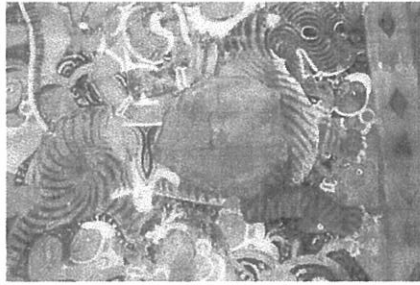
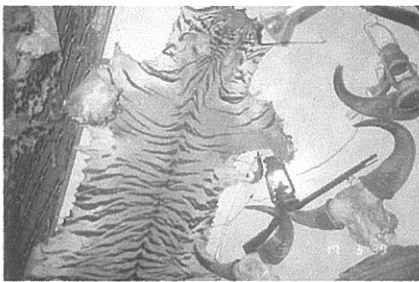


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**A National Tiger Action Plan  
for  
The Union of Myanmar  
(FINAL DRAFT VERSION)**



Prepared by  
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For  
Myanmar Forest Department,  
Ministry of Forests



July 31<sup>st</sup>, 2002

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Preface

Director-General  
Forest Department  
Ministry of Forestry

## Foreword

It is with great pleasure that I introduce the National Tiger Action Plan to the government and the people of Myanmar. Upon first arriving in Myanmar in 1993, I remember how surprised I was by the intense feeling of “rightness” that overcame me. Having worked more than a decade in other parts of Asia I was feeling despair over the future of conservation in the region. I had grown tired of grappling with issues that never got resolved, despite my best efforts, and I was losing faith in the ability of people to realize how important wildlife and wild lands were to the quality and integrity of their lives. It seemed impossible to me at the time that any place I chose to work again would be different. But I was wrong. Myanmar was different.

I had first become interested in Myanmar because of its potential as one of the world’s last strongholds for large mammal species such as tigers, clouded leopards, and Asian elephants. And I hungered to go into the hinterlands of a country that contained the world’s last great stands of teak trees, rugged, unexplored mountain ranges, and a diversity of wildlife almost unparalleled in the Asia-Pacific region. But what I had never anticipated was the intelligence, kindness, and diversity of the Myanmar people, and how seriously the Myanmar Forest Department and the Wildlife Division took their mandate to protect and conserve the country’s remaining forests and wildlife.

I am pleased to have had the opportunity for the last nine years to work with staff of the Myanmar Forest Department. I feel honored to have played a role in helping survey and designate some of the country’s and the region’s finest protected areas, such as Hkakabo Razi National Park and Hukaung Wildlife Sanctuary. But our work is only beginning. I was saddened to learn the results of the tiger surveys that were carried out by WCS and the Myanmar Forest Department. Yet I was heartened by the fact that there were still places of intact habitat where tigers and other wildlife had a chance for the future if proper actions were taken.

This National Tiger Action Plan compiled by Dr. Antony Lynam is a landmark document. Nothing of this magnitude has been compiled for any country where tigers still roam. But this document should not simply be viewed as a finished product to be placed on a shelf. It is a realistic plan of action that, if followed, could bring the tiger, a national treasure, back to Myanmar in numbers that will guarantee their future for many generations to come. I am optimistic that the government and the people of Myanmar will do what needs to be done to save the tiger and the other spectacular wildlife species that wander their forests. And I hope that I and other WCS scientists will continue to be given the opportunity to assist in any way possible towards this effort.

I was correct about the feeling of “rightness” when I came to Myanmar in 1993. I hope I am also correct that in the years to come, Myanmar will point to its forests and wildlife with pride, and they will be held up as an example to other countries of what is possible when one cares about its natural heritage.

Alan Rabinowitz Ph.D  
Director, Science and Exploration Program  
Wildlife Conservation Society

## A Guide to Using This Document

This document is divided into three sections. An executive summary of findings and general recommendations and a National Action Plan with specific recommendations, a schedule for the implementation of these actions, and responsible agencies is provided in pages 8-13. This is minimum reading for decision makers. For readers with some time to appreciate the background and rationale for these actions, PARTS 1-5 of this document (pages 14-43) is essential reading. PART 6 (pages 44-62) provides details of the field program that was mounted to acquire the information that provides the foundation for the Action Plan, and is optional reading.

## Executive Summary of Findings and Recommendations

### Background

1. A hundred years ago the tiger (*Panthera tigris*) occurred across Asia from eastern Turkey to the Russian Far East and south to the Indonesian archipelago. Myanmar is one of fourteen countries in Mainland Asia where tigers persist today.
2. Reports and anecdotal information from surveyors, hunters, foresters, consultants and researchers attest to the former widespread occurrence of tigers in Myanmar, except in very high elevation areas in the north. That tigers existed over wide areas in the past was partly due to the existence of large expanses of intact habitat where human population density was low and disturbance to tigers and their prey was minimal.
3. Recent attempts to quantify Myanmar's tiger population were hampered because while rapid assessments for wildlife had been made in many areas, dedicated field surveys for tigers had not been done.
4. While tiger status remained uncertain, the trends for tigers and their habitats are well understood. Widespread sport hunting in the past, and commercial hunting spurred by a recent demand for traditional medicines in Asia led to the demise of tigers across the remaining habitats. By the early part of the 20<sup>th</sup> Century thousands of tigers had been reported killed in Myanmar.
5. Myanmar lost 25% of its forest cover, potential habitat for tigers and other wildlife between the 1940's and 2000. By 2002, 4.73% (31,792 sq. km) of the country was either formally protected or proposed for protection. Tigers require areas 3,000 – 15,000 sq. km in size for long-term survival. While forest areas of this size exist in the country only three areas are currently protected. Nearly 80% of the protected areas are less than 1,000 sq.km, with 10 areas less than 100 sq.km.

### Summary of activity and main findings

1. As a first step towards long-term future planning for tigers in Myanmar, and to guide efforts to identify new areas for protection, a project to develop an updated National Tiger Action Plan was initiated in 1998. The primary objective of the program was to determine tiger occurrence via direct field



survey across potential tiger habitats, and use this information to select areas for special protection for tigers.

