Monitoring tiger and their prey species in Kerinci Seblat National Park, Indonesia

Final Report to Report to 21st Century Tiger
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Monitoring team

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Sugarna (Community ranger)
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Undergraduates who completed their field research in KSNP and volunteers during funding period of Months 1-6 in Project Year 1.
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Introduction

Current Project Status

Kerinci Seblat National Park (KSNP), Sumatra, is an important protected area for tigers because it is still contains large blocks of forest that continue outside the national park boundaries. Whilst these large forest blocks could support viable tiger populations, the pervasive threats of illegal logging and poaching of both tigers and their prey render the future of this species uncertain. In order to assess the impact of these different threats and the conservation strategies aimed at reducing them, information is need on the population trends of tigers and their prey. This report highlights project activities completed in the first six months of Project Year 2, which

aimed to collect baseline data on tigers and their prey in KSNP. More specifically the project objectives were:

- Conduct surveys of tigers and prey for Year 2 in the KSNP monitoring programme;
- Continue to investigate the factors that determine tiger and prey abundance in KSNP;
- Determine tiger and prey population status in KSNP;
- Train KSNP staff and Indonesian students in tiger and prey monitoring techniques;
- Disseminate project information to project partners and policy makers; and,
- Monitor and evaluate project results and effectiveness.

The monitoring programme in Year 2 has been implemented and is being conducted under the following time scale (Table 1). This report covers activities from Months one to six.

Table 1: Year 2 programme activities scheduled for February 2005 and January 2006

	Month											
Activity	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
Steering committee meeting												
Workshop in Sumatra (KSNP HQ)												
New project personnel field survey training												
Continue data collection (detection/non-detection surveys)	RAI	NY							SE	AS	O	N
Continue data collection (camera trapping)												
Presentation to national universities												
Workshop in Jakarta (Dept. Forestry)												
Submit report to 21st Century Tiger												
Mid-term and end of Year 2 term M&E												
End of Year 2 term data transfer to KSNP and TPCUs												

First term activities

Information on all first term activities (Months 1 to 6) is detailed in the November 2004 midterm report sent to UFWS and so only a brief summary is provided here.

Activity 1.1. Steering committee workshop

This activity was scheduled for Month 1, but was actually completed three months before the UFWS funded project began, as funding from other sources was disbursed earlier. Instead, a meeting with the Director of KSNP was held in Month 1 to discuss overall project progress and project expansion under the USFWS grant, including the identification and allocation of KSNP staff for Activity 1.2.

Activity 1.2. Workshop in Sumatra (KSNP HQ)

A workshop was held during Month 2 in Sumatra (KSNP Head Office), which involved all project collaborators (FFI, KSNP and local NGOs) was convened during this time and project results were presented and discussed. All project data files were transferred to the KSNP Head Office computers.

Activity 1.3. Project personnel field survey training

As scheduled, during Months 1 and 2, project personnel comprising two KSNP forest rangers, four community scouts and two Indonesian national university graduates received four weeks training in field equipment use, including GPS and camera traps, and field survey methods. A tiger and prey monitoring programme, based on indirect sign (detection) surveys and camera trapping surveys, was then implemented for KSNP.

Activities 1.4. Detection/non-detection field transect surveys

Transect surveys using a detection/non-detection method developed by this project were tested during the rainy season in Month 2. However, the surveys did not start properly until the camera trap surveys had been completed (Months 3-6). Thus, the detection/non-detection surveys began in Month 6. A total of four teams consisting of three personnel (a community scout, a volunteer or student and a full-time staff member) have surveyed 12 grid cells (1 x 2 km) during Month 6. An additional 68 grid cells are planned to be surveyed in Months 7-12. However, during Months 3-5 transect surveys were conducted in conjunction with the camera trap surveys within a hill forest study site (Sipurak). All the principal tiger prey species were recorded (Table 2). No snare traps were encountered during these surveys.

