The Republic of the Union of Myanmar

Ministry of Forestry

Forest Department

Taninthayi Nature Reserve Project

A Report on Malayan Tapir (*Tapirus indicus*) surveyed in Taninthayi Nature Reserve

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1 Executive Summary

Taninthayi Nature Reserve, an area of (1700) km^2 which is situated in Taninthayi Range, southern Myanmar had been notified in 2005 mainly to conserve tropical rain forest ecosystem and its biodiversity. TNR posses many endangered mammals species such as tiger, elephant, gaur and tapir, etc. To know the abundance, distribution and ecology of Malayan Tapir (*Tapirus indicus*) in TNR, a consultancy has been awarded from March 2011 to end of June 2011 (4 months). Camera trapping, tracks and sign and questionnaire survey methods were used.

A total of 62.06 km distance was walked during the survey with an encounter rate of 0.05 per km. A total of 631trap nights recorded 2,774 pictures during the survey. The 19 species of mammals, 1 reptile and 1 bird species were recorded. A total of 3 individuals of tapir were recorded by camera traps in 2 different sites at *Khotama* and

Make Byat ka than salt licks. The *Yebone* salt lick and its vicinity had been defined as tapir presence area by previous year's camera trap data and footprint recorded by tiger survey consultant as well in 2011. But no sound data available for population and density by capture – recapture methods.

A total of (119) persons from (21) villages and (2) battalion infantry were interviewed. The 90.75 % of the interviewees had encountered tapir last 14 years ago (n = 119). And then 29.41% of them were encountered eating tapir meat. But only (4.2%) of the interviewees had seen tapir carcass and skeletons. According to interview results, records of 26 individuals of tapirs were killed by local hunters and elephant capturers within last 2 decades. Those populations killed are almost identical with the total number of tapirs in Huai Kha Khaeng Wildlife Sanctuary from Thailand and 58 % population of Kru Wildlife Reserve from Malaysia. The fate of Tapir in TNR occurred during two major periods, viz., the elephant capturing by pit fall traps (1981 to 1996) and during legal commercial logging border trade period with Thailand (1989 – 1996). Diets for tapir are poorly known in TNR.

Hunting and habitat depredation are major threats to tapir in and around TNR region. The awareness program, effective law enforcement and biological surveys are strongly recommended as Tapir conservation program in future. Occupancy survey and further study are needed. Myanmar Tapir Conservation and Action Plan are recommended to formulate with other line agencies for effective conservation of dwindling Tapir population in Myanmar.

Keyword: camera trapping, hunting, Malayan Tapir, population, Taninthayi Nature Reserve.

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3 Abbreviations

CITES	Convention on International Trade in Endangered Species of Wild Fauna and Flora
DNA	Deoxyribonucleic acid
EE	Environmental Education
FD	Forest Department
FIT	Footprint Identification Technique
IUCN	International Union for Conservation of Nature
LOUs	Local Operation Units

MGTC	Mottama Gas Transportation Company
MVP	Minimum Viable Population
NC	National Consultant
NTFP	Non - Timber Forest Product
NWCD	Nature and Wildlife Conservation Division
PAS	Protected Area System
TNR	Taninthayi Nature Reserve
TNRP	Taninthayi Nature Reserve Project
TOR	Term Of Reference
TPC	Taninthayi Pipeline Company
TSG	Tapir Specialist Group
WEFCOM	Western Forest Complex

4 Introduction

Myanmar, covering an area of 667,553 square kilometers is endowed with vast areas of natural forest ranging from beach and dune forests, mangrove forests in coastal and delta areas in the south to varied terrestrial vegetation of dry and moist deciduous

forests and evergreen forests in the central and coniferous dominated sub-temperate forest types on the high mountainous parts of far north and tropical evergreen forests in southern Taninthayi *(Tenasserim)* Range. The Taninthayi Range is clothe with pristine rain forests and possesses galore wildlife in Myanmar and significant place for Trans - boundary conservation between Myanmar and Western Forest Complex (WEFCOM) of Thailand. (Tordoff *et al*, 2005).

To conserve the tropical rain forest and its flora and fauna, Taninthayi Nature Reserve (TNR) was declared as Nature Reserve under Protected Areas System (PAS) in 2005 with a total area of 1700km ^{2}. It consists of three reserves, viz., the eastern parts of *Kaleinaung* Reserve and *Heinze* Reserve (857 km^2), and *Luwaing* Reserve (843km^2). These reserves were declared as Reserve Forests in 1885, 1902 and 1932 respectively which are one of the oldest reserved forests consisting of tropical rain forests in Myanmar. The endangered mammals species such as Tiger (*Panthera tigris*), Leopard (*Panther pardus*), Asian Elephant (*Elephas maximus*), Asian Black Bear (*Ursus thibetanus*), Sun Bear (*Helarctos malayanus*), Gaur (*Bos frontalis*), primates species and Malayan Tapir (*Tapirus indicus*) can be found in TNR (Ye Htut *et al* .,2008). And also 244 species of birds (Nay Myo Shwe *et.al, 2008*) and 82 species of reptiles and amphibians are recorded in TNR. (Vindum,2010)

5 Taxonomy and Distribution of Tapirs

The word “Tapir” comes from Brazilian Indian word meaning “thick,” which refers to its hide. The Tapir family Tapiridae is part of the order of Perissodactyla (odd toed ungulates). Members of this order are large, herbivorous mammals with one or three

toes on each foot (except tapirs, which have four toes on each front foot)(Francis. 2008).The family Tapiridae was first recognizable as a taxonomic entity in the Eocene of North America, nearly 50 million years ago. The genus Tapirus first appeared in the Miocene (25-5 Million years ago), so extant tapirs derive from an ancient lineage that is related to the primitive horse and to the rhinoceros (Medici, 2010). (See Table .1)

Table 1. Living families of Perissodactyla

Family	Common Name	Genera	Species	Distribution
Equidae	horses, asses, zebras	1	6	Ethiopian , Palearctic
Rhinocerotidae	rhinoceroses	4	5	Ehiopian, Oriental
Tapiridae	tapirs	1	4	Neotropical, Oriental

The Tapir family Tapiridae consists of four species (see Table . 2), three of which are found in Central and South America, with the Asian (or Malayan) tapir *Tapirus indicus* being the only Old World species(see Figure . 2). Tapirs are nocturnal, shy and inoffensive, minding their own business and keeping well out of sight in the dense undergrowth near water (Tun Yin, 1966).

Table 2. Living species of Tapiridae

Species	Common Name	Distribution
Tapirus indicus	Malayan Tapir	Myanmar, Thailand, Malaysia and Indonesia
Tapirus pinchaque	Mountain Tapir	Colombia, Ecuador and northern Peru
Tapirus terrestris	Lowland Tapir	Brazil, Columbia, Paraguay, Argentina.

Tapirus bairdii	Baird's Tapir	Mexico, Central America, northern Colombia

Figure 1. Left to right: Malayan Tapir, Mountain Tapir, Lowland Tapir and Baird's Tapir

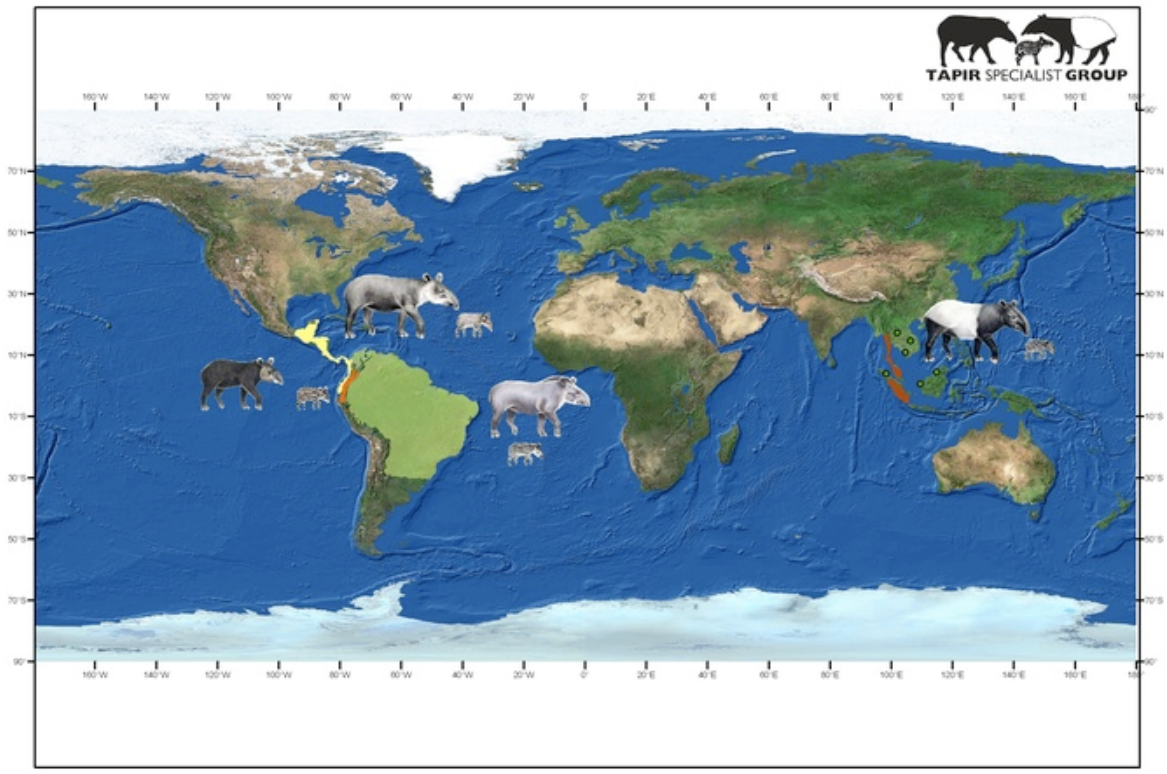


Figure 2. Tapirs habitat range. Map by Carlos Pedraza, TSG, 2008.

6 Justification

Malayan Tapirs (also called Asian Tapir, Malay Tapir or Blanket Tapir) *Tapirus indicus* are the largest of all tapir species. The species occur in two disjunct and isolated

populations, the first one occurring on mainland Southeast Asia – Peninsula Malaysia, Thailand, and Myanmar and the other in the southern and central parts of the island of Sumatra in Indonesia.

Historically the range extended through Myanmar and Thailand to Cambodia and Viet Nam, but much of the former range is now highly fragmented (Khan, 1997). The species present range is restricted to South East Asia, with scattered population in Thailand, Myanmar (south of latitude 18°N; Lekagul & McNeely, 1997), Peninsular Malaysia and Sumatra (see Figure. 3).

Figure 3. Range of Malayan Tapir (*Tapirus indicus*) (Map source; Carlos Pedraza, TSG, 2008 and IUCN)

The Malayan Tapirs are threatened throughout most of their range. The population is considered to present a higher level of endangerment. The species is listed as Endangered (EN) due to an ongoing population decline caused by habitat loss and fragmentation and increasing hunting pressure throughout its range. (TSG. 2008)

Malayan Tapir has been listed under CITES Appendix I and classified as Endangered (EN) on The IUCN Red list 2010. In Myanmar, the species has been listed as totally protected status under the Protection of Wildlife and Protected Areas Law (State Law and Order Restoration Council Law No.583/94, 1994).

The species currently is only known to be existed in the Taninthayi Region, a narrow strip of territory between Thailand and the Indian Ocean in the southern part of Myanmar. However, the past and present population of tapir, their distribution, ecology and potential threats in their natural habitats is little known. Therefore, it is necessary to assess the distribution, abundance and ecological factors of Tapir in Taninthayi Nature Reserve.

In order to know the distribution, abundance, ecology of Tapir in TNR and to assist the species management strategies, a national consultant was assigned with the following tasks from March 2011 to end of June 2011 (4 months).

Tasks

1. *Compile all known background information to understand current and historical Tapir occurrence in TNR.*
2. *Using topographic maps identify suitable areas for the detection of Tapirs and then ground check whenever possible.*
3. *Set camera traps in suitable areas where tracks or other signs have been found to document individual animals.*
4. *Collect large herbivores scat for DNA testing by WCS/AMNH so that herbivorous identities can be confirmed and interrelationships documented. This is particularly*

important to understand the dynamic role TNR plays as a potential genetic corridor between populations in western Thailand.

5. *Document historical killing and trade to understand presumed decline and key areas for law enforcement and/or educational activities.*
6. *Involve local LOU staff in all activities so that activities can continue once the consultancy is completed.*
7. *Provide recommendations for the recovery and long-term protection of the species in TNR*

7 Objectives

This survey was carried out with the following objectives:

- To estimate the Malayan Tapir abundance and distribution in TNR.
- To identified the major threats to Malayan Tapir in TNR.
- To support the ecological data of Malayan Tapir for TNR species management plan.
- To train local LOU staff in camera trap skills for follow up monitoring activities.
- To collect large herbivore scat for DNA test in order to know the potential genetic corridor between Myanmar and western Thailand.
- To provide recommendations for the recovery and long term protection of Tapirs in TNR

8 Study Area

8.1 Location

Taninthayi Nature Reserve – TNR covers (1700 km ^{2}) located between Ye - Dawei (*Tavoy*) road in the west along with the Andaman Sea and Myanmar - Thailand border in the east. TNR is located administratively in Yebyu and Dawei townships of

Dawei district in the northern part of Taninthayi Region in the south of Myanmar (see Figure .4). TNR is geographically located between 14˚20´50˝ N and 14˚57´55˝ N and 98˚ 5´10˝ E and 98˚ 31´32˝ E (Anon, RS & GIS, FD, 2007).

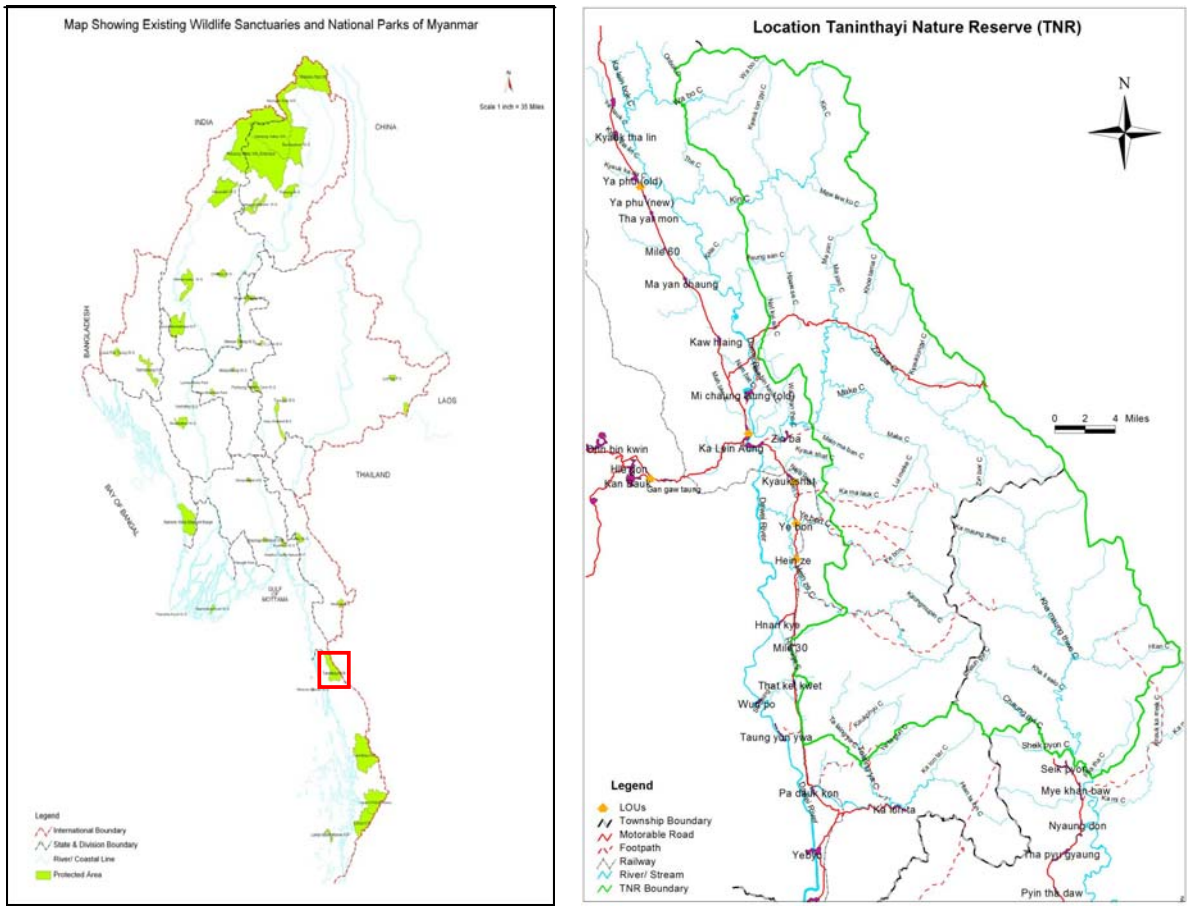


Figure 4. Location Map of the Taninthayi Nature Reserve

8.2 Climate

The climate in the study area is seasonally tropical monsoon with high rainfall. According to the weather station of Motamata Gas Transportation Company (MGTC), average annual rainfall near the study site was 5,326 mm in 2001 to 2010, with about 145 rainy days from May to October. (Rainfall pattern shown in Table. 3 and Figure 5).