2. Tigers may serve as conservation “umbrellas”. This is the concept that protecting places with tigers effects the conservation of other wildlife and biodiversity elements with smaller ranges.
3. The program was initiated by the Myanmar Forest Department and the Wildlife Conservation Society with financial support from the “Save The Tiger Fund” a joint project of the National Fish and Wildlife Foundation and ExxonMobil.
4. A tiger conservation and survey techniques training workshop was conducted for Forest Department and NGO junior staff at Alaungdaw Kathapa National Park, historically known for its tigers. From the training, a team of seven participants was recruited to carry out field surveys, and conduct awareness work in communities adjacent to survey areas.
5. Using the results of a previous planning analysis for tigers, and updated maps of forest cover, a set of 17 potential tigers areas were identified from large blocks of forest.
6. Interviews of local people were done to determine likely places where tigers existed in these forest complexes and guide the selection of survey locations.
7. Using a field technique first developed in India, and modified for use in Southeast Asia, a team of trained staff conducted presence-absence surveys for tigers at each site. A field survey effort during 1999-2002 involving >15,000 nights with camera-traps, and >1,300 hours of sign searching across 5,500 sq.km of potential tiger habitat revealed the following results;
  - Tiger occurred in less than a quarter of the potential areas;
  - Tigers have disappeared from five areas surveyed; Alaungdaw Kathapa, Thaugndut, Mahamyaing, Nankamu, Panlaung-Pyadalin;
  - Tigers have disappeared or occur at very low density in ten of the areas surveyed; N. Rakhine and S. Chin State, Sumprabum, Khaunglanphu, Paunglaung, Momeik-Mobain, Bago Yoma, S. Rakhine Elephant Range, Shan Yoma (Kayah-Kayin), S. Kachin, Saramati Taung and adjacent areas;
  - Tiger occur in Htamanthi Wildlife Sanctuary, Sagaing Division and surrounding areas. The population is small (<10 individuals) and is threatened with extinction;

- Tigers occur in a large intact forest landscape comprising Hukaung Valley and surrounding areas, in Kachin State. Moderate numbers (<50) of tigers are thought to exist there;
  - Tigers occur in a large intact forest landscape in northern and southern Tanintharyi Division. A relatively large (>50) population is thought to exist there. Forests in Thailand's Western Forest Complex and Kaeng Krachan potentially serve as source populations for the tigers there. Together these areas represent the largest, intact habitats for tigers in Indoburma;
  - In all areas where they persist in Myanmar tigers are threatened by poaching for commercial international trade, and poaching of prey for local consumption and local trade
  - Respect for the tiger via local customs in Tanintharyi Division is possibly outweighed by the risk posed by roving groups of Lisu hunters who are attempting to penetrate the region to supply the commercial trade;
  - At Htamanthi, tigers additionally face the potential loss of habitat by major development projects
8. Probably no more than 150 tigers now exist in the wild in Myanmar but the population is rapidly declining so that tigers are on the verge of extinction in this country.

#### Recommendations for addressing conservation needs of tigers

1. Although the situation is critical tiger populations may potentially be recovered if an immediate and long-term commitment is made by the Government.
2. The priority actions necessary in the short-term (2-5 years) for saving tigers are;
  - Establish protected areas, protected corridors and priority management areas in and around the Hukaung Valley, and in Tanintharyi Division to protect wild tigers and their habitat
  - Establish monitoring programs for tiger and prey population in these places to assess the effectiveness of conservation efforts
  - Reduce killing of tiger prey species and trade that has developed around those species. Train government staff in anti-poaching and anti-trafficking

techniques and develop systems for patrolling these areas to ensure the preservation of these resources;

- Suppress all killing of tigers and the illegal trade in tiger products. Introduce new legislation to enable enforcement of CITES laws. Conduct wildlife conservation and awareness training for government personnel and recruit them to help identify and suppress wildlife trade
  - Define roles and responsibilities of government and non-government personnel responsible for tiger conservation
3. The priority actions necessary for saving tigers in the long-term (6-20 years) are;
- Improve public awareness and develop education curricula concerning the importance of tiger conservation to increase support from local people;
  - Improve forestry management to stop further loss of tiger habitat and to restore degraded habitat;
  - Improve forestry management to reduce intrusions of local people into tiger habitat, and improve landscape planning to avoid development in tiger critical areas;
  - Improve international cooperation to maintain connectivity of tiger habitat across international boundaries possibly through the establishment of transboundary protected areas.

**Table 1: National Tiger Action Plan for Myanmar**

Action	Organisation delivering		Timeframe / to be completed by				
	Lead	Other	2003	2004	2005	2006	2007
<b>1. Suppressing all killing of tigers and the illegal trade in tiger products</b>							
a) Modify the Protected Wildlife and Protected Areas Law to enable the enforcement of CITES laws within Myanmar. This would include articles prohibiting the sale or purchase of products suggesting or implying content of tiger bone, hair, organs, blood, teeth, claws or hide.	Myanmar Govt		✓				
b) Impose heavy fines for offenders and use partial proceeds towards implementing CITES legislation	Myanmar Govt		✓				
c) Conduct wildlife conservation and awareness training for 100 government personnel, including military, customs, police, immigration and local administrative staff in Yangon, Mandalay, Myitkyina and other internal transit points for wildlife. This would include basic training in identifying wildlife listed in the Myanmar Protection of Wildlife and Protected Areas Law 1994, and knowing their protection status.	Myanmar Govt (relevant Ministries)	WCS and other NGOs	✓				
d) Conduct wildlife conservation and awareness training for all staff in tiger sites and landscapes	Myanmar Govt. & WCS		✓				
e) Recruit local government staff to help identify tigers in trade and encourage them to report their observations to relevant authorities	Myanmar Govt. & Sagaing Taniharyi Division, Kachin and Shan States	WCS and other NGOs	✓				
f) Create a Wildlife Investigations Unit to investigate and suppress crime against wildlife, including trade, trafficking, illegal killing and capture, habitat destruction, and other persecution. The unit will enforce domestic and CITES legislation. The unit would include staff of the Ministries of Interior, Forestry and Tourism and would report directly to the Minister of Forestry	Myanmar Govt.	WCS and other NGOs		✓			
g) Train and recruit government staff to join the Wildlife Investigations Unit. Form mobile units to suppress wildlife crime across the country.	Myanmar Govt.	WCS and other NGOs		✓			
<b>2. Reducing killing of tiger prey species and associated trade.</b>							
a) Modify the Protected Wildlife and Protected Areas Law to enable the enforcement of CITES laws within Myanmar. Modify Chapter V, Article 15 to recognize the IUCN and CITES classifications of wildlife species, and their associated protection status.	Myanmar Govt.	WCS	✓				
b) Ban the commercial farming of all wildlife species. Revoke Articles 17 and 18, Chapter V in the Protected Wildlife and Protected Areas Law.	Myanmar Govt.		✓				
c) Ban the hunting of all wildlife species pending scientific evidence that proves it can be done sustainably. Revoke Chapter VI in the Protected Wildlife and Protected Areas Law.	Myanmar Govt.		✓				
d) Suppress all killing of prey species at tiger sites and landscapes.	Myanmar Govt.	WCS and other NGOs					✓
e) Train government staff at Hukaung Valley and Htamanthi, in anti-poaching and anti-trafficking techniques. Where possible involve local military personnel as instructors.	Myanmar Govt.		✓				
f) Recruit teams of EcoRangers whose sole responsibility is protection. Numbers of EcoRangers should at least 3 guards/100 sq. km for effective management. Provide EcoRangers with necessary equipment, and salary incentives to motivate them to combat poaching	Myanmar Govt.	WCS			✓		
g) Develop systematic patrolling inside all protected areas using EcoRangers. Make patrolling a mandatory management activity with a monthly schedule and budget.	Myanmar Govt.				✓		
h) Update the Wildlife Law to include protection for wildlife outside protected areas, and empower government staff to enforce the legislation.	Myanmar Govt.	WCS			✓		
i) Outside protected areas, study patterns of hunting and consumption of wildlife to determine its sustainability, especially for prey species.	WCS						✓
j) In the List of Protected Animals (Ministry of Forestry, 1994), promote the following tiger prey species	Myanmar Govt.		✓				

