Interim report

Linking ecological research, local knowledge, and collaborative management to protect large mammals in Thailand

funded by

Keidanren Nature Conservation Fund

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WWF-Thailand

Introduction

This report documents the progress of the project "Linking ecological research, local knowledge, and collaborative management to protect large mammals in Thailand" funded by Keidanren Nature Conservation Fund, and conducted in Kuiburi National Park (Pratchuap Kiri Khan Province). We briefly restate the project's goal and objectives, then describe recent activities and outcomes. Recent activities pertain mostly to the first wildlife survey expedition conducted by the project.

Goal Develop the capacity of rangers and local people in Kuiburi National Park to conserve endangered large mammals through scientific research and collaborative problem-solving.

Objectives

1. Provide ecological information for conserving the large mammals of Kuiburi National Park.

    - Determine the distribution and relative abundance of large carnivores and prey species in different zones and habitats of the protected area.
    - Establish a baseline for future monitoring of trends in distribution and relative abundance.

2. Strengthen capacity of protected area staff and local people in ecological assessment, problem-solving, and management planning.

    - Train park staff to conduct ecological research and apply results to conserving wildlife and habitats in Kuiburi National Park.
    - Determine relative magnitude of changes in population abundance and distribution of tigers and their prey, over past 20-30 years, using knowledge of local people and rangers.
    - Conduct problem diagnosis and determine root causes of wildlife population declines, using knowledge of local people and rangers.
    - Develop shared definitions of conservation issues and problems, and identify possible solutions to the decline of large mammals.
    - Improve the sustainability of subsistence hunting by local people.

Activities conducted

January, 2006

- Met with park superintendent to schedule of the first training and field surveys and discuss personnel requirements.
- Consulted with statisticians and other biologists regarding final details of project's ecological research design.
- Prepared training materials (charts, maps), data recording forms, and purchased field equipment for Kuiburi rangers.

February, 2006

- Introduced the project to park staff at Kuiburi NP.
- Selected 3 study sites to conduct large mammal surveys and monitoring, and selected potential partner villages.
- Introduced the project to 20 village headmen and district government officials at special meeting at park headquarters.
- Conducted 1-day training for 15 park rangers, covering the following topics: tiger conservation status, biology of focal species, survey objectives, field method overview, how to record data, how to identify and measure tracks and signs of focal species.
- Conducted 2-week field survey covering 120 km^2 in the center of Kuiburi National Park. A team of 4 rangers from the training accompanied project biologists and received daily on-the-job training in application of the methods taught in the training.
- We introduced the project to local people of one key village - Pa Maak (2 day visit). This is a large Karen village situated within the park, whose activities affect wildlife in the park, and whose collaboration will be crucial for implementing successful conservation measures.
- In Pa Maak village, we met with the assistant village headman and local school teachers, and 4 other small groups of villagers on their way to or from the forest. At these meetings, we discussed the project's objectives and indicated that we wanted their help to achieve these objectives. All villagers seemed receptive to this idea.

March, 2006

- Project staff analyzed field data, and prepared survey report and maps.

April, 2006

- Project staff redid data analysis with park staff (capacity building).
- Assisted rangers to prepare a results presentation.
- Presented results from survey #1 to park superintendent and staff.
- Presented results from survey #1 to Director of National Park Research Division, Department of National Parks, Bangkok.
- Made plans for upcoming work (survey #2).

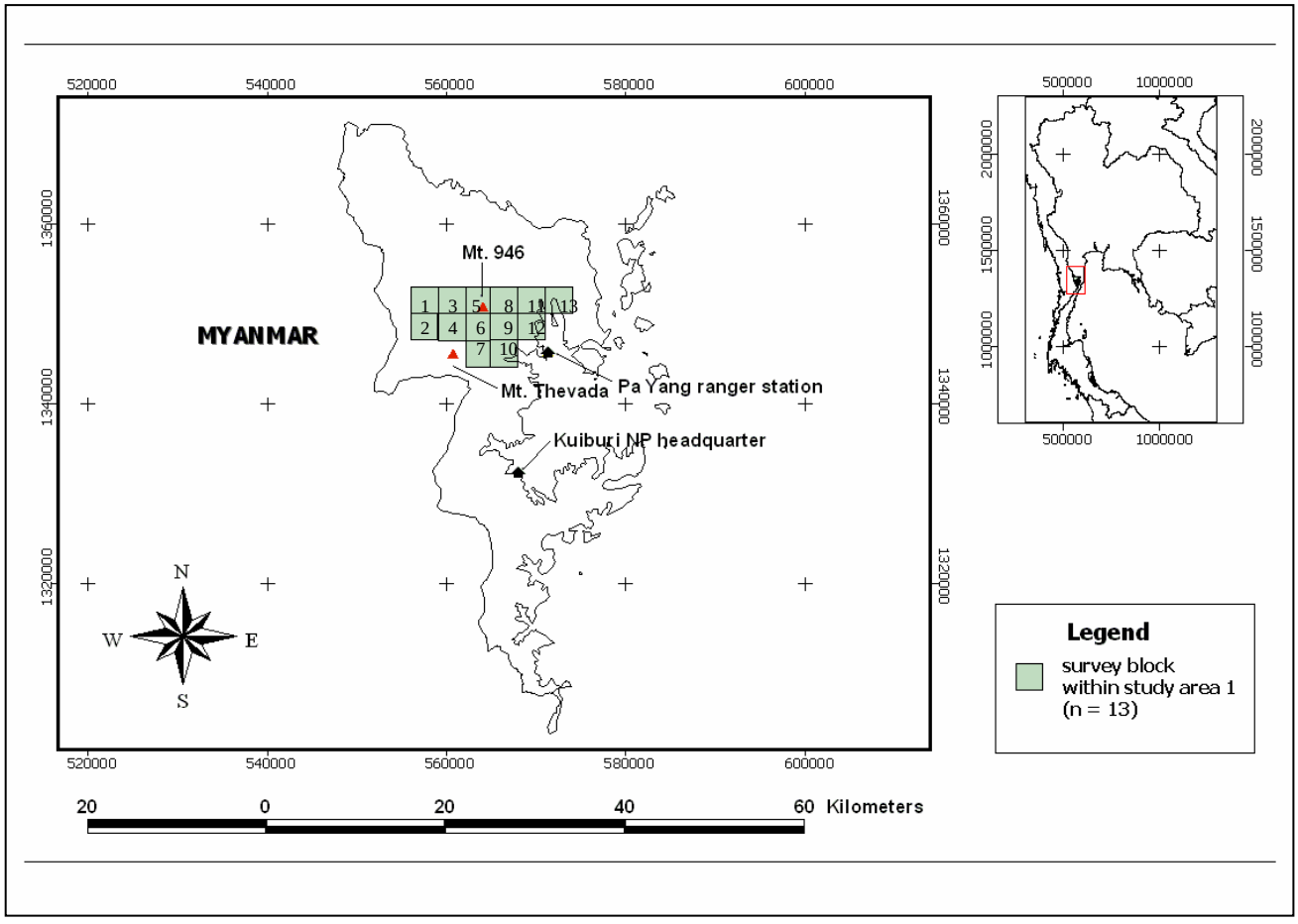
Wildlife survey #1

Kuiburi National Park
Study area 1 (central Kuiburi)
February 26 – March 10, 2006

Study area

The central portion of Kuiburi National Park was chosen as the project's first long-term study area (Figure 1). The western half of this area lies within a few kilometers of the Myanmar border, represents the most remote core forest within the national park, and was previously unexplored by protected area rangers. In contrast, the eastern half is adjacent to agricultural areas, previous logging concessions, and is easily accessible to hunters. These different conditions are likely to be important from both the perspectives of both park management and local people. Thus, the area seemed suitable for fulfilling one of the project's main objectives: describing and understanding links between large mammal distribution and abundance, and patterns of forest use, in different areas.

Figure 1. Kuiburi National Park, showing study area 1, and numbered survey blocks in which large mammal research was conducted.



Methods

- The study area was divided into 13, 9 km^2 blocks (Figure 1).
- Each block received one day of effort by a team of 2-3 people.

Carnivores

- Teams walked slowly (1-2 km /hour) along streams, trails, or ridges searching for signs of tigers and other large carnivores. These linear topographical features were divided into 1 km sample units, in which signs of tigers and other large carnivores were recorded as present or absent.
- Repeat surveys were conducted within each block in the same day (by the same team) by walking along different 1 km routes. This produced a capture history of sign encounters for each block; this capture history was used to estimate detection probability and proportion of area used by tigers (Karanth & Nichols 2002).
- The sign data were also used to derive an index of relative abundance, expressed as the proportion of 1 km survey segments in which signs were found.
- All large carnivore scats (> 2.0 cm) encountered were collected (for later analysis).
- Signs of tigers were differentiated from leopards by hind foot pad width > 7.5 cm, and other dimensions. Scats > 3.5 cm diameter were considered to be from tiger. Felid scrapes were classified as large cat sp. unless accompanied by a clear measurable foot print.