Average temperature ranges from 25 to 28 °C with the hottest month being March and the coldest in January (Meteorological Department of Dawei District).

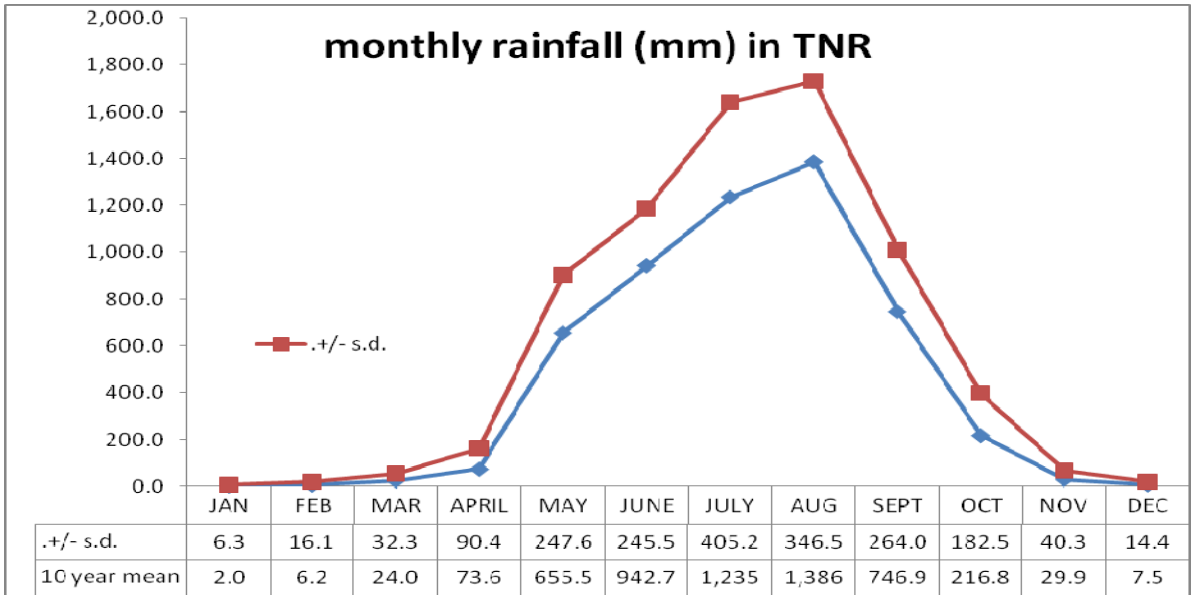
Table 3. Yearly rainfall (mm) from 2001 - 2010 in the study area Source: MGTC

MONTH	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
JANUARY	0	0	0	0	0	0	0	0	0	20
FEBRUARY	0	0	0	0	0	0	0	51	10.50	0.0
MARCH	80.8	0	80.4	0	8.3	32	0	6.50	31.50	0.0
APRIL	0	21	13.8	0	28	236.3	70	180	182.00	4.5
MAY	822.5	890.2	851.1	503.1	594.9	719.3	640	984.10	304.30	245.8
JUNE	1231.2	802.1	850	1078.4	1322.4	940.5	627.5	890.6	1112.10	572.2
JULY	1087.6	1437.7	1199.9	825.9	1632.4	1944	1167.7	928	1527.4	601.2
AUGUST	1864.3	1469.1	1515.5	1814.7	1037.4	1696.6	1271	1039.2	851.7	1301.3
SEPTEMBER	362.8	1110	741.9	516.5	876.1	548	784.7	1038	1021.5	469.3
OCTOBER	90.9	111.3	121.5	32.4	291.6	374.2	597.5	251.8	296.3	0
NOVEMBER	40.2	69.8	0	0	110.3	0	0	69.5	9.5	0
DECEMBER	0	42.2	0	0	9	0	0	0.00	0.00	24.2
	5580.3	**5953.4**	**5374.1**	**4771**	**5910.4**	**6490.9**	**5158.4**	**5438.7**	**5346.8**	**3238.5**

Figure 5. Average monthly rainfall (2001 to 2010) in the study site of TNR.

8.3 Type of vegetation

TNR is almost completely covered by tropical rain forest in the higher elevation of the mountain range. The forest is associated with deciduous hardwood and bamboo forest in the lowland as shown in land use and land cover map of TNR (Table. 4 and Figure .6). According to Maxwell (2001), Anon, RS & GIS, FD (2007), Smith (1926) the composition of flora in the study site is briefly described as follows: "*The canopy layer is occupied by evergreen tree species with the height ranging from 40-60 m. Some ev-ergreen canopy species include Dipterocarpus costatus, Dipterocarpus turbinatus, Hopea odorata, Dysoxylum excelsum, Sweintonia schwenkii in association with*



	JAN	FEB	MAR	APRIL	MAY	JUNE	JULY	AUG	SEPT	OCT	NOV	DEC
.+/- s.d.	6.3	16.1	32.3	90.4	247.6	245.5	405.2	346.5	264.0	182.5	40.3	14.4
10 year mean	2.0	6.2	24.0	73.5	655.5	942.7	1,235	1,386	746.9	216.8	29.9	7.5

deciduous species, are Parkia sumatrana and Tetrameles nudiflora in the study area. Understory species are mostly evergreen in which the common understory species are Polyalthia simiarum, Shima wallichii, Diospyros brandisiana and Cinnamomum iners while some of shrub and tree let species includes Microtropis bivalves, M. discolor, Leea indica, L. xora and L. diversofolia. Some species of evergreen woody climbers are Ancistrocladus tectorious, Sphenodesme involucrate and Premna latifolia, and some ground herbs are Aglaonema simplex, Hypolytrum nemorum and the ferns Asplenium

apogamus. Several rattan species of the genus Calamus, and some bamboo species such as Dentrocalamus longispathus and Gigantochloa apus of bamboo species were found in the study area." (Hla Maung Thein, 2007)

Table 4. Land covers percentage of TNR (Source: TNR management plan)

No.	Land use class	Acre	Hectare	%
1.	Evergreen_(closed)	256942	103983	61.17
2.	Evergreen_(open)	70241	28426	16.72
3.	Scrub land	50994	20637	12.14
4.	Bamboo	33156	13418	7.89
5.	Grass land	4690	1898	1.12
6.	Agri/ horticulture land	3034	1228	0.72
7.	Sand	27	11	0.01
8.	Water body	986	399	0.23
Total		**420,070**	**170,000**	**100.00**

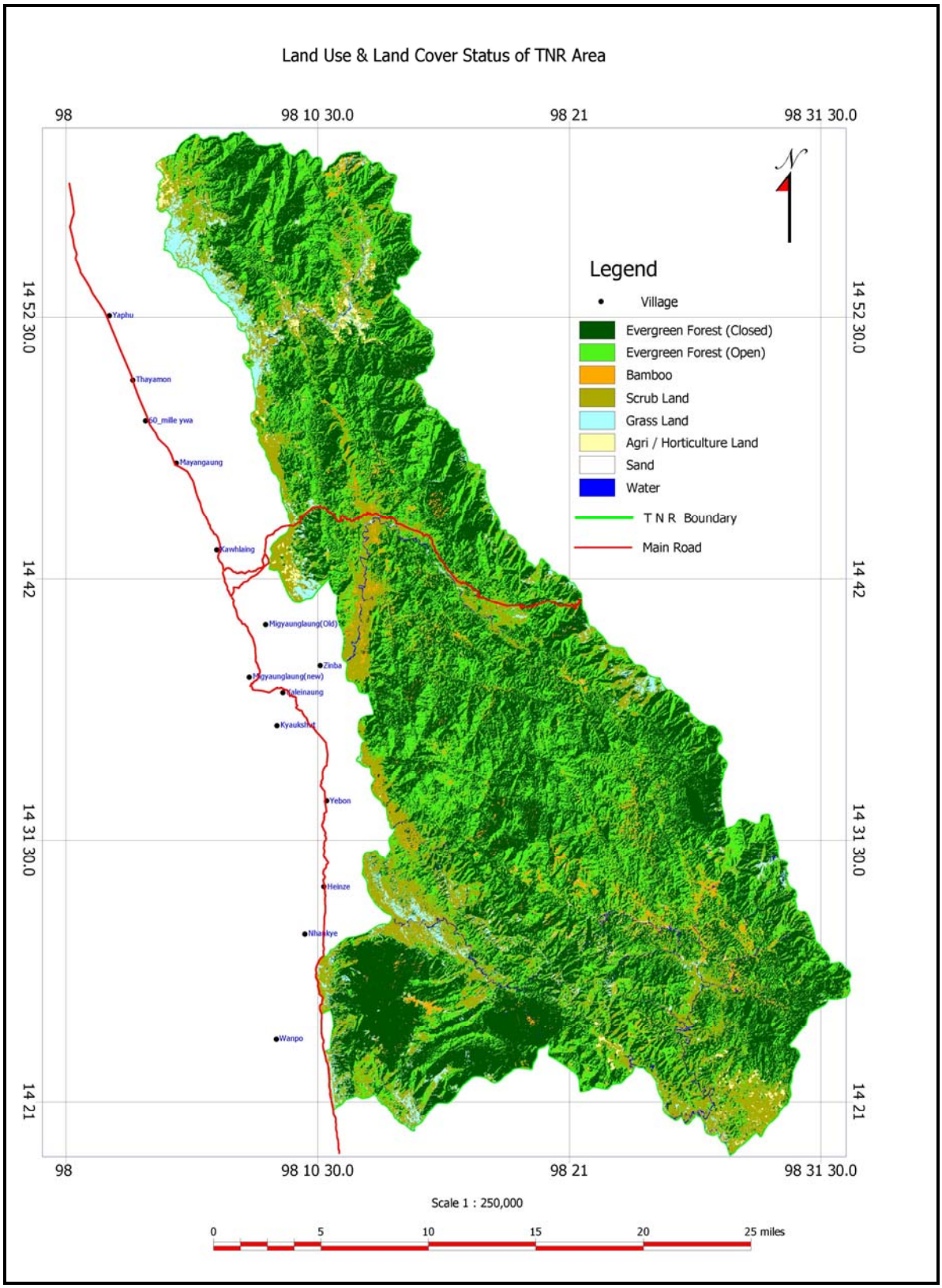

Land Use & Land Cover Status of TNR Area
98
98 10 30.0
98 21
98 31 30.0
14 52 30.0
14 42
14 31 30.0
14 21
N
Legend
Village
Evergreen Forest (Closed)
Evergreen Forest (Open)
Bamboo
Scrub Land
Grass Land
Agri / Horticulture Land
Sand
Water
T N R Boundary
Main Road
Yaphu
Thayamon
60_mille ywa
Mayangaung
Kawhlaing
Migyaunglaung(Old)
Zinba
Migyaunglaung(new)
Kyaukshut
Yebon
Heinze
Wanpo
Scale 1 : 250,000
0
5
10
15
20
25 miles

Figure 6. Land Use and Land cover status of TNR.

Figure 7. Scrub land (left) and bamboo forest (right) in TNR

Figure 8. Evergreen forest (left) and understory of evergreen forest (right) in TNR.

8.4 Topography

Most areas in TNR are of high elevation and the range of the terrain varies from 15 m above sea level in lowlands to 1400 m at the ridge to the Myanmar / Thai border. The slopes in most parts of the area exceed 37 %.(see Figure .9). The mountain range runs from north to south while the slope rises from west to east towards the ridge top and

is oriented to the western aspect. Streams at north, west and south western part of the reserve flow into Dawei River. *Kamaungthwe* and *Pya tha* streams started from mid eastern part of reserve and flows towards Taninthayi River. The area is generally described as rolling to hilly along the border areas and most of the southern portions are considered as rugged to very steep and mountainous.

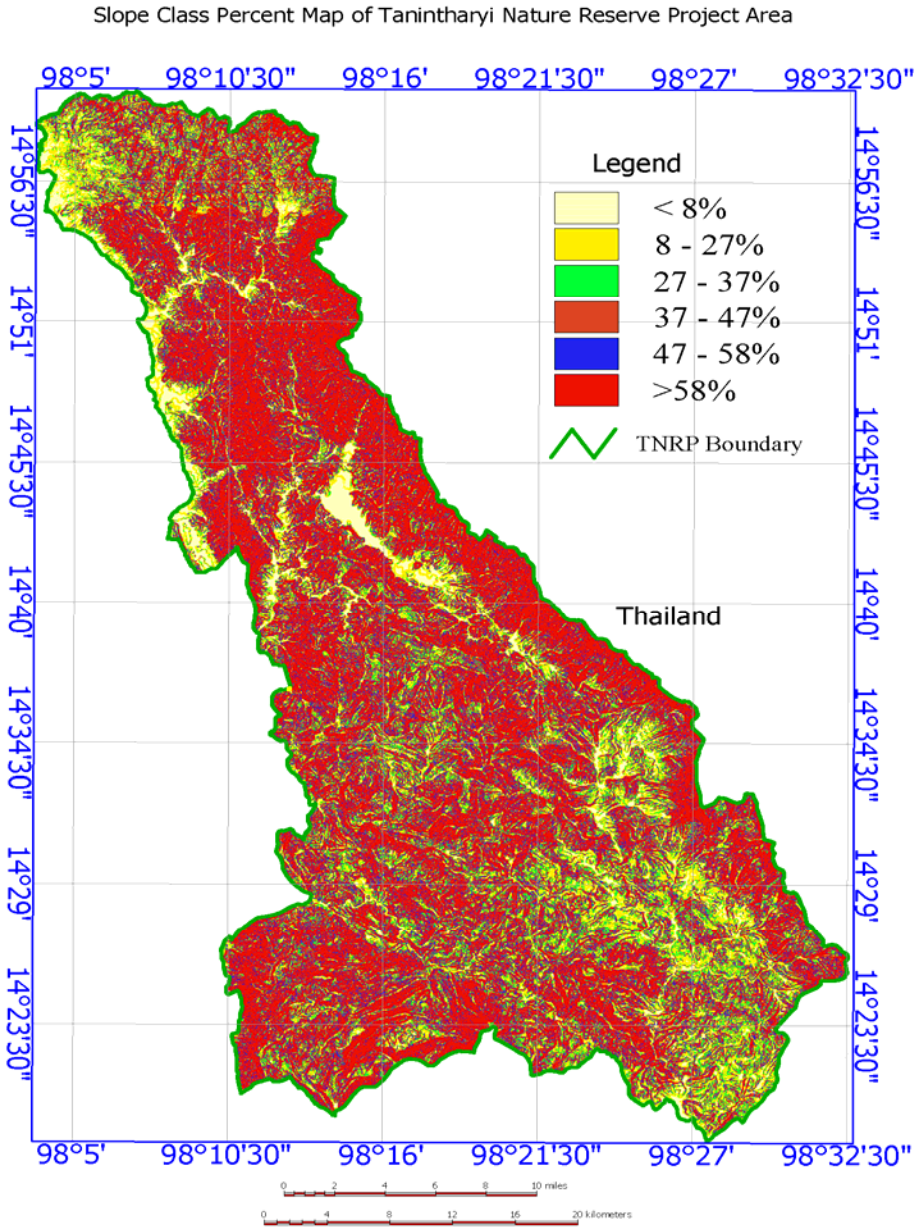


Figure 9. Slope class percentage of TNR.