Table 2 Field transect surveys from Sipurak

Date	Number of surveys	Total distance (km)	Average survey (km)	Tiger[a]	Tiger prey[a]
17/03/05	13	80	6.7	1,5	Tapir[1,2,6], Sambar[1], Wild boar[1]
01/04/05	13	82	6.7	1,5	Tapir[1,2,6], Serow[1], Sambar[6], Wild boar[6]
17/04/05	13	78	6.7	1,2,5	Tapir[1,2,6], Sambar[1]
08/05/05	13	76	5.8	1,3,5	Muntjac[1], Tapir[1], Serow[1]
22/05/05	13	76	5.8	1,5	Tapir[1,2,6]

[a] 1 = prints, 2 = faeces, 3 = hair, 4 = nest, 5 = direct sighting

Activity 1.5. Camera trap surveys

A fully operation camera trapping campaign began in an area of submontane-hill forest, Sipurak, that included part of a former logging concession that has been recently repatriated into KSNP. Camera trapping was conducted continuously between Months 3 and 6. A total of 89 tiger photographs have been obtained from a five month camera trapping period (Table 3).

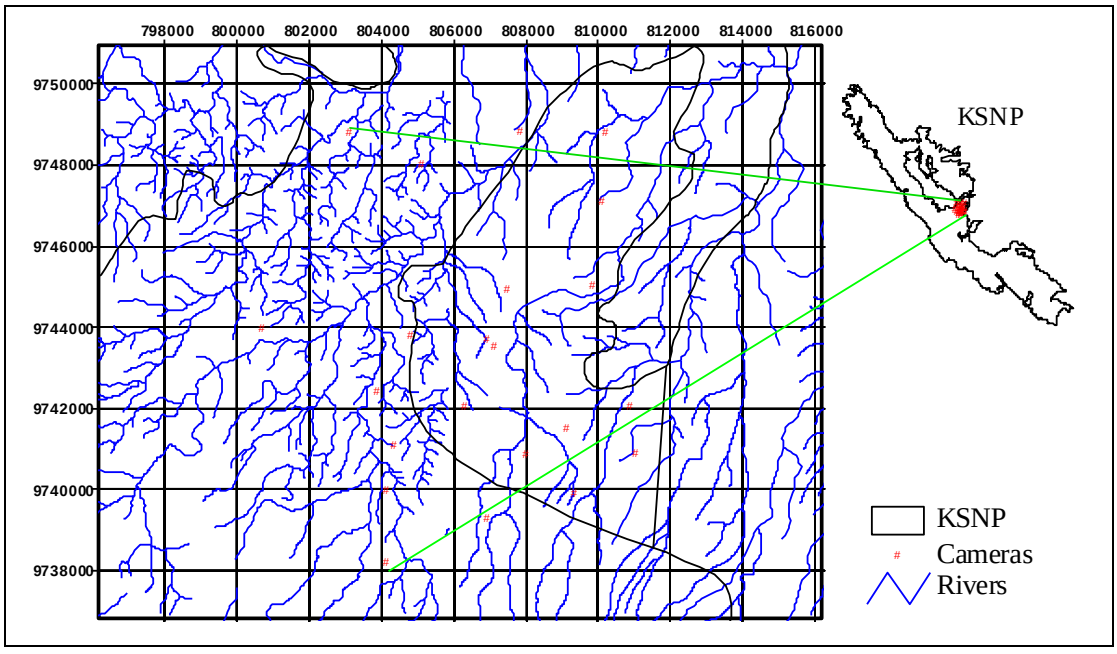

Figure 1. Camera trap location in the hill forests of Sipurak, KSNP.

Including tiger, a total of 20 wildlife species have been photographed in Sipurak (Table 3).

Table 3. Camera trap photographs from Sipurak

No	Species	Number of photos
1	Pig-tailed macaque	225
2	Bearded pig	275
3	Wild Boar	10
4	Sunbear	100
5	Tiger	89
6	Muntjac	106
7	Great Argus pheasant	193
8	Serow	2
9	Marbled cat	3
10	Sambar	8
11	Golden cat	31
12	Porcupine	117
13	Mouse deer	22
14	Tapir	70
15	Asian wild dog	4
16	Rhinoceros hornbill	4
17	Yellow-throated martin	5
18	Banded linsang	1
19	Clouded leopard	11
20	Binturong	1

Next, we used a subset of camera trap data from the Sipurak study area to ensure that the population closure assumption was not violated. Thus, a total of 28 camera trap stations were placed for 1848 trap nights. The closure test did not reject the null hypothesis that the population was closed during the period of camera trapping (z = -1.048, P = 0.147). A total of 6 individual tigers were identified from 50 tiger photographs, with an estimated capture probability of 0.3611 and a tiger abundance of 6 ± 1.28 (Table 3). Model M_h in CAPTURE was ranked second to the null Model M_o, but Model M_h was selected in preference because it is a more realistic model that assumes each individual tiger has a unique capture probability (Karanth & Nichols 1998). Using the strip width boundary method, resulted in an effective sampling area of 294.1km^2 that yield a tiger density of 2.0 tigers/100km^2. The camera trap data was used to derived a tiger density using the encounter rate indices method (Carbone et al. 2001; Table 4).