Herbivores

- To determine relative abundance of large herbivores, 3 permanent 400 m sign transects were established in each survey block, along the same routes that teams used to search for tiger signs.
- Each transects was divided into 8, 50 m long segments (with a hipchain). Signs of focal species were recorded as present or absent within each segment.
- Signs of herbivores that live in herds (pigs, wild cattle, elephants) were distinguished from signs of individual males, to reflect differences (if any) in habitat use and abundance between different social units of these species.
- An index of relative abundance was derived from the proportion of transect segments with signs of a species, across the study area overall, and within each survey block. We considered four classes of abundance: rare (species observed on <5 % of transect segments), uncommon (6-20%), common (21-50%), and abundant (>50%).
- The diversity of size classes of prey species influences the capacity of an area to support the coexistence of tigers and other large carnivores. This feature of the prey base, here called *prey diversity*, was summarized for each block according to the presence or absence of prey in multiple size classes (Table 1), following Smith et al. (1999).

Table 1. Prey diversity classes used to categorize the value of survey blocks to large carnivores in Kuiburi National Park.

Prey diversity	Prey species present	Size class
Low	muntjac and/or wild pig	Small
Medium	muntjac and/or wild pig + sambar or wild cattle sp.	Small + medium
High	muntjac and/or wild pig + sambar + wild cattle sp.	Small + medium + large

Habitat conditions and local people's use of the forest

Within each survey block, we noted (1) the type of forest (semi-evergreen, mixed deciduous, bamboo), (2) structural conditions (canopy cover closed or open, canopy tall or low, abundance of bamboo), and (3) indications of human use of the area.

Results

Survey effort

A team of seven people (3 WWF biologists, 4 rangers) spent 13 days in the central study area. Work was conducted from 5 different base camps (Figure 2). We established 21 prey sign transects, and walked a total of 38 km in search of tiger signs.

Distribution and relative abundance of large carnivores

- Signs of six species of large carnivore were found during the survey (Table 2, Figure 2). In addition, one dhole was observed in semi-evergreen forest along a stream.
- The estimated proportion of the study area used by tigers was 0.47 (47 %) (Table 2). This estimate has relatively low precision (standard error 0.38) because detection probability of tiger signs was low (0.25). Increasing our present sample effort (13 blocks, 3 repeat surveys) would improve the accuracy and precision of this estimate, and will be possible as we survey additional areas (i.e., study area 2).
- Tiger and leopard signs were equally abundant (0.08 signs/km) (Figure 3), though leopard signs were slightly more widespread within the study area (Figure 2).
- Signs of large cats (unidentified to species) were widespread and relatively abundant (0.16 signs/km); these consisted of scats between 2.0-3.4 cm and scrapes without accompanying footprints. One large scat (3.3 cm diameter) in one block was probably from a tiger.
- Clouded leopard signs (scrapes, footprints, scat) were clumped along a stream in semi-evergreen forest in a single survey block (Figure 2).
- Tigers and leopards occurred in blocks with low, medium, and high prey diversity. They were especially concentrated in the medium diversity blocks along the entire northern section of the study area.
- Both bear species (Asiatic black bear and sun bears) are present in the study areas, based on ranger sightings and from claw mark measurements on climbed trees. Only footprints (species combined) are summarized in Table 2.

Table 2. Summary of the occurrence of large carnivores in central Kuiburi National Park (study area 1), February/March, 2006.

Species	Number of survey blocks at which signs found	Proportion of survey blocks at which signs found	Detection probability	Estimated proportion of study area used (standard error)
Tiger	3	0.23	0.246	0.47 (0.38)
Leopard	4	0.31	0.121	*not calculated*
Clouded leopard	1	0.08	*not calculated*	*not calculated*
Large cat sp.*	7	0.54	0.212	1.00 (0.0)
Dhole	1	0.08	*not calculated*	*not calculated*
Bear sp.	3	0.23	*not calculated*	*not calculated*

* Tiger signs plus unidentified large cat signs possibly from tiger; see methods.

Figure 2. Distribution of large carnivores and tapir in Kuiburi National Park, February/March, 2006, based on signs and sightings.

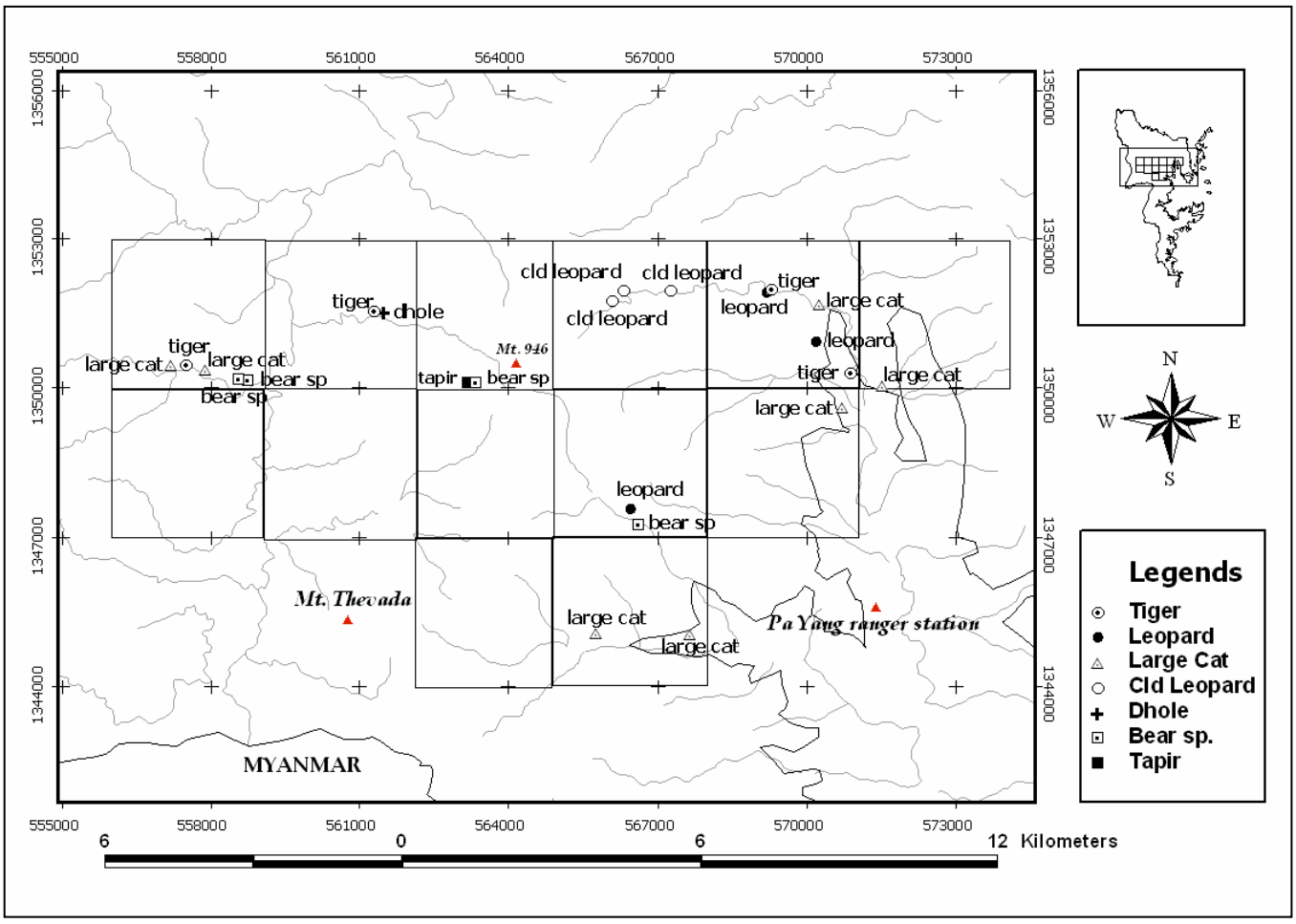
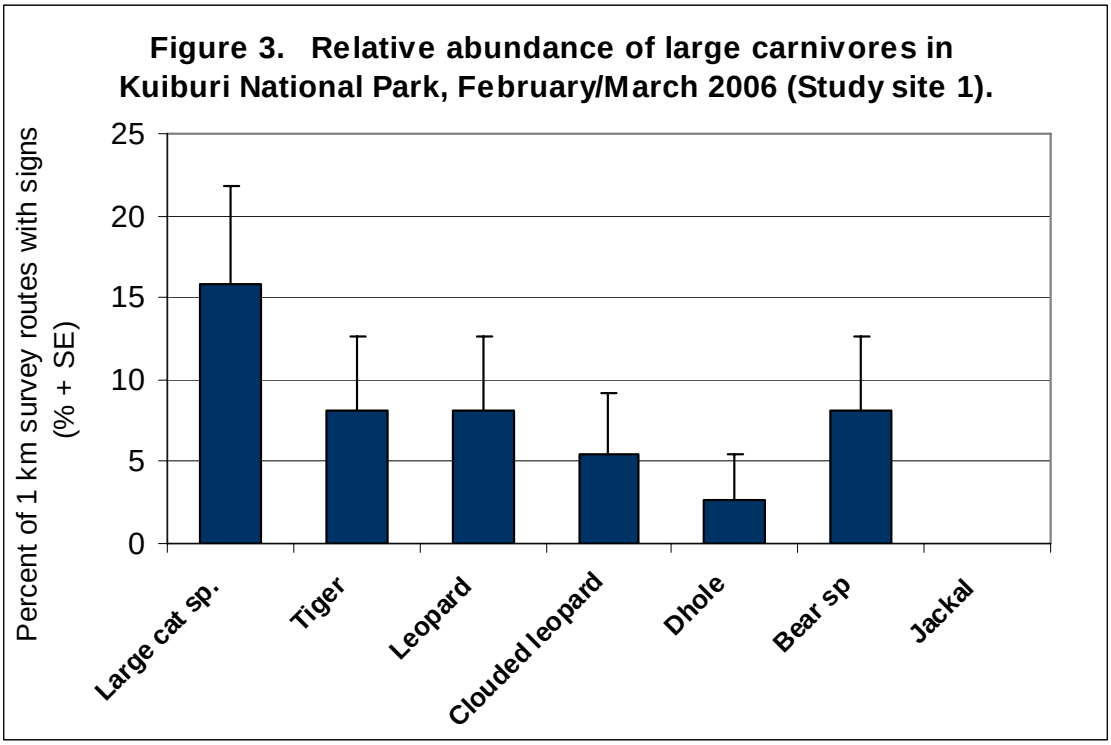