8.5 Types of soil

Geological formation in the *Kleinaung* and *Heinze* reserves consists mostly of granite intrusion, and weathering of granite gives rise to gravelly soil on which giant evergreen forest is found (Smith, 1926). The soil type in the study site falls into yellow and red brown forest soil zone. The red brown and well structured forest soils have a good drainage with the pH value ranging from 5.5 to 6.5 occur on the well drained hill slopes at the elevation from 300 m to 1,200 m above sea level. The region of gentle slopes of low hills and foot hills at the elevation of 100 m to 500 m above sea level are covered by the yellow brown forest soils.

8.6 Communities around TNR

A total of 13,222 people from 2,761 households and 23 villages are living near the western and southern boundary of the Reserve (See Table. 5).

Table 5. Villages, households and population size around the TNR

No	Village Name	households	Population size	Dominant Tribe
1	Law Thyl	113	365	Karen
2	Yaphu (old)	198	1068	Mon, Dawei,
3	Yaphu (new)	67	390	Karen
4	Thayar Mon	113	482	Mon
5	Mile 60	28	117	Mon
6	Mayan Chaung	106	495	Mon, Dawei
7	Kaw Hlaing	65	275	Dawei , Bamah

8	Mi Chaung Hlaung (old)	77	470	Karen
9	Mi Chaung Hlaung (new)	75	399	Dawei, Bamah
10	Zinba	143	789	Karen, Bamah
11	Kalaingaung Town	501	2305	Dawei ,Bamah
12	Kyauk shut	175	904	Dawei, Bamah,Karen
13	Ye Bone	115	655	Dawei, Karen
14	Heinze	38	173	Dawei, Bamah
15	Hnan Kye	96	452	Dawei, Bamah
16	Kayin Shinhtabi	79	399	Karen
17	Thetkekwet	20	100	Dawei, Bamah
18	Othayan	60	300	Dawei, Bamah
19	Talaiya	35	175	Dawei , Bamah
20	Kalonehta	105	525	Dawei, Bamah
21	Nyaung Don	102	499	Karen
22	MyeKhan Baw	250	1250	Karen
23	Seik phyone	200	1000	Karen

The *Mon*, *Karen (Kayin), Dawei* and *Bamah* ethnic groups are the largest entities living along the western and southern parts of TNR. Based on tribal dominance, the TNR southern area can be recognized as *Dawei* ethnic vicinity; while *Kayin* dominated the middle part and Mon inhabit mainly the northern part. Nowadays, *Dawei* are the most dominant ethnic group, representing about 40% of the people residing in the area. (TNR Management Plan, 2009).

Their livelihood consists mainly of horticulture crops such as betel nut, cashew nut, citrus species and rubber for their subsistence and economic well being (Aung Ko Thet, 2010). But local people heavily rely on natural resources for their livelihood. The subsistence farmers rely on traditional shifting cultivation practices for their living and some are augmenting their livelihood by harvesting natural forest resources, such as timber and bamboo, or hunting wildlife for trade (Ngwe Thee, 2008). In addition population growth rate in the area is quite soaring due to high biological potentials (high fertility rate) and traditional conducts (early marriage) (Min Thant Zin, 2009).

8.7 Staffing and Areas of Responsibility

A total of six Local Operating Units – LOUs are formed in TNR namely *Yaphu, Michaunghlaung, Kyauk Shat, Ye bon, Heinze* and *Myaekhanbaw.* Major responsibility of LOUs are area protection, wildlife crime control and community development (see Table 6).

Table 6. LOUs Staffing at TNR

No	Name of LOUs	Warden	Range	Ranger	Forester	Local	Total
1	Yaphu	-	-	1	1	3	5
2	Michaunghlaung	-	-	1	2	8	11
3	Kyauk shat	-	-	1	1	1	3
4	Yebone	-	-	1	1	2	4
5	Heinze	-	-	1	1	3	5
6	Myaekhanbaw	-	-	1	-	1	2
Total		-	-	6	6	18	30

Currently on average, one ranger is responsible for 283.33 km^2 suggesting a provision of higher staff compared to other PAs such as Hkakaborazi National Park,

Hukaung Wildlife Sanctuary, Htamanthi Wildlife Sanctuary, Rakhine Yoma Elephant Sanctuary and Inlay Wildlife Sanctuary. A statement for per ranger responsible area in USA and Brazilian Amazon is also appended for comparison (See Table 7). (NWCD, 2011).

Table 7. Comparison of Park Ranger Ratio

PAs Name	Area km^2	No of Rangers	Responsible area/ ranger (sq km^2)
Hkakaborazi National park	3812	2	1906
Hukaung Wildlife sanctuary	6371	6	1062
Htamanthi Wildlife Sanctuary	2150	4	538
Rakhine Yoma Elephant Sanctuary	1756	5	351
Inlay Wildlife Sanctuary	641	2	320
Taninthayi Nature Reserve	1700	6	283
Brazilian Amazon	139222	23	6053
United States	326721	4002	82

Sources (NWCD, 2011) and Peres and Terborgh (1995)

Also without transportation gear for long patrol such as elephants, communication equipment, and guards without arms are major difficulties not only for patrolling but also for wildlife crime control and reserve protection at TNR.

9 Methodology

There are various study methods for mammal survey. The following methods were applied during the surveys:

1. Camera trapping
2. Track and sign survey
3. Interview survey
4. Herbivore scat collection

9.1 Camera Trapping

The camera trap survey methods are suitable for monitoring presence / absence and distribution of shy and nocturnal species such as Tapir and other predators in TNR.

Placement of photo trapping devices in specific areas was prioritized based on tapir ecology, results from previous survey reports and local information. Firstly, mineral salt licks, existing animal trails, feeding ground and mountain ridge were explored and identified to determine adequate locations for the placement of trap-cameras inside TNR. And also discussions were made with forest dwellers from villages which are situated near TNR and military personnel assigned along the service track of gas pipelines that traversed the TNR area from west to east to find out whether they had noticed tapir footprints or sighting in the wild.

Ten Photo Scout cameras (Bushnell Trophy Cam model # 119435/ 119445/ 119455) were used during the survey. Cameras were mounted on a sturdy tree about 5 meters away from the place to be monitored. The distance and sensing angle were tested before setting up the cameras. Cameras were set up to operate 24 hours, with 3 seconds time interval between pictures to minimize the chance of missing photo- capture of tapirs travelling in pairs especially at trail sites. And clock set and time stamp was “on” to

imprint the date and time on every photo. No bait or lure was used to attract the tapirs toward the camera stations.

Initially cameras were attempted to retrieve after one month time but some cameras had to be left in the forests for some more days due to security reasons. The number of trap nights was calculated for each camera location from the day the camera was mounted until the day it was retrieved. Capture rate per trap night is provided in appendix I.

In accordance with the TOR, The basic concept of site selection and camera setting protocol were delivered to TNR LOUs staff before operation and did practical training along the field survey for continuation of the process.

Figure 10. Camera trap setting at TNR

Table 8. Camera setting used for the study

Specification	Requirements
Set mode	Camera
Set Clock	Set

Time Stamp	On
TV Out	NTSC
Format	Execute
Sensor Level	Normal
Interval	3 Second
Video Length	5Second
Video Size	640 x 480 dpi
Capture number	1 photo
Image Size	3M/8M Pixel

Table 9. Area coverage by camera trap survey

Plot number	Areas cover with two km radius from camera post (km^2)	Local name of region	Observation team
1	34.9	Khotama	Tapir/Tiger
2	76.2	Make, U kying and Zinba	Tapir team
3	12.2	Make (maw ka pi)	Tapir team
4	30.2	Make upstream	Tiger team
5	48.7	Yepone hot spring	Tiger team
6	15.4	Malyume po stream	Tiger team
7	52.6	Heinze stream	Tiger team
8	19.8	Sinbo sinma ridge	Tiger team
Total area	**290 km^2**		

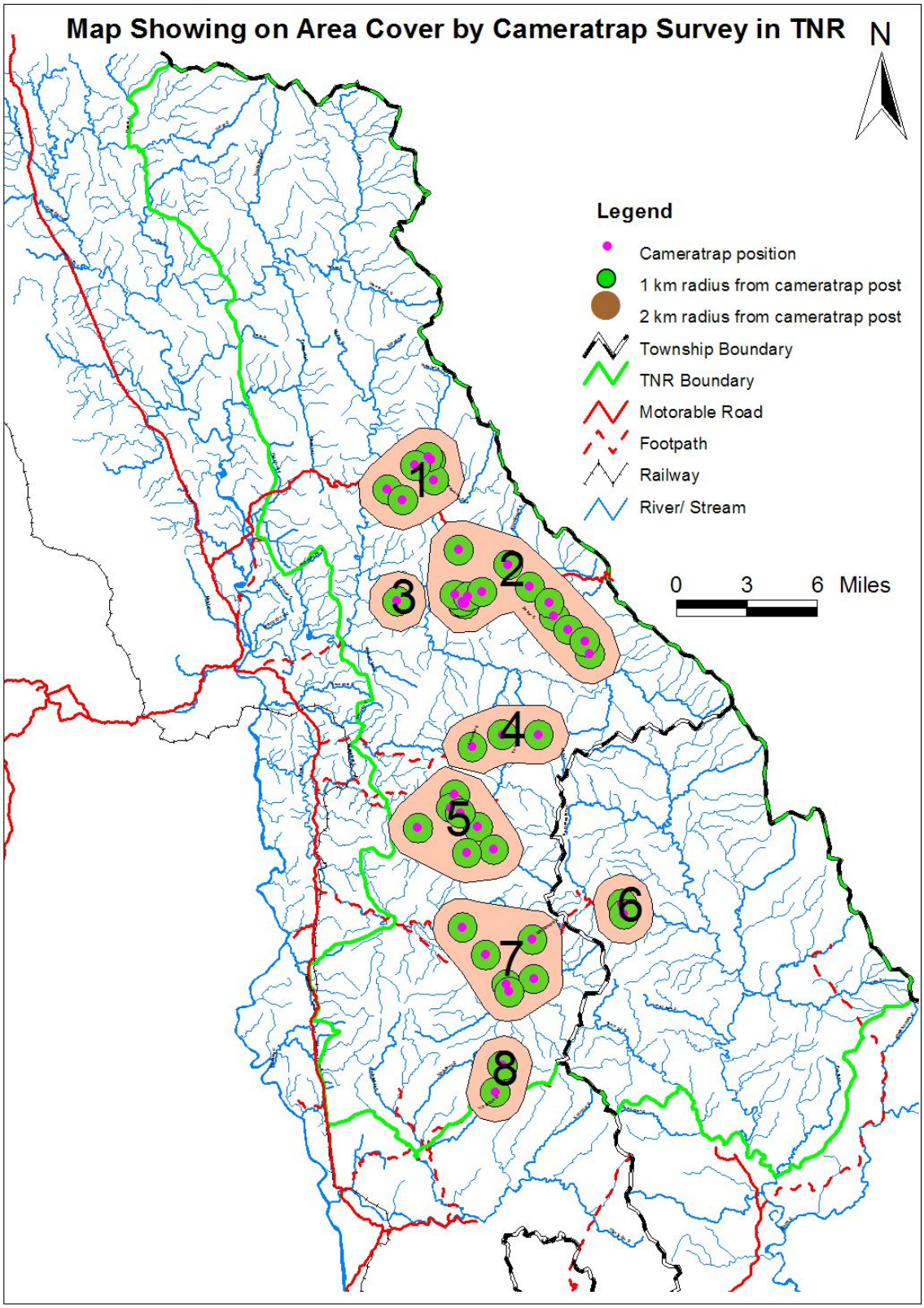


Figure 11. Areas cover by camera trap survey in TNR

9.1.1 Individual identification

Tapir individuals were normally identified from distinguished external sex organs, or permanent body marks such as damaged ears and scars. Color patterns on the hind part of animal or outlines revealing to the necklines enhanced were not utilized using Adobe Photoshop CS2 (Navarion *et al.*, 2004) because only occasionally records were obtained without sufficient quality to use this methods. Also the patterns are mostly unreliable as they change in appearance according to the actual position of the hind legs and neck.

9.2 Tracks and Sign survey

Tracks and sign survey results cannot estimate the population density of tapir, but can define the extent of home ranges. Surveys were conducted during the identification of potential locations for camera trapping. Animals' tracks and signs were recorded along the trails, stream beds and mountain ridges. The aim was mainly to focus on the distribution of tapirs and other associated wildlife species. These data were used to establish relative abundance. Footprint Identification Technique (FIT) could not be productively used, because some tracks do not pertain due to low encounter footprint rates and unclear footprints and washed out signs due to heavy rains. During the survey, the team walked cautiously and slowly along (62.06) km of transect and recorded all tracks and signs (faeces, soil scrapes, signs of tusks and antlers, vocalizations, burrows, ground clearing and willow) along the routes. To avoid overestimation, tracks of the same animal traveling in groups in the same direction, such as wild boars or Sāmbhar were counted only once. (Distance encounter rate of track and sign data is shown in

appendix III). The team used the mammal tracks of Thailand card (WCS, undated) for identification.

Figure 12. Tracks and sign survey; tapir foot print at *Make* stream (left) and elephant dung at *Khotama* stream (right) in TNR.

9.3 Interview survey

Interview surveys gain importance if large and insecure region cannot be surveyed using field teams. Interviews also are suitable for historical information on specific species. Surveys were conducted at villages located around TNR, particularly to obtain indirect information on the past and present status of Tapir and other wildlife. Interviews were mainly conducted with hunters, elderly man and persons who mostly spend their life in the forest. (See Table .9) (Questionnaire survey form is presented in Appendix VI).

Table 10. The list of interviewees around TNR.

No	Villages Name	Occupation						Total
		HT	LB	OO	GS	HK	F E C M	

1	Law Thyl	-	-	-	-	-	3	3
2	Ya phu (old)	-	1	2	-	-	-	3
3	Yaphu (new)	1	1	5	-	-	-	7
4	Thar Yar Mon	-	2	1	-	-	-	3
5	Mile 60	-	3	-	-	-	-	3
6	Mayan Chaung	1	1	1	-	1	-	4
7	Kaw Hlaing	1	-	3	-	-	2	6
8	Battalion infantry 282	0	0	0	2	0	0	2
9	Battalion infantry 273	0	0	0	2	0	0	2
10	Mi Chaung Hlaung (old)	-	-	10	-	-	-	10
11	Mi Chaung Hlaung (new)	1	1	6	-	-	-	8
12	Zinba	3	1	3	-	-	1	8
13	Kyauk shut	1	-	4	-	-	-	5
14	Ye Bone	2	1	4	-	-	2	9
15	Heinze	-	1	4	-	-	-	5
16	Yaung Ne Oo oil palm estate	-	2	1	-	-	-	3
17	Kayin Shin Htabi	1	-	4	-	-	-	5
18	Hnan kye	-	-	6	-	-	-	6
19	Talai Ya Chaung Wa	1	1	2	-	1	-	5
20	Kalone Hta	-	-	3	-	-	-	3
21	Myitta	-	-	-	-	-	1	1
22	Nyaung Done	1	-	5	-	-	4	10
23	Mye Khan Baw	-	-	2	-	1	5	8
	TOTAL	**13**	**15**	**66**	**4**	**3**	**18**	**119**

Note: **HT**; hunter. **LB**; Labor. **OO**; Orchard owner, **GS**; Government staff, **HK**; House Keeper, F**ECM**; Former Elephant Capture Man

9.4 Herbivore scat collection

Scats of large herbivores were collected along the survey mainly for DNA test. Team members took GPS points of each sampling site and recorded microhabitat aspects. Collected scat samples are being kept at Yangon TNR office. The WCS Myanmar Program will be contacted for the delivery of specimens to the Laboratory in the United States in order for DNA test. (Details of herbivore scat collection are shown in Appendix X).

