Monitoring tiger population trends in Kerinci Seblat National Park, Sumatra, Indonesia.

Final Report to 21st Century Tiger

June 2011

Grantee: Durrell Institute of Conservation & Ecology (DICE)

Grant Period: November 2010 – April 2011

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Field Team Leader: Mr Doddy Saputra

Monitoring team:

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Introduction:

Current Project Status:

Kerinci Seblat National Park (KSNP), west-central Sumatra, is one of the two Sumatran tiger strongholds and contains a globally important tiger population (Figure 1). The continued survival of this population depends upon sound conservation management that is based on reliable population trend data of tigers and their prey in KSNP. 21st Century Tiger Fund was the first donor to fund scientific tiger monitoring using camera traps in this Level 1 TCL. This led to the first rigorous estimations of tiger densities in KSNP, the development of a new data analysis technique (based on detection/non-detection surveys), increased capacity of Indonesian staff (e.g.>20 Indonesian scientists trained, Indonesian Field Manager completing an M.Sc at DICE, 2007/08, and the Dept. Forestry camera trap Coordinator currently studying at WildCRU's PGDip programme) and several key scientific publications (including Journal of Applied Ecology and Biological Conservation). 21st Century Tiger enabled the collection of 2004-2006 baseline information on tigers, their prey and their threats. These data were used by the former Head of KSNP and Head of Protected Areas to reclassify our project camera trap sites as 'core protection zones' inside KSNP and were used to support a case, ultimately successful to veto the construction of a road that would have bisected KSNP.

Recognizing the importance of camera trap data for the future protection of tigers in KSNP, the Head of KSNP has requested That DICE/KSNP conduct repeat surveys (5yrs on) in the four 21st Century Tiger camera sites to enable tiger population trends to be estimated. For three sites, funding has been secured through small grants. However, for the fourth and final site, funding was requested from 21st Century Tiger. This site, located in the southern end of KSNP in Bengkulu province, is considered to be the most threatened given its lowland-hill forest status. However, the previous tiger surveys showed that this area still had a good density (1.55±0.34 adult individual/100km^2). Since the surveys were conducted in 2006, Bengkulu province's forest has undergone extensive conversion to oil palm, which has increased forest accessibility through the creation of inroads. At the same time, KSNP law enforcement units have begun patrolling and protecting the tiger population here. So, there is a need to reassess the Bengkulu tiger population's status and investigate its population trend and whether it is linked to the conservation intervention strategy. Finally, there is a 1 year window of opportunity (ending April 2011) to influence District Government spatial plans by incorporating 21st Century Tiger data within KSNP zoning activities, the project will use this as a basis for supporting KSNP, through working with district government, to secure the KSNP borders and buffers forests from oil palm conversion. Finally, the project data will be provided to update the Ministry of Forestry's Sumatran Tiger Action Plan and to support the Ministry in meeting its target of monitoring tiger population trends.

This report highlights the project activities completed over the six month period, which aimed to collect tiger data in a fourth study area in KSNP. The results from all study areas collectively aimed to produce the first estimates of Sumatran tiger population trends by

comparing data between the years from 2004/6 to 2009/11. More specifically the project objectives were:

- Objective 1: Increase local capacity to monitor and protect tiger populations and tiger prey.
- Objective 2: Obtain trend information to assess the conservation status of tiger populations
- Objective 3: Enhance prey protection measures

Study area:

Kerinci Seblat National Park is a global treasure classified by UNESCO as a world heritage site. At 13,300km^2, KSNP represents one of the largest protected areas in Asia. The large tracts of rainforest, lowland hill, hill, submontane and montane types in the 36,400km^2 Kerinci Seblat region extend outside of the KSNP border in many places and into adjacent logging concessions with different levels of degradation and protection status.

