STATUS OF THE TIGER AND ITS CONSERVATION IN CAMBODIA

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ABSTRACT

Following decades of political instability, Cambodia is currently undergoing rapid development and changes in land use. Although the government made important progress protecting biodiversity during the 1990s, more accurate information is urgently needed to develop a comprehensive, landscape scale tiger conservation plan. The purpose of this study was to: (1) review the brief history of biodiversity conservation in Cambodia (2) determine tiger distribution and status and (3) study the role of wildlife trade and hunting in the long term protection of this species. Information on tiger distribution, abundance and the role of hunters in wildlife trade was obtained through interviews with local hunters. I used GIS and SAS to analyze tiger distribution in relation to prey distribution, forest cover type, protected areas, forest concessions and human population centers. Trade in tiger products was studied using wildlife dealer interviews and investigations on the distribution, routes, and economics of internal and international trade. I found that tigers are still widely distributed in the forests of Cambodia and the 2 metapopulations is one of the largest in Southeast Asia. However, only 26% of tiger breeding habitat is included in the national protected area system. The remaining habitat is in forest concessions (38%) or on national lands available for human settlement. Even tigers living in protected areas are threatened by widespread illegal hunting. I visited >200 wildlife markets (7 types) and checkpoints throughout the country. Major centers of trade are located in Phnom Penh and Poipet. Price of tiger products typically increases >100-fold between hunter and sale in the non-tiger range countries. Local hunters are generally satisfied with the economic benefits of hunting because profits from wildlife products make important contributions to their lifestyle. Wildlife trade proliferates

despite international (CITES) and national policy because local authorities are untrained and have low salaries. Therefore, corruption is common This study documented that Cambodia still has 2 significant tiger nxtapopulations but pressures from trade, hunting and forest loss are rapidly causing this population to decline. A national tiger action plan is urgently needed to (1) review the previous protected area system and identify critical new tiger habitat for inclusion, (2) develop new strategies to significantly control illegal wildlife trade and hunting, and (3) adopt recently created community-based conservation efforts to protect tigers. Little time is left for survival of tigers in Cambodia without immediate action.

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CHAPTER I

INTRODUCTION:

BIODIVERSITY CONSERVATION IN CAMBODIA

1.1. History of Biodiversity Conservation in Cambodia

1.1.1. Background:

The Kingdom of Cambodia occupies an area of 181,035 km^2 (E 102°-108°, N 10°-15°); it is located east of Thailand, south of Lao PDR and west of Vietnam (Figure 1). The country's geographical shape is almost round and at its center is a large lake, Tonle Sap, which is surrounded by a large floodplain. Extensive unfragmented stretches of tropical evergreen and deciduous forests surround the floodplain. Cambodia supports a population of 11.3 million people; about 85% are farmers who live in rural areas and depend on agricultural production and direct harvest of natural resources for their survival (Government census, 1998).

The majority of the population lives in villages in central Cambodia, which encompasses only 20% of the country's land area. It contains the largest extent of natural forest in mainland Southeast Asia (Ashwell, 1997), but forest cover has decreased from 73% (FAO/UNDP, 1968-1970) to 60% (DFW, 1996-1997). However, it is still high compared to neighboring Thailand (21%), Vietnam (18%) and Laos (54%) (Collins et al. 1991). The Cardamom and Elephant mountains in southwestern Cambodia are the most extensive mountain ranges within the country; they generally exceed 1,000 meters in elevation. Aural Mountain, in the southeast part of the Cardamoms, is Cambodia's highest point, at 1813 meters. Cambodia's climate is characterized by a tropical monsoon with marked dry and wet seasons. The southwest monsoon brings heavy rain from May to October. From November to January there is a continual drying period and the driest

months of the year are from February to April. There are intermittent premonsoon rains in May,

1.12. History of Biodiversity Conservation

Before the 1960s, there was a single department, the Department of Water, Forestry, Wildlife and Fisheries (DWFWF) under the Ministry of Agriculture that was responsible for all natural resource management and conservation in Cambodia. Four regional offices of Inspectors were created for the Mekong, North of Tonle Sap, South of the Tonle Sap, and the Gulf regions. A Hunting Inspector was also created for wildlife conservation and hunting. All research activities were conducted by the National Institute of Forest Research. During this period, forest logging was confined to the vicinity of towns and cities due to the lack of technology and low human population.

In 1960, the DWFWF was split into the Department of Fisheries and the Department of Water, Forestry and Wildlife in response to increasing illegal activities and poor law enforcement that occurred with increases in the human population. After the division, Cambodia's natural resources were under stricter control and management. A wildlife regulation, Royal Decree No 24, issued 26 January 1940, was still in effect. In 1960 only 11 species of mammals (elephant, gaur, wild water buffalo, banteng, kouprey, brow-antlered deer, hog deer, sambar deer, barking deer, mouse deer, and another unrecognized deer species; see Appendix for scientific names) were prohibited from hunting (Prakas No 191, 1960). Tiger, leopard, and other wild cats and dogs were designated as ferocious animals and hunting of these species was permitted (Royal Decree No 24, 1940).

During 1970-1978, Cambodia was involved in the Indochinese War and Khmer Rouge Genocide. The country was bombarded by 257,465 tons of American explosives

during a 6-month period in 1973, which was 50% more than the total tonnage dropped by the U.S. on Japan during World War II (Chanda, 1986). With the end of the war, the Khmer Rouge had killed at least hundreds of thousands (estimates range as high as two million) of Cambodians (Kamm, 1998). In some parts of the country, the destruction still continues even though the Khmer Rouge regime has ended because people and wildlife species still die or are maimed by the millions of landmines that remain. People are also still suffering serious mental health problems as a result of the Khmer Rouge. It is estimated that 22% of the productive forests were destroyed during the 1970's (UNDP/FAO analysis of satellite images, 1986). There was little interest in biodiversity conservation during this period

From 1979-1992, the country was under the Vietnamese communist rule. The Department of Forestry and Wildlife (DFW) and the Department of Fisheries (DF) were reestablished in the Ministry of Agriculture, Forestry and Fisheries (MAFF). In September 1992, the administrative structure of the DFW was updated and a new Wildlife Protection Office (WPO) was established to be responsible for wildlife conservation and management (Declaration No 412 of the MAFF, 1992). During this period, large areas of Cambodia were legally clear-cut to eliminate Khmer Rouge guerrillas and secure Cambodia's national boundaries. Trees also were illegally logged by local people who needed timber for their houses and income for survival after the end of the war and Khmer Rouge control. There were three main stages of legal forest exploitation during this period. Before 1987, forest exploitation occurred through contracts between the DFW and communist community groups. During this period, forest products were for local use and export to Vietnam and Russia. A second stage, from

1987-1991, shifted management back to the DFW, which created five forest supply areas (Declaration No 608 of the MAFF, 1986). At the end of this period a new policy was initiated by the government that established forest concessions that were auctioned to the public under the technical supervised by the DFW (Sub-decree No 11 of the Council of Minister, 1991). Law enforcement and other forest technical rules including wildlife hunting regulations were established in 1988 by National Assembly Decree No 3.5.

From 1992 to present, there has been considerable international interest in Cambodia's biodiversity. After the signing of the Comprehensive Political Settlement of the Cambodian Conflict in Paris on October 23, 1991, civil war ended. The United Nations Transitional Authority (UNTAC) was established to conduct a free and fair general election for the country. After the UN supervised elections in 1993, the political situation improved. A new environmental organization, the State Secretariat for Environment was established to be responsible for the country's environment issues. In November 1993, under a directive from King Sihanouk, the Royal Government of Cambodia (RGC) established a network of 23 protected areas, totaling 3.3 million ha (18.23% of the total land area). These consist of ten Wildlife Sanctuaries (IUCN Category 1), seven National Parks (IUCN Category 2), three Protected Landscapes (IUCN Category 5), and three Multiple Use Areas (IUCN Category 6) (Royal decree, 1993). Unfortunately these protected areas were established without proper analysis of national biodiversity and as a consequence many important areas for biodiversity are not included within this national protected area system. In August 1994, the MAFF issued the first protected list of Cambodian wildlife that included 36 species of mammals, 102 species of birds and 6 species of reptiles (Appendix 1). Most internationally recognized

endangered species were protected, including tiger and other wild cats (Declaration No. 359 of the MAFF, 1994). In January 1996, the RGC updated the State Secretariat for Environment to the Ministry of Environment (MOE) and established within the Ministry the Department of Nature Conservancy (DNC) to be responsible for all protected area management (Royal Decree No. 196-21, 1996). During this period, forest logging was operated under a system of 31 forest concessions and exportation of round logs was prohibited. After the concessions were established there was a loophole that allowed old logs cut anywhere in the country to be moved and sold without taxes. This allowed people to illegally cut outside concessions and then pretend the new logs were old logs, which could be sold to the concession companies. In 1998, RGC approved a new policy that did not allow non-tax permits and classified all cut logs as illegal products

1.1.3. Previous tiger related projects

The first tiger related project was the IUCN/WWF aerial survey in 1993 (Olivier and Woodford, 1994). It focused on estimation of large mammal densities and was particularly interested in determining if kouprey was still extant in Cambodia. Due to security concerns the survey was done completely by air. This survey recommended where ground surveys should be conducted, but because they flew only parts of the country and did not fly anywhere in western of Cambodia, subsequent surveys continued to overlook the Cardamom Mountain area.

In 1996, a ground survey for large mammals was conducted by Flora and Fauna International (FFI) and WPO in the eastern **part** of Cambodia (Desai and Vuthy, 1996). The objectives of this survey were to determine the distribution and relative abundance of endangered large mammals, the primary threats to these species, and levels of human

activities including hunting, trade in wildlife and illegal logging. A total of 43 species of mammals, 76 species of birds and 9 species of reptiles was recorded during this survey. In addition, 41 wildlife trade species were recorded in three main wildlife markets (Phnom Penh, Ratanakiri and Mondulkiri) including 2 tiger skins and a pair of the recently described bovid species from southern Vietnam (*Pseudonovibos spiralis*) (Peter and Feiler, 1994), which were long known in Cambodia as khting vor (Dioli, 1995). Desai and Vuthy (1996) reported seeing a photograph of male and female kouprey horns that were given to a local wildlife dealer by a Thai trader who was offering a very high price for the horns. They report an even greater demand for tiger products that make it worthwhile for hunters to spend long periods of time in the forest hunting this species. Their report also states that two traders sold respectively 20 and 10 tiger skeletons and skins in the past 15 years.