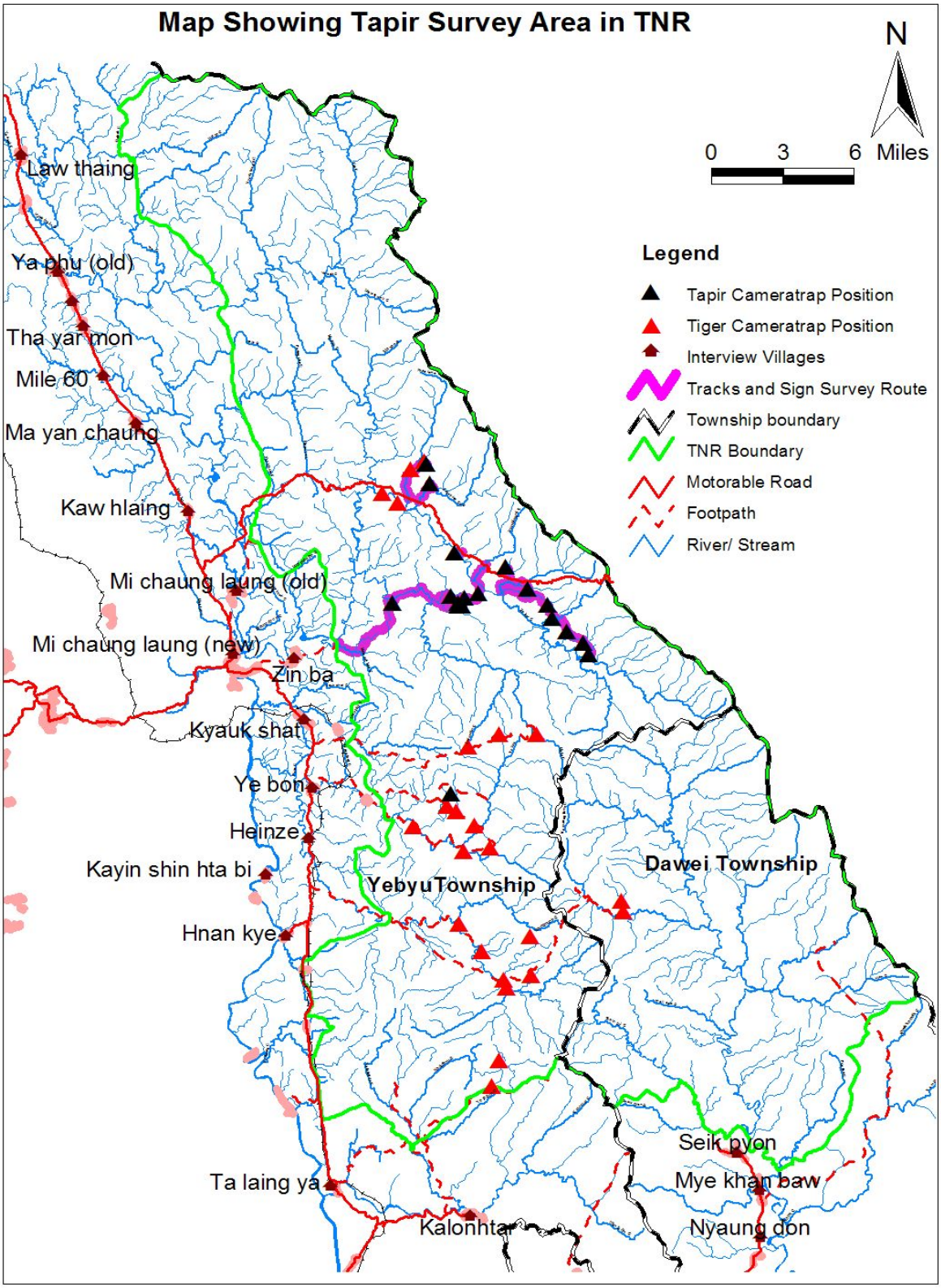
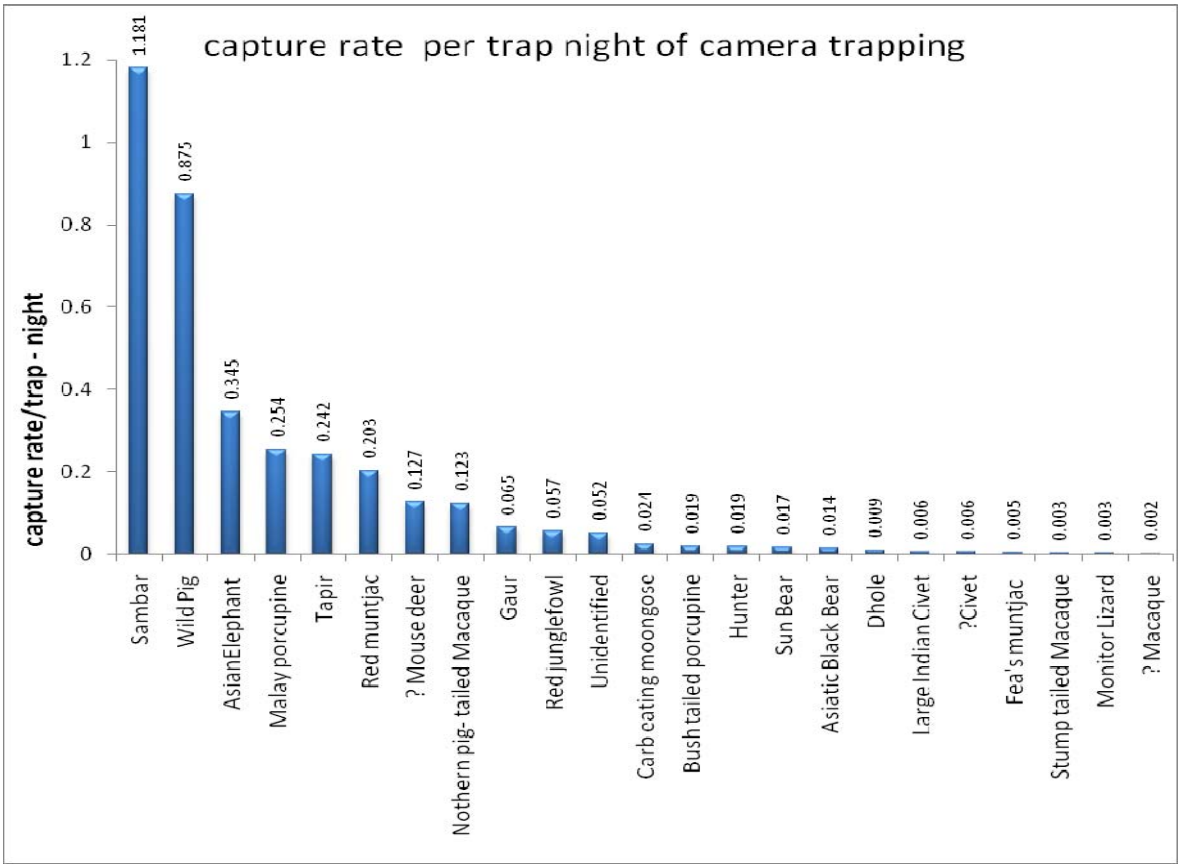


Figure 13. Map showing Tapir survey areas in TNR.

10 Results and Discussion

10.1 Camera Trap and Tracks and sign surveys

A total of 631 trap nights recorded 2,774 pictures of various animal species, hunters and failed traps. Out of this, a total of 19 species of mammals, one reptile and



one bird species were recorded.

Figure 14. Capture rate per trap night of camera trapping in TNR

In accordance with the capture rate per trap night of camera trapping, sambar, wild pig, asian elephant and Malayan porcupine were recorded more abundant than tapir in TNR (see Figure .14).

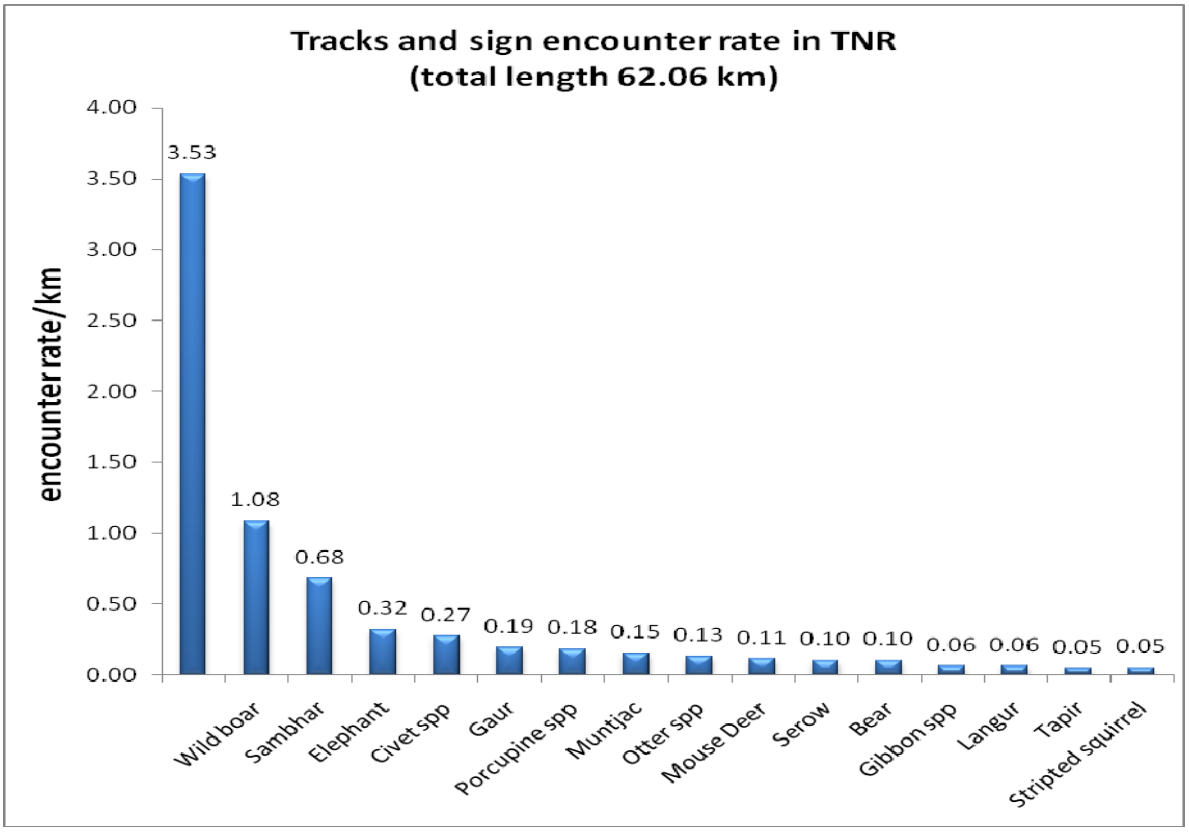


Figure 15. Tracks and sign encounter rate in TNR

A total of 62.06 km track walk was conducted during the camera trap survey. There are no big cat tracks and sign during the survey. Most of the tracks and sign survey were conducted at trails, abandoned roads and streams beds. However tracks and sign survey along the streams are not effective during raining season because of flooding. Encounter rate for tapir is 0.05 per km (see Figure .15). Capture rate trap night and encounter rate per km for herbivores are compared (see Table .11 and Figure .16).

It can be implied that sambar, muntjac, mouse deer, elephant and gaur are major herbivore species like Tapir in TNR.

Table 11. Comparison between capture rate per trap - night and encounter rate per km of main herbivore species in TNR.

Species	Camera trapping (capture rate/trap night)	Track and sign survey (encounter rate/km)
Sambar	1.181	0.68
Elephant	0.034	0.32
Tapir	0.242	0.05
Muntjac	0.208	0.15
Gaur	0.065	0.19
Mouse deer	0.126	0.11

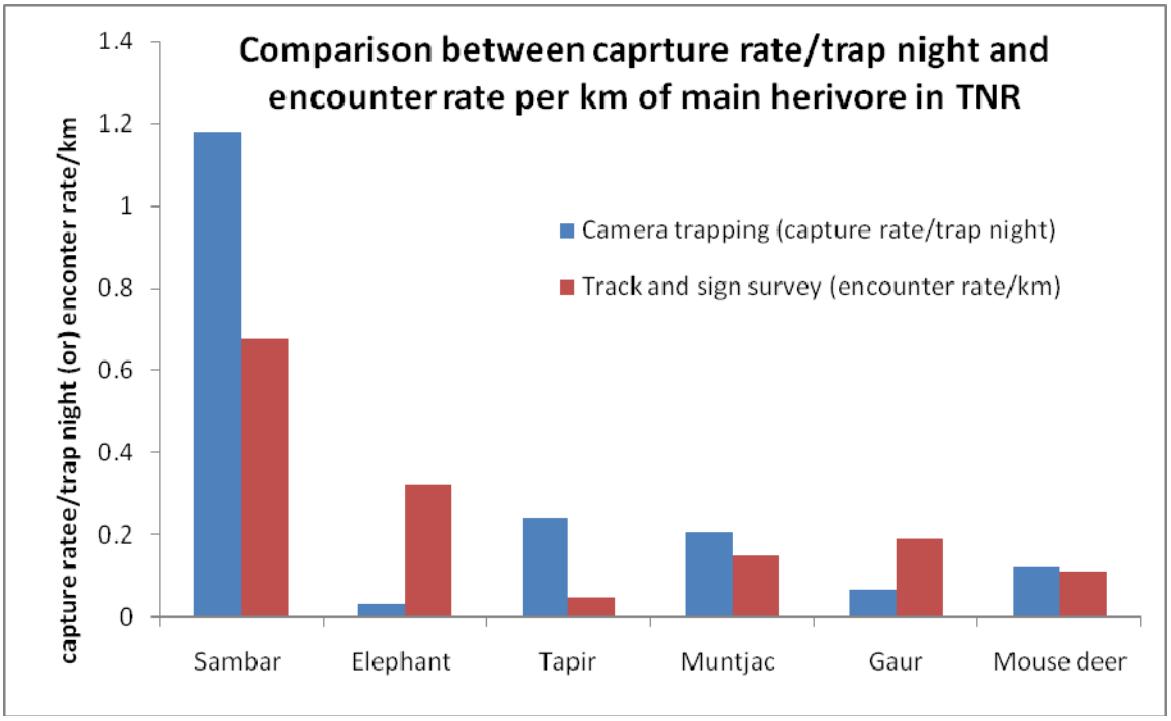


Figure 16. Comparison between capture rate per trap – night and encounter rate per km of main herbivore species in TNR.

Figure 17. Male tapir with rapture ear and distinguish external sex organ at *Khotama* salt lick

During the camera trap survey, 3 Malayan tapirs out of 153 pictures were recorded at two camera trap sites. Two individuals (1 male and 1 female) were recorded upstream of the *Khotama* mineral saltlick and one individual without sex differentiation

was recorded at *byak ka than* salt lick near *Make* stream. The distinguished body topography of a male from *Khotama* salt lick has a ruptured left ear and some scars on the front leg and rump (see Figure .17).

Most tapir has a distinguished body mark through rubbing with thick vegetation or while trying to escape from natural predators. However, male tapir had ruptured ear as a result of biting each other during their mating period or competing to seize the domain as well as escape from predators (see Figure .18).

Figure 18. Male tapir with ruptured ear and scar on left forearm (left) and female tapir with scar on right outer leg (right) at *Khotama* upstream salt lick.

Figure 19. Male and female tapirs are feeding around mineral salt lick.

According to camera trap surveys, tapirs used to feed around salt licks only at night time about 4 consecutive days from 8 April (21:04:02) to 12 April 2011 (04:58:45). During tiger survey period on 29 January 2011, two tapirs were recorded in the same salt lick. However, it is not easy to distinguish whether those tapirs are same or different.

10.2 Interview survey

A total of (119) persons from (21) villages and (2) battalion infantry were interviewed. 90.75 % of the interviewees had encountered tapir last 14 years ago (n = 119). It was also found that 29.41% of them were tapir meat eaters. But only (4.2%) of the interviewees had seen tapir carcass and skeletons at *Thitka* ridge, *Ai mel* mountain region and *Pilok* near Myanmar/Thai border. According to interview results, most Karen are knowledgeable about tapir physical characteristics, behavior, habit and ecological factors, while others such as *Mon*, *Dawe*i and *Bamah* are less familiar with tapirs. Interview survey yielded that immature tapirs with mother can only be found in December.

