Survey, Assessment and Conservation of the Sumatran Tiger (*Panthera tigris sumatrae*) in Bukit Barisan Selatan National Park

Final Report
on
Year two of a three-year project

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A report to the
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INTRODUCTION

This is the final report for year two of the Wildlife Conservation Society's (WCS) project entitled, "Survey, Assessment and Conservation of the Sumatran Tiger (*Panthera tigris sumatrae*) in Bukit Barisan Selatan National Park, Indonesia." The project is to examine the distribution and abundance of tigers and their prey in the Bukit Barisan Selatan National Park (BBSNP), Lampung Province, Sumatra, which is one of three national parks in Sumatra representing the highest priority Tiger Conservation Units (TCU) for tropical moist evergreen forests in Southeast Asia. The larger goal is to improve the conservation efforts for tigers in BBSNP.

During the first year of the project we established a survey method that provides robust and replicable results based on standardized statistical sampling in a stratified random block design. Tigers were recorded at every site surveyed, with the highest density being recorded in the southern portion of the park. Our photo-trap results demonstrated that BBSNP supports a full complement of Sumatra's charismatic mammals, including 33 mammal species, 6 bird species, and 1 reptile species, many of which were new species records for the park. These important data have since been used to draw government and NGO attention to BBSNP, an area that previously was under-appreciated as a critical conservation area.

During the second year of the project, we completed the park-wide survey, covering three additional sites in the central section of the park and two additional sites in the northern section. Original estimates of the tiger population in BBSNP in the early 1990s put the number at 70 individuals; however, based on the results of our survey, we estimate there to be fewer – 45 to 50 adults. We also found tigers and their prey are more abundant in the southern region of the park. It appears that hunting of tigers and their prey is the greatest threat to their persistence. We found the most evidence of hunting in the central part of the park.

Also this year, we conducted a GIS analysis of the park and updated our habitat analysis. Preliminary analysis indicates that approximately 28% of the park's forests have been converted since 1985. We initiated training of Indonesian Conservation Department (PKA) staff in camera trap-monitoring techniques so that they will have the skills to maintain a long-term monitoring program. And, we sparked collaborations between local NGOs to create low-level lobbying efforts for better tiger conservation in Lampung Province. And finally, as a next step for the project, we initiated more thorough tiger density estimation sampling in the southern region of the park. We report on these findings and more below.

GOALS AND OBJECTIVES

The specific goals and objectives of our project include:

1) Gathering data on tiger and prey distribution and density, and tiger habitat use;

2) Establishing a long-term monitoring program;

3) Promoting capacity building through training of PKA staff, local NGOs and Indonesian students working with WCS-IP; and

4) Working with government agencies and scientists to develop a tiger conservation strategy for BBSNP that can be integrated into larger plans for conservation of the Sumatran tiger across its range.

YEAR TWO ACCOMPLISHMENTS

Gathering data on the status of tigers and their prey

- Completed first survey of BBSNP for distribution of tigers and prey.
- Established relationship between prey density and frequency of occurrence in camera trap photos. This result confirms that tigers and prey density can be directly related to camera trap indices
- Initiated density estimation sampling for the southern third of the park where the best tiger population is believed to exist
- Continued line transect sampling in BBSNP and detected major hunting pressure at end of 2000
- Completed a preliminary GIS analysis of habitat loss in the park showing that 660 km^2 of forest has been lost in the park since 1985 and that forests in the buffer zone now amount to 39 km^2
- Presented results of initial survey to Society for Conservation Biology Meeting in Missoula MT in June 2000.
- Manuscript in preparation describing initial survey, and status of tigers and prey in BBSNP.

The survey

This year we completed the first survey of BBSNP for the distribution of tigers and prey species. To sample the park, we established 10x2km sampling blocks at 10km intervals for the length of the park (see map of camera locations, Attachment I). Blocks were oriented from the edge of the park to the center. Within each block, we randomly assigned one camera per km^2 using UTM coordinates. We then used GPS units to navigate to the random point and set the camera at an "optimal location" within 100m of the point. We define an optimal location as a place where large mammals are likely to pass, usually a game trail. The cameras were set out for 30 to 35 days and operated 24 hours/day to sample tigers and their prey.