1.2. Conservation legislation and policy

There are two management authorities involved with the conservation of biodiversity in Cambodia. The MAFF is responsible for forest and wildlife monitoring and conservation outside protected areas and the implementation of the Convention on International Trade in Endangered Species (CITES). The MOE is responsible for managing the protected area system formed in 1993. There are two main departments under MAFF, the DFW and the DF. The DFW is responsible for forest management and wildlife conservation including controlling wildlife trade and the issue of hunting and exporting licenses for terrestrial animals. The DF is responsible for fishery management and production including the issue of fish exploitation and exportation licenses for

aquatic animals. Under MOE, is the DNC, which is located within the MOE and is responsible for protected area management.

1.2.1. Current conservation regulations

After the Khmer Rouge regime, Cambodia developed and updated several pieces of biodiversity conservation legislation. Tigers and other wild cats were first listed as protected species in Cambodia in Declaration No. 359 (Table 1, Appendix 1).

Table 1. Previous applicable biodiversity conservation regulations.

Code	Title	Date of issued	Agency of issued
Decree No. 33	Fishery Management and Administration	9 March, I.957	National Assembly
Decree No. 35	Forest Practice Rules	25 June, 1988	National Assembly
Declaration No. 359	List of protected wildlife species	1 August, 1994	Ministry of Agriculture, Forestry and Fisheries
Joined Declaration No. 1563	Law enforcement on wildlife destruction in Cambodia	20 September 1996	Ministry of Environment and Ministry of Agriculture, Forestry and Fisheries
Order No. 02	Requesting the restriction of illegal logging	6 January 1999	Royal Government of Cambodia
Declaration No. 01	Actions on forest management and law enforcement	25 January 1999	Royal Government of Cambodia
Sub-decree No. 45	Creation of checkpoint stations along the border and communication routes	29 August 1997	Royal Government of Cambodia
Sub-decree No. 38	Management and control of all types of firearms and explosive	30 April 1999	Royal Government of Cambodia

In addition, pending legislation will attempt to reduce illegal hunting and trade in endangered species. This legislation has been sent to CITES and TRAFFIC for review.

1.2.2. Current conservation policy

Since the 1998 elections, the Kingdom of Cambodia has made tremendous strides in conserving its biodiversity. A growing national concern about the loss of biodiversity and ecosystem integrity and strong international pressure to reduce illegal logging has resulted in several new natural resource policies. These include:

A National Forest Policy was drafted wiih the assistance of UNDP/FAO. It was formulated after a series of meetings and workshops with all stakeholders. This policy will provide guidelines to direct the forestry sector in the 21st century. This policy statement is being reviewed by the MAFF and other 'relevant Ministries before presentation to the Council of Ministers and the National Assembly.

A Forest Crime Monitoring and Reporting Project also was conceived with the assistance of the World Bank, United Nations Development Program (UNDP) and Food and Agriculture Organization (FAO). It was funded by the British Government and the AusAIS as a component of RGC's ongoing comprehensive forest policy reform program.

A draft Forest Law has been prepared with assistance from the Asian Development Bank (ADB). It is currently under review by the DFW. This law is likely to be passed by the National Assembly and the Senate in year 2000. It will establish new stricter control of forest concessions and will improve the legal framework of biodiversity conservation. Furthermore, a Sustainable Forest Management Project will review the performance of logging concessions.

1.2.3. Current NGO conservation activities and plans

Following the UN assessment of Cambodia and elimination of Khmer Rouge guerrillas, many NGOs came to Cambodia to help assess and conserve biodiversity. NGOs and their activities are summarized in Table 2.

Table 2. Current conservation NGO activities in Cambodia.

No	Name of Organization	Activities and Plans
1	Wildlife Conservation Society (WCS)	Assists in technical capacity building to enable Government staff to carry out wildlife conservation
2	World Wildlife Fund (WWF)	Supports development of capacity in the MOE for protected area management including control of illegal wildlife trade in Northeast Cambodia
3	Fauna and Flora International (F F I)	Surveys biodiversity to support future protected area designation and management
4	Cat Action Treasury and University of Minnesota (CAT/UMN)	Develops conservation infrastructure at the community level by creating TCU* offices and employing local hunters as wildlife technicians
5	Mlup Baitong (Local NGO)	Increases environmental awareness through education, training and a variety of local projects that support sustainable and equitable use of natural resources throughout the country
6	San&ohs Satprey (Local NGO)	Provides technical support to Wildlife Rescue Centers and promote wildlife welfare education.
7	WildAid	Supports ranger training program in Bokor National Park in collaboration with WCS
8	International Development Research Center (IDRC)	Continues to administer long-term participatory management of mangroves project in the Peam Krasop Wildlife Sanctuary, Koh Kong Province.

continued.....

Table 2. continued....

s o	Name of Organization	Activities and Plans
9	IUCN	Completed a botanical evaluation project in Bokor and Ream National Parks; currently involved in a Mekong basin wide GEF biodiversity project coordinated out of Bangkok
1 0	UNESCO	Continues to support the Technical Coordination Unit in the MOE and the Floating Environmental Center in Prek Toal, Tonle Sap Lake.
11	Wetlands International (WI)	Works with the MOE to prove input on a regional coastal protected area project funded by the ADB
12	Global Environment Facility	World Bank-GEF has approved approximately S3 million over the next three years for biodiversity management capacity building related to Virachey National Park and surrounding buffer region UNDP-GEF recently initiated the Cambodia Biodiversity Enabling Activity to produce a Biodiversity Strategy and Action Plan for Cambodia
13	German Rainforest Alliance (ARA)	Implemented a community-based conservation project in the Cardamom Mountains
14	Conservation International (CI)	Supported a national consensus building workshop with all stakeholders; developed sanctuary management plans; evaluated logging concession economics.
15	Global Witness	Lobbies for policies to improve forestry practices in Cambodia
16	TRAFFIC Southeast Asia	Assists MAFF and MOE to publish a guide to CITES and wildlife law enforcement; funded by World Bank and WWF
17	International Crane Foundation (ICF) and Wild Bird Society of Japan (WBSJ)	Assists Siem Reap Forestry and Wildlife Office and WPO to conduct Sarus Crane surveys at Ang Trapeang Thmor, north of Tonle Sap.

*Tiger Conservation Units

CHAPTER II

TIGER DISTRIBUTION AND STATUS IN CAMBODI.4

2.1. Introduction

Prior to 1990, there was little information on the distribution of tigers and other large mammals in Cambodia. With the end of civil strife there was increased national and international interest in the status of Cambodia's biodiversity. Due to the lack of general geographic information on the distribution of tigers or other large mammals ii was difficult for the government to undertake a conservation program. Nevertheless, the International Union for the Conservation of Nature and other international NGOs put pressure on the Cambodian government to establish a protected area system. The first protected areas were delineated without any real biological data and the Cambodian government is still suffering the consequence of this premature effort

Because there are few trained resource managers in Cambodia the international community attempted to use the rapid assessment team model by bringing in "experts" to assess biodiversity. In Cambodia there were problems with this approach. These small teams of experts could cover only a small part of the country; they had little information with which to prioritize where to survey; and lastly, they were somewhat reticent about visiting areas where there were threats of land mines or kidnapping. As a result of limited information and these fears, early surveys conducted by IUCN and World Wide Fund for Nature (WWF)(Olivier and Woodford, 1994) were strictly aerial and confined to areas where threat of gunfire was minimal. The Olivier and Woodford survey quite understandably found no tigers and observed only a few deer, *Cervus unicolor, Muntjak munjacus,* and banteng, *Bos javanicus*, despite weeks of flying. In 1996, the first ground survey for large mammals were conducted by the Wildlife Protection Office (WPO) and

Flora and Fauna Internationals (FFI) in the eastern part of Cambodia (Desai and Vuthy. 1996). Although this survey was undertaken in an area where tigers were reported, the actual route of the survey avoided the areas thought best for tigers, again, because of fear of landmines and other security problems. This 4-month survey observed a total of 6 tiger tracks (4 recent tracks and 2 very old tracks)

The main information on tigers in Cambodia comes from wildlife markets studies (Martin, 1995; Martin & Philipps, 1996; Srifa et al., 1997; Ware, 1997; Sellar et al., 1999). Based on reports of new tiger skins in markets all over Cambodia, it was clear that tigers were being killed in all regions of Cambodia and were still widely distributed in the 1990's, but under very strong poaching pressure. Vuthy and Ashwell (1995) mapped distribution of tigers based on reports collected by WPO. Most reports were of tigers killed by hunters or the army or observations by government officials of freshly killed tigers in rural areas. In 1996, the government drafted a National Tiger Action Plan that estimated 100-200 tigers were traded each year at the markets in Phnom Penh and Poipet (MOE, 1996). Either these kill estimates were incorrect or there recently was a sizeable tiger population in Cambodia able to sustain this high rate of tiger poaching.

More accurate information on tiger distribution and status is urgently needed to develop a comprehensive, landscape scale tiger conservation plan for Cambodia that will: (1) evaluate the role of the existing protected area system in conserving tigers, (2) identify other tiger habitat, and (3) develop a land based conservation plan. To survey the entire country and avoid the security threats that hampered earlier surveys I decided to use the current knowledge of local hunters, who lived in ths forests where they hunted for the past 5 to 35 years, to map the distribution and relative abundance of tigers and 34

other species of mammals and birds. The purpose of this paper is to report the distribution of tiger and their prey, to develop a predictive model of tiger distribution based data from the survey and other independent environmental variables, and to make tiger management recommendations based on the metapopulation of tigers in relation to forest cover, forest concessions, and the current protected area system in Cambodia.

