10	1	Y132	54	21	7	2016	0	0	0	1	0	0	On the main river	
11	1	AA131	144	24	7	2016	0	0	0	1	0	0	Felled and cut trees are in the jungle	
12	1	AA132	195	24	7	2016	0	0	0	1	0	0	Leftover cut 'medang' tree, took bark for alcohol	
13	1	X131	139	24	7	2016	0	0	0	1	0	0	Logging evidence, cut tree	
14	1	W137	241	25	7	2016	0	0	0	1	0	0	Stump of tree cut half of tree on the ground	
15	1	W137	241	25	7	2016	0	0	0	1	0	0	Sound of chain saws	
16	1	W137	322	25	7	2016	1	0	0	0	0	0	Evidence of snare but very old and no snare left, the poles are still here	
17	1	Z134	92	25	7	2016	0	0	0	1	0	0	Chainsaw evidence, need to cut tree & plank	
18	1	X132	100	26	7	2016	0	0	0	1	0	0	Sound of chain saws	
19	1	AA131	30	27	7	2016	0	0	0	1	0	0	Cutting tree	
20	1	AA131	64	27	7	2016	0	0	0	1	0	0	Cutting tree	
21	2	AA130	153	2	8	2016	0	0	0	1	0	0	Cutting tree	
22	2	AA130		2	8	2016	1	0	0	0	0	0	Barking deer trap	
23	2	AB130	64	2	8	2016	0	0	0	1	0	0		
24	2	AB130	43	2	8	2016	0	0	0	0	0	1	Bird catchers	
25	2	Z135	125	3	8	2016	0	0	0	1	0	0	Fresh timber	

No	Slot	Grid	Elev(masl)	Day	Month	Year	Snare	People with gun	Gun cartridges	Logging	Logger's camp	Other	Logging describe	Other describe
26	2	Y131	124	3	8	2016	0	0	0	1	0	0		
27	2	Y131	143	3	8	2016	1	0	0	0	0	0	Bird snare	
28	2	Non	46	3	8	2016	0	0	0	1	0	0	Slash-burn clearing logging near Muarabio Village	
29	2	Y135	105	4	8	2016	0	0	0	1	0	0	Cutting tree	
30	2	Z131		6	8	2016	0	0	0	1	0	0	Old cut tree	
31	2	Y131		6	8	2016	0	0	0	1	0	0	Cut little tree	
32	2	X132		7	8	2016	0	0	0	1	0	0	Old cut tree	
33	2	Z134		7	8	2016	0	0	0	1	0	0	Cut logs	
34	2	AA131	60	8	8	2016	0	0	0	0	0	1	Sound of chain saws	
35	2	AA132	170	8	8	2016	0	0	0	0	0	1	Barking tree	
36	2	AA131		8	8	2016	0	0	0	1	0	0		
37	2	AA132		8	8	2016	0	0	0	1	0	0		
38	2	W137		8	8	2016	0	0	0	1	0	0		

Appendix VI. Database of interview results in Bukit Rimbang Bukit Baling 2016

No	Slot	Name	Day	Month	Year	Grid	Place	Occupation	Age	Place of birth	Sex
1	1	Anonymous	19	7	2016		Tanjung Belit	Rubber farmer	64		Male
1	2	Anonymous	19	7	2016		Tanjung Belit				
3	1	Anonymous	20	7	2016		Batusanggan	Rubber farmer	34	Batusanggan	Female
4	1	Anonymous	21	7	2016	Y131-Z131	Batusanggan	Teacher	48	Batusanggan	Male
5	1	Anonymous	21	7	2016	Y131-Z131	Batusanggan	Teacher	41	Batusanggan	Female
6	1	Anonymous	26	7	2016		Aur Kuning	Rubber farmer	72	Aur kuning	male
7	2	Anonymous	2	8	2016	AA130	Tanjung Belit	Rubber farmer, head of sub-village	33	Tanjung Belit	Male
8	2	Anonymous	2	8	2016	AA130	Tanjung Belit	Rubber farmer, head of sub-village	29	Tanjung Belit	Male
9	2	Anonymous	3	8	2016		Batusanggan	Rubber farmer	71	Batusanggan	Male
10	2	Anonymous	4	8	2016		Aur Kuning	Rubber farmer	52	Batusanggan	Male
11	2	Anonymous	4	8	2016		Gajah Betalut	Major of the village	43	Gajah Betalut	Male
12	2	Anonymous	7	8	2016	X132	Tanjung Beringin	Rubber farmer	40	Tanjung Beringin	Male
13	2	Anonymous	11	8	2016	AA130	Tanjung Belit	Housewife	27	Tanjung Belit	Female
14	2	Anonymous	11	8	2016	AA130	Tanjung Belit	Palm oil farmer	42	Tanjung Belit	Male
15	2	Anonymous	11	8	2016	AA130	Tanjung Belit	Rubber farmer, boat driver	55	Tanjung Belit	Male
16	2	Anonymous	11	8	2016	AA130	Tanjung Belit	Entrepreneur	43	Tanjung Belit	Male