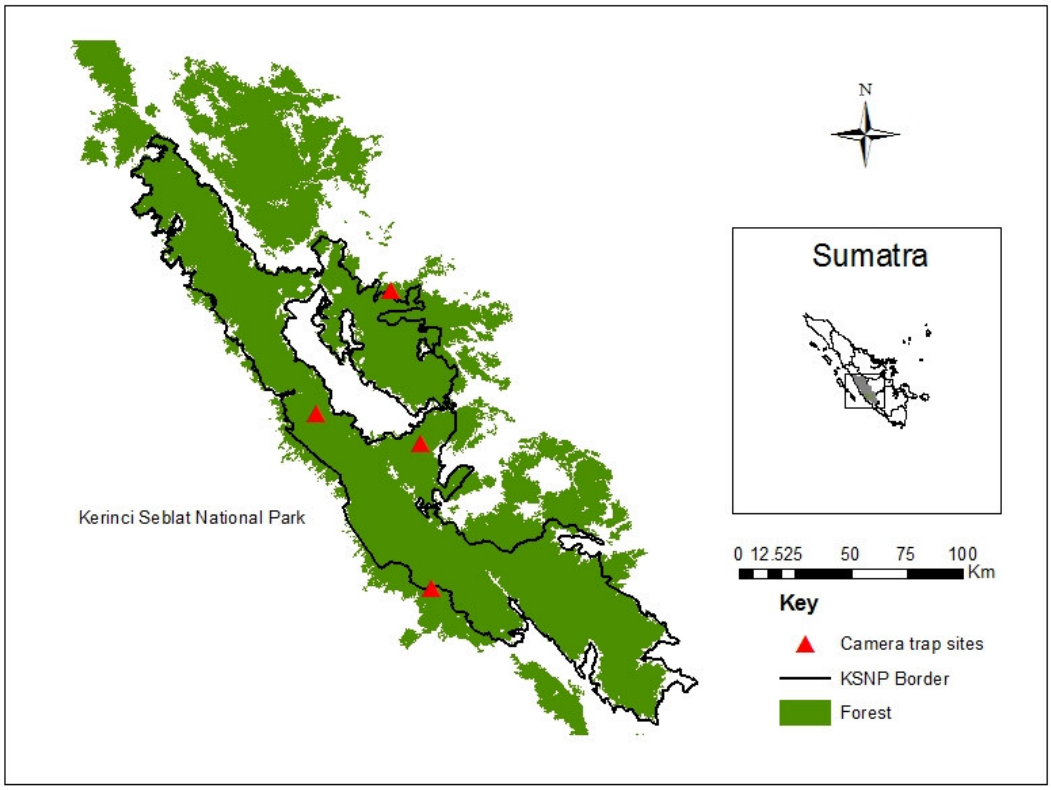

Figure 1: Camera trap study areas in KSNP for tiger monitoring

Project Timetable:

Activity	Month					
	1	2	3	4	5	6
Staff training						
Camera trapping fieldwork						
Data analysis						
Data publication and dissemination						

Activities:

Project personnel field training:

Further funding allowed the Sumatran tiger monitoring project (previously carried out by Dr Matthew Linkie, FFI-Indonesia Programme) to be continued for another season. It was important to increase the local capacity to monitor and protect tigers in KSNP and therefore vital to train new field researchers and promote existing members of the team with regards to responsibilities and management. A new generation of field researchers and community scouts were trained in field equipment use, including GPS, camera traps, and field survey methods. A previous member of the project, originally a field researcher, was chosen to become the field team leader to assist the principle investigator with field work organisation, logistics, management and data analysis. The Kerinci Seblat National Park management also requested our help to train new National Park rangers. They joined with us on field trips learning the techniques mentioned above.

Camera trap surveys:

Camera trapping was conducted in three study areas from December 2009 – October 2010. Funding from 21st Century Tiger allowed a fourth study area to be camera trapped from November 2010 – February 2011 in order to produce tiger population trend estimates from a broader habitat range and create a clearer and accurate picture of the tiger conservation status in KSNP (Table 2).

Table 2. Camera trap study areas used for estimating tiger densities in and around Kerinci Seblat National Park (KSNP)

Study area	Camera trap area (km^2)	Altitudinal range (m)	Habitat type and protection status	Camera trapping period	
Study area 1 (Sipurak)	88	694-1254 (mean: 901)	Primary hill/submontane forest bordering ex-logging concession;	January 2005 – March 2005	December 2009 – March 2010
Study area 2 (Bungo)	90	363-1630 (mean: 753)	Primary-secondary hill forest predominantly inside an ex-logging	April 2006 – July 2006	April 2010 – July 2010
Study areas 3 (RKE)	104	947-1941 (mean: 1194)	Primary submontane forest; inside KSNP	September 2004 – November 2004	August 2010 – November 2010
Study area 4 (Ipuh)	118	145-1032 (mean: 511)	Primary/selectively logged lowland/hill forest predominantly	August 2006 – December 2006	**November 2010 – February 2011**

Camera trapping was conducted in primary/selectively logged lowland/hill forest (Ipuh) that straddles the southern KSNP border. A total of 21 camera placements recorded 1890 camera trap nights in Ipuh (Figure 2). Camera traps were placed with a spacing 1.5-4km along ridge and animal trails, with the outermost cameras forming an approximate circular boundary around the trapping area that left no apparent gap. Cameras were deployed for a period of three months and were visited every two weeks to replace film, memory cards and check their maintenance. Using the standard capture-mark-recapture protocol, a tiger density estimate of 1.16 adult individuals/100km^2 (1.16 – 1.86, 95% CIs) was recorded from Ipuh (Table 3).