Table 1. (ctd) National Tiger Action Plan for Myanmar

Action	Organisation delivering		Timeframe / to be completed by				
	Lead	Other	2003	2004	2005	2006	2007
f) Create new protected areas or special tiger management zones in the Tainintharyi Division, including the Lemya River, Greater and Lesser Tainintharyi River catchments. These sites will protect tigers and their habitats and allow limited human use of natural resources around the reserves in a manner complementary to tiger conservation.	Myanmar Govt.						✓
g) Use existing GIS capabilities in the PD to identify and demarcate special management zones and corridors for tigers.	Myanmar Govt. & WCS		✓				
<b>6. Improving international cooperation and establish transboundary protected areas to maintain connectivity of tiger habitat across international boundaries</b>							
a) Conduct wildlife conservation and awareness training for 100 government personnel, including military, customs, police, immigration and local administrative staff, stationed near or on country borders. This would include basic training in identifying wildlife listed in the Myanmar Protection of Wildlife and Protected Areas Law 1994, and knowing their protection status.	Myanmar Govt. & WCS		✓				
b) Hold 2 internal workshops involving local government officials to discuss transborder issues including trade, trafficking and wildlife, and develop plans to suppress the trade.	Myanmar Govt.	WCS	✓				
c) Recruit local government officials on both sides of the Thailand border to suppress transborder wildlife trade at Mawdung-Prachup Kiri Khan, Kalehnaung-Ban I Tong, Kawhaung-Ranong (especially Tha Htay Island), Myawaddy-Mae Sot, Three Pagoda Pass, and Tachileik-Mae Sai, and prevent access by professional poachers from Thailand.	Myanmar Govt.	WCS		✓			
d) Create a tiger reserve in Tainintharyi Division opposite Thailand protected areas that support large populations of tigers. Western Forest Complex and Kaeng Krachan National Park.	Myanmar Govt.			✓			
e) If possible expand the reserve or create new reserves to form a corridor between these two Thai reserves.	Myanmar Govt.						✓
f) Develop a spatially explicit tiger conservation database for the Hwai Kha Khaeng – Thung Yai Naresuan TCU (Level I TCU 73).	Myanmar Govt. & WCS, Thailand Govt.				✓		
g) Where possible mount annual joint anti-poaching patrol/wildlife surveys along the Thailand-Myanmar border involving security personnel from both countries	Myanmar Govt. Thailand Govt.	WCS			✓		
<b>7. Monitoring the status of the tiger and prey population to assess the effectiveness of conservation efforts</b>							
<i>For Hukawng Valley landscape:</i>							
a) Identify critical habitats and core areas for tigers and prey across the landscape	Myanmar Govt. & WCS	*	✓				
b) Estimate numbers of female tigers within the landscape and ascertain that there is a reproductively viable population of tigers	Myanmar Govt. & WCS		✓				
c) Document the current threats, demographics, and range of human activities that must be taken into account if the proposed landscape is to be successful and sustainable in the long term.	Myanmar Govt. & WCS		✓				
d) Create a GIS map and database to show current land use patterns, possible future land use trends, and tiger and prey source areas.	Myanmar Govt. & WCS		✓				
<i>For Tainintharyi Division landscape:</i>							
e) Train local foresters how to identify tiger and prey via sign surveys, in use of camera-traps for wildlife survey, and methods for making observations and recording data	WCS			✓			
f) Determine occupancy of habitats in accessible sites across the landscape, including Myinmolekat and Lemya River areas, which away from sites where tigers are known	Myanmar Govt. & WCS			✓			
g) Determine prey abundance using line transect sampling	Myanmar Govt. & WCS			✓			
h) Determine tiger abundance using double-sided camera-trap sampling	Myanmar Govt. & WCS			✓			

*For sites in N. Rakhine and S. Chin State, Sumptrabum, Khaunglanphu, Paunglaung, Momeik-Mobain,*