10.3 Abundance

Abundance is referring to the relative representation of a species in a particular ecosystem. It is usually measured as the large number of individual found per sample. A total sampling effort of 631 trap-nights at 19 trap sites yielded 153 photographs of 3 unique individual of Malayan Tapir (1 male, 1 female and 1 unknown). Sampling design for camera trapping was intended to estimate tapir density and abundance applying the formula of 'Capture – Recapture' approach using CAPTURE software.

One of the footprints was recorded during the tiger survey at *Yebone* route (Myint Maung, 2011). At the same place, one photo of tapir was recorded by TNR LOU staff on 13 May 2010 during the routine biological survey. Distance from *Yebone* and *Byat kathan* is about 13.6 km. So, previous findings of tapir could be different individual from the present study at *Byat ka than* salt lick. The low number of occasion rates by camera traps was not sound enough for estimating population density using CAPTURE 2 (at least 7 occasions are needed).

According to the survey results, Tapir population is threatened by hunting and habitat degradation. According to camera trap results, sex ratio of Malayan tapir in TNR is in good shape of 1:1:1 (1 male: 1 female: 1 unknown). Nevertheless, calculating the Minimum Viable Population – MVP in TNR is unreliable, because factors for model input are unreliable or missing. MVP is depending on survey area and specific species. To maintain a viable population, Morro do Diabo State Park, Brazil stated that the minimum of 200 individual of Lowland Tapirs could be necessary for the next 100 years. (Medici, 2010)

10.4 Distribution

Tapir could inhabit in theory all of TNR including mountainous area and lowland environments. In Indonesia, the tapirs inhabit lowland areas during the dry season and move to mountain areas during the wet season (Khan, 1997). In Thailand tapirs were recorded at various altitudes from 100 m to 2100 m (Kanchanasaka, 2008). In Malaysia, records indicate altitudes 1430 m at Gunung Tahan, 1,720m at Gunung Benom and 1,730 m at Gunung Bintang Hijau ;(DWNP, 2009). Francis (2008) stated that Malayan

tapirs can found mainly in intact rainforest, from lowland up to about 2,000m. In TNR, tapirs are recorded by camera traps at the elevation between 146 m and 177 m.

Tapir encounter sites outside of TNR areas are *Sinku* village and region(situated in north west of TNR), *Wun po* villages (south west of TNR) *Zalut* village (the way to Laung Long town) , Sin – phyu- taing and Myin –mo-let – khat region from southern part of TNR. And also Yaung Ne Oo oil palm farm workers answered that they had seen tapir in *Boke Pyin* which is situated in southern Taninthayi region.

The results of interview survey indicated the following locations as past and present distributions of Tapirs in TNR (see Figure. 20).

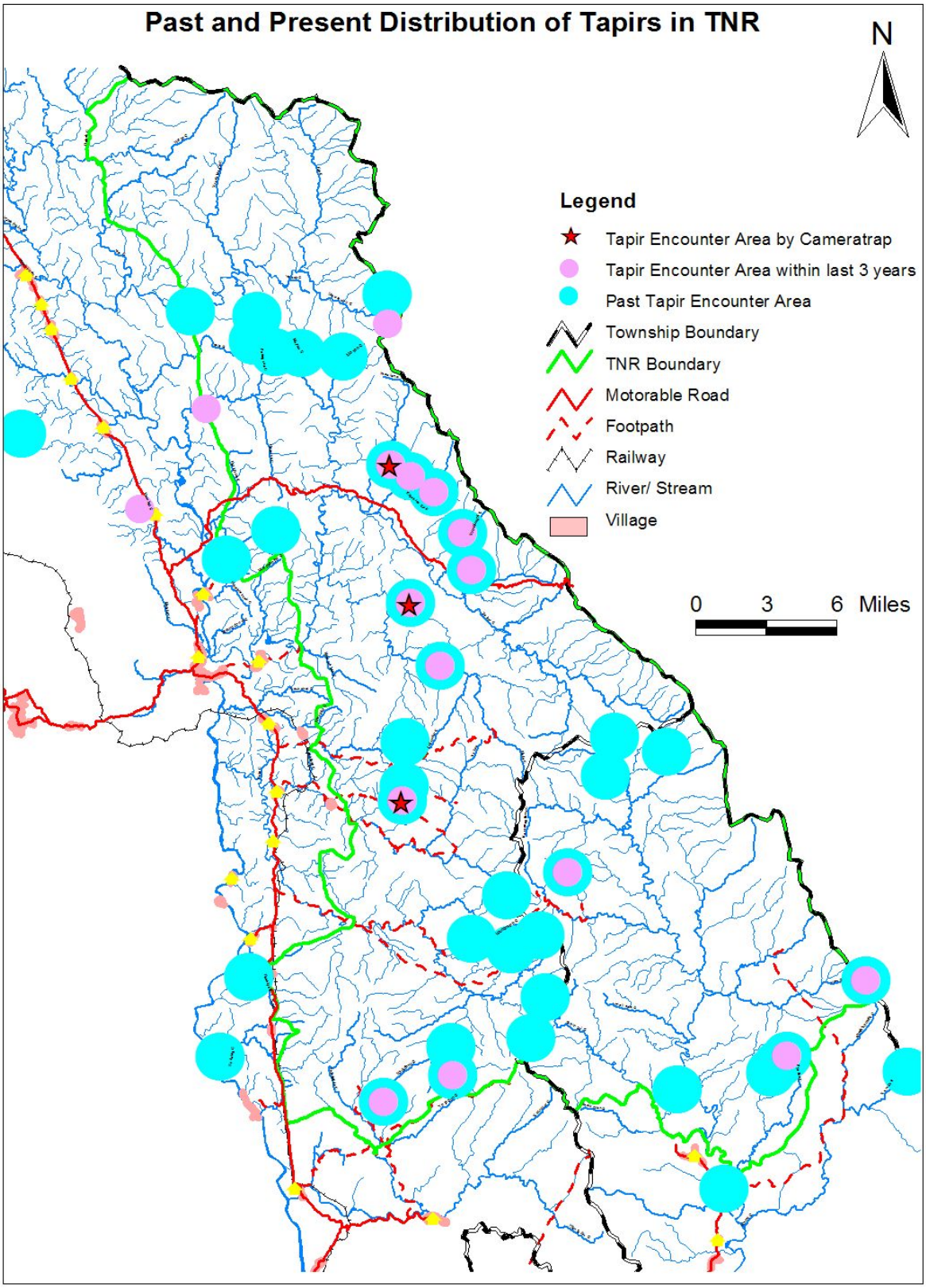


Figure 20. Past and present distribution of Malayan Tapir in TNR

10.5 Ecology and Behaviour

In order to understand the ecology of tapirs in TNR, more baseline data and detailed observations are needed. The Malayan Tapir or Asian Tapir (*Tapirus indicus.* Desmarest.1819), also named **Kyan - thu – daw** in **Myanmar** words, literally translated means Kyan - a rhinoceros and thu – daw means saint , **Shu - sin - moung** in **Dawei** (which means elephant proboscis like spiral shape), **Ter- kaw** in **Kayin** (means camouflage) and **Set** in **Mon** (but not definite meaning).

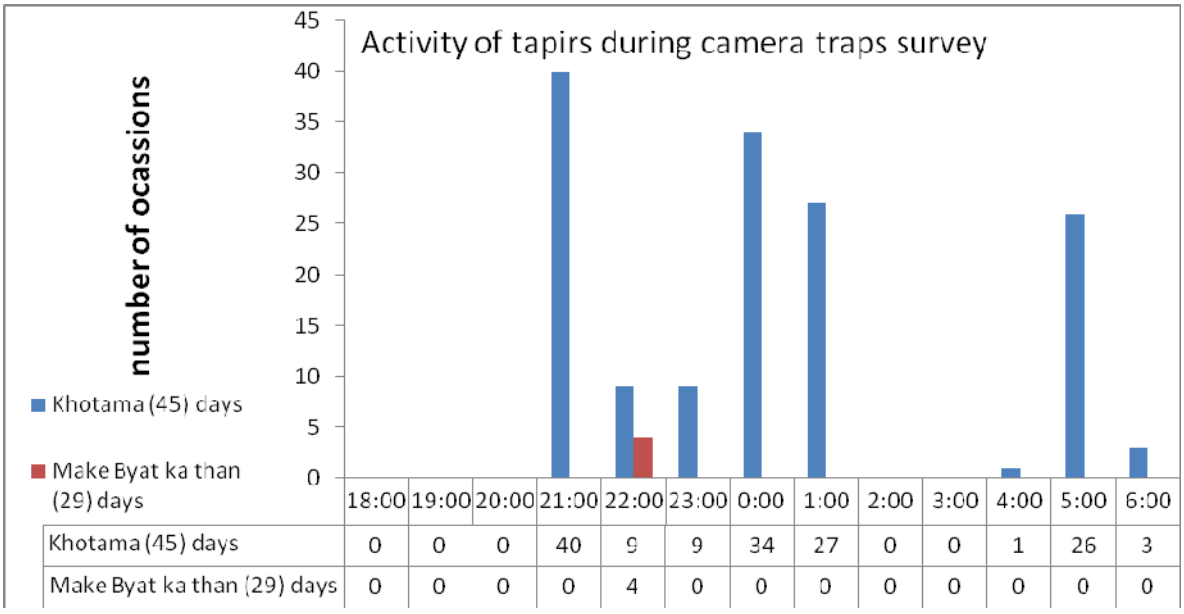
Malayan Tapirs grow to between 6 and 8 feet (1.8 to 2.4 m) in length, stand 3 to 3.5 feet (90 to 107 cm) tall, and typically weigh between 550 and 770 pounds (250 to 350 kg) (Francis, 2008). The females are usually larger than the males. (Tun Yin, 1966) Like the other types of tapir, they have small stubby tails and long, flexible proboscises. They have four toes on each front foot and three toes on each back foot. The Malayan Tapir has rather poor eyesight but excellent hearing and sense of smell. (www.elpasozoo.org)

The gestation period of the Malayan Tapir is approximately 400 days, after which a single offspring, weighing around 15 pounds (6.8 kg), is born. Weaning occurs between six and eight months of age, at which time the babies are nearly full-grown, and the animals reach sexual maturity around age three for males, and average 2.8 years for females (Khan, 1997). Breeding typically occurs in April, May or June, and females generally produce one calf every two years (Khan, 1997). Records of male and female at *Khotama* salt lick dated from 8 April to 12 April and could indicate the beginning of mating in TNR. The life span is about 30 years (Khan, 1997). Malayan Tapirs are primarily solitary creatures, marking out large tracts of land as their territory, though the-

se areas usually overlap with those of other individuals. Tapirs mark out their territories by spraying urine on plants, and they often follow distinct paths which they have bulldozed through the undergrowth.

When threatened or frightened, the tapir can run quickly, despite its considerable bulk, and they can also defend themselves with their strong jaws and sharp teeth. Malayan Tapirs communicate with high-pitched squeaks and whistles. They usually prefer to live near water and they are also able to climb steep slopes (Khan, 1997).

Tapirs are mainly active at night, though they are not exclusively nocturnal. They tend to eat soon after sunset or before sunrise, and they will often nap in the middle of the night (see Figure. 21). According to camera trap results, tapir feed at salt lick up to early morning 6 o'clock.



	18:00	19:00	20:00	21:00	22:00	23:00	0:00	1:00	2:00	3:00	4:00	5:00	6:00
Khotama (45) days	0	0	0	40	9	9	34	27	0	0	1	26	3
Make Byat ka than (29) days	0	0	0	0	4	0	0	0	0	0	0	0	0

Figure 21. During the survey, the number of occasions on which photographs were made by the photo- traps between 20:00 and 06:00. No photographs were made at other times.

Along the survey, 2 civet scat, 2 tapir dung , 1 sambar scat and 1 monkey scat were collected. Furthermore, tapir hoof collected during mammal survey was found in TNR office are also listed (Appendix. IX) Scat and dung are not abundant along the streams and trails inside TNR due to heavy rain.

10.6 Human Wildlife Conflicts in TNR

There are no records of crop damage by Tapir around TNR and its vicinity. According to interview survey results, wild pig (*Sus scrofa*) and bamboo rats (Rhizomyidae) are major depredating species to cultivation. The wild pigs mainly damage *Taung Ya* paddy fields and bamboo rats mainly harm young rubber plantations and cash crop farms. There is no documentation of serious human wildlife conflicts in and around TNR. However, during the survey period an injured patient at *Kanbouk* hospital was noticed due to wild boar attack whilst collecting cashew nut in her orchard which is located right outside of TNR. Furthermore, elephants destroyed an abandoned military frontier camp located at service track inside TNR (*Khotama*) in early April 2011.

11 Threats

Most important threats to wildlife and biodiversity in Tenasserim corridor is encroachment of people (BCI 2007).There are many potential threats to wildlife and specially the tapir in TNR. Hunting, deforestation and forest degradation are the major threats to Tapir and wildlife in and around TNR.

11.1 Major cause of population decline in TNR

The tapir population hurt in TNR during the last elephant capturing time (from 1981 to 1996) due to application of pit fall traps. Local *Karen* peoples described pit fall

traps consisting of 5 meters long, 2 meters wide and 2.5 meter deep holes in the ground covered with bamboo sticks, small tree branches and camouflaged with forest debris. According to interview survey results, animals captured in the pit fall traps were elephants, tiger, leopards, gaur, sambar, wild pigs, monkeys and tapir. In addition, in some instances unfortunate humans have been trapped inside pit fall traps. Based on interview survey, it is guesstimated that, approximately 500 elephant pit fall traps are located inside TNR. At present, all pit fall traps are abandoned and open (see Figure. 22); however some wildlife could accidentally still got trapped, for instance one infant wild pig.

Figure 22. Abandoned elephant pit fall traps inside TNR

According to the interview survey, local people had eaten up tapir meat when they captured inside elephant pitfall trap while some intentionally shot them. But some attempt to let them escape while some try to tame. They cut and feed the branches of trees with new shoots near elephant pitfall trap. Most people noticed that tapir can make

various peculiar sounds. Peoples who ate tapir meat answered that the meat is not delicious and quite fibrous with tendons.

Local people are not only hunting tapir for their subsistence but also commercial purpose at Taninthayi Nature Reserve and its vicinity. The elder people advise youth to avoid shooting tapir for their belief and religious reasons. Some local peoples believe that killing a Tapir brings bad lucks up to death. But some peoples shot and sold the meat as if guar or wild pig.

During the interview survey, out of 30 individuals of tapirs responded, 10 killed by hunters, 15 trapped inside elephant pit fall traps and dead while trying to domesticate. Fortunately 4 had been released while1 male tapir is left inside the forest due to aggressiveness. Detail interviewees name, villages, year of evidence and poachers are mentioned in table12. Those populations killed around TNR are equal to total population of Tapirs at Huai Kha Khaeng Wildlife Sanctuary from Thailand and 58 % population of Kru Wildlife Reserve from Malaysia.