2.2. Methods

2.2.1. Data collection

2.2.1.1. Study areas and interviewer experience

Survey areas were identified by reviewing spatial data of human population distribution (distance from villages), forest cover, and maps of Tiger Conservation Units (TCU)(Dinerstein et al., 1997). I focused on areas located distant from villages. Five recent graduates from the Cambodian Royal University of Agriculture were hired to interview local hunters. To initiate this project they conducted a series of preliminary oral interviews with provincial authorities to identify villages in each province, where experienced hunters lived. These five graduate students were trained in wildlife management and conservation at the Royal University of Agriculture, Phnom Penh. They previously worked with local hunters to research traditional hunting and trapping methodologies. I trained the students to conduct interviews with local people.

2.2.1.2. Interviewee selection

Interviewees were selected because they were experienced hunters. They knew their areas and the wildlife intimately because during the extended period of economic and social disorder they depended on hunting and gathering to sustain their families. I was able to obtain information in areas where there were landmines and other security

issues, because in tbose places the hunters were usually former members of the Khmer Rouge army. They knew the location of landmines and therefore moved safely through the forest. These people were fulltime hunters or farmers. soldiers, woodcutters, rubber gatherers, rattan collectors, and krasna wood collectors, who hunted to supplement their daily foods or income. I use the word "hunters" to represent the diversity of interviewees because even though they often had other employment they were skilled hunters. Due to lack of communication and transportation, interviews were organized primarily in populated villages. Interviewees living in isolated villages were paid to come for interviews. In some minority villages. where Khmer was not spoken, local interpreters were hired to translate.

2.2.1.3. Interview materials

To conduct these interviews my team and I used a questionnaire, a 1:500,000 scale local map and a series of animal photographs.

The questionnaire consisted of three parts. The first part listed 29 large mammals and 6 bird species. Although the main purpose of the research was tigers and their prey I did not want to miss the opportunity to broaden the survey to include all large mammals and a few species of endangered forest birds. If a hunter indicated that a species was present, he was asked to rank its abundance as High, Medium or Low based on the probability of encounter during a 1-2 week hunting trip. "High" density was based on observing abundant tracks on each hunting trip, a high probability of seeing the animal on each trip, or a high probability of a successful hunt of that animal. "Medium" indicates probability that tracks of a species will be encountered on each hunting trip, but the

animal may not be observed on each trip. Density was rated “Low” when tracks are not seen on every trip and visual encounters are rare.

The second part of the questionnaire asked hunters about their forest experience. Their response helped me judge the quality of the information and to develop a profile of Cambodian hunters (Appendix 2). The third part asked specific questions about tigers: (1) How many times have hunters seen tigers, their tracks or their kills? (2) What information do hunters have on livestock predation or man-eating? (3) How many tigers do they estimate are living in the area where they hunt? (4) How many tigers were killed in their area in the last year? (5) How many people hunt tigers in their area? (6) What is known about tiger trade, prices and market destinations? An analysis of questions 5 and 6 are reported in chapter 3.

A local map of 1:500,000 scale was prepared for each interview. Hunters were asked to describe the geographical extent of their hunting territory and to outline it on the map. In many cases hunters could not read maps or understand Khmer; so the interviewers used interpreters to help them obtain a verbal description of the mountain ranges, rivers, and political districts that delineate a hunter’s territory. The interviewer and interpreter then mapped the hunter’s territory.

To avoid confusion among the listed animals, a set of photographs was shown each hunter to ensure he was talking about the correct species. The name of animals varied throughout the country, so without photographs, it would have been difficult to obtain accurate data.

22.2. Data analysis

Because we only had relative abundance and absence data for the area encompassed by the home ranges of the hunters, I used two models to predict tiger distribution. The first model, which predicted tiger distribution inside Cambodian home ranges of all hunters, was based on prey distribution, forest cover and distance from villages. A second model was used to predict tiger distribution outside hunter ranges. This model was based on forest cover types and distance from villages. All animal distribution and environmental variable data were recorded using a grid of 2 x 2 km' cell size. Cambodia was divided into 46,071 cells using Arc/Info (Figure 2). For each cell within the grid, known species distribution and environmental variable values were recorded.

2.2.2.1. Building animal distributions

Hunting territories of all hunters interviewed were digitized in Arc/Info. Each hunter ranked his territory as supporting Low, Medium and High densities of tigers and other wildlife species, which included the four primary prey species of the tiger, used in my analysis, Spatial coverages with the population status of low, medium and high were built using Arc/View. Where there was conflicting information, polygons were ranked using the most conservative scenarios (Table 3, Figure 3). I also used scenarios (Table 4) to build practical combined prey coverage (Figure 6).

Table 3. Scenarios used to make decisions on overlapped hunting territories.

Ranking Status Overlapped	Scenario decision	Density category
High and High	High	3
High and Medium	Medium	2
High and Low	Medium	2
Medium and Medium	Medium	2
Medium and Low	Low	1
Low and Low	Low	1

Table 3. Scenarios used for the decision on tiger prey integration.

Scenarios decision	Sambar deer	Gaur	Banteng	Barking deer
H	H	H	#	#
H	H	#	H	#
H	H	M	M	#
H	M	H	H	#
H	M	H	M	#
H	M	M	H	#
H	M	M	M	H
M	H	#	#	#
M	L	H	H	H
M	M	M	#	#
M	M	#	M	#
M	L	H	H	#
M	L	H	M	#
M	L	M	H	#
M	L	M	M	H
L	L	L	#	#
L	L	#	L	#
L	M	L	L	#

H = high population; M = medium population; L = low population; # = whatever it was

2.2.2.2. Building environmental variables

I used two main environmental variables for the tiger distribution analysis: forest cover type and distance from villages. Distance from roads was not included for this analysis because there is very low human activity along roads in Cambodia because their borders are often heavily mined. For cover types, I used a 1998 cover classification of Cambodia that was visually interpreted by DFW. From thematic mapped data, I selected the cover classes that were very important tiger habitat (Figure 4). Those selected were assigned numerical values; high values represent better habitat (Table 5).

Table 5. Assigned numerical values of forest cover types.

Forest Cover Types	Values of Degree of Tiger Presence
Deciduous forest	8
Evergreen forest	7
Semi-Evergreen	6
Grassland	5
Shrub land	4
Secondary forest	3
Fragmented forest	2
Other types	1

Human village centers were buffered at 5 km and 15 km to create a coverage that included heavy, moderate and low human impact (Table 6, Figure 5)

Table 6. Assigned numerical values of human impact buffering.

Human impact	Buffered distance	Values of Degree of Tiger Presence
Low	>15km	3
Moderate	5km to 15km	2
Heavy	< 5km	1

2.2.2.3. Model development

Before developing the models, Spearman's correlation coefficient for each pair of environmental variables was computed by using CORR procedure, SAS. Highly correlated variables contain similar information that can lead to poor predictions. I used a correlation coefficient of 0.8 to eliminate highly correlated variables. All remaining variables were used to construct the following models: sambar deer distribution, gaur distribution, barking deer distribution, banteng distribution, distance from villages, and forest cover types.

1 used logistic regression to build the distribution model based on data from the surveyed cells. The general form of a logistic regression model is

$$\text{Logit (p)} = \alpha + \beta X_1 + \beta X_2 + \beta_i X_i$$

P: probability of tiger presence

X_i: value of the environmental variable

α: intercept of the equation

β_i: coefficients of the equation

I ran two separate models. One was based on all environmental variables. It was used to predict tiger presence inside the interview areas. A second model was based on forest cover types and distance from villages. The data used to build this model were from combined home ranges of all hunters, I used this model to predict the distribution of tigers outside interview areas, I examined robustness of the first model by randomly dividing data, building a model with half the data and testing predictions with the other

half. I had no data to test the second model. Results from this model can only be tested by future field surveys.

1. The model for tiger presence inside the interview areas:

$$\text{Logit}(Pi) = -16.2929 + 1.5284X_1 + 0.9388X_2 + 0.6383X_3 - 0.4613\% + 0.5462X_5 + 0.0439X_6$$

2. The model for tiger presence outside the interview areas:

$$\text{Logit}(P_2) = -3.7453 + 0.7101X_5 - 0.00015X_6$$

Where, P_1 is probability of tiger presence inside the interviewed areas

P_2 is probability of tiger presence outside the interviewed areas

X_1 is sambar deer distribution

X_2 is gaur distribution

X_3 is barking deer distribution

X_4 is banteng distribution

X_5 is distance from villages

X_6 is forest cover types

I calculated each model's probability of tiger presence by:

$$P_1 = \exp^{\text{logit}(P_1)} / (1 + \exp^{\text{logit}(P_1)})$$

$$P_2 = \exp^{\text{logit}(P_2)} / (1 + \exp^{\text{logit}(P_2)})$$

Then, the two models were fitted together to obtain an entire country predicted distribution of tigers by using Arc/View. I classified the predicted tiger probability into five categories: category "No Tigers" (probability 0 – 0.07), "Poor" (probability 0.07 – 0.25), "Low" (probability 0.25 – 0.50), "Medium" (probability 0.50 – 0.80), and "High" (probability 0.80 -1.00) to display the results.

2.2.2.4. Population estimate

1 classified the high and medium probability (0.51-1.00) of occurrence areas as tiger breeding habitat. The low and poor probability (0.07-0.50) of occurrence areas were classified as non-breeding habitat (e.g. dispersal corridors or sink habitat). To estimate the number of tiger in Cambodia, I used 2 density scenarios: (1) less conservative (1 adult tiger/100 km^2 for high quality habitat and 1 adult tiger/l34 km' for medium quality habitat), and (2) conservative (1 adult tiger/134 km^2 for high quality habitat and 1 adult tiger/200 km^2 for medium quality habitat). Because there are no density estimates for tigers in Cambodia, I chose a range of density estimates that were conservative compared to estimated tiger densities from other areas in Nepal and India, which had similar estimates of prey richness and abundance. Density from other locations is often reported, not as true density, but as the home range size of a tiger. For example, Rabinowitz (1993) estimated that a male tiger in Thailand had a home range of 100 km'; then he used that home range size as a density estimate of 1 tiger1100 km^2. To avoid this problem, I constructed a table that shows the relationship between home range size and density (Table 7). In this calculation tigers were considered polygamous with male home range overlapping 2 female home ranges; reported male home range overlap varies from 2-7 female home ranges (Sunquist 1981, Smith et al. 1987. Smith and McDougal 1991, Smith 1993, Rarantha 1995, Chundarwat 1999).