bubalis).								
k) In the List of Protected Animals (Ministry of Forestry, 1994), promote the following tiger prey species from Seasonally Protected status to Completely Protected status; Hog deer (Axis porcinus) and Barking deer (Muntiacus muntjak).	Myanmar Govt.							
l) Compulsory wildlife conservation and awareness training for all wildlife offenders.	Myanmar Govt.	WCS						
m) Impose heavy fines for wildlife offenders in tiger areas with partial proceeds towards supporting antipoaching activities.	Myanmar Govt.							
<b>3. Improving forestry management to stop further loss of tiger habitat and to restore degraded habitat</b>								
a) Review forest harvest practices of all concessions in Myanmar forests. Provide incentives to logging companies to adopt traditional harvest practices.	Myanmar Govt.	WCS, FAO, UNDP						✓
b) Provide incentives to logging companies to prevent the use of firearms by their staff, and encourage them not to kill, eat or sell wildlife.	Myanmar Govt.	WCS						✓
c) Provide special tiger conservation training to site managers in forest concessions.	WCS	Myanmar Govt.						✓
d) Revoke concessions which violate regulations governing forest harvest practices	Myanmar Govt.							✓
e) Impose fines or revoke concessions which fail to provide adequate protection for wildlife	Myanmar Govt.							✓
f) Introduce a Wildlife Conservation Tax on all forest concessions to compensate for damage done to wildlife habitats. Use the tax towards wildlife management activities.	Myanmar Govt.							✓
g) Define Strict Conservation Zones for Hukaung Valley and Htamanthi where no human use of natural resources is allowed. Create buffer areas to allow restricted use by local people including extraction of non-timber forest products, fuelwood collection, and livestock grazing. Ban shifting cultivation and hunting of all kinds in the buffer area. Use EcoRanger patrol teams to enforce the restrictions.	Myanmar Govt.	WCS						✓
<b>4. Improving forestry management to reduce intrusions of local people into tiger habitat, and improve planning to avoid development in tiger critical areas</b>								
a) Reclaim plantations and revoke all mining licences in Hukaung Valley and Htamanthi Wildlife Sanctuaries	Myanmar Govt.							✓
b) Relocate any military camps and permanent settlements outside of these reserves	Myanmar Govt.							✓
c) Ban the construction of new roads in the reserves	Myanmar Govt.							
d) Close or limit access along logging roads in Tanintharyi Division to reduce the risk of collisions with tigers.	Myanmar Govt.							✓
e) Include wildlife assessment in land development programs for Tanintharyi Division	Myanmar Govt.	WCS						✓
f) Develop education programs to improve awareness about wildlife for local people living in and around forest reserves in Tanintharyi Division	WCS	Myanmar Govt.						✓
<b>5. Establishing protected areas, ecological corridors and priority management areas to protect wild tigers and their habitat</b>								
a) Revise or create management plans for the Hukaung Valley and Htamanthi to include specific actions for conserving tigers, including recommendations in 6.2.2, 6.3.2, and 6.4.2, and below.	Myanmar Govt. & WCS							✓
b) Expand Htamanthi Wildlife Sanctuary to increase its size to at least 3,000 sq. km to ensure long-term survival of tigers.	Myanmar Govt.							✓
c) Create a dedicated tiger reserve including the Hukaung Valley and adjacent forest reserves. The reserve will serve to link tiger populations in India with those in Myanmar. Expand the eastern border of Hukaung Valley Wildlife Sanctuary to protect potential tiger habitat in the Sumprabum area.	Myanmar Govt.							✓
d) Establish limited human use zones (buffers) that will "soften" the edges of Hukaung Valley and Htamanthi reserves reducing the risk of mortality for tigers.	Myanmar Govt.							✓

j) Determine occupancy of habitats at the sites using sign surveys	Myanmar Govt. & WCS		✓					
k) Establish a logbook to record observations of tiger and prey, and encourage use of the logbook	Myanmar Govt. & WCS		✓					
<b>8. Improving public awareness of the importance of tiger conservation to increase support from local people</b>								
a) Develop wildlife education programs to discourage hunting by local people in and near tiger reserves. Where possible recruit local people, especially ex-hunters to help implement these programs.	WCS			✓				
b) Involve 50 local people in wildlife survey and research activities to make positive use of their local or indigenous knowledge.	WCS	Myanmar Govt.	✓					
c) Collaborate with authorities in charge of development projects to include wildlife conservation as a component of those projects and resolve any potential conflicts between the needs of people and wildlife.	Myanmar Govt. & WCS		✓					
d) Produce a documentary about tiger conservation in Myanmar and broadcast it on National television	WCS			✓				
e) Dub existing wildlife documentaries about Myanmar into Burmese and broadcast	WCS		✓					
f) Adapt WCS education materials about tigers in Burmese and implement a special training program for schoolchildren at selected high schools in Yangon, and adjacent to tiger reserves	WCS			✓				
<b>9. Defining roles and responsibilities of personnel responsible for tiger conservation</b>								
a) Provide special training for managers of tiger reserves in management techniques, including leadership skills, decision making, planning, protection, use of information and technology, and personnel management.	WCS		✓					
b) Invite managers of tiger reserves to observe the day-to-day operations in selected tiger reserves in India and Thailand.	WCS	Thailand, India Govts	✓					
c) Define roles for junior staff in Hukawng Valley and Htanantthi Wildlife Sanctuaries, and for Tantiaryi Division junior forestry staff, and staff and in other areas in conducting field monitoring of tigers and prey.	Myanmar Govt.			✓				

PART 1: Introduction

Myanmar is a high priority country for biodiversity conservation in Asia with extensive forested landscapes, high species diversity and endemism (Wikramanayake et al. 2001). This diversity ranges from rich alpine floras and tropical pine forests in the north, to dry dipterocarp and mixed deciduous forest in central dry zone, to tropical rainforests in the Peninsular. Coral reef ecosystems in the Mergui Archipelago are among the least disturbed in the region.

Unique to the region natural forests in Myanmar cover a third of the country, including large intact expanses with low human inhabitation (UNEP 1995). Prior to 1994 the country had <1% of lands in protected areas but by 2001 this had increased to just under 5% (Fig. 1), a 500% increase in size in less than a decade. While most reserves in the system are too small to support tigers, later additions to the system include large expanses of forest and corridors between areas that are more than enough to support tigers as well as other species with large area requirements.

Deforestation in neighbour countries brought about by unsustainable land-use practices has led to pressure on Myanmar's natural resources, especially in border areas in the far north and south which contain high biodiversity but are difficult to access and monitor. Logging, extraction of forest products, internal fragmentation of forests and hunting have reduced wildlife populations and their habitats.

The remainder of this essential reading section includes a review of the pressing threats to tigers in Myanmar (Part 2), a review of the history of conservation planning for tigers (Part 3), a summary of the current status and distribution of tigers in the country (Part 4), and a rationale for the National Tiger Action Plan (Part 5), with proposed solutions for addressing the threats, for recovering tiger populations and guiding future conservation efforts in the country.