After picking up cameras and developing films, we classified all photographs to species and retained independent photo events as our data. For each species, we used a relative abundance index based on the number of independent photos per trap day. A trap day was defined as a 24-hour period. Thus, 20 cameras active for 30 days equals 600 trap days. For example, six independent muntjac photos would give an index of .01 muntjac per trap day. We also used an index of effort needed to take a photo as trap days per photo.

We evaluated camera trap indices by trapping our research site in Bukit Barisan and comparing the indices to density estimates based on line transect sampling. Attachment 2 is a graph that shows a regression of trapping effort on density. The data include density estimates for argus pheasant, sambar deer, muntjac, two mousedeer species, pig, pig-tailed macaques over three sampling periods. The log of density explains 80% of the variation in camera trap indices and we are fairly confident that differences in camera trap effort or relative abundance reflect real differences in density.

Using the number of photos taken per trap day as an index and graphing the data, we found that tigers are generally rare throughout the park and that their abundance declines from south to north. (see graph – Attachment 3)

We were able to make a preliminary density estimate for the southern four blocks using a capture program at 1.6 tigers per 100km2. However, we did not obtain enough recapture photos to make population estimates based on capture-recapture methods for the central and northern parts of the park. But we think density in the central section may be as low as one tiger per 200km2, and a bit higher in the north. We suspect that the low density of tigers in the park is due to the hunting of tigers and their prey, habitat loss, and pressures from development.

Now that the preliminary survey of the park has been completed, we have a much better understanding of the population status of tigers and prey. We recently initiated the next phase, which is to more intensively survey the southern part of the park where we found the best habitat, prey base, and the most tigers. Further surveys in this area will build on the database already collected to provide a more robust estimate of the population and to gain more insight into the ecology of tigers in the area.

Hunting of tiger and prey

Hunting occurs throughout BBSNP but it is difficult to collect accurate data because of limited resources and the fact that hunting in parks is illegal. However, over the past two years we have been able to gather some direct and indirect evidence of hunting. We have seen and heard hunters in the park, and have photographic evidence that tigers are being killed there. From the photographs, we were able to identify two tiger poachers. We have also seen tiger prey being sold in local markets.

Although we have known about hunting in BBSNP since we first arrived, the scale of hunting was unknown until recently. The graph appearing as Attachment 4 reveals that the decline in tigers coincides with dramatic declines in six important prey species that

we know to be hunted in the park, including sambar deer, red muntjac, two mousedeer species, wild pig, and pig-tail macaques. It is clear that there is a major decline in prey abundance, especially for deer and pig species.

The difference in relative abundance of tigers and prey for the south compared to the rest of the park can be seen in table of Attachment 5. The ratio of photos in this table is the ratio of mean number of photos per trap days in the southern third of the park compared to the northern part. Unhunted species are photographed two to three times more often in the northern samples, whereas hunted species are photographed two to ten times more often in the southern samples. Especially striking is the difference between abundance of pigs in the south and north. We believe these differences are indicative of hunting pressure. At first, it was puzzling that pigs would be hunted in a park that is surrounded by Muslims who do not eat pork. Further investigation found that the sport hunting club PERBAKIN, made up of high officials and military people, hunt pigs in Lampung province and sell the meat to zoos (there was a scandal last year when PERBAKIN was accused of providing pork for sale in Jakarta markets as beef). We also learned that Balinese transmigrants were actively hunting in the park.

We conclude that hunting pressure on tigers is still high, and we have identified some of the poachers. We have demonstrated that changes in tiger abundance are also correlated with changes in prey abundance and that the decline in prey appears to be due to illegal hunting in the park.