No	Slot	Name	Livestock type (number)	Seen tigers?	When?	Where?	What?	How feel?	What?	When?	Where?	How feel?
1	1	Anonymous	Goat, cow	Yes, seen tigers	1980-1990	Deep in the jungle	Didn't know	Scared				
1	2	Anonymous		No, never seen sign of tigers								
3	1	Anonymous		Yes, seen track and people seen tiger sign	Sound roar	Scared						
4	1	Anonymous	Cow (4), chicken (18)	Yes, seen tigers	15 years ago	Rubber plantation	Crossing a creek they followed thinking it deer realised tiger went separate way	Scared	Sound prey remnants	1 year	Rubber plantation	

No	Slot	Name	Livestock type (number)	Seen tigers?	When?	Where?	What?	How feel?	What?	When?	Where?	How feel?
5	1	Anonymous	Chicken (10)	No, never seen but Yes, know a person that has seen a tiger								
6	1	Anonymous		Yes, seen sign of the tiger	Very long time ago			Scared				
7	2	Anonymous		Yes, seen sign of the tiger	2 years ago	Behind the hill behind the village	Footprint	Scared				
8	2	Anonymous		Yes, seen sign of the tiger	1 year ago	Behind the hill behind the village	Footprint	Scared				
9	2	Anonymous	Chicken	Yes, seen tigers	When he was young	Near the creek upstream	Walking in the creek and jumped to stream bank	Not scared				
10	2	Anonymous		No, never seen sign of tigers								
11	2	Anonymous	Buffalo	Yes, seen sign of the tiger					Tracks	Around 10 years ago	Up the hill behind the village	Scared
12	2	Anonymous		Yes, seen sign of the tiger					Tracks	3 months ago	Near by Telaga River	Not scared
13	2	Anonymous	Chicken(5)	No, never seen sign of tigers								
14	2	Anonymous	Water buffalo	Yes, seen sign of the tiger					Tracks	3 months ago	Near the village	Scared
15	2	Anonymous	Chicken(10)	Yes, seen tigers	Two weeks ago	On the right side from the river with oil palm and rubber plantations	Crossing the river	A bit scared				
16	2	Anonymous	Water buffalo	No, never seen tigers								

No	Slot	Name	Location	Impact	Good country	Tell impact?	Feel tigers?	Like tigers?	Attack people?	What makes?	Suggestions	Frequent
1	1	Anonymous		Detrimental		People afraid to go the jungle	Afraid	Neutral	No			
1	2	Anonymous		Detrimental		Because people are afraid			Yes	Long time ago		

No	Slot	Name	Location	Impact	Good country	Tell impact?	Feel tigers?	Like tigers?	Attack people?	What makes?	Suggestions	Frequent
3	1	Anonymous	Do not true tell to each others as causes fear, will stop thinking going to the forest	Beneficial		Good, but can be sad immigrant tiger local	Afraid, but tiger guardian or forest so good	Like	No			No
4	1	Anonymous		Beneficial	Good	30 years ago was not good to have tigers now he wishes there were more. Too many wild boars so they want more tigers because pigs eat crops, benefits Indonesia, increasing tourism	He likes tigers when people get lost in jungle the tiger shows the way by sound, tigers eat pigs then pigs eat crops and rubber	Like	Yes	If prey was scared, 35 years many tigers attack people because few pigs, now too many pigs	If you do not hunt tigers they would not attack people	No
5	1	Anonymous	Deep in the jungle	Detrimental	Good	Her mother's sister was eaten by a tiger when she was a child. People leave village to cities in fear of tigers	Important for country and good for student. To learn about tigers myth. If you say no scared of tigers you will get eaten. If someone make a big mistake a tiger will come and scare them	Like	No			
6	1	Anonymous		Detrimental	Bad	People life from the forest product and it they we afraid	afraid because the elder told about tigers killing people	Dislike	yes	tigers hungry, and people walk in the forest and conflict happen	Don't know	yes
7	2	Anonymous	He willing to guide us to go the location	Detrimental	Good	No impact	Proud of tigers, tigers are ancestors so respect to tigers	Like	No			
8	2	Anonymous	2 hours up the hill	Detrimental	Bad	Tigers attack livestock	Dangerous animal	Neutral	No		Protecting livestock by fencing and cages	
9	2	Anonymous	Too long ago	Detrimental	Good	Not big impact	Tigers are bad because when there are tigers they can't walk in the jungle	Dislike	Yes	People enter their territory and they get territorial	No idea, just be careful	No