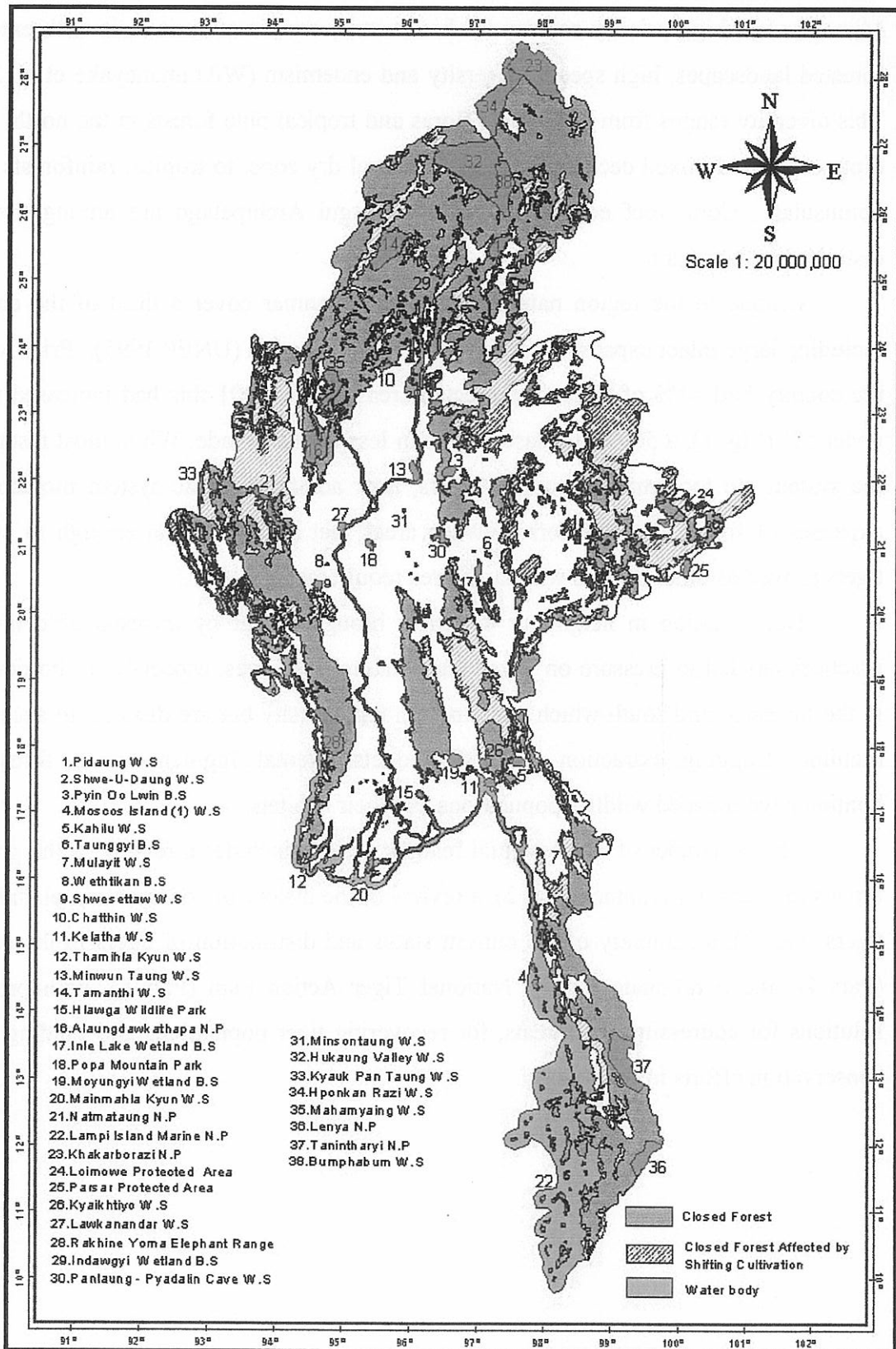


Fig. 1. Forest cover, existing and proposed protected areas of Myanmar – 2002.

## PART 2: Threats to tigers

Although the tiger is potentially found over a wide range of habitat and disturbance conditions, it is sensitive to a variety of human influences. The prospects for tiger survival in places where they occur in Myanmar are affected by a number of key threats;

2.1 Hunting for commercial trade in tiger products – The hunting of tigers has a long history in Myanmar (Pollok & Thom 1900). Tigers were traditionally considered pests and until 1931 the government provided licences and rewards for killing them. This led to depopulation on a massive scale through sport hunting. For example, during a 4 year period from 1928-1932, 1,382 tigers were reported killed in British Burma (Prater 1940), an order of magnitude larger number than the current tiger population in Myanmar. Tigers were historically widespread in Myanmar (Fig. 2) although their densities were not uniform across intact habitat, possibly a result of variation in hunting pressures from place to place (Prater 1940). More recently, declining tiger populations across the range combined with increasing prosperity of Asian countries, have led to an increasing demand for tiger products for traditional Chinese medicines. Tigers were hunted by various tribal groups to supply the trade (Rabinowitz 1995) leading to their extirpation in some areas (Rabinowitz 1998). The sale of tiger products was banned by CITES since 1975 but thrives in the black market, especially in some border areas where it is uncontrolled (Fig. 3a). Although it is difficult to measure the size of the trade, at least 10,000 kg of tiger bone representing 500-1,000 tigers was imported by East Asian countries between 1970 and 1993 (Hemley & Mills 1999). Tiger hunting continues in those areas that still contain tigers (Myint Maung, pers. comm. 2002)(Fig 3b.). As the population declines every tiger killed makes the harvest an increasingly unsustainable one. To demonstrate the efficiency of the trade, Burmese shopkeepers on the Thai border claim they can provide a tiger within 3 days for a deposit of only 500 Baht (Kalyar, pers. comm. 2002). Direct hunting of tigers threatens to drive the Myanmar population to extinction. Improved domestic legislation combined with monitoring of markets and law enforcement can contribute to reducing the trade in tiger parts.