Table 12. Lists of respondents from Questionnaire Survey with time and action on tapir

No	Interviewees Name	Village name	evidence year	action on tapirs				Total	Remark Killed by-poachers
				killed	release	Un release	Try to tame while dead		
1	Saw Htoo Eh	Law Thyl	27	-	--	-	1	1	
2	Saw Kaw Thet		27	-	-	-	1	1	
3	Saw Than Maung	Yaphu (new)	34	-	-	-	1	1	
4	Saw Say Wah		30	1	-	-	-	1	
5	Saw Phee Yaw		27	-	-	-	1	1	

6	U Hlaing Htun	Mayan Chaung	45	-	-	-	1	1	At ZaLut village
7	Saw Pho Ka Raw	Ye Bon	15	1	-	-	-	1	
8	U Chit Sein		30	1	-	-	-	1	U Kya Pai
9	Saw Than Win	Myae Khan Baw	29	-	-	-	1	1	
10	Saw Dae Gay		29	-	-	-	3	3	
11	Saw Eha Nel Phoe		29	1	-	-	-	1	
12	Phe Daw Lay		28	-	-	-	1	1	
13	Saw Lay Phaw		28	-	1	-	-	1	
14	Saw Sae Phaw		26	-	-	-	2	2	
15	U Ba Phoe	Nyaung Tone	50	1	-	-	-	1	
16	U Than Lone	Mechaunghlaung	30	-	1	-	-	1	
17	U Tin Maung Latt	Zinba	3	-	1	-	-	1	
18	U Tin Myint		4	1	-	-	-	1	By UHlaThan
19	Saw Shee Hlo	TalaingYa Chaung Wa	18	1 1	- -	- -	- -	1 1	By Mg Oo Tin By Saya Gell
20	U Aung Zaw		5	-	-	1	-	1	
21	U Win Shein		8	-	1	-	-	1	
22	U Hla Htun	Kalone Hta	4	-	-	-	1	1	
23	U Su Nge		28	-	-	-	1	1	By Thein Than
24	U Cho	Padauk kone	18	-	-	-	1	1	
25	Saw Pho Pa De	Kaw Hlaing	30	1	-	-	-	1	By SawTinNyunt
Grand Total				**10**	**4**	**1**	**15**	30	

11.2 Hunting

Hunting and trapping for subsistence requirements is still in practice among all the villages in the vicinity of TNR (Reserve management plan). Poachers from Thailand, local villagers and pipeline security military persons are major hunters in TNR.

Local villagers from nearest villages were night halt inside TNR for hunting not only for their subsistence but also as bush meat for trade. During the camera trap survey,

four photographs of hunters were observed in three different sites at *Khotama* and *Make byat ka than* (tapir recorded sites) and *U Kyaing mine* area. Focus on the hunters, 71% of hunters is from *Zinba*, which is the nearest and easily assessable village situated at mid-western part of TNR boundary.

Another two photographs were also recorded from cameras mounted at *U Kyaing* mine abandoned route site. Local guide assumed that hunters could be from Thai village. The poachers from Thailand come occasionally with powerful rifles at upstream of *Zinba*. According to the interviews survey results, professional teams such as Milarshikara elephant captures in May khan baw region and tiger hunters are enter the Reserve especially at upstream of Kamaung thwe and Zinba.

Figure 23. Local hunters with handmade guns photo recorded by camera trap

Almost all of local people have been using handmade guns (locally called *Taw pone*) for their subsistence use. (see Table. 13)They used to carry a gun while going to

their orchard and forest for NTFP collection and hunt while they found wildlife along the way. They hunt wildlife for their subsistence in some cases. In addition, occasionally use the dogs for hunt and kill wildlife near their cultivated areas.

Figure 24. Tapir hoof and bone (left) recorded from *Thit kha* ridge and bush meat dry shelf (right) inside TNR.

Pipelines security staff and military personnel are used to hunt in TNR. They mainly targeted at gaur, sambar, wild pigs, barking deer, monkeys and small wildlife such as civet species or jungle fowl. While the personnel hunts for bush meat they typically take only a fraction for their own use and sell the remainder at nearest village markets such as *Ban I Taung* in Thailand or *Kanbauk* and *Kalaingaung* in Myanmar.

Table 13. Villages households and handmade gun list around TNR

Sr No	Village Name	Number of households	Number of handmade gun
1	Kwe Ta Lin	100	34
2	Law Thyl	113	35
3	Yaphu (old)	198	17
4	Yaphu (new)	67	18
5	Thayar Mon	113	14
6	Mile 60	28	4

7	Mayan Chaung	106	15
8	Kaw Hlaing	65	15
9	Mi Chaung Hlaung (old)	77	26
10	Mi Chaung Hlaung (new)	75	5
11	Zinba	143	50
12	Kyauk shut	175	17
13	Ye Bone	115	17
14	Heinze	38	7
15	Hnan Kye	96	8
	Total	1509	282

Source: TNR office

11.3 Forest degradation

According to the TNR Operational Management Plan (2009-2012), the extent of forest degradation is reduced to 50% in comparison to the extent of last 10 years period. However, the extent of deforestation inside 10km buffer is in the reverse order (seeTable. 14).

Table 14. Annual deforestation rate in TNR

Areas	TNR Area Only (ha)			10 km Buffer Only (ha)		
Year	1990	2000	2006	1990	2000	2006
Annual deforestation rate (ha)		-1465	- 712		- 467	- 871

(Assessments made on Landsat 5 TM scenes of 1990, 2000 and 2006: RS/GIS section: 2009)

List of timber confiscated by TNR during 2010 and 2011 up to now has been provided in table 15. The drastic decline in timber confiscated during the later years may probably be due to the intervention of TNR through effective patrolling campaign.

Table 15. List of timber confiscated by TNR

No	Evidence Year	Confiscated (tons)	Remark
1	2010	93.0556	All are come from TNR
2	2011 to now	4.4644	

Source: TNR office

Due to large land use changes to rubber and oil palm estates in the vicinity of TNR, its forest edges and forest corridors are fragmented. Old quartz mining around *Ky-aukphyu* stream is major forest degradation along the southwest boundary of the Reserve.

Figure 25. Oil palms farm near TNR (left) and slash and burn for rubber plantation (right)

11.4 Natural predators

The tapirs have few natural predators. The main natural predators to Malayan tapirs are tiger, leopard and dhole in TNR. Due to very low population of tiger in TNR the chance of tapir predation is quite low (Myint Maung, 2011). In fact leopard and dholes are the main natural predators for tapir in TNR. Dholes were recorded by photos, both

during tiger and tapir camera trap surveys. However, no reports and evidence of tapirs killed by natural predators during visual and interview surveys at TNR.

11.5 Disease

Diseases spreading from domestic cattle to wild ungulates are no recorded in and around TNR. There is currently no livestock grazing inside TNR. But the *Heinze* cattle smuggling route is still regularly used inside TNR and it can become hazard to tapir and other wild ungulates. Last seven years ago, the anthrax and foot and mouth disease break out in cattle at *Kalaingaung* region. In addition to that, esophagus disease outbreak of cattle occurred at present. (U Shwe, farmer from Gangawtaung, *per comm*.)

11.6 Forest Fire

There is no serious evidence of forest fire inside TNR. About 77% of the areas are covered with moist evergreen forests which has a closed canopy that protects from wind and due to the moist microclimate, moist fuels and heavy rainfall. But some accidentals fires are occurring around TNR due to slash and burn practice.

12 Recommendation

12.1 Recommendation for species management

- Continuation of camera trap survey is needed at unexplored area such as upstream of *Kamaung thwe*, *Make*, *Zinba* and *Paun San* in different seasons.
- Search and GPS record of main wildlife feeding ground such as mineral saltlicks, hot water spring and old elephant captured pits for effective reserve management strategies.

- In order to know the tapir movement and habitat viability, deploy monthly camera traps at Tapir recorded areas such as *Khotama* salt lick, *Yebone* hot spring and Make *Byat ka than* salt lick.
- To dig tunnel at abandoned elephant pitfalls trap as escape routes to save fallen wildlife inside TNR during patrolling.
- To monitor *Heinze* cattle smuggling route cross TNR mainly for unnecessary disperse of livestock diseases such as Foot and Mouth and Anthrax to wild ungulates from smuggling cattle.
- To have an available formal and informal educational material about tapirs to the public not only to TNR region but also to tapir range of Myanmar.
- Comprehensive studies on Tapirs are strongly recommended.
- Establish and define of corridors between TNR and surrounding forests fragments especially in southern part of TNR with *Myintmo let khat* and other reserved forest.
- To find funds for tapir conservation in and around TNR with an intention to mainly draw up National Tapir Action Plans, organized with relevant departments and agencies.

12.2 Recommendation for Reserve Management

- To reduce hunting inside TNR by local people, handmade gun control strategies should be formulated urgently with other relevant agencies such as police, military, general administration department, forest department and village leaders.

- To find out the proper solution on hunting inside TNR by army personnel whose task at natural gas pipelines is for security only.
- Socio economic intervention should be initiated at TNR.
- More patrolling and surveillance plans should be developed to prevent the hunting at tapir recorded areas such as *Khotama* salt lick, *Make byat ka than* salt lick and *Yebone* hot spring region.
- To set up four temporary camps with green management principals along the service track at *H-3, Kyuk Lone Gyi, Khotama* and *H - 6* for multipurpose use such as biological survey and patrolling.
- To set up permanent operation unit and checkpoint at *Ban I Taung* particularly for wildlife crime control bilateral collaboration with Western Forest Complex, Thai-land.
- To recruit law enforcement staff for southern (*Mye khant baw*, *seik phyone*) and northern parts (*Law thyl* and *Kyauk kadain*) of TNR, and provide appropriate training and field gear (provision of elephant for field transport during field operation) as poaching is a serious problem in TNR.
- Environmental education and outreach program for local communities are important at TNR for effective conservation of wildlife. Mobile environmental education program are urgently needed at schools, religious festivals and occasional events.

- To conduct awareness campaigns about the tapir, directed towards communities around PAs and relevant authorities.

13 Conclusion

The TNR is the only PAs which is effectively conserving the Malayan Tapir in Myanmar so far. The flora and fauna in TNR is still diverse. The carry capacity and basic parameters such as food, water and cover for tapirs in TNR is sufficient. But tapir surveyed in TNR is representing only part of the reserve due to many constraints. However, tapir population is still threatened in and around TNR. The major threats to tapir are hunting and habitat degradation. It had been recorded that tapir were being slaughtered in TNR during two major periods, elephant capturing by pit fall traps time (1981 to 1996) and during official border trade in commercial logging period at Thai / Myanmar border (1989 – 1996). Moreover, hunting pressures inside TNR is ongoing by different stakeholders. Handmade guns are still traditionally used by local people. And also forest degradation is more in the buffer zone of Nature Reserve than in the core zone, despite TNR Project's effort to suppress wildlife crime and habitat degradation.

Among the other PAs in Taninthayi Region, TNR is the only one area properly managed with staff, budget and other field gears for effective wildlife conservation. However, PAs management in developing countries is not trouble-free. Reasons such as security problems, frequent shuffling of trained staff and many stakeholders are involved in and around TNR which complicated the reserve management.

Continuation of tapir occupancy survey at TNR is recommended for effective long term management. Awareness program is also essential for tapir conservation in TNR.

The context of tapir should be included in the awareness campaign, schools program and mobile education programs in future. Law enforcement activities in TNR are essential requirement for effective management. Action plan for tapir should be drawn up with relevant departments and line agencies as one of the major objectives for tapir conservation in TNR as well as Myanmar.

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15 Appendices

15.1 Appendix I: Capture rate per trap night of camera trapping data

Camera Number	Set up date /Time	Retrieval date /Time	Trap night	Tapir	Asian Elephant	Sun Bear	Asiatic Black Bear	Wild Pig	Sambar	Gaur	Malay porcupine	Bush tailed porcupine	Large Indian Civet	?Civet
1	9.3.11	26.4.11	48	0	0	4	0	14	1	0	0	0	0	0
2	11.3.11	25.4.11	45	83	0	0	0	21	412	41	0	0	0	0
3	11.3.11	25.4.11	45	66	0	0	0	42	138	0	18	0	1	0
4	12.3.11	25.4.11	44	0	0	0	9	225	2	0	37	0	2	0
5	13.3.11	24.4.11	42	0	0	3	0	132	0	0	79	10	0	0
6	14.3.11	18.3.11	4	0	0	0	0	0	68	0	0	0	0	0
7	15.3 11	17 .5.11	63	0	3	2	0	2	1	0	0	0	0	0
8	15.3.11	17.5. 11	63	0	9	0	0	7	37	0	4	0	0	4
9	29.3.11	29.4. 11	31	0	10	0	0	12	4	0	0	0	0	0
10	6.5.11	9 .5. 11	3	0	0	0	0	0	0	0	0	0	0	0
11	7.5.11	5.6. 11	29	0	0	0	0	11	0	0	0	0	0	0
12	7.5.11	5.6. 11	29	4	0	0	0	0	0	0	11	2	0	0
13	7.5. 11	5.6. 11	29	0	0	1	0	6	1	0	0	0	0	0
14	7 .5.11	5 .6. 11	29	0	0	0	0	23	0	0	1	0	0	0
15	8.5.11	6.6. 11	29	0	0	1	0	0	0	0	0	0	1	0
16	8.5.11	6.6. 11	29	0	0	0	0	0	75	0	0	0	0	0
17	18.5.11	21.6.11	34	0	0	0	0	47	0	0	0	0	0	0
18	18.5.11	19.6.11	1	0	0	0	0	1	0	0	0	0	0	0
19	18.5.11	21.6.11	34	0	0	0	0	9	6	0	10	0	0	0
			631	153	22	11	9	552	745	41	160	12	4	4
Capture rate/trap night				0.242	0.034	0.017	0.014	0.875	1.181	0.065	0.253	0.019	0.006	0.006

Capture rate per trap night of camera trapping data (continued)

Camera Number	Set up date /Time	Retrieval date /Time	Trap night	Dhole	Red muntjac	Mouse deer	Carb eating moongose	Nothern pig- tailed Macaque	Stump tailed Macaque	? Macaque	Fea's muntjac	Total animal traffic	Hunter
1	9.3.11	26.4.11	48	0	0	0	0	0	0	0	0	19	0
2	11.3.11	25.4.11	45	0	0	0	0	0	0	0	0	557	0
3	11.3.11	25.4.11	45	5	107	0	0	0	0	0	0	377	6
4	12.3.11	25.4.11	44	0	0	3	11	0	0	0	0	289	0
5	13.3.11	24.4.11	42	0	15	75	0	0	0	0	0	314	0
6	14.3.11	18.3.11	4	0	0	0	0	0	0	0	0	68	0
7	15.3 11	17 .5.11	63	0	0	0	0	0	0	0	2	10	0
8	15.3.11	17.5. 11	63	0	0	0	0	0	0	0	0	61	2
9	29.3.11	29.4. 11	31	0	0	0	0	0	0	0	0	26	0
10	6.5.11	9 .5. 11	3	0	0	0	0	0	0	0	0	0	0
11	7.5.11	5.6. 11	29	0	0	0	0	0	0	0	0	11	0
12	7.5.11	5.6. 11	29	0	0	0	3	0	0	0	0	20	0
13	7.5. 11	5.6. 11	29	0	0	0	0	0	0	0	0	8	0
14	7 .5.11	5 .6. 11	29	0	0	0	0	4	0	0	0	28	0
15	8.5.11	6.6. 11	29	0	3	0	0	0	0	0	0	5	0
16	8.5.11	6.6. 11	29	0	3	0	0	4	2	0	0	84	4
17	18.5.11	21.6.11	34	1	0	0	0	0	0	0	1	49	0
18	18.5.11	19.6.11	1	0	0	0	0	0	0	0	0	1	0
19	18.5.11	21.6.11	34	0	0	2	1	0	0	1	0	29	0
			631	6	128	80	15	8	2	1	3	1956	12
Capture rate/trap night				0.009	0.203	0.126	0.024	0.013	0.003	0.002	0.005	3.1	0.019

15.2 Appendix II. List of Mammal Species found in Taninthayi Natural Reserve

No	Common Name	Scientific Name	Myanmar Name	Type of evidence
1	Sunda pangolin	*Manis javanica*	သင်းခွေချပ်	QS
2	House shrew	*Suncus murinus*	စွေ့	QS
3	Least Horseshoe Bat	*Rhinolophus pusillus*	ဝါးလင်းနို့	Visual,
4	Asian Slow Loris	*Nycticebus bengalensis*	မျောက်မောင်းမ	QS,Visual
5	Banded Langur	*Presbytis femoralis*	မျောက်မြီးရှည်	QS,
6	Phayre's langur	*Trachypithecus phayrei*	မျောက်မျက်ကွင်းပြာ	QS,
7	Tenasserim Langur	*Trachypithecus barbei*	တနင်္သာရီမျောက်ညို	QS,
8	Northern Pig -Tailed Macaque	*Macaca leonina*	မျောက်ပတီး	QS, Cam
9	Stamp - tailed Macaque	*Macaca arctoides*	မျောက်မြီးတို	QS, Cam
10	White - handed Gibbon	*Hylobates lar*	မျောက်လွဲကျော်	Visual
11	Golden Jackal	*Canis aureus*	ခွေးအ	QS
12	Dhole	*Cuon alpinus*	တောခွေး	Cam,QS
13	Asian black Bear	*Ursus thibetanus*	ဝက်ဝံကြီး	Cam,QS,T&S
14	Sun Bear	*Helarctos malayanus*	မလေးဝက်ဝံ	Cam,QS,T&S
15	Yellow - throated Marten	*Martes flavigula*	စက်ခလောက်	QS
16	Large - toothed Ferret - Badger	*Melogale personata*	ကြောင်အူကြီး	QS
17	Hog Badger	*Arctonnyx collaris*	ကြွက်တူဝက်တူ	QS
18	Oriental small - clawed Otter	*Aonyx cinerea*	ခြေသည်းငယ်ဖျံ	QS,T&S
19	Smooth Otter	*Lutrogale perspicillata*	ဖျံမွေးချော	QS,T&S
20	Small Indian Civet	*Viverricula indica*	ကြောင်ကတိုး	Visual