Table 4. Tiger density for different forest habitat types in the Kerinci Seblat region, shown with methods used to estimate density

M_{t+1}	$\hat{N}$ (±S.E.)	Effective sampling area (km^2)	Tiger density (tigers/100 km^2)	
			Capture-recapture method (95% C.I.)	Encounter rate method (95% P.I.)
5	6.0 (±1.28)	294.1	2.0 (2.0-4.1)	3.3 (0.7-15.4)

Activity 2.1 Tiger and prey landscape analysis

Using camera trap data collected during Year 1 funding from 21st Century Tiger, an Indonesian undergraduate, Gunawan (UNAS), helped to analyse data from Renah Kayu Embun, submontane forest. From 2506 active camera days at 33 camera placements, 29 tiger prey photographs were obtained. This was equivalent to a relative abundance (or encounter rate, ER) of 1.157 tiger prey photographs/100 days. In comparison, a total of 23 tiger photographs were obtained, which was equivalent to a lower ER of 0.918 tiger photographs/100 days.

A preliminary single factor analysis of the ERs from individual cameras that were set at varying distances to the forest edge showed that tiger prey ER was not related to proximity to forest edge, whilst tiger ER was related to proximity to forest edge (Table 5). Tiger ER was highest at cameras that were located further from the forest edge (Figure 2). Although tiger prey had a lower ER at the forest edge, the large standard error bars indicated greater variation around the mean ER values and so no clear pattern emerged (Figure 2). However, in order to conduct more meaningful analyses larger datasets, for which fieldwork is currently compiling, are required. This should reduce the larger variation shown in the tiger prey ERs. It will also enable individual analyses of each tiger prey species ER. This work will form part of the Project Year 2 activities.

Table 5. Spearman's rank correlation coefficient for ER (tiger prey and tiger) and proximity to forest edge

Factor	N	Correlation coefficient	*P*
Log_{10} ER Tiger prey	33	0.282	0.112
Log_{10} ER Tiger	33	0.515	0.002

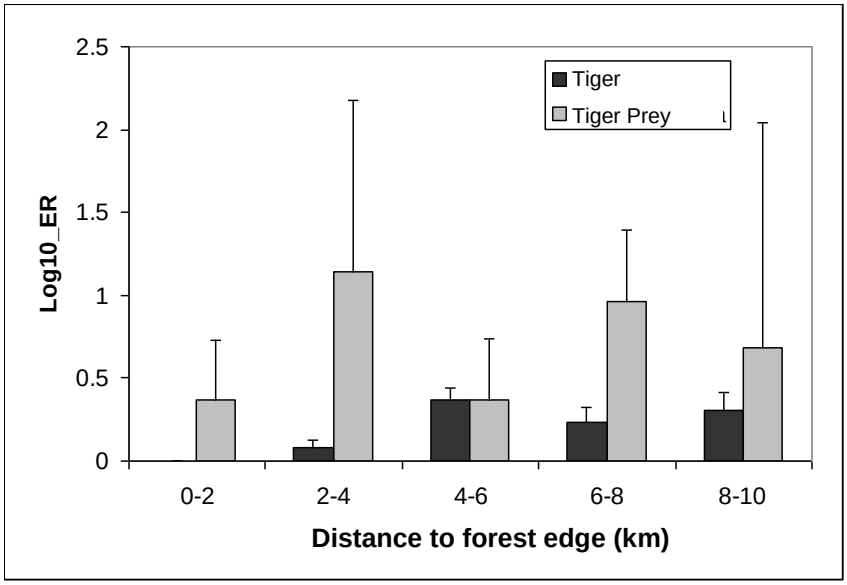

Figure 2. Comparison between tiger encounter rate (ER) and tiger prey ER (with S.E. bars)

Regression analysis was then used to investigate which combination of spatial factors best explained tiger prey ER and tiger ER. The factors included in the analysis were presence of poaching, distance to forest edge, distance to public roads, distance to settlements, distance to rivers and elevation. In order to maintain statistical rigor and perform the most appropriate test, it was necessary to test if the residuals of the tiger prey ER and tiger ER followed a normal distribution. A stepwise multiple linear regression was performed to test if these data were normally distributed and a logistic regression was performed if not. Using a logistic regression analysis showed that tiger prey ER was not related to any of the spatial factors (Table 6).