Table 7. The relationship between home range size and tiger density using a ratio of polygamy of 1 male for 2 females.

Home range (km^2) males and females	Density (km^2/tiger)
Male = 100 *	33
Female = 100	67
Female = 150	100
Female = 200	134
Female = 300	200

* tiger home range estimate for Thailand (Rabinowitz 1993)

2.2.2.5. Metapopulation structure

To define the extent of individual populations I used two criteria. Populations had to encompass > 1500 km^2 to be considered viable; populations were considered as discrete units (not necessarily completely isolated) if the connecting habitat was < 10 km wide

2.3. Results

A total of 153 hunters was interviewed. They were distributed in 100 villages, 35 districts and 13 provinces. Their hunting territories covered 60,800 km^2 (33% of Cambodia) or roughly 50% of the total forest cover of the country.

2.3.1. Prey distribution

The major tiger' prey in Cambodia are barking deer; wild boar, *Sus scrofa;* sambar; gaur and banteng. My survey did not include wild boar. Within the combined home range of the hunters (60,800 km'), barking deer had the widest distribution followed by sambar, gaur and banteng (Table S). We summarized overall prey abundance based on Table 4 and Figure 6. The strongest correlation among prey species was

between sambar and barking deer and the second strongest correlation was behveen gaur and banteng (Table 9).

Table 8. The area in km' of high, medium, or low relative abundance of the 4 major tiger prey species. Overall abundance was calculated by the criteria in Table 4.

	Barking deer	Sambar deer	Gaur	Banteng	Overall prey abundance
High	42,400	31,784	12,120	9,992	61,080
Medium	13,852	17,852	14,680	33,450	55,928
Low	4.480	11,124	27.532	15,020	12,680

Table 9. Spearman Correlation Coefficients among prey species.

	Sambar Deer	Barking Deer	Gaur	Banteng
Sambar Deer	1.000	0.788	0.419	0.460
Barking Deer	0.788	1.000	0.346	0.4s 1
Gaur	0.419	0.346	1.000	0.597
Banteng	0.460	0.481	0.597	1.000

Among all environmental variables, tiger distribution was most highly correlated to sambar and least correlated to forest cover (Table 10).

Table 10. Spearman correlation coefficient between tiger and prey species.

	Correlation with tieer
Sambar deer	0.597
Gaur	0.47
Barking deer	0.465
Banteng	0.311
Distance for village	0.267
Forest cover	0.065

2.3.2. Tiger distribution and metapopuiation structure

The logistic model predicted the probability of tigers occurring in each of the 46,071 cells in Cambodia (Figure 7, 8, **9).** I categorized these probabilities as high, medium, low and not present, and as breeding and non-breeding habitat (Table 11). A total of 68,836 km^2 was considered breeding habitat and 26.148 km^2 was dispersal or potential dispersal habitat

Table 11. Categories of tiger density and breeding status in Cambodia

Probability of occurrence	Density categories	Area (km')	Breeding habitat
1.000–0.801	High	55,604	Yes
0.800-0.501	Medium	13,232	Yes
0.500-0.251	Low	7,112	No
0.250-0.071	Poor	19,036	NO
0.070-0.000	Not present	86,051	NO

I hypothesized there are 10 populations of tigers in Cambodia (Table 12. Figure IO). They range in size from 1,678-20,348 km^2 and include 90% of the predicted tiger habitat. The rest (10%) of the high and medium quality tiger habitat that tit my model criteria were considered too small and isolated to support viable populations of tigers. By these criteria I eliminated 7,190 km^2 of habitat and used only the 10 largest areas to define tiger populations. Out of 68,836 km^2 of the high and medium tiger habitat (probability 0.50-1.00), there remained 61,646 km' of tiger habitat. Using both the less conservative and more conservative scenarios the number of tigers **in** Cambodia is estimated to range from 436-591.

Table 12. Tiger density estimates **based on 2 scenarios where density is either 100 or 134 km^2 for high quality areas and 131 or 200 km' for medium quality areas.**

No	Population location	Areas occupied (km^2)	Tiger population estimate	% Tigers in Protected Area	% Tigers in Forest Concessions
I	Cardamom	20,348	146-198	31%	56%
2	Kratei	**9,670**	69-93	**29%**	**39%**
3	Preah Vihear	5,403	58-79	43%	**26%**
4	Virachey	5,296	39-52	59%	**17%**
5	Mondulkiri	5,077	36-48	**21%**	**0%**
6	Kampong Thorn	3,560	25-34	**0%**	**74%**
7	East Stung Treng	3,268	22-31	**0%**	**57%**
8	East Preah Vihear	2.338	16-22	**2%**	**43%**
9	West Stung Treng	1,678	13-18	**35%**	**33%**
10	Kirirum-Bokor	**2,005**	11-16	0%	**79%**
	Total	61,646	436-591	29%	**42%**

2.3.3. Contribution of protected areas and forest concessions to conservation of tiger habitat

Protected areas cover approximately 18% of Cambodia; 54% of protected area habitat (17,794 km') supports breeding tigers. However, tiger breeding habitat **in** protected areas is only 26% of the 68,836 km^2 of tiger habitat in Cambodia (Table 12). In contrast forest concessions encompass 27% of Cambodia and 52% (25,804 km^2) of concession land is tiger breeding habitat. Thus forest concessions include 35% of tiger habitat compared to 26% in protected areas (Figure 11). Much of the other 37% of unprotected tiger habitat in Cambodia is also high quality breeding habitat.

2.4. Discussion

The information from hunters allowed me to map for the first time the distribution of tigers and their prey throughout the entire country This information is urgently needed because both the government of Cambodia, development agencies (e.g. The World Bank), international NGOs and funding organizations recognize there is great urgency for the government to implement a comprehensive conservation program. Development and resource harvest is now occurring at an unprecedented rate that can not be sustained. My analysis used two models to predict tiger distribution. The first model, covering the combined home ranges of the hunters interviewed, included data on relative abundance of tiger prey and was the strongest predictor of tiger presence. The second model was based only on human population distribution and forest cover. Because the second model was based on less information, it was not as accurate at predicting tiger presence. The most important information obtained from this study was a more comprehensive understanding of tiger distribution and metapopulation structure, an objective, pre luminary estimate of tiger numbers in Cambodia, and the relatively small contribution that the current protected area system makes to tiger conservation. Large areas of important tiger habitat are located in forest concessions and in other unprotected areas of the country where development pressures are growing. Based on my study, the government of Cambodia now has the information to revise the current protected area system and develop a national tiger conservation action plan.

2.4.1. Prey and tiger distribution

Sambar was the most widely distributed large prey in Cambodia and was the best predictor of tiger distribution. Throughout the tiger's global range the sambar is the most widely distributed prey and it is also thought to be the most important prey species for tigers (Seidensticker and McDougal 1993, Karanth & Sunquist 1995, Chundawat et al. 1999). Karanth & Sunquist (1999) modeled the relationship between prey depletion and decline of tigers. Their results are consistent with my model showing the strong relationship of sambar, gaur and to a lesser extent banteng and breeding tiger habitat. Thus in Cambodia these three species may be good indicators of the quality of tiger habitat. Most of the hunters interviewed reported that their primary motivation for hunting is to provide food for their families and that the primary species hunted are barking deer, sambar, gaur and banteng. Efforts to change this reliance on hunting will need to provide hunters a dependable, alternative way to sustain their families.

2.4.2. Landscape scale management

In the late 1980's the Cambodian government established the first forest concessions. In 1993 the protected area system was established in response to global concern for biodiversity loss. The determination of protected areas was done without data on biodiversity distribution and abundance. As a result the system does not adequately protect Cambodia's diverse plant and animal species. Biodiversity conservation issues in Cambodia, especially tiger conservation, were intensified after 1998. Many NGOs came to the country to help conserve the tiger, but these efforts were not coordinated and some duplicated those of others. Additionally, coordination among

government agencies and the NGOs was poor. For example, the government did not have a plan to conserve tigers and therefore was not able to direct the actions of the NGOs. Without a plan in place, some NGOs took responsibility for developing government policy. Furthermore, the two government agencies MAFF and MOE were given similar assignments on tiger conservation without clear distinction of their roles. MAFF were responsible for management of forest reserves and concessions since 1988 and MOE was assigned responsibility of the new protected areas in 1993 without consultation among these two agencies. These examples of initial lack of communication and coordination led to some serious problems in landscape scale management for tigers. My study demonstrated that only 26% of tiger habitat is located in protected areas and rest is in forest concessions or unprotected areas that are vulnerable to logging, hunting and encroachment by new human settlements.

2.4.3. Advantages of using hunter interview approach

The success of my study was based on using the hunter interview approach. To my knowledge, I was the first person to use this approach to obtain population and distribution data in South and Southeast Asia. Since my study, it has also been used successfully in Myanmar (K. Nowell, pers. comm.) Although Myanmar does not have the same history of recent warfare, it is characterized by long term political instability that made "foreign expert" ground surveys difficult. In Cambodia ground surveys could not be conducted in many areas due to lack of security and presence of landmines. Previous surveys were haphazard and did not utilize the natural history knowledge of local people. Given these limitations it is understandable that much of the country was not surveyed and that some of the best tiger habitat was not identified. Because

subsistence hunting has been an important part of the rural economy in Cambodia for the past three decades, I knew that local hunters had an intimate knowledge of most of the good wildlife habitat in the country. I was confident that hunter interviews could provide information on tiger distribution and abundance in Cambodia that was not easily obtained by traditional methods typically used in other parts of the tiger's global range.

Given the widespread adoption of the concept of community based conservation which advocates drawing local people into the decision making process, it is a very small additional step to recognize that some of these local people may also have extensive natural history knowledge of the local area. By using these people as part of my study not only was I able to utilize their knowledge, but I also established a strong relationship through them to the local community. Some of these hunters have been recruited to be wildlife technicians for the next phase of tiger management. Led by provincial government personnel and members of the tiger team these wildlife technicians will conduct wildlife monitoring surveys.