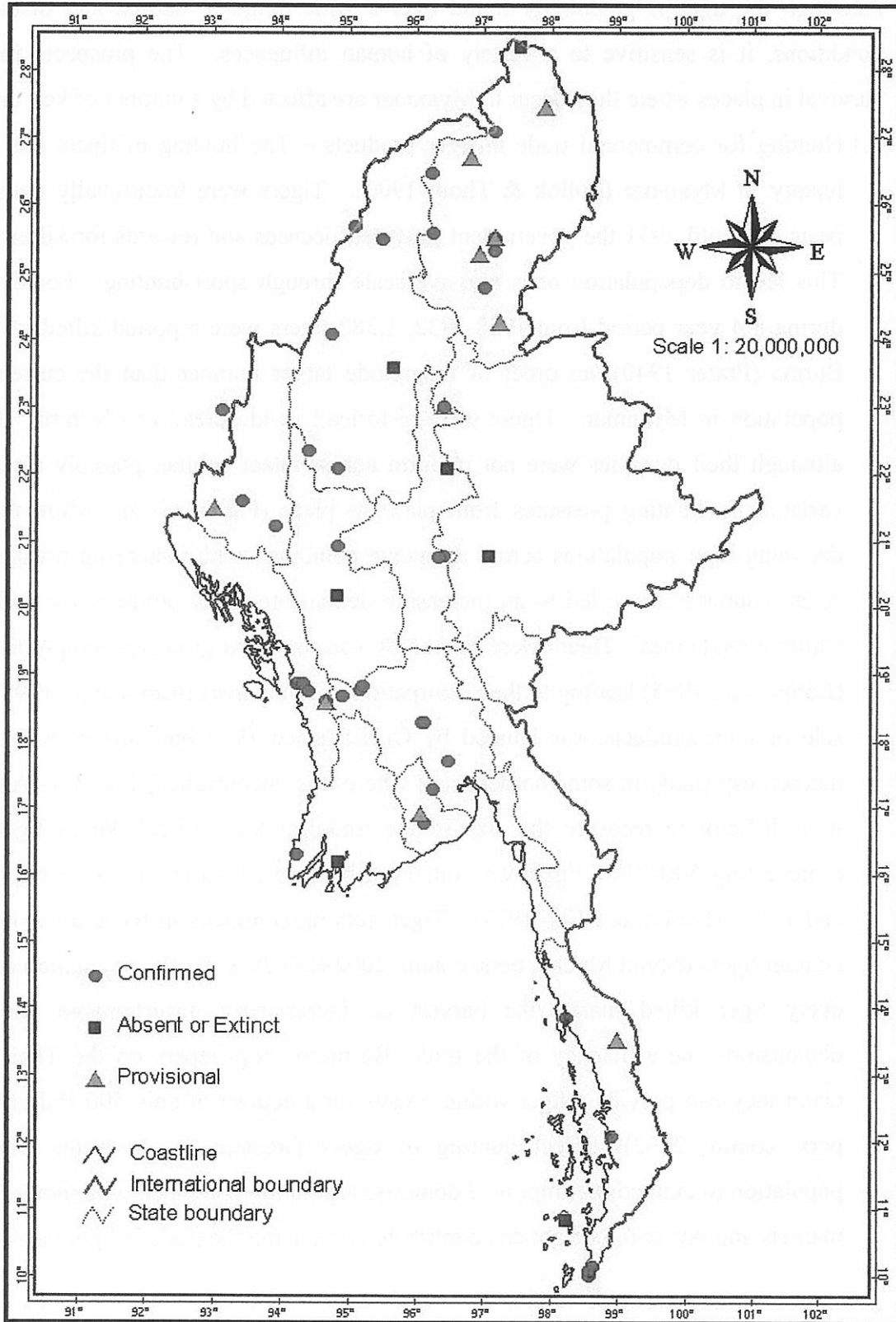


Fig. 2. Historical (pre-1999) records of tiger occurrence in Myanmar.

2.2 Prey depletion - Because it is dependent on a relatively large intake of food to support its metabolism, tigers are sensitive to loss of prey through hunting (Karanth & Stith 1999). The erosion of available energy has a “bottom-up” effect on ecosystem structure (Seidensticker 2002). Myanmar’s per capita income in 1998 was US\$1,200, making it one of the poorest countries in the world. People living in and around forested areas traditionally hunted wildlife for subsistence. More recently local people hunt to supplement increasingly meager incomes from farming. This trend is widespread (Saw Htoo Tha Po, pers. comm. 1999)(Rabinowitz 1995) occurring in up to 70% of protected areas (Rao et al. 2002). Trade in tiger prey species occurred near all the places where field surveys were conducted by the National Tiger Team during 1999-2002.

The illegal trade in wildlife is globally worth \$7 billion a year, only less than the trade in arms and drugs (Kanwatanakid et al. 2000). Myanmar is a part of the trade in Asia with a network of markets and routes established to supply the demand in China and Thailand. Markets for the sale of wild meat and trophies, of tigers and prey species have existed along the Thai border at Tachileik, Myawaddy, Three Pagodas Pass, and Maung Daung for a long time and continue to offer wildlife prohibited by CITES (Bradley-Martin & Redford 2000; Hill 1994; International 1999; Bennett and Rao 2002). The volumes of wildlife in the trade fluctuate according to the security situation, and decreased following the cancellation of Thai logging concessions after 1993, and escalation of hostilities between KNU and the Myanmar government after 1996 (International 1999). There is some evidence to suggest that some of the Thai border wildlife trade may have moved to Yangon. As an example, in April, 2002, a seafood restaurant in central Yangon offered a range of wild meat dishes, and tonics made from animal parts (A.J. Lynam personal observation). A shop where wildlife can be purchased is located on Maha Bandula Road in the Downtown area. In contrast, wildlife trade is rampant and uncontrolled in Shan State, especially towns near the China border (Than 1998)(see Essay Box I; Fig. 4.). Prey and tiger populations may be restored in the wild if they can be protected from hunting and wildlife trade (Madhusudan & Karanth 2002).

2.3 Habitat loss, degradation and fragmentation – Myanmar had an estimated 46.6% closed forest cover in 1990, with 37.4% remaining in 1997 (FAO 2000), one of the highest levels in the Asia - Pacific region. The net deforestation rate between 1989 and 2000 was 0.21% (Brunner et al. 2002), a fraction of the deforestation rate in Thailand during the same period. Deforestation is highly concentrated and is largely a result of logging in forest reserves (Rao et al. 2002)(Fig. 5). While forests are easily cut down they are only restored with great investments of time and resources (Elliott et al. 2000), usually beyond the capacity of forestry budgets. Except in parts of Shan State, where remaining forest resembles the highly fragmented situation in Thailand, large extensive tracts of closed forest characterize the Myanmar landscape providing good potential tiger habitat (Fig. 1). Disturbance that degrades or destroys natural forests, including grazing by domestic animals, shifting and permanent cultivation, mining, permanent human settlements, and plantations occur in 90% of protected areas (Rao et al. 2002). These threats could be reduced by improved agricultural and animal husbandry practices, and improved land-use planning.