Figure 3. Relative abundance of large carnivores in Kuiburi National Park, February/March 2006 (Study site 1).



Distribution and relative abundance of herbivores

- Herbivore relative abundance is summarized for the entire study area (Figure 4), and spatially for each species (Figures 5 to 17).
- No species was considered abundant (e.g., with signs in >50% of transect segments) in any survey block.
- Muntjac was the most widespread and abundant of the herbivore species (Figures 4, 5). They were especially abundant in the eastern portion of the study area where secondary forest occurred.
- Tapir was the rarest herbivore species; signs were found at a single location, along a high ridge near mountain Mt. 946 in semi-evergreen forest at 900 m elevation (Figure 2).
- Gaur were more abundant and widespread than banteng, however most signs were of single animals rather than herds (Figure 7, 8). Signs of banteng herds were also generally rare, but common in one central block (Figures 9, 10).
- Herds of pigs were consistently absent or rare, though signs of single individuals were widespread (Figures 11, 12).
- Overall, three blocks had high prey diversity (23% of the study area), three had low diversity (23%), and six had medium diversity (46%) (Figure 18). The high diversity in the northwestern corner of the area was due to the presence of domestic cattle. The other two high diversity blocks contained a complete assemblage of small (muntacs, pigs), medium (sambar), and large (wild cattle) prey species.
- Single male elephants were concentrated in the eastern portion of the study area, where they were common along streams within evergreen forest (Figure 15).
- Elephant herds occurred mostly along the eastern and southern edges of the study area (Figure 16). Their distribution thus overlapped with areas where secondary forest (from past logging and pineapple plantations) was abundant. Elephant herds generally did not occur within the core of the study area. There was one exception: signs of a small herd (3-4 animals including a calf) were found deep within evergreen forest in one block.
- Elephants were absent from the western half of the area (Figures 15, 16).
- Old elephant signs (> 2 months; Figure 17) were distributed similarly to recent signs, indicating that the population was distributed similarly in the cool season (December-January, when the signs were made).

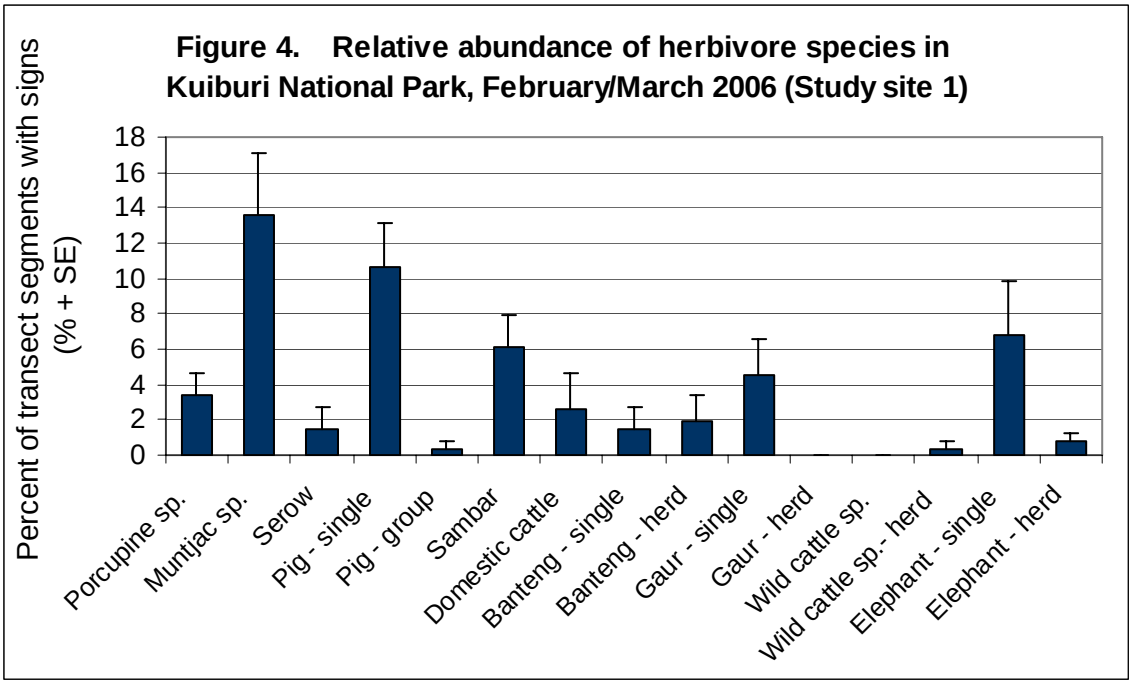


Figure 5. Abundance of Muntjac spp. in Kuiburi National Park (Study area 1, February/March 2006)
Abundance classes derived from percentage of transects segments with signs

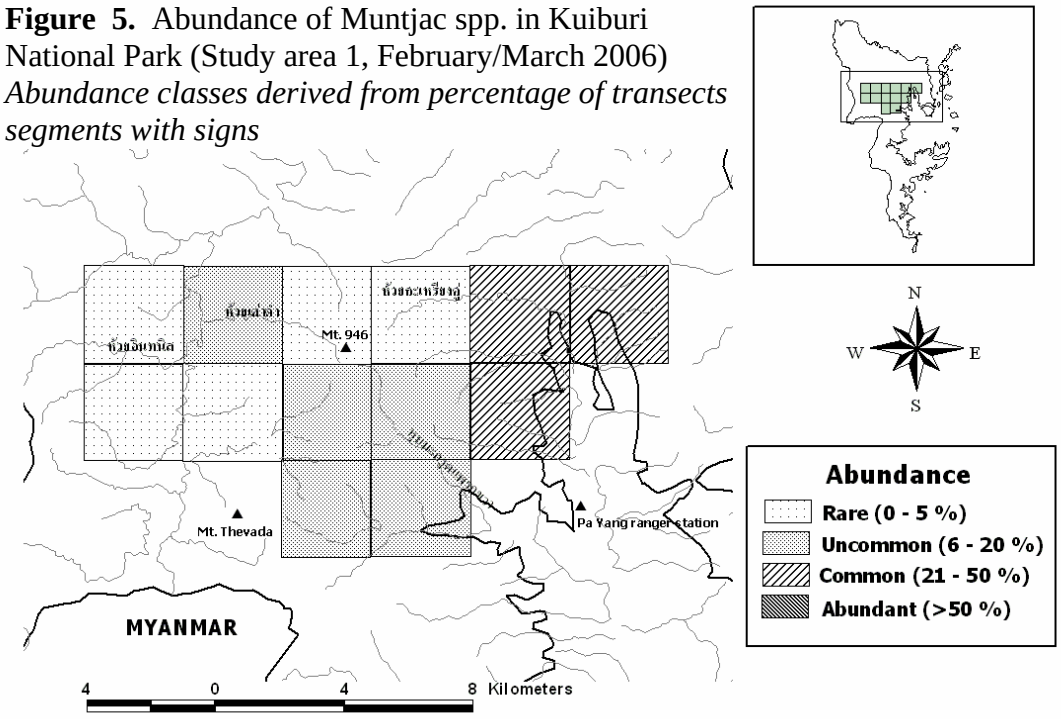


Figure 6. Abundance of Sambar in Kuiburi National Park (Study area 1, February/March 2006)
Abundance classes derived from percentage of transects segments with signs