Table 6. Relationship between tiger prey encounter rate (ER) and the different spatial factors

Factor	Coefficients ± S.E.	Wald	*P*
Log_{10} Distance to forest edge	-		0.109
Log_{10} Distance to public roads	-		0.248
Log_{10} Distance to settlements	-		0.231

Log_{10} Distance to rivers	-		0.606
Log_{10} Elevation	-		0.198
Constant	-0.693 ± 0.369	3.523	0.061

Using a stepwise multiple linear regression, with the inclusion of tiger prey ER as an independent factor, showed that tiger ER was still only related to the single factor of distance to forest edge (Table 7). Thus, tiger ER was greater at distances further from the forest edge.

Table 7. Relationship between tiger encounter rate (ER) and the different spatial factors (r^2 = 0.209)

Factor	**Coefficients ± S.E.**	**T**	***P***
Log_{10} Distance to forest edge	0.334 ± 0.116	2.865	0.007
Log_{10} Distance to public roads	-	1.007	0.322
Log_{10} Distance to settlements	-	0.969	0.340
Log_{10} Distance to rivers	-	-1.346	0.188
Log_{10} Elevation	-	0.148	0.884
Log_{10} ER tiger prey	-	0.516	0.610
Constant	-1.027 ± 0.420	-2.448	0.020

A similar analysis is planned for the Sipurak dataset during Months 7-12. However, subsequent analyses will combine all camera trap data to increase the sample size for the regression analysis.

Activity 3.1 Workshop in Jakarta (Dept. Forestry)

A workshop was held during Month 5 in Jakarta to present the project results to the Department of Forestry. In attendance from the Department was the Director General for Nature Conservation and the Director of Protected Areas, who had not been exposed to this project and its donors before. The Director of DICE, Prof. Nigel Leader-Williams, also attended the workshop. Clear and concisely written reports documenting project results and conclusions were then presented to the Indonesian Institute of Sciences, Ministry of Forestry, donors and project partners.

Activity 4.1. Mid-term project monitoring and evaluation

This was conducted according to schedule, through a workshop where all project partners met and reviewed the project, its results and evaluations. The main outputs were improving the design of the camera traps to stop water leaking in (a new tin roof has now been made for each camera), expanding the monitoring programme to simultaneously cover the Bengkulu (southern) area and the Jambi/West Sumatra (central) area and modifying the detection/non-detection surveys. The main problems identified in surveying Bengkulu were the inaccessibility of forest areas in Bengkulu (a new vehicle has been applied for through a 2006/07 21st Century Tiger proposal) and the lack of project personnel (a new monitoring team will be set up in 2006 if submitted grants are successful).

There were four problems that were encountered with preliminary detection/non-detection surveys: i) an insufficient number of teams to conduct multiple surveys; ii) difficulties of working during the rainy season; iii) low detection of tiger sign; and, iv) surveying an unrealistically large number of grid cells over a short time period. In response, the number of survey teams has been increased from 3 to 4 teams by reducing the number of staff per team from 4 persons/team to 3 persons/team. All staff have now been issued with waterproof rain coats and Wellington boots. Overcoming points (iii) and (iv) has proved more difficult because it involves matching statistical rigor with feasible field survey design. However, it was decided that collecting sufficient data (i.e. from 80 grid cells), which should result in much more reliable estimates of tiger and prey abundance (MacKenzie in press), is essential to accurately monitoring focal species.

Activity 5.1 National university presentation

The project presentations will be given to the universities of Indonesia (Jakarta), National (Jakarta), Bengkulu (Sumatra), Andallas (Sumatra) and Agriculture (Bogor) during Months 8 and 9 instead of Month 5 as originally planned. The revised dates should coincide with term times and ensure a greater student presence.