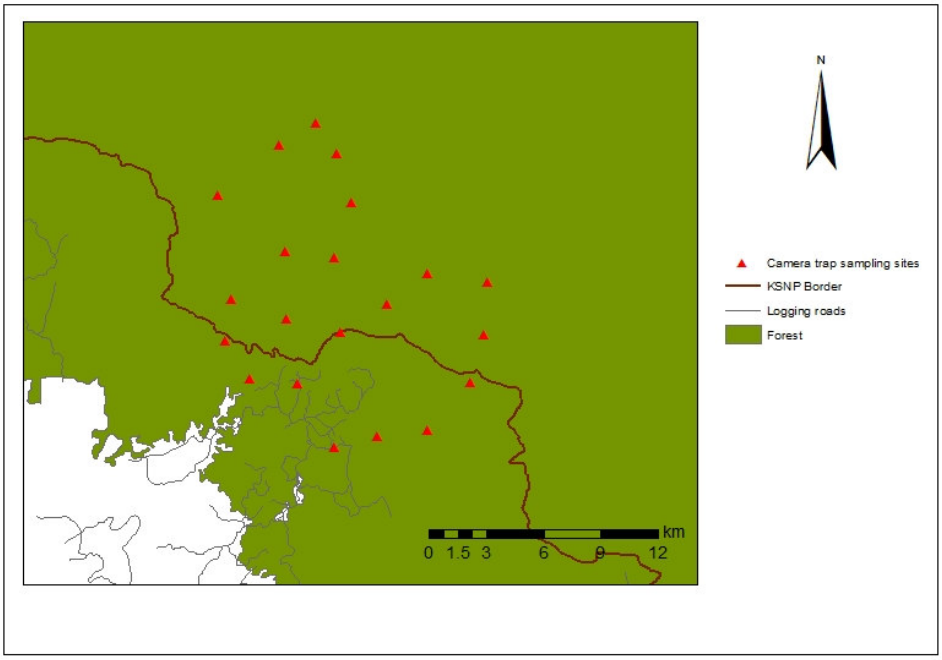

Figure 2: Camera trap surveys conducted in primary-selectively logged lowland-hill forest of Ipuh in and around Kerinci Seblat National Park, showing inserts of camera trap locations

Analysis:

Individual tigers were identified from photographs by looking at the stripe pattern. Tiger detection histories were constructed for each individual tiger over 15 consecutive sampling occasions using a standard 'X-matrix format'. Thus for each individual tiger and each occasion, '1' indicated the detection (photograph) of that tiger, while '0' indicated the non-detection. Detection histories were produced for each of the four study areas and entered separately into CAPTURE software. This software provided information on tiger abundances which were then divided by the effective sampling area to produce density estimates. Finally the density estimates are multiplied by 100 to give the number of tigers per 100km^2 as they are usually presented.

Tiger population trends:

Table 3: Tiger data recorded from four study areas over two periods of time; 2004/6 (Linkie et al), 2009/11 (Wong et al).

2004/6

Study area	No. Identified individual tigers	No. Tiger photographs	*N*(±SE)	Effective tiger sampling area (km^2)	*D* (±SE) adult tigers/$100km^2$	95% Confidence Intervals
Sipurak	5	50	6 (1.28)	294.10	**2.0 (0.44)**	**2.0 - 4.1**
Bungo	10	63	13 (2.48)	441.00	**2.95 (0.56)**	**2.49 - 4.99**
RKE	5	12	6 (1.87)	396.50	**1.5 (0.47)**	**1.5 - 4.0**
Ipuh	15	64	19 (4.21)	1227.18	**1.55 (0.34)**	**1.30 - 2.93**