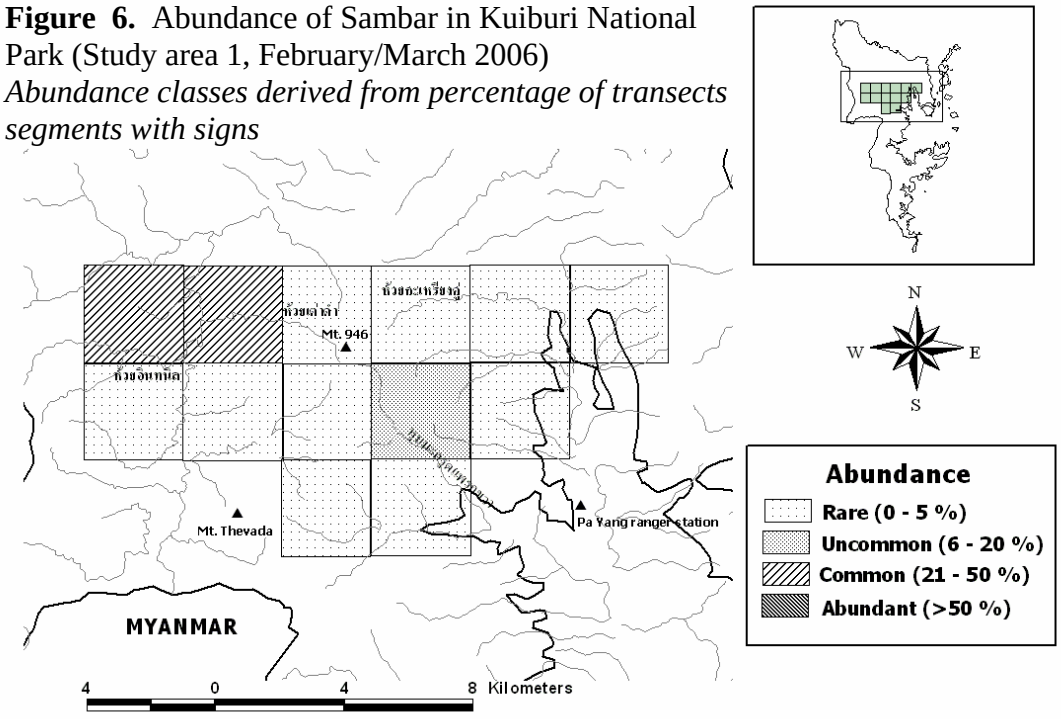


Figure 7. Abundance of Gaur (single individuals) in Kuiburi National Park (Study area 1, February/March 2006). *Abundance classes derived from percentage of transects segments with signs.*

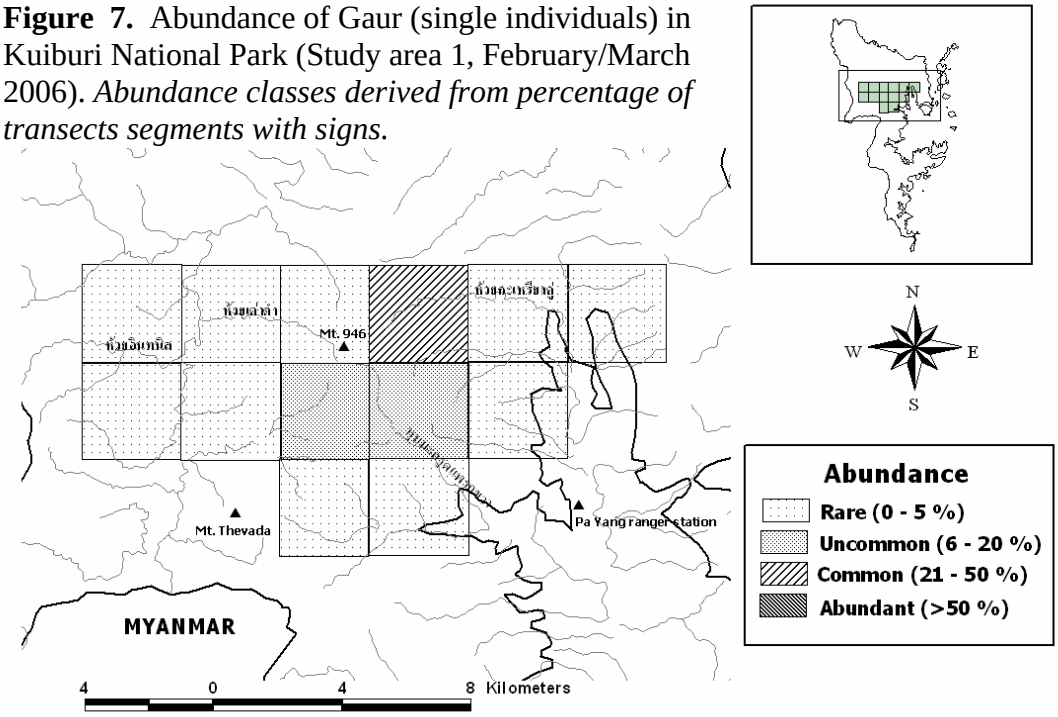


Figure 8. Abundance of Gaur (herds) in Kuiburi National Park (Study area 1, February/ March 2006). *Abundance classes derived from percentage of transects segments with signs.*

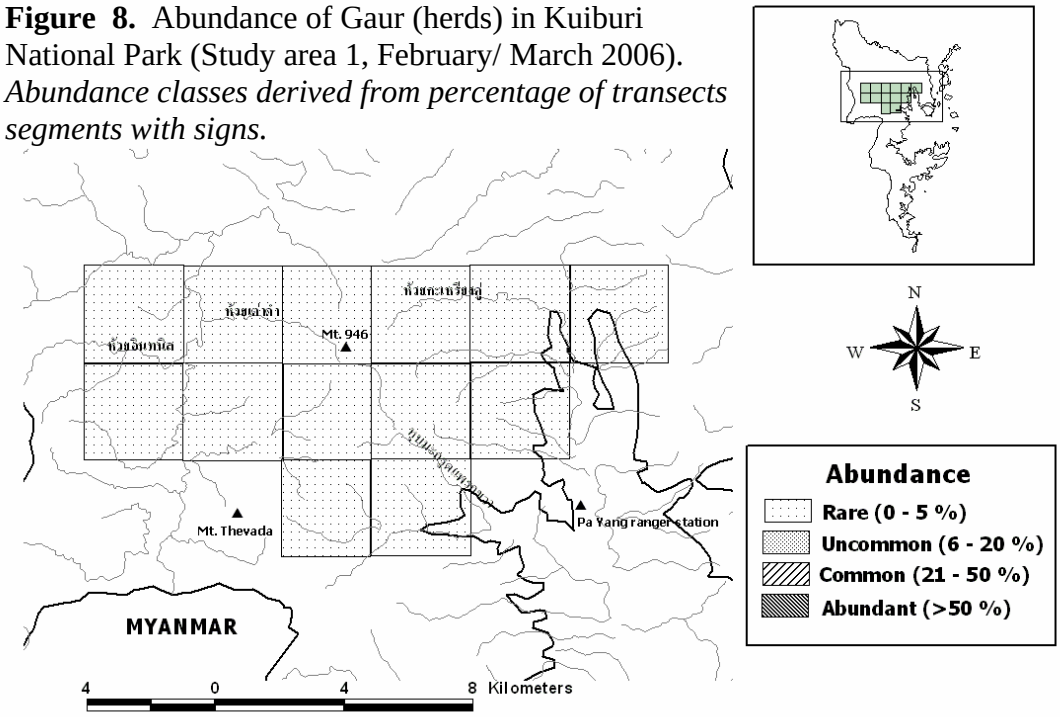


Figure 9. Abundance of Banteng (single individuals) in Kuiburi National Park (Study area 1, February/ March 2006). *Abundance classes derived from percentage of transects segments with signs.*