21	Large - spotted Civet	*Viverra megaspila*	ကြောင်မြင်းကွက်	QS
22	Large Indian Civet	*Viverra zibetha*	ကြောင်မြင်း	QS,Cam
23	Masked palm Civet	*Paguma larvata*	ကြောင်ဝံနဂါး	QS
24	Common Palm Civet	*Paradoxurus hermaphroditus*	ကြောင်ဝံပိုက်	QS
25	Small - toothed palm Civet	*Arctogalidia trivirgata*	ကြောင်ဝံနားရွက်ဖြူ	QS
26	Binturong	*Arctictis binturong*	ဝံကြောင်	QS
27	Small Asian Mongoose	*Herpestes javanicus*	မြွေပါ	QS
28	Crab eating Mongoose	*Herpestes urva*	ဂဏန်းစားမြွေပါ	Cam, QS
29	Clouded Leopard	*Neofelis nebulosa*	အင်းကျား	QS,
30	Leopard	*Panthera pardus*	ကျားသစ်	QS,
31	Tiger	*Panthera tigris*	ကျား	QS
32	Marble Cat	*Pardofelis marmorata*	ကြောင်သလင်း	QS,Visual
33	Leopard Cat	*Prionailurus bengalensis*	သစ်ကြောင်	Visual,QS
34	Fishing Cat	*Prionailurus viverrinus*	ကြောင်တံငါ	QS
35	Jungle Cat	*Felis chaus*	တောကြောင်	QS
36	Asian Elephant	*Elephas maximus*	ဆင်	Visual,T&S, Cam
37	Asian Tapir	*Tapirus indicus*	ကြံ့သူတော်	Cam,T&S,
38	Asian two horned rhinoceros	*Dicerorhinus sumatrensis*	ဝက်ကြံ့	QS
39	Eurasian Wild Pig	*Sus scrofa*	တောဝက်	Cam,Visual,T&S,
40	Lesser Mousedeer	*Tragulus kanchil*	ယုန်သမင်/ချေလျော်င်	Cam,Visual,QS
41	Greater Mousedeer	*Tragulus napu*	ယုန်သမင်/ချေလျော်င်	QS,
42	Fea's Muntjac	*Munticus feae*	မူလာရစ်ချေ	Cam
43	Red Muntjac	*Muntiacus muntjak*	ချေ	Cam,Visual
44	Sambar	*Rusa unicolor*	ဆတ်	Cam,Visual,T&S
45	Gaur	*Bos frontalis*	ပြောင်	Cam,T&S
46	Chinese Serow	*Capricornis milneedwardsi*	တောင်ဆိတ်	T&S
47	Black giant squirrel	*Ratufa bicolor*	ရှည်ငပေါ	Visual
48	Western striped squirrels	*Tamiops mcclellandii*	မြန်မာရှဉ့်ကြား	QS,
49	Indochinese ground squirrel	*Menetes berdmorei*	မြေရှဉ့်	QS,
50	Red Giant Flying Squirrel	*Petaurista petaurista*	ရွှေပျံနီ	QS,
51	Indian Giant Flying Squirrel	*Petaurista philippensis*	ရွှေပျံကြီး	QS
52	House rat	*Rattus rattus*	အိမ်ကြွက်	QS/Visual
53	Indomalayan Bamboo rat	*Rhizomy sumatrenensis*	ဝါးပိုးကြွက်ကြီး	QS

54	Hoary Bamboo rat	*Rhizomys pruinosus*	ဟိုဝါရီ ဝါးပိုးကြွက်	Visual
55	Lesser Bamboo Rat	*Cannomys badius*	ဝါးပိုးကြွက်ကလေး	QS
56	Malayan Porcupine	*Hystris brachyura*	ဖြူကောင်ကြီး	Cam,QS,Quill
57	Bush tailed Porcupine	*Atherurus macrourus*	ဖြူမြီးဖွာ	Cam,QS,

Note: **QS** = Questionnaire survey, **Cam** = photo recorded by camera trap , **Visual** = seen alive or dead inside and outside of TNR, **T&S** = Track and sign

Common name and scientific name nomenclature followed by A field Guide to the Mammals of South East Asia (2008) Charles M. Fracis and Myanmar name followed to A Guide to the Large Mammals of Myanmar by John W.K.Parr and U Tin Than.

15.3 Appendix III: Distance encountered rate per km of tracks and sign data

Sr No	Date	Location	Distance (km)	Sambhar	Muntjac	Mouse Deer	Porcupine spp	Civet spp	Wild boar	Otter spp	Gaur	Bear	Elephant	Tapir	Serow	Gibbon spp	Langur	Stripted squirrel	Total Animal Traffic
1	8.3.2011	along Kyauklone gyi stream trail	4.02	2	1	1	1	2	5	2	1		1		3	1		1	**21**
2	9.3.2011	E3 stream-bochartake stream trail	1.60	3			1	1	4				1					1	**11**
3	11.3.2011	Khotama stream trail	5.63	5	1	2	2	4	5	2	3		1	1					**26**
4	12.3.2011	along Tha phyu stream trail	3.21	7	1		1	4	7	1	1		1		3	1	1		**28**
5	13.3.2011	up to Pike thone lone stream trail	2.41	4				2	3									1	**10**
6	14.3.2011	Sinswe stream trail	1.60	2	1	1		1	3				1						**9**
7	15.3.2011	Kyar stream - u kyaing mine trail	7.24	7	1	1	4	2	7	2	3	1	3			1	2		**34**
8	5.5.2011	Zinba to Make stream trail	8.85						9		1	1	1	1		1			**14**
9	6.5.2011	along Make strem	6.43	5	2	1			8	1									**17**
10	7.5.2011	along Byat ka than stream	5.79	3	1		2		7		2	1	6	1					**23**
11	8.5.2011	Byat Ka Than to kyauk lone gyi	7.24					1				2	2				1		**6**
12	18.5.2011	to U kying mine trail	8.04	4	1	1			9		1	1	3						**20**
Total			**62.06**	**42**	**9**	**7**	**11**	**17**	**67**	**8**	**12**	**6**	**20**	**3**	**6**	**4**	**4**	**3**	**219**
Encounter rate/km				0.68	0.15	0.11	0.18	0.27	1.08	0.13	0.19	0.10	0.32	0.05	0.10	0.06	0.06	0.05	3.53

15.4 Appendix IV. The characteristic of placement sites of camera traps.

Camera No#	Location (local name)	GPS location	Altitude (a.s.l) (Feet)	Micro habitat	Trap nights
1	Bo Char Take aban-doned orchard	N 14° 40' 24.2" E 098° 19' 03.5"	496	Riverine	48
2	Kho tama salt lick (Khotama upstream)	N 14° 45' 03.7" E 098° 15' 24.1"	581	Salt lick	45
3	Kho tama salt lick (Khotama upstream)	N 14° 45' 03.7" E 098° 15' 24.1"	581	Salt lick	45
4	Tha Pyu stream (up-stream of waterfall)	N 14° 44' 19.7" E 098° 15' 31.2"	672	Riverine	44
5	Pike Thone Lone Chaung upstream	N 14° 41' 13.0" E 098° 18' 15.6"	466	Riverine	42
6	Sin Swel Chaung (after crossing Zinba Stream)	N 14° 41' 45.5" E 098° 16' 25.7"	430	Grassland	4
7	U Kying Mine road (1)	N 14° 39' 48.8" E 098° 19' 46.6"	960	Abandoned road trail	63
8	U Kying Mine road (2)	N 14° 39' 19.6" E 098° 19' 57.3"	588	Abandoned road trail	63
9	Yebone hot spring	N 14° 31' 47.1" E 098° 16' 17.3"	553	Salt lick	31

10	Maw Ka Pe stream tributary to Ma Ke stream	N 14° 39' 53.0" E 098° 14' 10.1"	121	Trail	3
11	South part of Byat Ka Than salt lick (MeKe stream)	N 14° 39' 47.4" E 098° 16' 34.0"	480	Salt lick	29
12	Middle part of Byat Ka Than salt lick(MeKe stream)	N 14° 39' 47.136" E 098°16' 40.097"	480	Salt lick	29
13	Nothern part of Byat Ka Than salt lick(MeKe stream)	N 14° 39' 52.518" E 098°16' 33.304"	480	Salt lick	29
14	Northern ridge of Byat Ka Than salt lick(MeKe stream)	N 14° 40' 7.515" E 098°16' 17.335"	480	Salt lick	29
15	Byat Ka Than top mountain ridge	N 14° 40' 03.3" E 098° 16' 46.4"	1086	Ridge trail	29
16	Kyauk Lone Gyi mountain ridge	N 14° 40' 13.3" E 098° 17' 17.2"	912	Ridge trail	29
17	U Kyine Mine aban-doned road	N 14° 38' 49.8" E 098° 20' 28.4"	709	Abandoned road trail	34
18	U Kyine Mine aban-doned road	N 14° 37' 56.5" E 098° 21' 16.2"	649	Abandoned road trail	1
19	U Kyine Mine aban-doned road	N 14° 38' 23.8" E 098° 21' 04.8"	825	Abandoned road trail	34

15.5 Appendix V: Camera traps setting locations and species recorded in TNR.

Camera No	(1)
Camera Frame ID	B 100704022
Setup Date / Time	9 March 2011 (13:00)
Retrieval Date/ Time	26 April 2011 (08:26)
Location (local name)	Bo Char Take abandoned orchard (near H3 camp, the way to Kyar Kone)

Position N 14° 40' 24.2"

E 098° 19' 03.5"

Micro Habitat salt licks (riverine evergreen)

Animal Sign fresh wallows, wild pig's footprint

Observers U Nay Myo Shwe (NC), U Chit Saw (Ranger, TNRP), Saw Thaw Thu Htoo (local staff, TNRP), U Win Min Oo (Local staff, TNRP)

No	Common Name	Scientific name	No of shot	Remark
1	Sun Bear	*Helarctos malayanus*	4	
2	Wild Pig	*Sus scrofa*	14	
3	Sambar	*Rusa unicolor*	1	
4	Fail tarp		6	
5	Unidentified		1	
	Total shot		26	

Camera No (2)

Camera Frame ID B 100701813

Setup Date/Time 11 March 2011 (11:00)

Retrieval Date/ Time 25 April 2011 (08:58)

Location (local name) Kho tama salt lick (Khotama upstream)

Position N 14° 45' 03.7"

E 098° 15' 24.1"

Micro Habitat: Mineral salt lick (Evergreen)

Animal Sign: Tapir, gaur, sambhar and wild pigs footprint

Observers: U Nay Myo Shwe (NC), U Kyi Oo (Range Officer, TNRP), Saw Thaw Thu Htoo (local staff, TNRP), Saw Yo Nar Thar (Local staff, TNRP)

No	Common Name	Scientific name	No of shot	Remark
1	Wild Pig	*Sus scrofa*	21	
2	Sambar	*Rusa unicolor*	412	
3	Gaur	*Bos frontalis*	41	
4	Tapir	*Tapirus indicus*	83	1male and 1 female
5	Fail tarp		83	
6	Unidentified		5	
	Total shot		647	

Camera No (3)

Camera frame ID: B 100720940

Setup Date/ Time: 11. March 2011 (11:30)

Retrieval Date/ Time: 25 April 2011 (08:50)

Location (local name): Kho tama salt lick (Khotama upstream)

Position: N 14° 45' 03.7"

E 098° 15' 24.1"

Micro Habitat: Mineral salt lick (evergreen)

Animal Sign: Tapir, gaur, sambhar and wild pigs footprint

Observers: U Nay Myo Shwe (NC), U Kyi Oo (Range Officer, TNRP), Saw Thaw Thu Htoo (local staff, TNRP), Saw Yo Nar Thar (Local staff, TNRP)

No	Common Name	Scientific name	No of shot	Remark
1	Wild Pig	*Sus scrofa*	42	
2	Sambar	*Rusa unicolor*	138	
3	Malayan Porcupine	*Hystrix brachyura*	18	
4	Tapir	*Tapirus indicus*	66	1 male and 1 female
5	Large Indian Civet	*Viverra zibetha*	1	
6	Dhole	*Cuon alpinus*	5	
7	Red muntjac	*Muntiacus muntjak*	107	
8	Fail tarp		80	
9	Unidentified		1	
10	Hunters		6	2 persons with guns
	Total shot		465	

Camera No (4)

Camera Frame ID: B 100704034

Setup Date/ Time: 12. March 2011 (10:45)

Retrieval Date/ Time 25 April 2011 (08:55)

Location (local name) Tha Pyu stream (upstream of waterfall)

Position N 14° 44' 19.7"

E 098° 15' 31.2"

Micro Habitat Riverine evergreen

Animal Sign Tapir, gaur, sambhar and wild pigs footprint

Observer U Nay Myo Shwe (NC), U Chit Saw (Ranger, TNRP), U Win Zaw Aye (local staff, TNRP), Saw Yo Nar Thar (Local staff, TNRP)

No	Common Name	Scientific name	No of shot	Remark
1	Wild Pig	*Sus scrofa*	225	
2	Sambar	*Rusa unicolor*	2	
3	Malayan Porcupine	*Hystrix brachyura*	37	
4	Crab - eating mongoose	*Herpestes urva*	11	
5	Large Indian Civet	*Viverra zibetha*	2	
6	Asian black Bear	*Ursus thibetanus*	9	
7	? Mouse deer	*Tragulus sp;*	3	Not clear
8	Monitor lizard	*Varanus salvator*	2	
9	Fail tarp		156	
10	Unidentified		13	
	Total shot		460	

Camera No (5)

Camera Frame ID	B100720957
Setup Date/ Time	13. March 2011 (10:00)
Retrieval Date/ Time	24 April 2011 (16:15)
Location (local name)	Pike Thone Lone Chaung upstream (between Kyauk Lone Gyi camp and H3)
Position	N 14° 41' 13.0" E 098° 18' 15.6"
Micro Habitat	Riverine evergreen
Animal Sign	wallows and wild pigs footprint
Observesr	U Nay Myo Shwe (NC), U Chit Saw (Ranger, TNRP), Saw Thaw Thu Htoo (local staff, TNRP), U Win Min Oo (Local staff, TNRP)

No	Common Name	Scientific name	No of shot	Remark
1	Wild Pig	*Sus scrofa*	132	
2	Red Muntjac	*Muntacus muntjak*	15	
3	Malayan Porcupine	*Hystrix brachyura*	79	
4	Bush tailed Pocupine	*Atherurus macrourus*	10	
5	Sun Bear	*Helarctos malayanus*	3	
6	? Mouse deer	*Tragulus sp;*	75	Not clear
7	Red jungle fowl	*Gallus gallus*	36	
8	Fail tarp		118	
9	Unidentified		3	
	Total shot		471	

Camera No (6)

Camera Frame ID B 100704070

Setup Date/Time 14 March 2011 (09:00)

Retrieval Date/ Time 18 March 2011 (16:00) FAIL

Location (local name) Sin Swel Chaung (after crossing Zinba Stream)

Position N 14° 41' 45.5"

E 098° 16' 25.7"

Micro Habitat Grassland, evergreen forest

Animal Sign Sambhar and wild pigs footprint

Observer U Nay Myo Shwe (NC), U Chit Saw (Ranger, TNRP), Saw Thaw Thu Htoo (local staff, TNRP), Saw Yo Nar Thar (Local staff, TNRP)