Because of the success of the hunter interview approach, I believe it will be useful for long term monitoring of tigers in Cambodia. I also plan to use this method to monitor changes in elephant and ungulates distribution and abundance. As part of this study, I obtained information on other mammals and several bird species. Although data on these species have not been analyzed, I will use these data in reviewing the existing protected area system. For future efforts, there are several aspects of the interview approach that I plan to change. These include obtaining more accurate information on who the hunter population is in Cambodia and where they are located so that follow up surveys can locate previous interview participants. Another important change in future surveys will be

to obtain data on tiger absence from specific areas. I did not design my study to collect both presence/absence data because I wanted to go to locations where tigers occur. Subsequent studies need to examine habitat that does not support tigers to determine why they do not exist there and to identify opportunities for habitat restoration and population recovery. Finally, in future hunter interview studies I would refine my efforts to identify the most experience local hunters because they have the most sophisticated knowledge of the forest and animal distribution.

2.4.4. **Hunters and** future tiger conservation

Conservation of tigers requires cooperation and support of local people. It is Important to understand their attitudes and motivation concerning wildlife protection, because modifying their behavior and activities (e.g. hunting and habitat destruction) is critical to conservation. At present in many parts of the country hunters cannot survive without hunting. Unfortunately the motivation for hunting is changing. In the past, hunting was for subsistence and was a part of traditional culture. Now the high demand and prices paid for tiger parts has shifted hunting from a subsistence level to intensive commercial poaching.

Due to lack of law enforcement in Cambodia, local people hunt illegally throughout the country and are rarely involved in conservation programs created by the government or NGOs. Some people reject government decisions made without their participation because they do not understand the reasons for these decisions. There are few government programs to educate local people about government conservation policies. To make wildlife conservation effective, local people must support protection efforts. Community-based conservation, or conservation efforts that include local people

in conservation decisions and actions, should be applied as soon as possible in the major tiger population areas to negotiate and develop a strategy that will protect tigers and other wildlife and still provide local people with benefits that allow them to maintain a satisfactory lifestyle.

2.5. Recommendations

Based on the results of this study, I make the following recommendations to strengthen tiger conservation in Cambodia.

1- Initiate landscape scale planning for conservation:

My study demonstrated that earlier efforts to identify and protect habitat in Cambodia were successful at protecting approximately 18% of the land area of the country but failed to conserve critical habitat for the tiger, one of Cambodia's most important species from the perspectives of its global endangered status and the role it plays as an umbrella species for a multitude of plants and animals in deciduous and evergreen forest ecosystems. I recommend the government of Cambodia use my results as a guideline to conduct more biologically based surveys for reviewing the current protected area system to determine if new habitat should be included. Additionally, I recommend that where important tiger breeding habitat is documented to occur in forest concessions, the government should include a provision of "no logging inside those habitats" in the Forest Concessions Management Plan. Finally, important tiger habitat exists outside the current protected area system and forest concessions. I recommend that these areas be evaluated to determine the potential contribution of this habitat to tiger conservation. It is important to protect these areas before settlement of new villages is initiated.

2- **Initiate community based conservation and monitoring in major tiger habitats:**

Involvement of local people is required for tiger conservation. I recommend that tiger conservation units' offices be established as close as possible to communities adjacent to major tiger populations. The government and NGOs should start involving local people in conservation efforts by providing alternative jobs (instead of hunting) and salaries for family support. Education and other public awareness efforts for all community members should be accomplished through village workshops, training and special programs for children, For the long-term approach, rural development should be brought in by encouraging professional donations and organizations to support such efforts. The goal of such development should be to maintain or increase human welfare, protect ecosystem services and conserve biodiversity. Ecotourism should be considered as an important potential mechanism to build community economic sustainability.

CHAPTER III

TIGER TRADE AND HUNTING IN CAMBODIA

3.1. Introduction

Tiger parts have been a valuable commodity in Asia for thousands of years. Tiger bone is used in traditional Asian medicines, particularly in China, Vietnam, Korea and Japan, but also in Southeast Asian tribal medicines as well as traditional Khmer medicines in Cambodia. Its primary therapeutic value is believed to be anti-rheumatic. Other tiger body parts are considered tonics to promote vitality and good health, including the penis, meat, and other organs (Nowell, 2000). Tiger skins and live animals are prized for their beauty and as symbols of power.

In the eariy 1990s, the wildlife trade monitoring group TRAFFIC raised the alarm that poaching of tigers for illegal trade of their body parts, particularly the market for Chinese tiger bone medicine, was driving the tiger to extinction (Mills and Jackson, 1994). In 1993, the government of India seized large amounts of tiger bone, over 500 kg, reportedly for sale to China. But otherwise conservationists have had little information on the scale of tiger poaching in most of the tiger's range, particularly in Southeast Asia. Fear that the level of hunting was unsustainable was a response to widespread availability of traditional Asian tiger bone medicines around the world,

During the early 1990s, wildlife trade surveys indicated a substantial amount of tiger hunting and trade in Cambodia. In 1993 tiger bones from Cambodia were sold to buyers from Singapore and Vietnam for US$80-100 per kg, and tiger bones and other parts, including skins and live animals, were sold in many Cambodian markets (Martin and Phipps 1995, Martin 1995). Srifa, Duanggrat and Bok (1997) documented the flow of tiger and other animal products across the Cambodian-Thai border.

Previous studies on traditional wildlife hunting by five Cambodian graduate students indicated tigers were directly killed by guns, traps and snares, and indirectly by killing an elephant and then killing the tiger when it came to feed on the dead elephant (Heng 1997, Kry 1997, Ouk 1997, Sin 1997 and Uch 1997). Kry (1997) reported that elephants were hunted for their tusks and also for meat, which was used as bait for attracting tigers that were shot from tree, hides. Uch (1997) indicated that homemade landmines produced by the Khmer Rouge were also used for trapping tigers and elephants.

Tigers and other wild cats were classified as ferocious animals by Royal Decree No.24 issued on January 26, 1940, and the public was allowed to kill these animals. Tigers were widely killed during this period. It was not until 1988 that the General Assembly passed a decree (No. 35) that made tiger hunting and trade illegal in Cambodia. One article of the decree requested MAFF to produce a list of protected species. This was completed in 1994 and the tiger became one of the officially protected species (Declaration No. 359). Based on current regulations, people who kill tigers can be fined up to 1,000,000 Riel (US$270) and confiscated evidence (e.g. firearms, tiger parts, vehicle) becomes state property. When a person kills a tiger he is given a warning and must sign a contract not to do so again. If the person is a repeat offender he will be prosecuted (Joined Declaration No.1563, MAFF & MOE).

On October 1997, Cambodia joined the Convention on CITES as its 140th member. Cambodia is currently developing legislation to implement the provisions of the Convention. Stopping international tiger trade is a high priority for the Parties to CITES. In 1999, CITES sent an international technical expert team to Cambodia to learn

more about illegal tiger trade (Sellar et al 1999). The CITES team was concerned by the level of illegal trade they found. For the Cambodian government **to** carry out its responsibilities to CITES and bring tiger trade under control, it is necessary to know more about how trade operates and the role of hunters in providing animal products. The goal of my research was to obtain information that can be used to reduce illegal wildlife trade and hunting in Cambodia. My research focused on two important questions: (1) How does animal trade operate in Cambodia? (2) How does hunting contribute to the trade problem in Cambodia?

3.2. Methods

To study trade and hunting of tigers and their parts in Cambodia, I used two approaches, First I conducted a wildlife trade survey by relying on investigative skills. Because trade is illegal, it was important that shop owners and wildlife product traders did not know the purpose of my questions. I posed in a variety of roles and disguises depending on the situation at each market. Second I conducted an interview to determine hunter activities and their motivation for killing tigers. Because hunters are never prosecuted they are quite free to discuss their profession. Many of these hunters were the same people we interviewed to determine the distribution of tigers and other large mammals (Chapter 2) and we already had a good relationship

3.2.1. Data collection

3.2.1.1. National wildlife trade survey

To understand wildlife trade in Cambodia, I asked the following questions: (a) Where are markets located? (b) What type of trader buys tiger parts? (c) What products are used in trade? (d) What is the cost of tiger products? (e) What are the internal and

transborder smuggling routes? (f) How are products transported internally and across borders? and (g) What allows trade to occur despite national and international laws? I used the methods outlined below to investigate these questions.

From April-August 1999, I conducted the first national wildlife trade survey in Cambodia in cooperation with the Wildlife Protection Office (WPO) of the Department of Forestry and Wildlife (DFW). To identify illegal markets and plan where to survey, I reviewed all previous wildlife trade reports and information at the WPO. I also consulted provincial officers, local hunters and other individuals who had knowledge about this problem. Due to lack of law enforcement conditions in the country, wildlife hunting and trade activities are very common and quite open, so I was able to identify the key places to conduct the survey. I was particularly interested in where and how animal products were exported from Cambodia

Before going to the field I identified a WPO staff member to work with me as a permanent assistant. He had previously written a thesis on traditional medicine in Cambodia and was knowledgeable about animal trade issues. We planned the markets to visit, the questions to ask traders and the logistics of conducting our investigation. All of this planning was very important and needed to have a flexible approach because potentially our interactions with traders were very dangerous. For example, in 1997 an NGO staff person attempted to investigate animal trade in Phnom Penh and a dealer became suspicious and threatened him with a gun (Ware 1997).

After arriving at a provincial market, I located one of the local hunters who participated in the tiger distribution interview survey (see Chapter 2) and enlisted his help with the trade survey as another team member. These hunters were asked where they had

hunted recently and the price they received for selling animal parts and products to local shop owners and wildlife dealers. I tried to locate hunters who had recently returned from hunting and had products to sell to dealers. By following these people as they tried to sell their goods, I was able to get up-to-date, first hand information. I also sought out the most experienced hunters in the region and paid them to be a guide and informant.

To determine how much local wildlife dealers or shopkeepers pay for products from hunters, I went to shops with hunters and posed as one of them. When we arrived at a shop, the hunter began negotiating the price for the goods he had to sell and I asked the dealers about the prices they would pay for other species. 'In some cases dealers asked the hunters or me to procure for them other animal products. This gave us the opportunity to see samples of other products and to ask dealers how much they would pay us for these products. Generally, the buying price from hunters was obtained by posing as a hunter or middle person bringing products in from the forest.