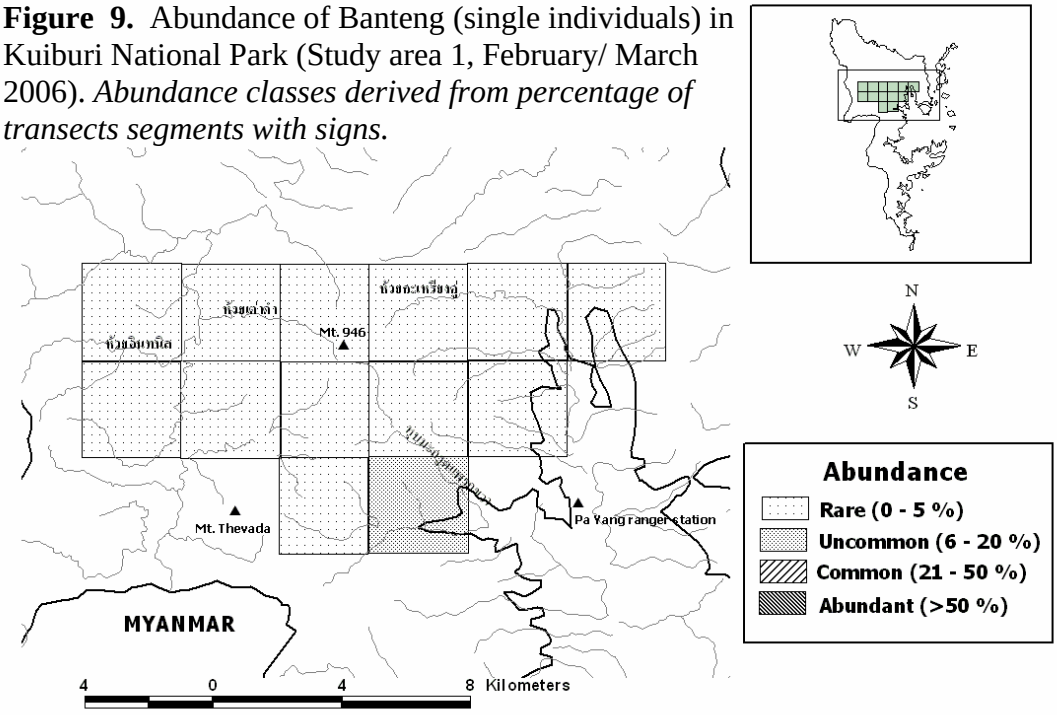


Figure 10. Abundance of Banteng (herds) in Kuiburi National Park (Study area 1, February/ March 2006). *Abundance classes derived from percentage of transects segments with signs.*

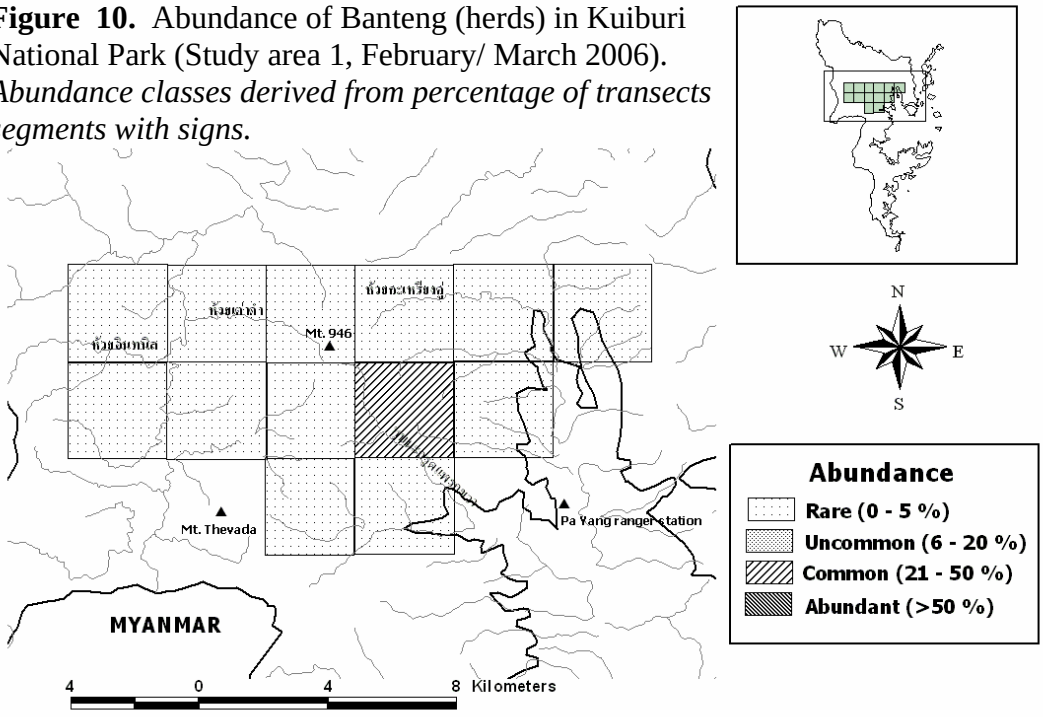


Figure 11. Abundance of Pig (single individuals) in Kuiburi National Park (Study area 1, February/ March 2006). *Abundance classes derived from percentage of transects segments with signs.*

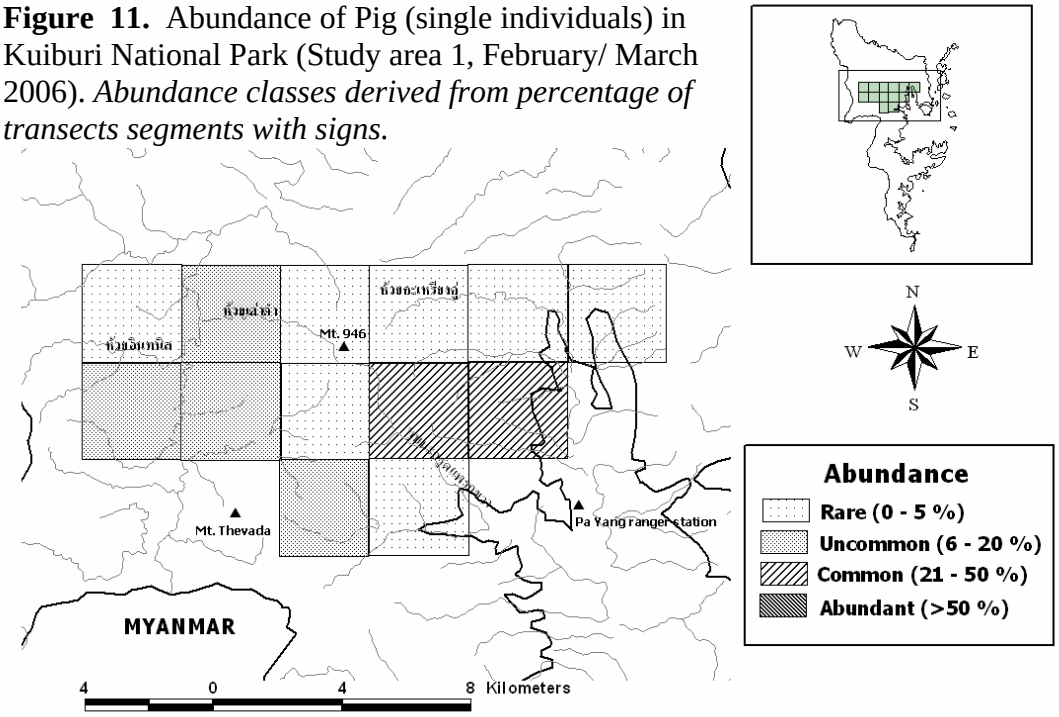


Figure 12. Abundance of Pig (herds) in Kuiburi National Park (Study area 1, February/ March 2006). *Abundance classes derived from percentage of transects segments with signs.*