GIS Analysis

In July and December, we conducted a preliminary analysis of changes in forest cover inside and outside the park with assistance from the EU Forest Inventory Mapping Project. We used LANDSAT images from 1985 to 1999 that cover approximately 70% of the park. We were especially interested in the rate of habitat loss due to encroachment and where the conflict areas are located. The most encroachment was found to occur on the east boundary of the park around the Liwa road during the 1980s, while encroachment from the west increased and during the 1990s. Over the course of the 14 years, it is visible that incremental encroachment has been a problem in all sites, but has been particularly problematic in the northern section of the park (see maps – Attachment 6; and table summarizing changes – Attachment 7).

Forest conversion accelerated in the 1990s and more than 28% of the forest was lost inside the park since it was gazetted in the early 1980s. Much of this forest conversion can be attributed to village expansion on the park boundaries. For example, in the south of BBSNP there is an enclave called Way Haru. Since 1982, when the enclave was established as a 7,500 ha inholding for 500 people, it has grown to more than 8,000 people, and they are spilling over its boundaries. The increase in people is due to in-migration and coffee growing. Two years ago, the local government forced the park to permit a road through the wilderness zone to connect the enclave to major roads. Now there is land clearing along the road. Since 1985, the forests in a 10 km buffer zone around the sampled park area has declined from 300 km^2 to 39 km^2 , an 87% decline in forest cover.

Much of this forest loss can be attributed to coffee plantations. As the price of coffee has risen, local farmers and land speculators from outside the area are clearing parkland on the premise that if they can claim it for agriculture, the park will permit the coffee plantations to remain. In the current climate of anarchy in Indonesia, this attitude is justified. Nestle Corp. has a large NESCAFE instant coffee factory in Lampung and probably buys most of the coffee grown in BBSNP. A possible solution to slow this problem would be to lobby Nestle to buy only coffee grown outside the park.

Designing and implementing a long term monitoring program
and
Identifying and training wildlife personnel and university students in tiger survey techniques

- Initiated training of PKA in camera trap monitoring techniques. To continue in 2001.
- Began negotiation with park staff on the mechanism of participation in park monitoring.
- Trained new employees of tiger team in census techniques.
- Developed preliminary GIS analysis of park that will aid in the design of the long term monitoring program.

Ultimately, the success of our program in BBSNP will depend on the national park adopting the monitoring techniques that we devise and improving the on-the-ground protection of tigers and other wildlife in the park. To this end we have trained around 10 park guards in setting cameras and camera maintenance. We have intensified our interaction with the park and asked that PKA guards or members of the park monitoring team be permanently assigned to work with the WCS tiger team. We have also begun a process of transferring technology (in collaboration with WWF AREAS program) to improve the park's ability to use the data we provide. The transfer includes training in database management and interpretation of GIS. These projects were initiated this year in anticipation of larger PKA participation in 2001-02. Finally, we are developing a joint WCS-WWF-PKA ground-truthing team to investigate encroachment in the park.

Working with government agencies and scientists to help formulate a Sumatran tiger assessment and conservation strategy

- Supported PKA staff in exhibition of park activities for local communities.
- Initiated collaboration between local NGOs and low-level lobbying effort for better tiger conservation in Lampung Province.
- Organized workshop between park and 16 local NGOs that resulted in a forum to anticipate illegal activities in the BBSNP.
- Assisted park management in blocking a proposal to establish a community forest management project in 8000 ha of tiger habitat in BBSNP. This move was an attempt to take over management from the park.
- Testified before the Lampung Provincial House of Representatives in opposition of a proposed tax law that would tax non-timber forest products illegally harvested in the

National Parks. WCS was credited with blocking the bill, and the story was written up in four local papers and hailed as a victory for park protection.