No	Common Name	Scientific name	No of shot	Remark
1	Sambar	*Rusa unicolor*	68	
2	Fail trap		17	
	Total shot		85	

Camera No (7)

Camera Frame ID B 100701829

Setup Date/Time 15 March 2011 (14:06)

Retrieval Date/ Time 17 May 2011 (13:47)

Location (local name) U Kying Mine road (1)

Position N 14° 39' 48.8"

E 098° 19' 46.6"

Micro Habitat Ridge trail, dense evergreen forest

Animal Sign elephant, cat spp; and wild pigs footprint

Observers U Nay Myo Shwe (NC), U Chit Saw (Ranger, TNRP), U Win Zaw Aye (local staff, TNRP), Saw Thaw Thu Htoo (local staff, TNRP), U Win Min Oo (Local staff, TNRP)

No	Common Name	Scientific name	No of shot	Remark
1	Wild Pig	*Sus scrofa*	2	
2	Fea's Muntjac	*Muntacus muntjak*	2	
3	Asian Elephant	*Elephas maximus*	3	
4	Sambar	*Rusa unicolor*	1	
5	Sun Bear	*Helarctos malayanus*	2	
6	Fail tarp		2	
7	Unidentified		1	
	Total shot		13	

Camera No (8)

Camera Frame ID B 100720955

Setup Date/Time 15. March 2011 (13:20)

Retrieval Date/ Time 17 May 2011 (14:22)

Location (local name) U Kying Mine road (2)

Position N 14° 39' 19.6"

E 098° 19' 57.3"

Micro Habitat ridge trail, dense evergreen forest

Animal Sign Bear claw mark and footprint

Observers U Nay Myo Shwe (NC), U Chit Saw (Ranger, TNRP), U Win Zaw Aye (local staff, TNRP), Saw Thaw Thu Htoo (Local staff, TNRP), U Win Min Oo (Local staff, TNRP)

No	Common Name	Scientific name	No of shot	Remark
1	Wild Pig	*Sus scrofa*	7	
2	Malayan Porcupine	*Hystrix brachyura*	4	
3	Sambar	*Rusa unicolor*	37	
4	Asian Elephant	*Elephas maximus*	9	
5	?Civet	*Viverridae*	4	
6	Fail tarp		45	
7	Unidentified		4	
8	Hunter		2	2 persons with guns
	Total shot		112	

Camera No (9)

Camera Frame ID B 100720942

Setup Date/Time 29 March 2011 (08:51)

Retrieval Date/ Time 29 April 2011 (16:04)

Location (local name) Yebone (hot spring)

Position N 14° 39' 19.6"

E 098° 19' 57.3"

Micro Habitat hot spring

Animal Sign ungulate foot prints

Observers U Chit Saw (Ranger, TNRP), U Win Zaw Aye (local staff, TNRP), Saw Thaw Thu Htoo (Local staff, TNRP), Saw Show Lomoe (Local staff, TNRP)

No	Common Name	Scientific name	No of shot	Remark
1	Wild Pig	*Sus scrofa*	12	
2	Sambar	*Rusa unicolor*	4	
3	Asian Elephant	*Elephas maximus*	10	
4	Fail tarp		40	
	Total shot		66	

Camera No 10

Camera Frame ID B 100720942

Setup Date / Time 6 May 2011(07:34)

Retrieval Date/ Time 9 May 2011 (FAIL)

Location (local name) Maw Ka Pe stream and Ma Ke stream meet up

Position N 14° 39' 53.0"

E 098° 14' 10.1"

Altitude 121 feet

Micro Habitat jungle trail (dense evergreen)

Animal Sign old tapir foot print, sambar and wild pig's footprint

Observers U Nay Myo Shwe (NC), U Maung Shwe (Ranger, TNRP), Saw Thaw Thu Htoo (local staff, TNRP), Saw Thu De (Local staff, TNRP), U Chaw Naing (local guide, Zinba village)

No	Common Name	Scientific name	No of shot	Remark
1	Fail trap		1	
	Total shot		1	

Camera No 11

Camera Frame ID B 100701813

Setup Date / Time 7 May 2011(10:40)

Retrieval Date/ Time 5 June 2011 (15:06)

Location (local name) southern part of Byat Ka Than salt lick (Me Ke stream)

Position N 14° 39' 47.4"

E 098° 16' 34.0"

Altitude 480 feet

Micro Habitat mineral saltlick (dense evergreen)

Animal Sign elephant footprint, wild pig's and sambar footprint

Observers U Nay Myo Shwe (NC), U Maung Shwe (Range, TNRP), Saw Thaw Thu Htoo (local staff, TNRP), Saw Thu De (Local staff, TNRP), U Chaw Naing (local guide, Zinba village)

No	Common Name	Scientific name	No of shot	Remark
1	Wild Pig	*Sus scrofa*	11	
2	Fail		3	
	Total shot		14	

Camera No 12

Camera Frame ID B 100704034

Setup Date / Time 7 May 2011 (10:02)

Retrieval Date/ Time 5 June 2011 (14:55)

Location (local name) Middle part of Byat Ka Than salt lick (MeKe stream)

Position N 14° 39' 47.136"

E 098° 16' 40.097"

Altitude 480 feet

Micro Habitat mineral saltlick (rocky ,open field)

Animal Sign tapir dung, elephant dung and wild pig's and sambar footprint

Observers U Nay Myo Shwe (NC), U Maung Shwe (Range, TNRP), Saw Thaw Thu Htoo (local staff, TNRP), Saw Thu De (Local staff, TNRP), U Chaw Naing (local guide, Zinba village)

No	Common Name	Scientific name	No of shot	Remark
1	Tapir	*Tapirus indicus*	4	
2	Crab - eating mongoose	*Herpestes urva*	3	
3	Malayan Porcupine	*Hystrix brachyura*	11	
4	Bush tailed Pocupine	*Atherurus macrourus*	2	
5	Fail tarp		21	
6	Unidentified		2	
	Total shot		43	

Camera No 13

Camera Frame ID B 100720957

Setup Date / Time 7 May 2011(10:36)

Retrieval Date/ Time 5 June 2011 (14:55)

Location (local name) Northern part of Byat Ka Than salt lick (MeKe stream)

Position N 14° 39' 52.518"

E 098° 16' 33.304"

Altitude 480 feet

Micro Habitat mineral saltlick (dense evergreen)

Animal Sign wild pig's and sambar footprint

Observers U Nay Myo Shwe (NC), U Maung Shwe (Range, TNRP), Saw Thaw Thu Htoo (local staff, TNRP), U Saw Thu De (Local staff, TNRP), U Chaw Naing (local guide, Zinba village)

No	Common Name	Scientific name	No of shot	Remark
1	Wild Pig	*Sus scrofa*	6	
2	Sambar	*Rusa unicolor*	1	
3	Sun Bear	*Helarctos malayanus*	1	
4	Fail Trap		4	
	Total shot		12	

Camera No 14

Camera Frame ID B 100704022

Setup Date / Time 7 May 2011(11:24)

Retrieval Date/ Time 5 June 2011 (16:08)

Location (local name) Northern ridge of Byat Ka Than salt lick (MeKe stream)

Position N 14° 40' 7.515"

E 098° 16' 17.335"

Altitude 520 feet

Micro Habitat animal trail (dense evergreen)

Animal Sign bear pugmark, wild pig's and sambar footprint

Observers U Nay Myo Shwe (NC), U Maung Shwe (Range, TNRP), Saw Thaw Thu Htoo (local staff, TNRP), Saw Thu De (Local staff, TNRP), U Chaw Naing (local guide, Zinba village)

No	Common Name	Scientific name	No of shot	Remark
1	Wild Pig	*Sus scrofa*	23	
2	Nothern pig- tailed Macaque	*Macaca leonina*	4	
3	Malayan Porcupine	*Hystrix brachyura*	1	
4	Fail tarp		11	
5	Unidentified		1	
			40	

Camera No 15

Camera Frame ID B 100720940

Setup Date / Time 8 May 2011 (09:30)

Retrieval Date/ Time 6 June 2011 (10:14)

Location (local name) Byak Ka Than top mountain ridge

Position N 14° 40' 03.3"

E 098° 16' 46.4"

Altitude 1086 feet

Micro Habitat ridge trail (dense evergreen)

Animal Sign Sambar, elephant footprint and bear claws mark

Observers U Nay Myo Shwe (NC), U Maung Shwe (Ranger, TNRP), Saw Thaw Thu Htoo (local staff, TNRP), Saw Thu De (Local staff, TNRP), U Thein Soe (local staff, TNRP), U Ar Kar Lin (local staff, TNRP), U Chaw Naing (local guide, Zinba village)

No	Common Name	Scientific name	No of shot	Remark
1	Sun Bear	*Helarctos malayanus*	1	
2	Red Muntjac	*Muntacus muntjak*	3	
3	Large Indian Civet	*Viverra zibetha*	1	
4	Fail trap		4	
	Total shot		9	

Camera No 16

Camera Frame ID B 100825010

Setup Date / Time 8 May 2011 (10:39)

Retrieval Date/ Time 6 June 2011 (11:05)

Location (local name) Kyauk Lone Gyi mountain ridge

Position N 14° 40' 13.3"

E 098° 17' 17.2"

Altitude 912 feet

Micro Habitat ridge trail (dense evergreen)

Animal Sign bear claw mark, sambar footprint, and elephant feeding sign

Observers U Nay Myo Shwe (NC), U Maung Shwe (Ranger, TNRP), Saw Thaw Thu Htoo (local staff, TNRP), U Saw Thu De (Local staff, TNRP), U Thein Soe (local staff, TNRP), U Ar Kar Lin (local staff, TNRP), U Chaw Naing (local guide, Zinba village)

No	Common Name	Scientific name	No of shot	Remark
1	Stump tailed Macaque	*Macaca arctoides*	2	
2	Nothern pig -tailed macaque	*Macaca leonina*	4	
3	Sambar	*Rusa unicolor*	75	
4	Red Muntjac	*Muntacus muntjak*	3	
5	Fail trap		24	
6	Hunters		4	2 time (2+1)
	Total shot		112	

Camera No 17

Camera Frame ID B 100720955

Setup Date / Time 18 May 2011 (11:49)

Retrieval Date/ Time 21 June 2011 (09:30)

Location (local name) U Kyine Mine abandoned road (3)

Position N 14° 38' 49.8"

E 098° 20' 28.4"

Altitude 912 feet

Micro Habitat ridge trail (dense evergreen)

Animal Sign ungulate footprint

Observers U Nay Myo Shwe (NC), U Zaw Min Naing (Forester, TNRP), Saw Aeroplane (local staff, TNRP), Saw Thu De (Local staff, TNRP),

No	Common Name	Scientific name	No of shot	Remark
1	Wild Pig	*Sus scrofa*	47	
2	Fea's Muntjac	*Muntacus muntjak*	1	
3	Dhole	*Cuon alpinus*	1	
4	Fail		31	
	Total shot		80	

Camera No 18

Camera Frame ID B 100701829

Setup Date / Time 18 May 2011 (11:19)

Retrieval Date/ Time 19 May 2011 (21:54)

Location (local name) U Kyine Mine abandoned road (4)

Position N 14° 37' 56.5"

E 098° 21' 16.2"

Altitude 649 feet

Micro Habitat ridge trail (dense evergreen)

Animal Sign ungulate footprint

Observers U Nay Myo Shwe (NC), U Zaw Min Naing (Forester, TNRP), Saw Aeroplane (local staff, TNRP), Saw Thu De (Local staff, TNRP),

No	Common Name	Scientific name	No of shot	Remark
1	Wild Pig	*Sus scrofa*	1	
2	Fail trap		1	
	Total shot		2	

Camera No 19

Camera Frame ID B 100825013

Setup Date / Time 18 May 2011 (10:49)

Retrieval Date/ Time 21 June 2011 (10:00)

Location (local name) U Kyine Mine abandoned road (5)

Position N 14° 38' 23.8"

E 098° 21' 04.8"

Altitude 825 feet

Micro Habitat ridge trail (dense evergreen)

Animal Sign ungulate footprint

Observers U Nay Myo Shwe (NC), U Zaw Min Naing (Forester, TNRP), Saw Aeroplane (local staff, TNRP), Saw Thu De (Local staff, TNRP),

No	Common Name	Scientific name	No of shot	Remark
1	Wild Pig	*Sus scrofa*	9	
2	Mouse deer sp;	*Tragulus sp;*	2	
3	Sambar	*Rusa unicolor*	6	
4	Crab - eating mongoose	*Herpestes urva*	1	
5	Malayan Porcupine	*Hystrix brachyura*	10	
6	Monkey sp:	*Macaca sp:*	1	Not clear
7	Undentified		2	
8	Fail trap		88	
	Total shot		119	

15.6 Appendix VI: Questionnaire form

Taninthayi Nature Reserve Project

Tapir Questionnaire form

Name Date

Age Residence

Occupation Race

1. When have you been living here?

2. How often do you visit nearby forest?

3. Purpose of visit.

4. Have you encounter tapir? When.

5. I f; where/ how many?

6. Selected your sighted animals in this chart.

7. Other sighted animals in the forest. (If)

No	Name of animals	Number		Location		Remark
		scarce	Abundant	Inside TNR	Outside TNR	
1.						
2.						
3.						
4.						

No	Name of animals	Number		Location		Remark
		scarce	Abundant	Inside TNR	Outside TNR	
5.						

8. Did you meet hunters?

9. How do they hunt?

No	Hunted animals	Hunting techniques					Remark
		Gun	Snare	Pitfall	Dog	Bow	
1							
2							
3							

10. Crop.....Acre.....

Crop raiding animals .....

11. Have you seen people ate Tapir meat? (Yes/No)

12. Have you seen Tapir carcass (or) skeleton in the forest? (Yes/No)

If YES when ( ) where ( )

15.7 Appendix VII: Photo recorded by camera traps

Asian Elephant (*Elephas maximus*)

Asian Black Bear (*Ursus thibetanus*)

Eurasian Wild Pig (*Sus scrofa*)

Gaur (*Bos frontalis*)

Sambar (*Rusa unicolor*) with left antlered shedding

Red muntjac (*Muntiacus muntjak*)

Photo recorded by camera traps (continue)

Mouse deer (*Tragulus sp*;)

Large Indian Civet (*Viverra zibetha*)

Crab – eating Mongoose (*Herpestes urva*)

Malayan porcupine (*Hystris brachyura*)

Stump – tailed Macaque (*Macaca arctoides*)

Monitor Lizard (*Varanus salvator*)

15.8 Appendix VIII: Wild mammal pho-

to recorded from TNR and around.

Marble cat (*Pardofelis marmorata*)

Northern pig tailed Macaque (*Macaca leonina*)

Black giant Squirrel (*Ratufa bicolor*)

Macaque sp; (*Macaca sp;*) juvenile

Leopard Cat (*Prioanilurus bengalensis*)

White – handed Gibbon (*Hylobates lar*)

15.9 Appendix IX: Details of herbi-

vores scat collection

No	Speci-men ID	Species	Collection Date/Time	Location	GPS position	Micro Habitat	Remark
1	001	Civet sp;	8 March 2011 (08:10)	Kyauk lone gyi stream trail		On the dead tree	Fruit seed
2	005	Civet sp;	11 March 2011 (09:22)	Kho ta ma stream trail	N 14°43'49.6" E 98°14'45.4"	Stream bed	Fruit seed
3	002	Tapir	May 2008	Thit Kha Taung ridge		forest	Hoof
4	003	Tapir	7 May 2011 (10:05)	Byat Ka Than salt lick	N 14°39’47.4" E 98°16'34.0"	grass	dung
5	004	Tapir	8 May2011 (08:45)	Byat Ka Than Mountain	N 14°39'49.5" E 98°17'30.0"	forest	dung
6	006	Sambar	10 June 2011 (13:45)	Khotama salt lick	N 14°45'02.9" E 98°15'23.6"	forest	faeces
7	007	Monkey?	10 June 2011 (14:00)	Khotama slat lick	N 14°45'02.9" E 98°15'23.6"	forest	faeces