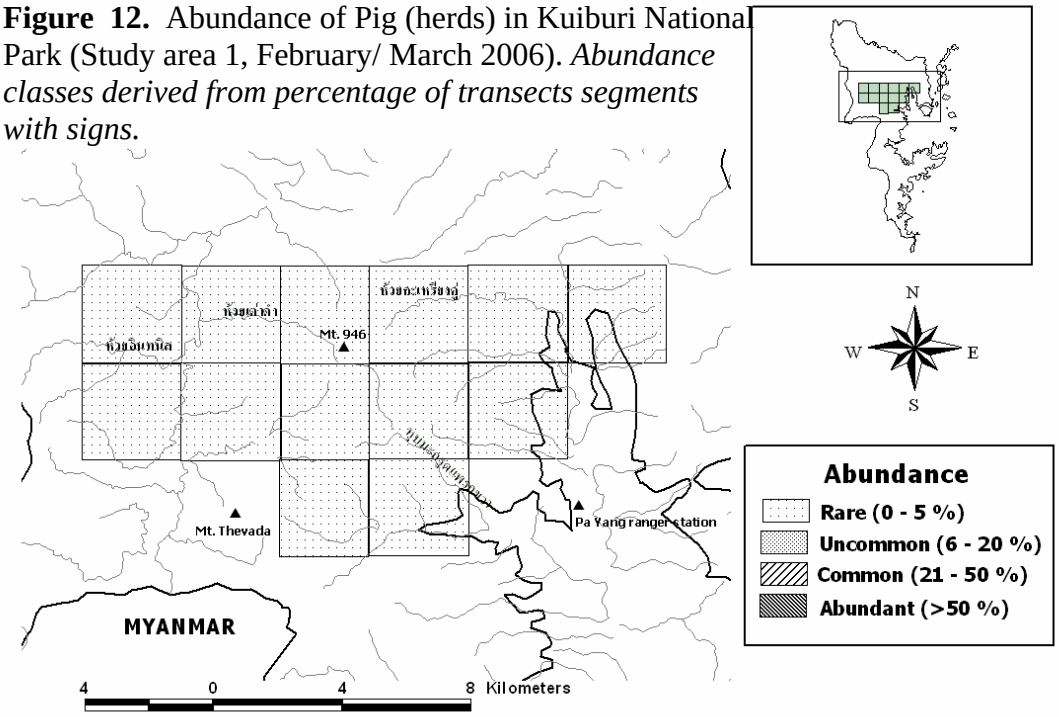


Figure 13. Abundance of Domestic cattle in Kuiburi National Park (Study area 1, February/March 2006). *Abundance classes derived from percentage of transects segments with signs.*

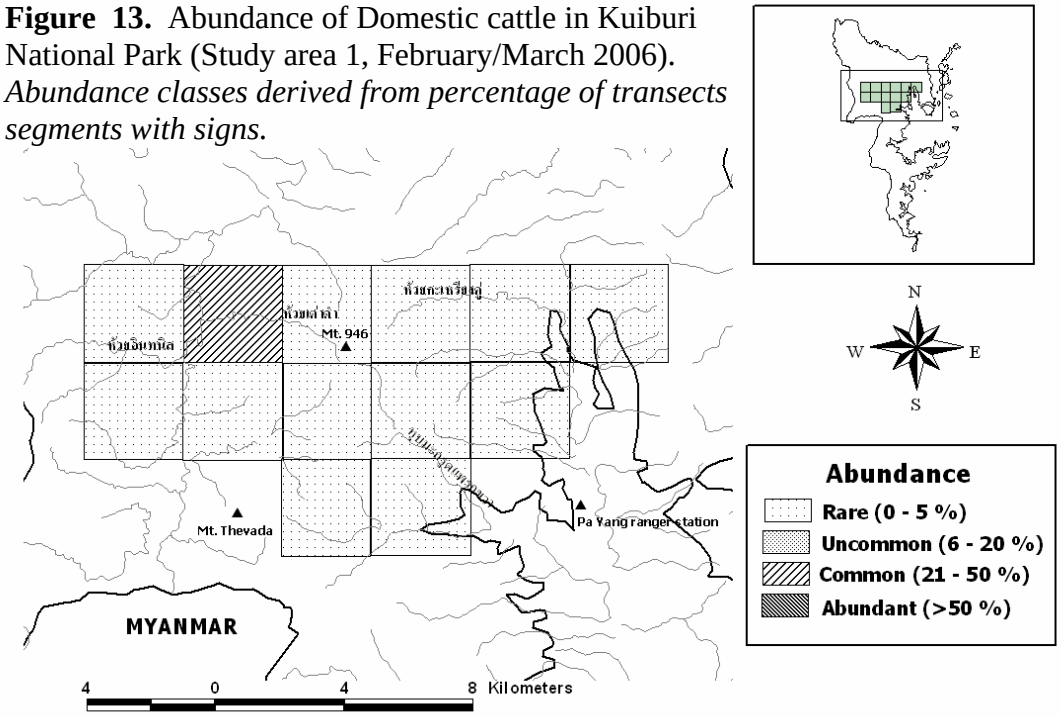


Figure 14. Abundance of Porcupine spp. in Kuiburi National Park (Study area 1, February/March 2006). *Abundance classes derived from percentage of transects segments with signs.*

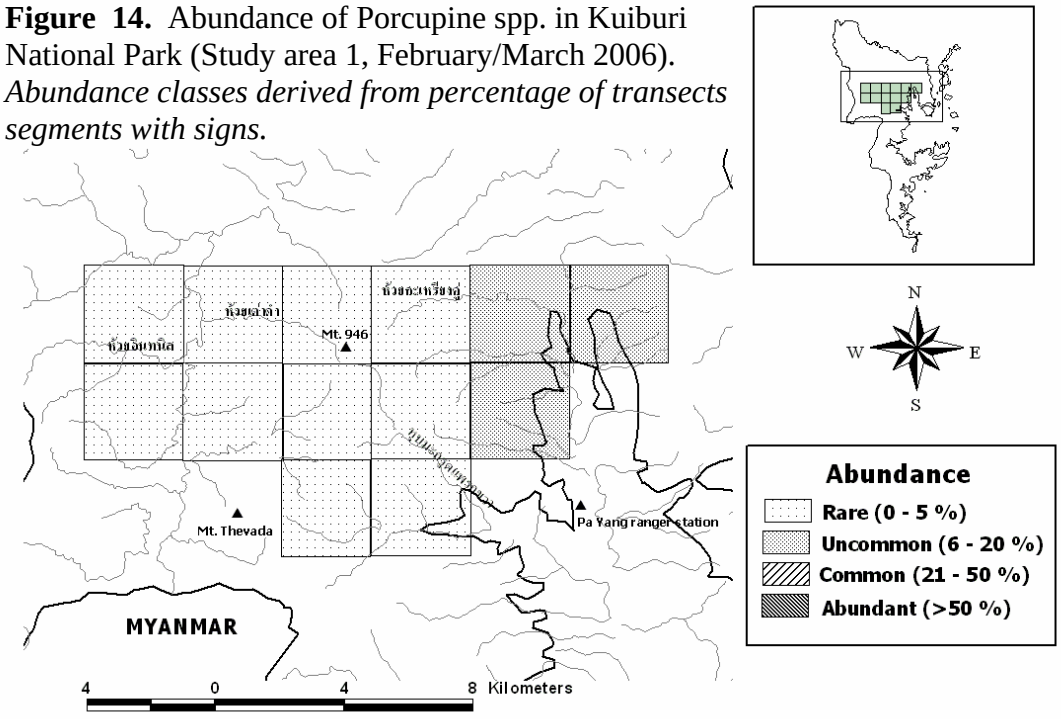


Figure 15. Abundance of Elephant (single individuals) in Kuiburi National Park (Study area 1, February/ March 2006). *Abundance classes derived from percentage of transects segments with signs.*

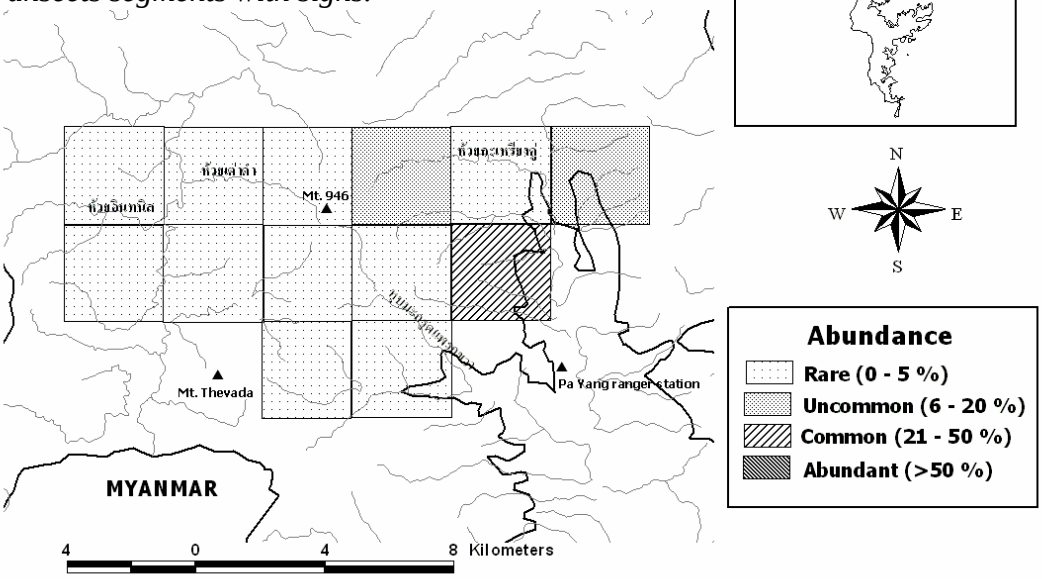


Figure 16. Abundance of Elephant (herds) in Kuiburi National Park (Study area 1, February/ March 2006). *Abundance classes derived from percentage of transects segments with signs.*