- Initiated plans to support two Tiger Protection Units in BBSNP that will focus on protection and anti-poaching in high risk areas in central part of park. Met with PKA, WWF, International Rhino Foundation (IRF) and the Flora and Fauna Society (FFI) to coordinate efforts.
- Prepared a brochure on the responsibility of local government toward tiger conservation and distributed 1000 copies. The brochure was aimed at provincial and district level bureaucrats. We have been distributing the brochure in personal meetings with officials and lobbying for support of tiger conservation and the national park. Response has been mixed: some officials are enthusiastic, while others view the park as a major impediment to income generation in their area.
- Presented results of project in workshops with PKA, FFI, STP and the Indonesian Tiger Management Committee.
- Presented results of project and served as resource people for WWF Asian Tiger Lansdscape Strategy Workshop.

FUTURE ACTIVITIES

- To more thoroughly survey the southern part of the park to learn more about the ecology of tigers where they are most numerous;
- To establish Tiger Conservation Units;
- To implement a long term monitoring program;
- To continue identifying and training wildlife personnel and university students in tiger survey techniques and;
- To work with government agencies and other Sumatra-based conservation programs to assist in formulating a Sumatran-wide tiger assessment and conservation strategy.

CONCLUSIONS

To date, we believe that the project has run extremely well. Although the news has not been great (habitat loss and fewer tigers than hoped for) we have been able to thoroughly assess the current status of tigers in BBSNP, increase the capacity of the park to monitor tigers, and we are initiating activities that will contribute to long term tiger conservation and management. Our work on establishing the relationship between camera trap indices and prey densities has broad application for monitoring tiger and prey populations and hopefully this method will be adopted elsewhere on Sumatra.

The bigger question “Are We Saving Tigers?” remains unanswered. We probably will not know until we have the results of consistent long term monitoring. As our awareness of threats to tigers in BBSNP increases, we believe that we are in a position to address several problems. In the next year we will concentrate on tiger protection and increasing awareness of the threat to tigers at the local level through a series of workshops and meeting at all levels of local government. Our Tiger Protection Unit Project will act to curb some of the immediate threats from tiger and prey poaching. Our conservation

advocacy program will address problems associated with habitat encroachment and poaching of prey. We hope that by informing local government of their responsibilities and offering to assist in formulating solutions to problems, we can insert a conservation agenda into local planning. Only by changing attitudes toward the use of national parks and scary wildlife can we hope to save tigers and their habitats.

In order for this to work, we will need the cooperation of park management, the Ministry of Forestry, the provincial and regional governments and the local people. These parties all have different agendas and are not in the habit of communicating honestly with one another. Given the chaos in Indonesia, the challenges are increased by the lack of law and order. But we are optimistic that these efforts to instill a conservation ethic locally will ultimately be successful.

Attachments

1) Map of camera locations within BBSNP
2) Graph of trap days to density
3) Graph of photos per trap day changes from south to north of tiger
4) Graphs of photos per trap day changes from south to north of prey
5) Table of hunting pressure
6) Maps showing land cover changes from 1985 to 1999
7) Table of changes in forest cover form 1985 to 1999
8) Representative photographs

Photo Captions

1) Side view of a tiger “captured” by the camera trap.
2) Training park guards to set cameras.
3) Training park staff to use computers for data management.
4) Villagers living around the park.