No	Slot	Name	Location	Impact	Good country	Tell impact?	Feel tigers?	Like tigers?	Attack people?	What makes?	Suggestions	Frequent
10	2	Anonymous		Detrimental	Neutral	No, animals have no benefit in general, wild boars attack his plantation		Dislike	Yes	Because of high population of tigers, tigers sometime they come to the village, mystic tigers some people get attack because have some specific signs (hairs pattern at the back)	Don't know	No
11	2	Anonymous		Neutral	Bad	Not sure, but bad impact	Tigers are useful locally because they attack wild boars that destroy plantations	Neutral	Yes	Because of high population of tigers	Don't know	No
12	2	Anonymous	Near by Telaga River	Neutral	Good	Tigers are ancestors and we respect like a great grandfather	Tigers are one of the scariest animal in the world	Neutral	No			
13	2	Anonymous		Detrimental	Good		The scariest animal in the region	Neutral	Yes	Because the tiger was hungry and human bother the tiger	Don't bother animals	No
14	2	Anonymous	2 hours up the hill	Detrimental	Bad	No benefit from tigers, they scare the people who want to work in the plantations	Is the leader animals in the jungle	Neutral	Yes	The tiger is hungry	Stay in your house	No
15	2	Anonymous		Beneficial	Good	The tiger is good in general, but keep the tiger in the forest, it could harm the livestock	He is scared, but tigers are good for the country and environment	Like	Yes	People work in the forest and they were more tigers in the forest	The tiger should stay in the deeper forest	yes
16	2	Anonymous		Detrimental	Good	In his opinion, the tiger is in the area is not good, because it scares the people	Beautiful	Neutral	Don't know		Do not go to the forest	Don't know

No	Slot	Name	How many tigers?	Protected	Legally protected	Tell more	Reduce large animals?	If yes, explain	If no, explain	Reduce small animals?	If yes, explain	If no, explain
1	1	Anonymous	Don't know	Yes	Yes	Tigers are animal that actually have nothing against us	No		Because there are so many	No		Because tigers are no longer in the area where small animals are
1	2	Anonymous		Don't know	Yes	Doesn't know						
3	1	Anonymous	Rare	Yes	Yes	People see tigers as guardian of the forest	Don't know		Never see tigers eat anything - carcass	No		In non plantation, eat large mammals, small mammals are as snack Because not enough tigers
4	1	Anonymous	Less than 500	Yes	Yes	Because so many enemies and tigers would eat enemies if there were more	Yes	Scare them or eat them		No		
5	1	Anonymous	Don't know	Yes	Yes	Population is decreasing	Yes	If tiger eat pigs is good and eat deer is bad		No		They think wild boars eat small animals
6	1	Anonymous	Don't know	Don't know	Don't know		No		wild boar still large in number	No		
7	2	Anonymous	Don't know	Yes	Yes	Tigers are the ambassador of Indonesia	Yes	Hunting prey		No		Too small
8	2	Anonymous	Don't know	Yes	Yes	Because tigers are endangered animals	Yes	Eating them		No		Too small
9	2	Anonymous	Don't know	Yes	Yes	Yes, as long as they are not near him	Yes	Scaring wild boars more to other areas		Yes	Scaring small mammals, more to other areas	
10	2	Anonymous	Don't know	Yes	No	No	Yes	Tigers eat large mammals		Yes	Tigers eat small mammals	
11	2	Anonymous	Don't know	Don't know	Yes	If the government protect tigers, that is good, but they should also monitor them	Yes	Eating them		Yes	Eat them	
12	2	Anonymous	Many	Yes	Yes	Tigers are endangered animals, we should protect them	Yes	They scare them away		Yes	They scare them away	