To determine type of trader, products used in trade and price that shop owners and wildlife traders set to sell animal products I sent team members to visit the shops. They posed as a product buyer or trader who purchased animal products for transport to Phnom Penh or to take out of the country. The teams that posed as hunters were different from the teams that sought to buy animal products from these wildlife dealers. Our buyers usually purchased small relatively inexpensive items; after establishing themselves as buyers, they obtained price quotes for more expensive items such as tiger bones and skins. In some situations, we used tape recorders and flexible questioning to collect information during interviews with traders and shop owners. Different languages were

also used during this survey, especially Chinese at the Chinese traditional medicine shops and Vietnamese for the Vietnamese traders.

To obtain information on trade smuggling routes, method of transport and factors that allow trade to occur despite conservation legislature I visited border or road checkpoints. I hired one or two law enforcement staff at each checkpoint to help organize the investigative work and examined animal confiscation reports and confiscated evidence (e.g. skins, bones) to obtain additional information on trade activities at each checkpoint. In addition to tiger products, I also investigated the more common animal products (e.g. horns of various bovid species, live birds and small mammals). Finally. local customs authorities were questioned to determine their attitudes about trade issues, their capacity to enforce the law and their knowledge of wildlife that was passing illegally through their checkpoint.

To obtain wildlife trade information from the traders or dealers and at the border checkpoints, I used one of the following roles or disguises depending on the situation. (1) Local hunter: I posed as a member of a group of hunters who came to sell animal products to traders; this disguise was used in areas where there was strong enforcement and animals products were not in view. (2) Wildlife buyer or trader: I bought inexpensive wildlife products in some specific shops that were owned by military personnel or policeman who used their position to protect their business; this disguise was used in these situation because of the potential danger of dealing with police. (3) Student: I informed dealer I was collecting tiger skin samples as a part of a tiger genetic study; this role was useful in places where regulation was not strongly enforced and information was easily available. (4) Government: If I got into a difficult situation (e.g. conflict with

police) I showed my official government papers and requested support from local authorities. I also used my government employee status at the border checkpoints to obtain cooperation

3.2.1.2. Hunting interview survey

To study how hunting influences wildlife trade issues in Cambodia I asked the following questions: (a) Who hunts tigers and why? (b) What other wildlife do hunters harvest? (c) Do tigers kill humans or livestock? (d) How do hunters kill tigers and how do they use tiger products? (e) Are hunters satisfied with economic relationship with the trader? (f) How important is hunting for welfare of local people? (g) What is hunter knowledge and attitude about hunting legislation and conservation? and (h) Are there animals that are not hunted because of traditional beliefs? I used the following methods to answer these questions

The hunting interview survey, based on the results from the tiger distribution interview, was conducted in the 3 prime tiger areas, the Cardamom Mountains, South of Sre Pok and the Northern Plains (Figure 12). These data were collected on a form (Appendix 3). To determine who hunts and why they hunt, I asked for information on occupation and motivation for hunting. The form also asked local hunters to list all species that they hunt and to specify hunting frequencies for each species, We showed each interviewee photographs to make certain that correct species identities were used Hunters also were asked to provide update the status of tigers (obtained by WPO in 1998) by reporting how many times they had seen tigers, tiger tracks, livestock kills or heard a report that a person was attacked or eaten by a tiger during the past 12 months. We also asked each hunter for an estimate of tigers they knew were killed in the past 12 months

This background information was important for two reasons. It provided a measure of the importance of tiger poaching in the local economy and some insight into the number of tigers that occur in Cambodia. In addition, we asked if individuals knew the government legislation and policy concerning hunting. Finally, we asked them to define conservation and to identify any animals they did not hunt because of traditional beliefs.

3.2.2. Data analysis

3.2.2.1. Wildlife trade survey data

These data were summarized and percentages were calculated

3.2.2.2. Hunting interview data

A post-diction analysis of the interview with local hunters examined why tigers are hunted in Cambodia. I converted answers from each local hunter into a degree value that related to tiger deaths. Answers for' each variable were given a numerical value indicating their association with tiger deaths. The closer the association, the higher the value. I used SAS (CORRE and LOGISTIC procedure SAS) to run correlation and logistic regressions between the response variable "tiger killed" and other variables listed in Table 13. Then I used SAS correlation coefficients, logistic parameter estimates and odds ratio to determine the strongest positive and negative factors that support the models "tigers killed" to draw conclusions

Table 13. Environmental variables included in tiger hunting post-diction analysis.

Variables	Original questions asked	Degree related
Occupation	What is your occupation?	1 = job beside hunting; 2 = other jobs including hunting; 3 = Hunting job only
Tigers seen	How many tigers did you see last year?	Value ranking from 1 – 9
Footprints seen	How many tiger tracks did you see last year?	Value ranking from 1 -12
Livestock/humans killed	How many livestock or people were killed in your locality last year?	Value ranking from 1 – 3

continued...

Table 13. continued.....

Variables	Original questions asked	Degree related
Product use	How do you use the products you hunt?	1 = all for food 2 = some for food and for sale 3 = all for sale
Hunting reliance	How important is hunting for you and your family?	Value ranking from 5% - 100%
Teach children	Do you teach your children how to hunt?	1 = No 2 = yes
Hunting methods	What different methods do you use?	1 = using a single method 2 = using two methods together 3 = using more than two methods
Product price	If you sell your hunting products to a dealer, do you think that the prices he gives you are reasonable?	1 =no 2 = yes
Policy knowledge	Do you know the government's policy on hunting?	1 =yes 2 = no
Policy agreement	Do you agree or disagree with it?	1 = agree 2 = not answer 3 = disagree
Conservation knowledge	Do you know what wildlife conservation means?	1 = yes 2 = no
Conservation agreement	Do you agree or disagree with it?	1 = agree 2 = not answer 3 = disagree
Respect beliefs	Are there any animals, you do not hunt, because of traditional believes?	1 = yes 2 = no
Population trend	Do you think wild animals in your area have increased, decreased or stayed the same over the last 5 years?	1 = increased 2 = stay the same 3 = decreased
Wildlife decline. concern	Are you worried about wildlife population decreasing'!	1 = yes 2 = no

3.3. **Results**

3.3.1. Wildlife trade status

3.3.1.1. Tiger trade markets and their locations

A variety of markets related to tiger trading were identified in Cambodia (Table 14, Figure 13). The most open markets were located in Phnom Penh and Poipet (northwest border with Thailand). Those markets have operated since early 1990s. Other places stocked tiger bones, produced traditional tiger medicine and sold tiger parts for gifts and magic objects. Tiger products sold in Phnom Penh were typically associated with traditional medicine shops. Because law enforcement along the border areas is poor: tiger skins and other parts were openly displayed in Poipet markets. I also found more wildlife markets were created along the border areas where additional border checkpoints were established by Cambodia and Thailand. Markets that operated in Phnom Penh and other provinces where law enforcement was restricted operated in secret.

Table 14. Types of markets dealing with tiger trade in Cambodia.

No	Type of market	Number	Location
1	Wildlife shop	9	Phnom Penh, Poipet, Preah Vihear. Stung Treng, Mondulkiri
2	Traditional medicine shops	21	Phnom Penh, Battambang
3	TKM manufacture & pharmacy	30	Phnom Penh, Pursat, Battambang, Preah Vihear
4	Gift shop and money exchanged centers	>100	Phnom Penh, Pursat, Battambang and others
5	Recycling center	>50	Phnom Penh, Kandal, Battambang, Pursat
6	Private zoo and park	3	Bayab, Kampot, Shihanouk Ville
7	Private dealer house	Many	All provinces with good wildlife population

3.3.1.2. Trader characteristics

Three levels of traders were involved in tiger trade in Cambodia. The first level was local wildlife dealers who live in the same village with hunters. Most were wealthy and have strong influence on daily economics of local hunters. These traders arrange advance money or foods or medicine for local hunters in exchange for hunting products brought back to them. Therefore, the price of tiger products at this level never increased. The second level was village/city wildlife shop owners or "middleman" who receive hunting products from local wildlife dealers. This group is composed mostly of policemen or soldiers who use their government position and transportation to operate a trade business. The third level was international traders who always ordered specific species and products from the wildlife shop owners to export out of the country. International traders sometimes brought pictures of the species and offered wildlife shop owner a very high price to obtain that item for them (Dasai and Vuthy, 1996).

3.3.1.3. Tiger products and prices used in trade

Hunters were asked about prices for tiger parts in the 1998 hunter interviews. They reported an average price of $169 per kg for tiger bone, and $149 for the tiger skin. There was not much variation in prices reported by hunters around the country. These prices can be also considered average wholesale prices paid by a dealer to a hunter, because there was no difference between retail and wholesale. Table 15 shows prices of tiger products starting with the hunter and ending in the international market place. The price of tiger products was >100 times higher than the price in local hunter villages. This high market value causes the extremely strong demand for tiger products.

Table 15. Variation in price of tiger products from Cambodian hunters to markets in non-tiger range countries. Data for Japan, Taiwan and Vietnam is from sources quoted in *Nowell* (2000).

Parts	Hunters	Trader	Dealer	Range Country	Non-range country
Bones (kg)	$169	$185	$200	$275 (Vietnam)	$2 1,740 (Japan)
Skin (each)	**$149**	**$420**	**$625**	$1,167 (Thai)	$ 15,000 (Korea)
Skull (each)		**S675**	$975		$1,200 (Taiwan)

The trade survey team obtained information on prices for tiger parts set by Cambodian traders. Table 16 shows different buying and selling prices for all tiger parts in trade in Cambodia. Different parts of the tiger are priced differently. The average shop owner or trader selling prices was higher than the average buying prices from hunters The lowest profit made by the dealer was about $1200 or 30% if comparing to other parties (Table1 5).

Table16. Price for individual tiger parts and total value when traded from provincial dealers to major dealers or shop owners in Phnom Penh and Poipet (on the Thai border) and from these shop owners to international traders.