S 18:58


15 1:10


WCS


3 17:58


08:20:20

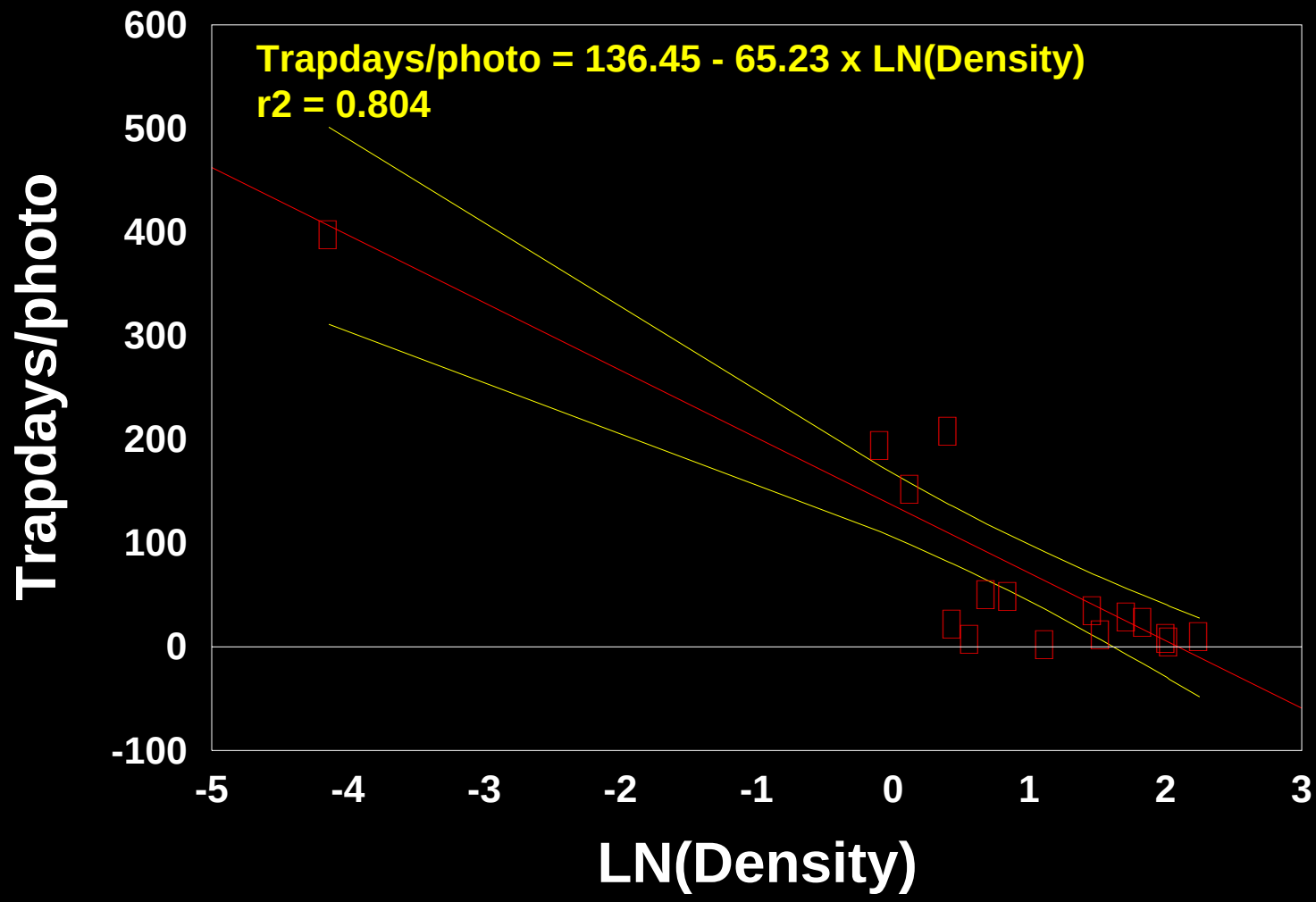

23:27


WCS

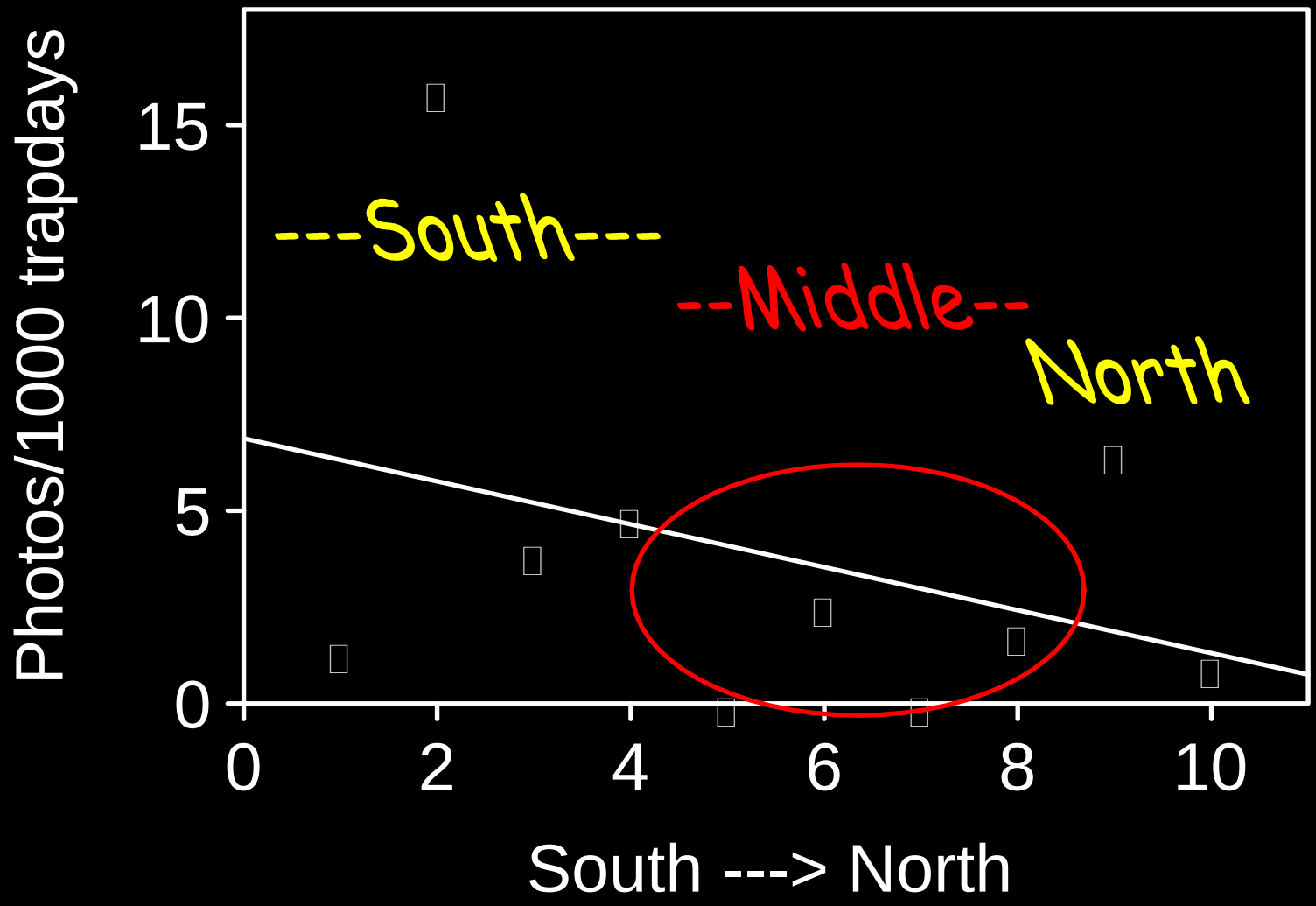
Attachment 1

Camera Locations

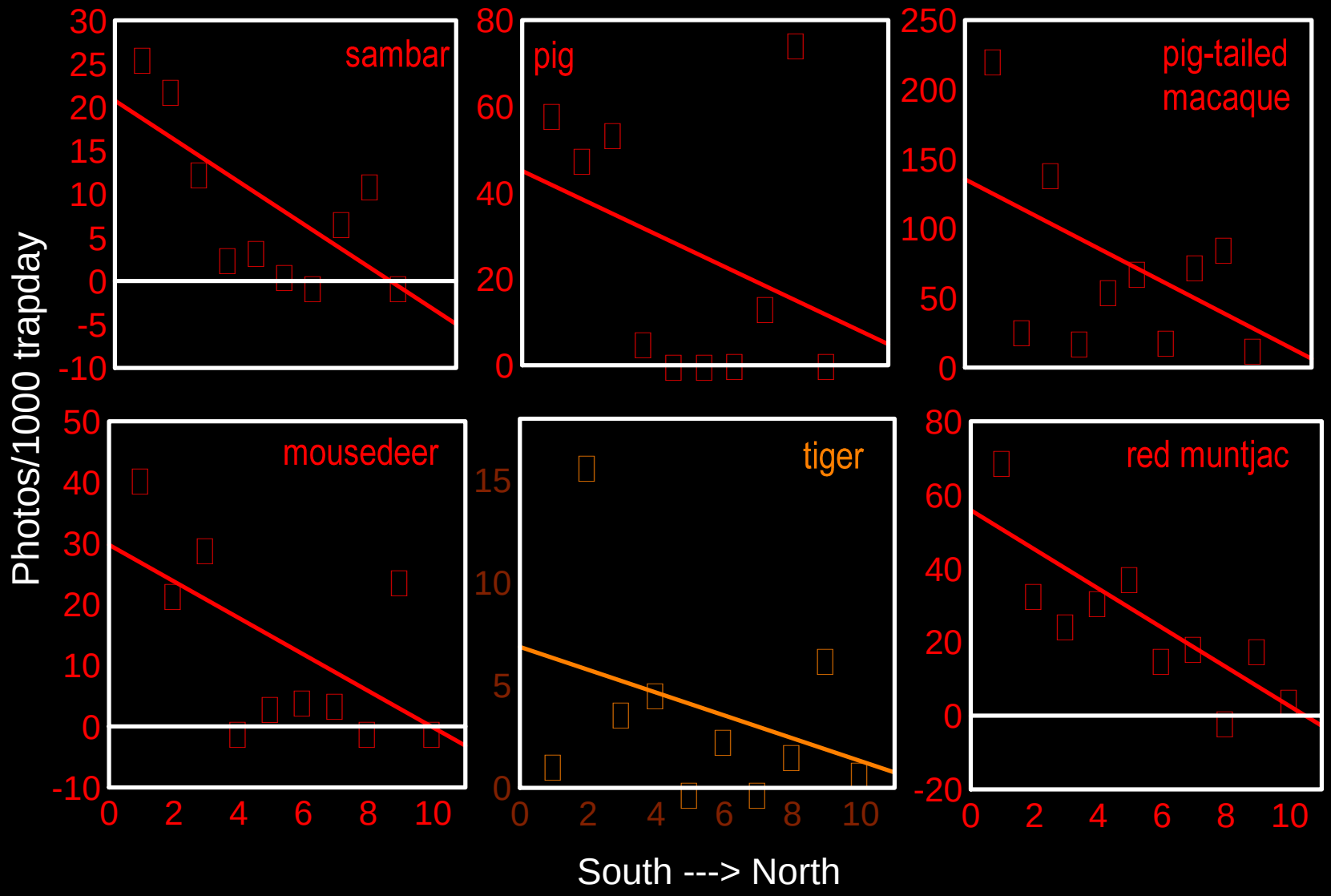