2.4 Harassment and displacement – Rural development has progressed slowly in Myanmar so that dams, roads, pipelines, powerlines, and settlements – infrastructure that disrupt wildlife populations by creating barriers to dispersal (Goosem 1997) – have had localized effects on tiger populations. For example, roads occur in only 25% of Myanmar protected areas (Rao et al. 2002) (Fig. 6) and most are non-paved and seasonal access only. However, roads whatever their condition provide improved access to forests for poachers. Because tigers often use non-paved roads as movement corridors, this potentially increases the chances of encounter with humans. Aside from human infrastructure, the disturbance caused by local people entering forests to engage in the extraction of non-timber forest products (Fig. 7.) can have adverse affects on tiger behaviour. Such disturbances occur in 85% of protected areas (Rao et al. 2002), and probably reflects the incidence in non-protected forests, so the effect may be considerable. Improved landuse planning and zoning in forest reserves can reduce the threat from internal fragmentation.

2.5 Genetic erosion – A number of studies have shown that small populations are more likely to go extinct than large ones. One of the reasons is that at small size, survival rate or reproductive rate of a population is reduced because its members have difficulty finding mates, sex ratios are skewed, and they tend to breed with related individuals (Allee 1931). This results in a net loss of genetic variation, sometimes expressed by an increase in expression of deleterious mutations through homozygosity. Fitness is often reduced in the process. Despite this, many populations have persisted for long-periods of time with low levels of genetic variation e.g. cheetahs (Caro 2000). It is likely that genetic and demographic processes interact so that as populations decline it is increasingly harder to recover them (Gilpin & Soule 1986). Tigers in severely fragmented habitats in Myanmar would fall into this category. Maintaining natural corridors between forest patches inhabited by tigers can reduce this threat.

2.6 Protected area management – Myanmar is one of the least externally funded and internally protected tropical countries in Asia (Balmford & Long 1995). As a result while forests have been conserved for timber production for almost 150 years (Bryant 1997), and the earliest protected area was gazetted in 1918, legislation to protect both wildlife and their habitats was only introduced in 1994. Wildlife training for protected area staff was initiated in 1995 with only a third of staff having received training (Rao et al. 2002)(Fig. 8). Only since 1998 have protected areas been designed to protect entire landscapes and the ecological processes within. Consequently, many of the older protected areas e.g. Pidaung Wildlife Sanctuary, no longer support tigers and other wildlife because of large-scale degradation and loss of habitat inside them. A recent review found that human activities incompatible with conservation occur in every protected area (Rao et al. 2002). Extraction of non-timber forest products occurred in 85% of the areas, hunting in up to 70%, while buffer zones for the protection of core forest zones were generally lacking. The combined effect is a loss of habitat quality for tigers. Myanmar protected areas (Fig. 1.) currently do not provide adequate representation of the diversity of habitats inhabited by tigers. Reserve managers need training to understand threats to wildlife,

and how to best manage available resources to enable effective conservation of wildlife. In general, the roles and responsibilities of protected area staff need to be carefully defined so that important tasks are covered by available personnel.

2.7 Social perception – where tiger populations have been decimated, their long-term recovery can be ensured only by a combination of political will and acceptance by people living in and around tiger areas. If tigers are worth more dead than alive to local people, then efforts to preserve tigers in the human dominated landscape will fail. Awareness and education of the importance of tigers can be improved through dedicated learning programs.



Fig. 3a. Tiger skin for sale in Tachileik market, Shan State.



Fig 3b. Poacher "caught" by a camera-trap, Paunglaung Catchment, Mandalay Division. Poaching of tigers was the single most important factor causing the demise of tigers in Myanmar in the past.



Fig. 4. Wildlife for sale at Mongla market, Shan State.



Fig. 5. Logging reduces available habitat, and alters habitat quality for tigers and their prey.



Fig. 6. Road construction opens up the forest facilitating access to poachers.



Fig. 7. The extraction of rattan and other non-timber forest products is often done on a massive scale and affects habitat quality for tigers and their prey.



Fig. 8. Myanmar foresters undertaking basic wildlife training with the author, Alaungdaw Kathapa National Park, December, 1998



PART 3: Brief history of conservation planning for tigers in Myanmar

Previous attempts to estimate the Myanmar tiger population were based on habitat models. Using information on existing forest cover (Collins 1991), and assuming tiger densities of 0.6-1.0 individuals/100 km<sup>2</sup> from other places (Rabinowitz 1993a), a conservation plan estimated 600-1,000 tigers for Myanmar across 12 priority areas and other fragmented populations (Myanmar Forest Department 1996). A previous tiger action plan recommended surveys to estimate population sizes in the priority areas, creation of tiger reserves, strengthening of institutional capabilities to protect tigers, a national policy and long-term action plan, increasing public awareness and cooperation with other tiger range countries.

Uga and Than (1998) revising this plan considered the original population estimates as overestimates and suggested the true numbers might be in the range 250-500. They considered tigers probably occurred in potential areas defined by Tiger Conservation Units (TCU's) (*sensu* Dinerstein et al. 1997). They defined a set of priority actions for tigers including training of government staff, mapping of habitats, field assessments to identify critical tiger populations inside and outside of protected areas, and actions to preserve these populations, including tiger reserves and protection of corridors, and the formation of mobile education units to provide awareness. This set the stage for the development of a new updated National Tiger Action Plan which was proposed to the Myanmar Government in June, 1998 (WCS 1998).

A number of important actions were taken as part of the new project;

1. A special tiger survey and conservation training course was provided to 23 protected area and forestry staff at Alaungdaw Kathapa National Park, during December, 1998.
2. A 7-member National Tiger Survey Team was selected from the training participants to be responsible for spearheading research and conducting tiger surveys within Myanmar.
3. Priority areas for tiger surveys were located and mapped.
4. Surveys to determine tiger presence-absence and prey relative abundance were done in high priority areas, and threats to tigers documented for these areas.
5. A tiger information database was created from current and historical data for use with designing tiger conservation activities and decision making.

6. Official meetings were held with Myanmar government officials, to present information on tiger status in order to draft and produce a National Tiger Action Plan for the Union of Myanmar.

#### PART 4: Status and distribution of tigers in Myanmar – 2002.

Direct field surveys for tigers were done at 17 sites (Fig. 9; see also Appendix I for site descriptions). Although the survey efforts covered only 1.3% of areas with forest cover, these sites were places where tigers were known historically, and where the most recent available evidence, including reports from foresters and local people, suggested tigers might still be found. The surveys provided new and unique records of occurrence for 19 globally threatened species, 16 CITES listed species and 45 Myanmar protected species (Appendix II).