Parts of tiger	Unit for an adult	Buying price (US$)	Buying price for adult tiger	Selling price (US$)	Selling price for adult tiger
Bone	12kg	185	**2220**	**200**	**2400**
Skull	1	675	675	1350	1350
Canine	**4**	**28.33**	**113**	**50.8**	**203**
Claw	1s	15	270	17.5	315
Skin	1	420	**420**	625	**625**
Penis	1	**400**	**400**	**420**	**430**
Total			**4,095**		**5,313**

When compared to other species' parts and products, tiger parts are one of the most expensive wildlife products in the Cambodian markets. In addition to genuine tiger products there are many fake parts and products on the market (Nowell, 2000). At Poipet a pair of fake tiger canines was on sale for US $5 at 10 times below the price of genuine canines; fake canines can usually be identified by shape and lighter weight as they are made from plastic. A shop owner in Poipet, who that sold fake tiger fat, told us it came from python

3.3.1.4. Tiger trade route and destination

Table 17 shows the price difference between Poipet, the main market for Thailand, and Phnom Penh, the main market for Vietnam. Although Cambodian traders from Phnom Penh and Poipet purchase most tiger parts from hunters, the ultimate destination for the vast majority of tiger parts is other countries. Tiger skins sold for decoration purposes are traded most often at Poipet and were destined for Thai markets or were shipped through Thailand. Tiger bones were most likely to be traded to Vietnam and then to other countries for traditional medicine purpose. A shop owner at Poipet told us that tiger bones are primarily shipped to China and that it is easier to smuggle them by ground through illegal checkpoints in Vietnam than **to** smuggle them in airfreight from Thailand to China.

Table 17. Prices, use and destination of tiger products in Cambodia.

Tiger parts	Phnom Penh price	Poipet price	Uses	Market route
Bone	215/kg	185/kg	TKM, TCM, TVM	VN, CH
Skull		2150/each	D, MO, TCM, R	TH, VN
Canine	37.5/each	80/each	D, MO, TKM	KH, TH
Claw	15/each	20/each	MO: TKM	KH, TH
Skin complete	600/each	650ieach	D, MO	KH, TH
Penis		420/each	TKM, TCM, TVM	KH, TH, VN
Live		1100/cub	P, R	KH, TH, VN

TKM = Traditional Khmer Medicine; TCM = Traditional Chinese Medicine; TVM = Traditional Vietnamese Medicine
D = Decoration; MO = Magic object; P = Pets; R = Research
KH = Khmer (Local use): CH = China; TH = Thailand; VN = Vietnam

Economically, iris also possible to understand the destination of trade by looking at the product price at two main markets. In Poipet most products are taken through Thailand; in Phnom Penh, most go to Vietnam. The higher the product price, the greater the likelihood that the product has been traded from another market. This observation is important because it allows law enforcement to determine trade routes. For example, tiger skins in Poipet are more expensive than in Phnom Penh because skins in Poipet are destined for interior decoration market in Thailand where prices are high. In contrast, tiger bone prices in Poipet are cheaper than in Phnom Penh because bone is mainly designated for Chinese traditional medicine and it is smuggled from Phnom Penh to Vietnam. The trade survey team also identified other trade routes and market places throughout the country (Figure 13) based on information provided by traders, reports on wildlife product confiscation and investigations made during the survey time.

3.3.1.5. Common methods of smuggling tiger products

It is illegal to trade tiger parts in Cambodia today, but due to poor law enforcement, traders have developed a number of routes and methods to smuggle tiger parts out of the country. They use higher classes of transportation, especially vehicles with official license plates (e.g. government, police, military) to transport illegal products throughout the country. Sometimes, official license plates were faked due to poor regulation of public works and transportation. Wildlife trade was also accomplished by hiring experienced taxi drivers (who were mainly government employees) to carry the illegal products at night across the checkpoints. Sometimes illegal products were seen by checkpoint authorities, but smugglers nere often able to bribe officials to get their products through the checkpoint and to avoid arrest. During our field investigation, an economic policeman at Nhek Leang asked one member of our team, who posed as a trader, for cooperation to transport wildlife products from Kampong Chhnang (south of Tonle Sap) to Nhek Leang (a large Vietnamese community at the meeting point between Mekong River and National Road No.1). The policeman also told us some of his experiences when he was hired by traders to transport illegal wildlife products.

Cambodia is connected to Vietnam by the Mekong and Basak rivers. It takes approximately one day to travel between these two countries by boat. The most common products exported from Cambodia to Vietnam are agricultural products, timber, and recycling materials (Vietnamese trader, pers. Comm. at Nhek Leang). Information from this source indicates that illegal wildlife products are usually exported in Vietnamese recycling boats travelling the Mekong and Basak rivers. Especially live animals, including tiger cubs, that traders hide in rooms under recycling materials with assess

lights and food (Trader in Bavet, pers. Comm. in Bavet). According to our interviews with checkpoint authorities at Chhrey Thorn (on Basak River) and Kha Orm Samnor (on Mekong River) border checkpoints, we were informed there were no cases that illegal wildlife product confiscations at these sites.

Investigations also indicate there are hundreds of illegal land and water crossing points along the borders created by local people and traders. To accomplish trade, local people living on borders and supported by powerful traders, were hired to carry illegal items across the borders. Most traders had good connections with two country checkpoint authorities to export/import illegal wildlife products. Sometimes, both country authorities, especially the neighboring partner that has stricter law enforcement, are involved in exporting the products if the illegal trade **is** valuable. If illegal trade **is** of small value (e.g. single animal or item) traders usually trade themselves.

3.3.1.6. Trade control authority and problems

According to government policy, a number of different agencies are assigned responsibility for wildlife trade control in Cambodia. These are listed in Table 18.

Table 18. Authorities assigned at checkpoints and their duties.

Agencies	Type of checkpoint	Role & Responsibility
National immigration police	IBC, NCBC, DA, Port	Govern and control border migration, traffic. security, safety and discipline
Import-export inspection	IBC, NCBC, Port	Control quantity and quality of import-export items, issue permits clarify product quantity and quality for import-exportation
Customs	IBC, NCBC, C I C , DA, Port	Control all types of goods, transportation, passengers, valuable *currency* (e.g. metal, stone, poison, opium) to collect tax and enforce illegal smuggling and other economic disturbances
Agriculture agency	IBC. Port	Check products and goods made from plants; control import-export of animals
Quarantine agency	IBC, Port	Check human health certificate and condition of transportation crossing the border
Medical inspection agencies	IBC. Port	Proceeds medical product import-export application, check medicine's import-export permit; control medicine quality
Kampuchea Shipping Agency and Brokers	Ports	Organize and check all shipping at ports
Port Directors	Ports	Team leader to responsible for all activities in their individual port
Civil aviation authority	L4, D.4,	Oversee all activities at the International Airport

IBC = International Border Checkpoint; NCBC = Neighboring Country Border Checkpoint;
CIC = Checkpoint inside the country, IA = International Airport; DA = Domestic Airport

Checkpoint authorities complained they cannot conduct a detailed check on every boat that moves across the border. They identified several reasons: (1) lack of equipment and ports to remove heavy products (e.g. recycling materials) to look for illegal wildlife products and (2) lack of cooperation behveen responsible authorities, limited experiences with wildlife trade control and low government wages. The team was also aware that low salaries (approximately $15/mo) for government officials created a strong temptation to accept corruption to supplement their family survival. An authority member at Bavet international border checkpoint complained that he could not survive with the small salary provided by the government; what he can do best now is earn extra money for his family.

3.32. Hunting interview *status* and analysis

A total of 71 hunters who live around the 3 major tiger populations in Cambodia (Figure 12) was identified and interviewed to obtain information over a 12 month period (1998) that was not included in the distribution interview survey (Chapt.2). In addition, the interview also included more information regarding the socio-economics of local hunter welfare.

3.3.2.1. Number of tigers killed and other wildlife hunted

In the hunter interviews, people were not asked directly if they hunted tigers because we did not want them to fear that their answers could be used to prosecute them. However, it is notable that a number of people openly informed us they hunted tigers. From this volunteered information, I estimated a minimum of 85 tigers was killed in 1998 in three main regions of Cambodia (Table 19). Most hunters reported hunting as the main

threat to tiger survival *in* Cambodia, *more* so than logging. Because of hunting pressure, most hunters considered local *tiger* populations to be decreasing (85%).

Table 19. Number **of tiger killed in 1998**

Region	Number interviewed	Tigers killed
Cardamom Mountains	20	15
South of Sre Pok	36	36
Northern Plains	15	34
Total	71	85

A total of 64 species of Cambodian wildlife, including tiger and its prey was hunted. Among these species, 36 were categorized as "Not Successfully Killed", which meant that these species are not harvested because they are rare or have no economic or food value. Another 14 species were categorized as "Rarely Killed" because they are rare or have limited economic or food value. Eleven species *were* "Sometime Killed" and 3 species were listed under the *criteria* "Often Killed" (Appendix 1). The latter two groups were composed of species that *are* more abundant and of *greater value* in the market *or* for food.

3.3.2.2. Hunter ***identity*** **and motivation**

Among all interviewees about 93% were hunters; and only 7% had other occupations (e.g. farmer, resin collector, policeman, soldier). Some said they still hunt to get additional foods.

Table 20 summarizes results of the logistic regression analysts. Four main variables were positively correlated with tiger hunting. The first was the extent to which hunters worried about decreasing tiger numbers. Those that worried less, hunted more

(Odds ratio 8.224). The second was **the** influence of traditional beliefs. The more the belief was respected, the less the tiger was hunted (Odds ratio 6.17). The third variable was hunting method. The greater the number of techniques used to hunt tigers, the greater the hunting success (Odds ratio 5.93). The fourth variable was satisfaction with the price a hunter received for tiger parts. Those that were most satisfied with selling price. hunted more (Odds ratio 3.77).