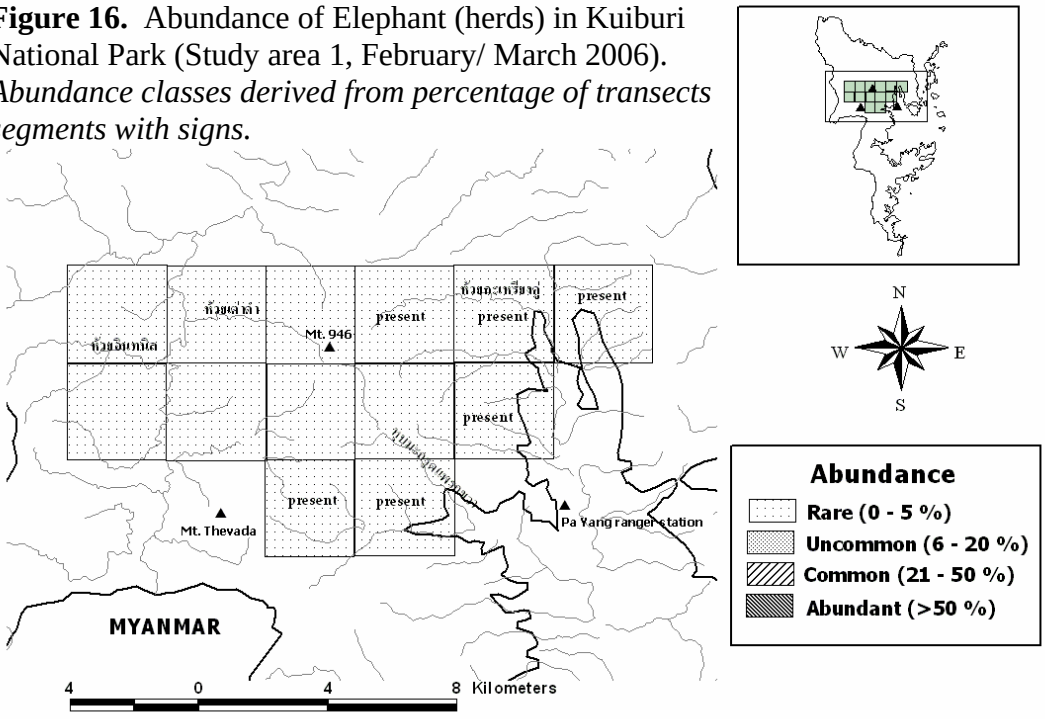


Figure 17. Abundance of Elephant (old signs) in Kuiburi National Park (Study area 1, February/March 2006). *Abundance classes derived from percentage of transects segments with signs.*

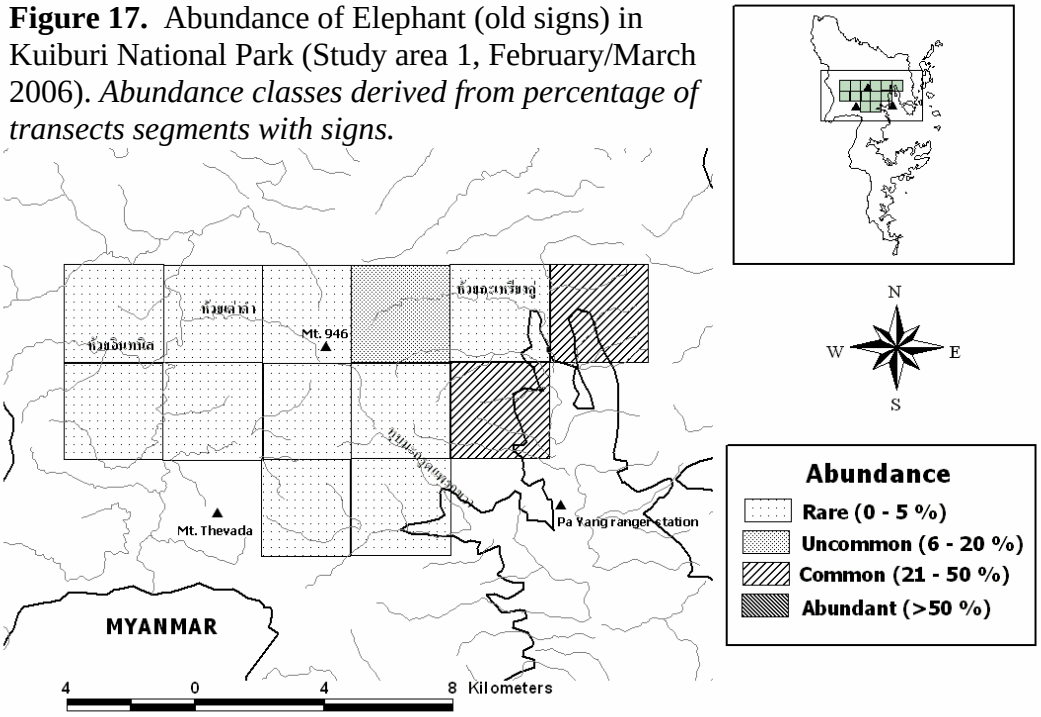
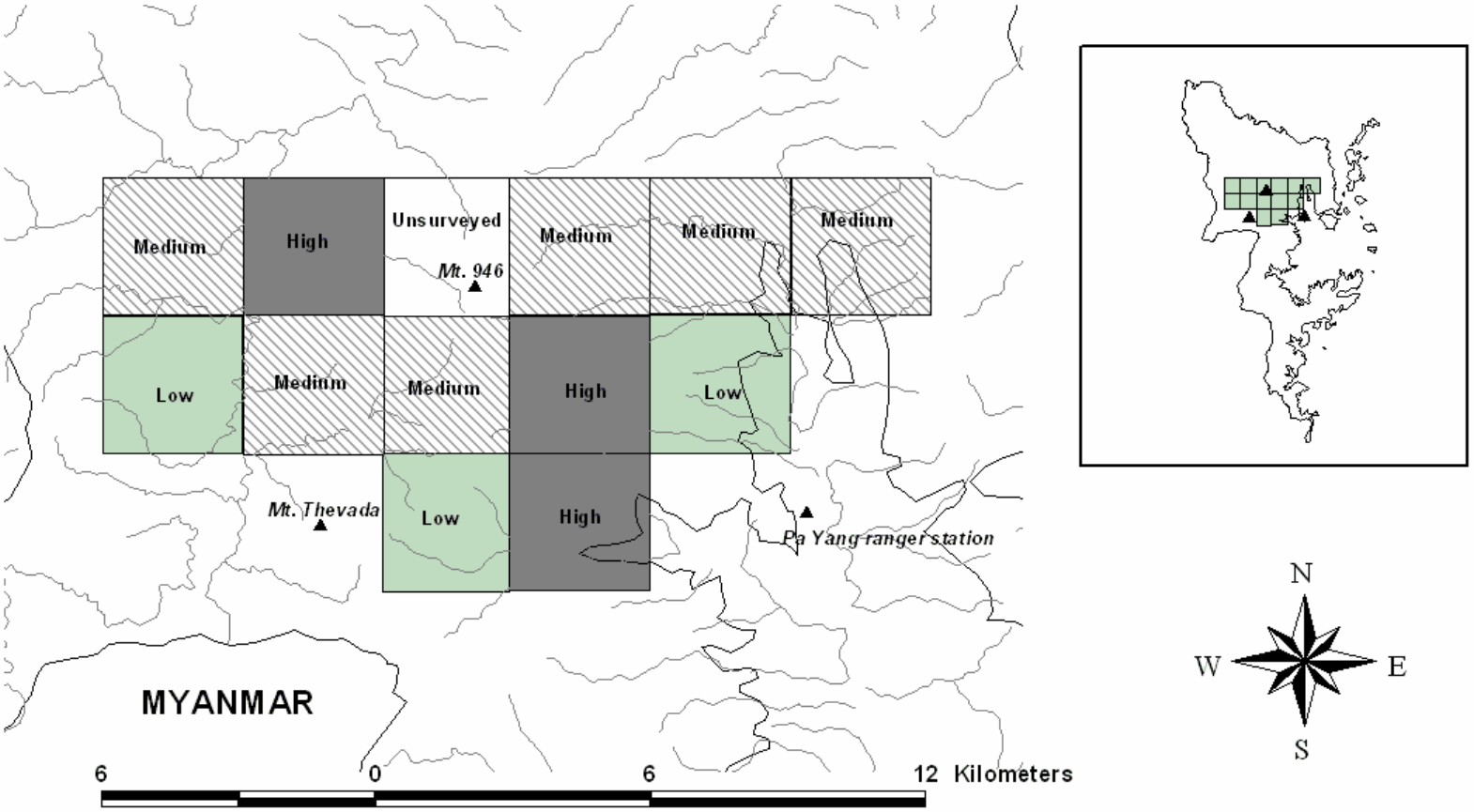


Figure 18 Ungulate diversity in Kuiburi National Park (study site 1), according to size class distribution of species present (see text) during survey, February 26-March 10, 2006.