Attachment 2



Attachment 3



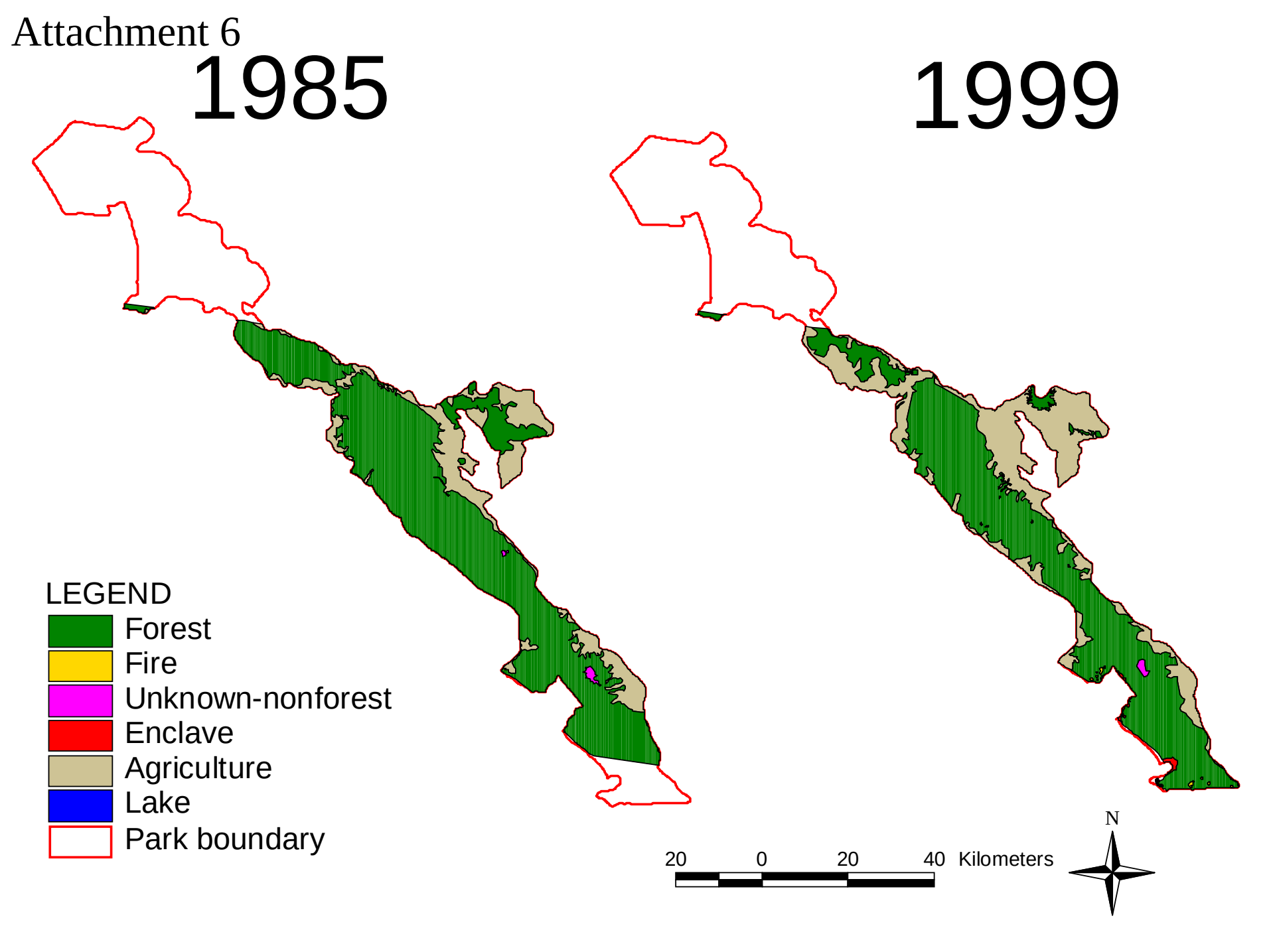
Attachment 4



Attachment 5

Species	Ratio of Photo Index south:north	
Argus Pheasant	1:3	low hunting pressure
Malay Tapir	1:3	
Porcupines	1:2	
Red Muntjac	2:1	heavy hunting pressure
Sambar Deer	5:1	
Mouse Deer	7:1	
Wild Pig	10:1	
Pig-tailed Macaque	2:1	
Sumatran Tiger	6:1	

Attachment 6



Attachment 7

Changes in forest cover between 1985 and 1999 for south and central portion of TNBBS (70% of total park area)

Time	% decrease	% change/year
1985-89	8.66%	2.16%
1989-94	8.85%	1.69%
1994-97	10.08%	3.36%
1997-99	5.72%	2.86%

1985-99 forest cover decreased from 76% to 54% of park