No	Slot	Name	How many tigers?	Protected	Legally protected	Tell more	Reduce large animals?	If yes, explain	If no, explain	Reduce small animals?	If yes, explain	If no, explain
13	2	Anonymous	100	Yes	Yes	They should protect it because the tiger is wise and tiger kill the bad people	Yes	They eat them		Yes	They eat them	
14	2	Anonymous	Many	Yes	Yes		Yes	They eat them		No		Small animals are not enough for tigers
15	2	Anonymous	Don't know	Yes	Yes	The number of tigers is decreasing	Yes	They eat them		Yes	Tigers eat small mammals	
16	2	Anonymous	Don't know	Yes	Yes	Because the tiger is almost extinct	Yes	They eat them		Yes	They eat them	

No	Slot	Name	Feed domestic animals?	If yes, livestock type?	Attract tourist?	Poach tigers?	How why?	Tourists?	Influence tigers?	Discussion
1	1	Anonymous	Yes	Goats and cows	Good	No		Good	Because maybe there are no tigers in your country and you want to see one	
1	2	Anonymous			Good	Yes				It is a good thing that WWF and BE do this
3	1	Anonymous	No		Good	No, Only tiger prey	Gun, snares for food	Good	Bring people here	
4	1	Anonymous	Yes	But in the past tigers fed on livestock cow and goat	Good	No tigers but hunt small deer	Snares for food		He thinks if tiger increase tourism will increase which he thinks is good	1978 120 houses in the village, 90 houses washed away during flood as a result of deforestation many people moved away, now some returning. In the past the rumour is that tigers would put their paws through house windows looking for people to eat. He doesn't understand why tiger population is decreasing, he thinks people may be snaring them.
5	1	Anonymous	No		Good	Tigers no scared of jungle. Other people of village. Prey no scared of jungle hunt deer. They do not hunt pigs, but want other people to kill because the pig eat crops.	Snares		More tigers is more tourism, but prefer less tigers as they are scared of them	50 years ago a lot of people were killed by tigers who were working in the rubber plantation. When her mother's sister was killed, it was on the river bank opposite the village. In civil society today, people make a lot of mistakes, but the tiger doesn't come to scare people because so few tigers left. she wishes, there were more tigers to scare the people.

No	Slot	Name	Feed domestic animals?	If yes, livestock type?	Attract tourist?	Poach tigers?	How why?	Tourists?	Influence tigers?	Discussion
6	1	Anonymous	No		Don't know	Deer	For food	Don't know		story about tiger from grand father were lot of tiger and killing people long time ago
7	2	Anonymous	No		Good	No		Good	Dangerous animal, the people want to see tigers	
8	2	Anonymous	No		Good	No		Good	Because the tiger is endangered animal so that everyone wants to see tigers	No, he doesn't agree with clear cutting and bad development
9	2	Anonymous	No		Good	No	They don't	Good	Don't know	
10	2	Anonymous	Yes	They eat them	Don't know	No		Don't know	The tiger is charismatic and endangered	
11	2	Anonymous	Yes	Water buffalo. Goat, domestic dog	Good	They poach barking deer for traditional hunting and eating		Good	Tigers are protected and also endangered animals	Compensation about human - tiger conflict from government
12	2	Anonymous	Yes	They ate water buffalo a long time ago 40 years ago	Good	People poach the prey species, not tigers		Good	No idea	
13	2	Anonymous	Yes	Long time ago	Good	No		Good	I have no idea but the tourist might like the tiger	
14	2	Anonymous	Yes	Water buffalo long time ago	Good	No, they poach mouse deer and wild boar	Some people eat them kill wild boar to stop them for being pest	Good	People come here because they like tigers	
15	2	Anonymous	Yes	Goats for example, the goat sometime is curious and goes to the tiger	Good	No, but prey species	Prey species for eating	Good	The villagers like him are happy with the tourist, because it give them some traditional income	When he saw tiger once he was fishing in the night, it was impressive because he could see glowing eyes
16	2	Anonymous	No		Don't know	No, they are not		Good	It is good because it gives interaction with local people	

Appendix VII: Expedition diary and reports



A multimedia expedition diary is available at <https://biosphereexpeditions.wordpress.com/category/expedition-blogs/sumatra-2016/>.



All expedition reports, including this and previous expedition reports, are available at www.biosphere-expeditions.org/reports.