##### 4.1 Tiger status and distribution

Tigers were reported present at 88% of sites, but confirmed by direct survey in just 23% of sites (Table 2). The rate at which tigers were “caught” (detected) by camera-traps was just over 3,000 trap nights of sampling per photo-record. For example, if 30 camera-traps were placed in the field each for 100 days, one might expect on average 1 photo-record of tiger from the survey effort. In comparison, using a similar survey design in Thailand (Lynam et al. 2001), tigers were reported at all seven potential tiger sites, and detected at 86% of the sites, for a capture rate of just over 200 trap-nights per photo-record. For example, if 20 camera-traps were placed for 10 nights, one might expect to get a single photo-record of tiger. The survey effort required to find a tiger at the Myanmar sites was an order of magnitude higher than at the Thailand sites.

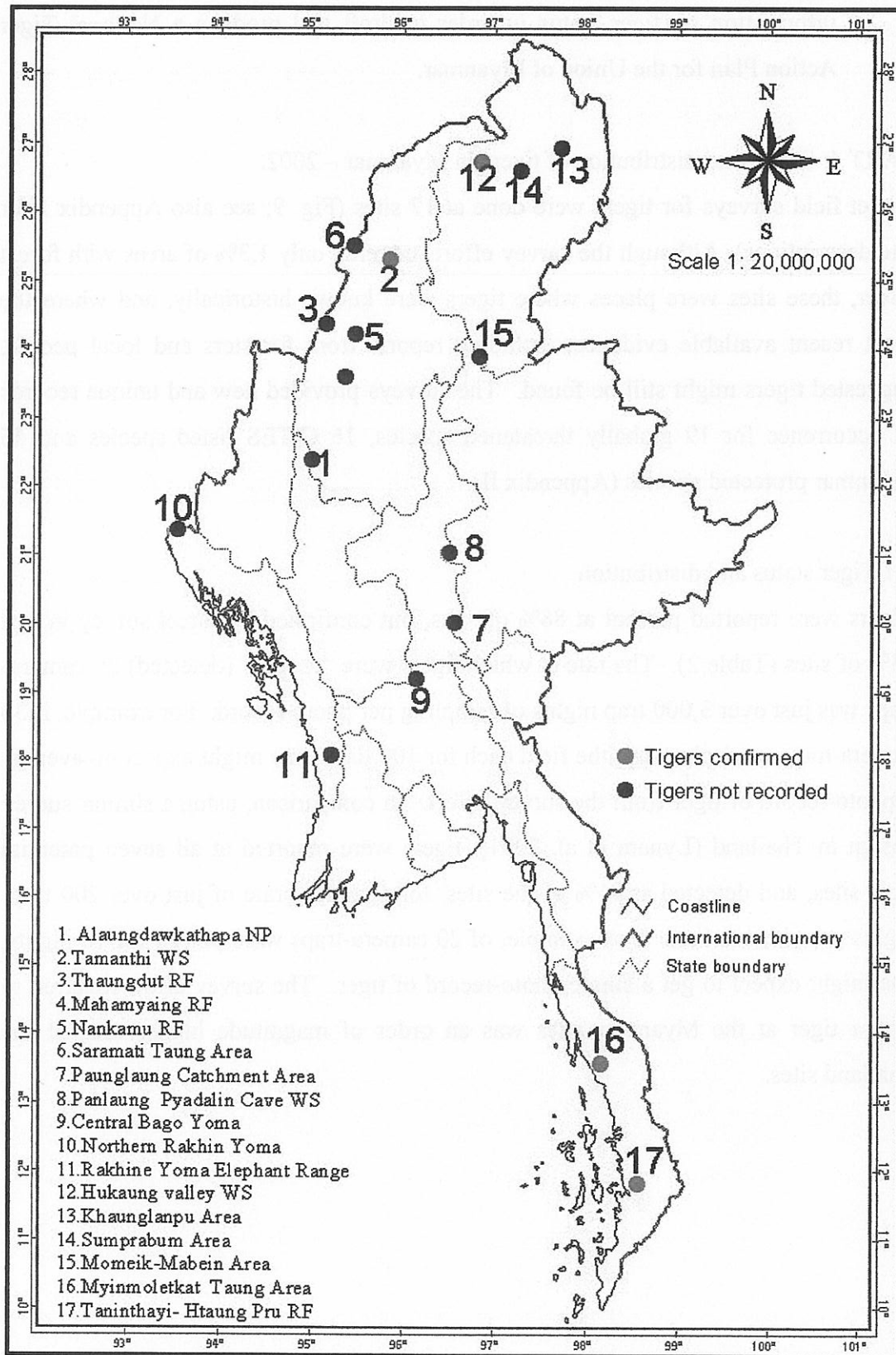


Fig. 9. Survey sites for tigers in Myanmar, 1999-2002.

Table 2. Comparison of tiger survey results in Myanmar and Thailand.

Results of survey	Myanmar (17 sites)	Thailand (7 sites*)
1. Reports of tigers (no. sites)	88%	All
2. Tiger confirmed	23%	86%
3. Capture rate – tigers (no. days per capture)	3,112	217
4. Capture rate – large mammals (“)	5	5
5. Species richness (large mammals)	16.4 ± 1.3	15.2 ± 1.8
6. Human traffic (walkpasts per 100 days)	2.3	3.4

\* All Thailand sites were in long-established protected areas

Several features of the data warrant further explanation. Firstly, tigers were detected at a low proportion of sites where tigers were reported. Some local people living in and near forest areas apparently perceive other animals in the forest as tigers. For example, in Alaungdaw Kathapa National Park, rangers mistook tracks of Golden cat and Asiatic leopard for tiger, and because these two species were abundant near park headquarters, the rangers reported tiger as common (Lynam et al. 1999). As a result, a conservation agency mounted a campaign to “Save the Tigers of Alaungdaw Kathapa”, when direct survey efforts across 25% of the park found no tigers. A wider monitoring of habitats found no further evidence of tigers suggesting that they are now extirpated from the Park (Ye Htut pers. comm. 2000). Clearly, some rangers and local people cannot resolve tiger track and sign from other cat species, and need further training to be able to do so with some degree of confidence.

Almost a third of the reports of tigers were of direct sightings made after 1990 (Appendix III). The two extreme explanations are that all local people made mistakes in identifying tigers e.g. they saw something else but reported tiger, or that all local people actually saw tigers when they reported seeing tigers. The truth probably lies somewhere between the extremes. For example, it is possible that tigers may have been present at AKNP until the late 1990’s when the last convincing reports of tiger sightings were made. Possibly tigers held on in low numbers at other sites, and were observed infrequently by locals but disappeared in the last few years.

It is possible, at least for more disturbed sites, that tigers are no longer resident but populations instead consist of transient individuals that hold no territory or