2009/11

Study area	No. Identified individual tigers	No. Tiger photographs	*N*(±SE)	Effective tiger sampling area (km^2)	*D* (±SE) adult tigers/$100km^2$	95% Confidence Intervals
Sipurak	8	82	9 (1.4217)	194.44	**4.63 (0.73)**	**4.12 - 7.20**
Bungo	6	51	7 (1.4079)	234.38	**2.99 (0.60)**	**2.56 - 5.12**
RKE	3	8	3 (0.7561)	189.77	**1.58 (0.40)**	**1.58 - 2.68**
Ipuh	5	31	5 (0.8980)	431.01	**1.16 (0.21)**	**1.16 - 1.86**

The standard capture-mark-recapture protocol was used to estimate tiger densities from the four study areas (Table 3). These results were then compared to previous tiger density estimates carried out by Linkie et al (2006) (Figure 3). From study areas 2, 3, and 4 tiger density estimates remained stable over the two time periods. Study area 1 showed a positive increase in tiger populations from 2.0 adult individuals/$100km^2$ (2004/6) to 4.63 adult individuals/$100km^2$ (2009/11). This is further supported as there is no confidence interval overlap.

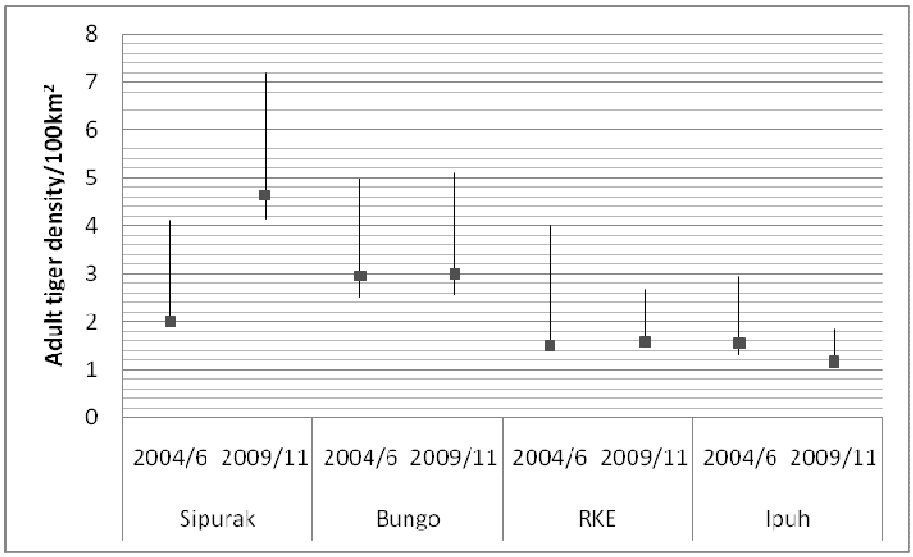

Figure 3: Graph showing tiger densities over two periods of time in the four study areas in KSNP

Tiger monitoring programme and Tiger Conservation Protection Units (TCPUs):

The large amount of fieldwork conducted widely across KSNP within this project means that threat information can be collected from a greater number of areas that the TCPUs can cover alone. Furthermore, our field teams are often able to safely survey in areas prohibited to the TCPUs because of their previous intervention there. So, an indirect benefit of this monitoring programme is that it is able to provide TCPUs with data on the status of tiger, their prey and their threats in these areas.

A significant amount of funding has been invested in the TCPUs to protect tigers and reduce the threats; however, there has been no evaluation of its performance and effectiveness. This tiger monitoring project provides the first rigorous study to show that the TCPUs have been effective and successful in conserving Sumatran tigers as all tiger populations in these study areas have either been stable or increasing (all measures of success).

Results dissemination:

We are currently in the process of writing a scientific paper to be published in a peer reviewed scientific journal. This scientific paper will document tiger and tiger prey population trends in KSNP and will be the first of its kind.

Additional non-tiger studies:

This project has allowed an additional study of a poorly known threatened tropical mammal species to be investigated. Sun bears (*Helarctos malayanus*) are classified as "Vulnerable" by the IUCN and the highest priority for bear conservation research. Like most tropical mammals, sun bears are difficult to study because they are cryptic and difficult to detect. In this study, we applied a detection/non-detection sampling technique using camera trap data on sun bears to estimate site occupancy form the four tropical study areas with different levels of degradation and protection status. As occupancy can be used as an alternative state variable to abundance, changes in occupancy over the years can be related to changes in population size. Linkie et al (2007) estimated sun bear site occupancy in the four study areas, therefore estimating occupancy between the years will yield information on the population trends of sun bears (and other tropical mammals), which can be used to provide more reliable conservation assessments.

Project Photographs:


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