Habitat conditions and local people's use of the forest

Forest types and their conditions varied greatly within the study area (Table 4). The eastern portion of the area was heavily logged about 20 years ago resulting in large expanses of open grassy, or vine-dominated areas. The central portion of the study area is the most mountainous, and supports little-disturbed semi-evergreen forest. The western portion is dominated by mixed deciduous forest, of which bamboo is a major component. This area was inhabited for about 90 years by Karen farmers. Seven years ago they were relocated to Pa Maak village, near the northern border of the national park.

Table 4. Forest types and conditions of wildlife habitat in Study area 1, Kuiburi National Park.

Survey block	Forest type	Comments, and condition of habitat
1	Mixed deciduous forest, semi-evergreen forest	Bamboo common in understory, resulting from past cultivation by villagers in this area.
2	Mixed deciduous forest, semi-evergreen forest	Patches of bamboo dominated forest interspersed with denser evergreen forest.
3	Mixed deciduous forest, semi-evergreen forest	Old village area. Bamboo abundant.
4	Mixed deciduous forest, semi-evergreen forest	Patches of bamboo dominated forest interspersed with denser evergreen forest.
5	Semi-evergreen forest	Tall forest in good structural condition, little disturbance.
6	Semi-evergreen forest	Tall forest in good structural condition, little disturbance.
7	Semi-evergreen forest	Moderately good condition.
8	Semi-evergreen forest , Mixed deciduous forest	50% of the area in moderately good condition, but about 50% of the block was logged commercially in the past..
9	Semi-evergreen forest	Good condition.
10	Mixed deciduous forest, semi-evergreen forest	Secondary forest recovering from commercial logging.
11	Mixed deciduous forest, semi-evergreen forest	Secondary forest recovering from commercial logging.
12	Mixed deciduous forest	Secondary forest recovering from commercial logging, open areas with no tree cover occur.
13	Mixed deciduous forest, semi-evergreen forest	Secondary forest recovering from commercial logging, open areas with dense vine cover are prevalent – movement very difficult.

The distribution of human uses of the forest in Study area 1 is presented in Table 5. Local use in the western portion of the study area was mostly subsistence-oriented at the time of our survey. In most cases local use appears to be of relatively low impact with regards to forest structure, plant species composition, and wildlife. Most activities we observed were related to gathering honey, gathering Galieng seeds (*Parkia timoriana*; sold to restaurants as a local specialty food), and fishing. No evidence of hunting was observed, although we searched for this at campsites. A small number of domestic cattle (< 20) are grazed within the park (Figure 13). The mountainous central portion of the study area had few indications of human use or passage (Table 5). The eastern portion of the study area also had little evidence of human use, however, Kuiburi rangers informed us this area was heavily hunted (perhaps in other months) by villages to the east of the park border.

Table 5. Local people's use of the forest in Study area 1, Kuiburi National Park.

Survey block	Human trails	Non-timber forest product collection	Domestic animals	Campsites
1	✓	✓	no	✓
2	✓	✓	no	✓
3	✓	✓	✓	✓
4	✓	no	no	✓
5	no	no	no	no
6	no	✓	no	no
7	✓	no	no	✓
8	no	no	no	no
9	no	✓	no	no
10	no	no	no	no
11	no	no	no	✓
12	no	no	no	no
13	no	no	no	no

The assistant headman of Pa Maak village showed us regenerating bamboo forest areas surrounding the village, in which sambar deer reside throughout the year. We saw a high density of recent foot prints of sambar deer in these bamboo areas. The villagers have independently started protecting this habitat for wildlife, and initiated a no-hunting policy focused on sambar deer. This is a very interesting initiative that we hope to build upon. Sambar deer are one of the major prey species for tigers.

Schedule for the next 7-month phase

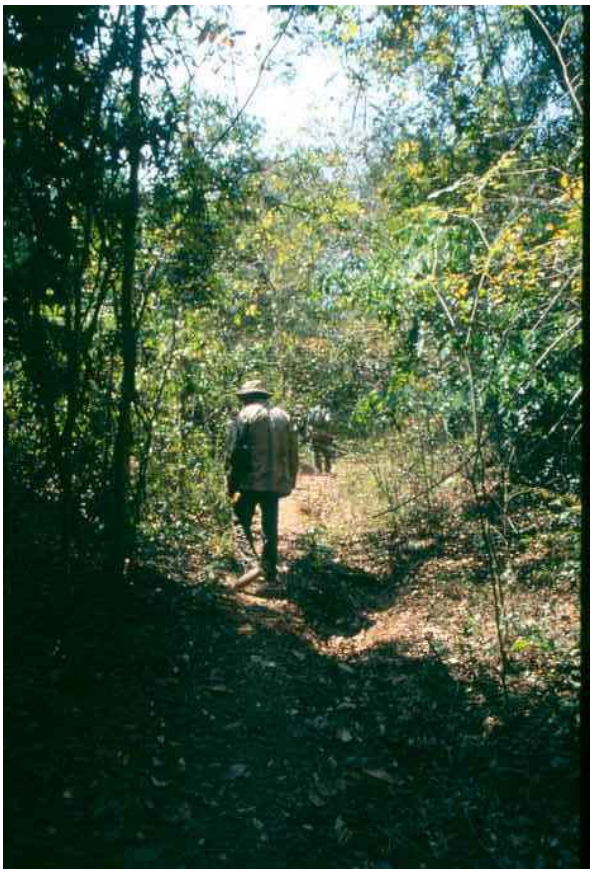
Activities/Tasks	**Jun 2006**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
Ecological research							
1. Wildlife survey #2 (establish signs transects and conduct presence/absence survey in study area 2)	X						
2. Data analysis with park staff		X					X
3. Camera trapping (*depends on funding**)					X	X	
4. Assist park to establish a monitoring system			X				
5. Training park staff in data entry and map-making			X				
Collaborative management							
1. Return results of wildlife surveys to 3 key villages			X				
2. Conduct wildlife workshop in Pa Maak village				X			
3. Discuss establishment of wildlife recovery zones, using Pa Maak sambar recovery zone as an example (see above).				X			

* Waiting for funding from US Fish & Wildlife Service to purchase equipment.

Training of Kuiburi National Park large mammal survey team (12 rangers), February 25, 2006. This training covered survey methods, focal species biology, and how to measure tracks of large carnivores. Most training, however, occurred in the forest, i.e., on the job (see photos below).

Photographs from the first large mammal field survey in Kuiburi National Park, February 26 – March 10, 2006. Permanent transects were established and their locations mapped. Survey teams searched along these transects for signs of focal species.

Sign transects followed streams, ridges, and elephant trails. We measured transect distance with a hipchain (upper left), and examined a 2-meter wide strip for tracks and signs of large mammals (bottom). Three transects required a full day to complete.



Large carnivore scats were collected for later analysis of contents. Scat analysis will provides a link for understanding the relationship between prey abundance and the status of the large carnivore community.

Examples of carnivore tracks and signs encountered. The top photo is the left hind footprint (superimposed on the front footprint) of an adult tiger. We found evidence for 2-3 tigers in the study area. The lower left photo shows a medium-sized cat foot print, perhaps a golden cat. In the lower right is a scrape from a clouded leopard; its scrapes were concentrated along one stream in semi-evergreen forest. Clouded leopards are rarely-seen and little-studied animals. Conclusive evidence of their presence, such as these scrapes and footprints, are rarely found.