Table 20. The relationship **between number of tigers killed and other environmental variables.**

Variables *Name*	Coefficients	Standard error	Odds *ratio*
Intercept	-2.092	3.827	
Occupation	-1.081	1.074	0.339
Tigers seen	0.081	0.167	1.084
Footprints seen	0.314	0.107	1.369
Livestock/humans killed	-1.066	0.565	0.344
Product use	-0.081	0.728	1.085
Hunting reliance	0.012	0.019	1.012
Teach children	-2.361	1.283	0.094
Hunting methods	1.781	0.822	5.937
Product price	1.326	1.056	3.769
Policy knowledge	-2.709	1.193	0.067
Policy agreement	0.179	0.412	1.196
Conservation knowledge	-1.789	1.366	0.167
Conservation agreement	0.275	1.256	1.322
Respect beliefs	1.820	0.923	6.174
Population trend	-1.466	1.318	0.235
Wildlife decline concern	2.107	1.277	8.224

3.3.2.3 Humans and livestock killed by tigers

Approximately 20% of interviewees reported tiger attacks on livestock or humans in 1998. For example, a soldier in Koh Kong province indicated that tiger attacks on humans were recent and occurred since a new forest concession road was constructed across tiger habitat in 1997. He also reported the Cardamom forest was very dense (evergreen forest) and that sometimes people go too close injured tigers left by previous hunters. The soldier openly informed us that after he killed two tigers in the area, the human tiger attacks stopped. Livestock killed by tigers were pig and cow.

3.3.2.4 Methods used to kill tigers and hunter use of tiger products

Hunters use a variety of methods to kill tigers, including guns, snares, land mine traps, and pit traps. Although there has been a lot of attention in the media about tigers being killed by land nines, this is not the preferred method because it damages the skin, lowering its value. According to the interviews, only one hunter said he used landmines to trap tigers, but not so often. The prefened method that hunters commonly used to kill tigers was a firearm (e.g. AK47, M16) that results in a complete skin and skeleton for the highest price (94%). However, they said the AK47 is the best one because it is an automatic firearm that can hold many bullets. Firearms were used to kill tigers with hvo primary methods: using baits to attract tigers or using a dog to chase the tiger and then shoot it. The second preferred method was to use a trap or snare (41%) to catch tigers, but this method is not as successful as with firearms. Trapping and snaring was also done using baits or placing traps near the tracks.

In general, most hunters reported hunting for daily food and sale for additional family income. Most considered themselves farmers and hunters and listed meat and other forest products as important for sustaining their families.

3.3.2.5. Hunter satisfaction with trader relationship

About 50% of hunters said they were satisfied with the price offered **by** local wildlife dealers, even through it was a very small amount compared to middleman and local wildlife dealer profits. This satisfaction was influenced by a number of factors. First, hunters felt it was the only way to pay back advanced financial arrangements (e.g. food, medicines, money) often made with these traders. The dealers requested only non-food products (e.g. skin, bones, horns, antlers) so the hunters also benefited by keeping the meat, in addition to a small financial profit, for family food. Also, due to lack of transportation and different language use, it was very difficult for these local hunters to travel to the town/city markets to sell their products for a higher price

3.3.2.6. Importance of hunting for hunter welfare

Among 71 interviewees; (45%) said their families depend on hunting more then half the time; and (55%) said their families depend on hunting less than half the time. The hunters who depend less on hunting mainly need hunting products for food and the hunters who depends more on hunting need those products for trade. The interview also showed that the most experienced hunters, strongly depend on their hunting activities because they hunt for profit, not for meat.

3.3.2.7. Hunter knowledge about legislation and conservation

All hunters live in rural area and 76% said they understood conservation policy and regulation. But because of their economic dependence, they could not stop hunting

tigers, even though most of them indicated they knew the local tiger population was decreasing.

3.3.2.8. Traditional beliefs and bunting

Most hunters said they were not teaching their children how to hunt (83%). Most said hunting is very easy; their children will learn by themselves. However, 38% reported they do not hunt some animals that are related to traditional beliefs. Influence of traditional belief on hunting behavior varied among individual hunters. Some who used elephant for transportation said they did not kill elephant, but they do capture them for use as transportation. The survey did not indicate the tiger as a species that is not hunted because of traditional belief.

3.1. Discussion

Wildlife trade in tiger products is very active in Cambodia. This study identified major market centers, routes and methods of trade and demonstrated the reliance of local hunters on the economic benefits of killing tigers. Hunters are not concerned about tiger population declines and potential extinction; for them, daily welfare for their families is more important. This study estimated that approximately 50 tigers are killed each year for the wildlife trade. The population of tigers must be higher than the earlier estimates by Wildlife Conservation Society of 100-200 animals to sustain this level of harvest. The total population is likely to be close to tigers estimated by Nowell *et al.* (1999). However, if the current high level of hunting continuing it will pose a serious threat to the survival of the tiger in Cambodia.

3.4.1. Tiger trade status

Experience from other countries indicates control of wildlife trade forces trade to the black market where it is much more difficult to eliminate. For example, in China it is very difficult to locate tiger parts for sale in the markets (Nowell, 2000). In Cambodia, due to lack of law enforcement, tiger products are still displayed in most of the markets. While this is the case, law enforcement should take the opportunity to document all illegal tiger trade markets and routes, and to understand more about smuggling methods that people use to operate this business. Then, they should act quickly and vigorously to close these markets and prevent creation of new wildlife markets

Even though local hunters receive low profits from tiger hunting this does not discourage them from hunting because there are many factors that affect their economic condition. International market pressure is so high that it has tremendous power **to** encourage continued illegal killing of tigers. Based on my results, I believe two main approaches will help reduce wildlife trade: elimination of international market pressure and improvement local welfare and alternative jobs to replace tiger hunting.

3.42. Uses of tiger products

All parts of a tiger are used. The complete skins and skulls are acquired for high status display by wealthy international people. They use it for decoration in hotels, restaurants, bars, and in some private homes. Small pieces of tiger skin are used for magic objects by some cultures. Superstition dictates that tiger skins retains their power and prevent bad futures. Tiger bones are widely used in traditional medicines. Most of the tiger range countries have their own methods to convert tiger bone into traditional medicine. Other parts of tigers (e.g. canines, claws, whiskers) are used for necklace

carvings and as magic objects or gifts. All of these uses lead to extremely high demands for parts from this endangered species. To reduce illegal trades, education and public awareness programs may be the best option for conservation

3.4.3. Hunting of tiger and its prey

The post-diction analysis of tigers killed demonstrated that local hunters (85%) are not concerned about tiger population trends even if it decreased. According to the interviews, this was not because of misunderstanding regulation or conservation policies. Motivation for hunting appears to *come* directly from immediate economic incentive. If the tiger goes extinct, they will look for alternative **ways** to support their families. Appendix 1 shows that most of the hunted species were killed primarily to obtain daily foods or sold for profit. To reduce these threats to tiger survival. community-based conservation, as discussed in Chapter 2, is a priority strategy

3.4.4. Profit made from tiger trade

Cambodia is *very* poor country Average *income* for a government officer is about $20 per month. It *is* less for the rural people, who support *themselves* by farming Tiger hunting and involvement in trade is a lucrative way to supplement their salaries or daily income. But tiger conservation is now very high on the international conservation agenda. Significant sums of money have been made available in the 1990s to support tiger conservation efforts. In Cambodia, some of that money needs to be aimed at hunters. Those with the skills to hunt tigers should be given the opportunity to use those skills to help save tigers, by monitoring their status. Nowell, (2000) emphasized that with tiger trade having gone underground in most Asian consuming countries, the most efficient way to monitor and affect the trade is to develop this capacity in rural areas

where tigers live. The profits in the tiger trade have compromised law enforcement efforts. Part of the reason the trader's price so much higher than hunter price is the need to pay off officials. It is critical that tiger trade is brought under control. A recent *review* of global tiger trade found that, although there has been a reduction in the availability of traditional tiger bone medicines around the world, there is little evidence for a similar reduction in tiger poaching (Nowell 2000).

3.5. Recommendations

1. Eliminate international pressure: The ultimate challenge for reducing trade in tiger products must occur at the international level. Since Cambodia joined CITES an opportunity has existed for international wildlife trade control between Cambodia and neighboring countries that engage in illegal trade. I recommend that Cambodia sign bilateral agreements with all neighboring countries agreeing to control illegal tiger trade. Additionally, Cambodia does not have the institutional framework to make CITES work. This needs to be developed. Cambodia is a new member and appropriate staff need special training to be effective in enforcing the CITES agreement. The US government has criticized many countries in Asia for their week implementation of CITES. Cambodia is ready to make a concerned effort to control trade. The USFWS Tiger Rhinoceros and Tiger Fund is helping Cambodia implement tiger conservation. This help is appreciate and critical to tiger conservation. At the internal national level, new legislation and policy need to be developed to address illegal hunting and wildlife trade.

2. Institute programs in wildlife trade law enforcement training and professional enhancement: currently there is no training for local authorities who deal with illegal wildlife trade. Special training should focus on teaching these individuals to (a) identify illegal trade products for tigers and other priority species, (b) inform them about trade routes and methods of smuggling and (c) educate them about the importance of their job to conserve tigers and control trade. To be effective at their jobs and not be tempted by corruption, local authorities responsible for controlling trade need to earn salaries that meet their family needs,

3 Develop general public education programs: Cambodia is facing many serious needs as it struggles to overcome problems created during decades of political unrest. Although the tiger is viewed as a special species in other parts of its range, to the average Cambodian citizen, this species is feared and there is little concern for its conservation status. Programs targeting school children and adults in other countries (e.g. India, Nepal, Thailand) have successfully raised public awareness of the endangered status of tigers and have motivated national campaigns to take pride *in* the species and develop stronger conservation efforts. Such programs are needed in Cambodia.

4. Provide local hunters with alternative income and incentives for not killing tigers: because incentives for killing tigers are so strong for the local hunter despite relatively low price for his efforts, alternative income opportunities are needed to replace hunting with another form of income that is easier and more profitable to obtain, One approach is soon to be implemented. Local hunters will be hired to

be wildlife technicians involved in tiger monitoring network in the three main tiger habitats in Cambodia.

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APPENDIX I. Cambodian protected species list and related status.

No	Common Name	Scientific Name	Cites	Trade	Hunting
		Mammal			
1	Kouprey	Bos sauveli	I	*T*	**NS**
2	Javan Rhinoceros	Rhinoceros sondaicus	I	T	
3	Asian Elephant	Elephas masimus	I	T	**NS**
4	Southern Serow	Naemorhedus sumatraensis	I	T	**NS**
5	Gaur	Bos gaurus	I	T	S
6	Banteng	Bos javanicus		T	S
7	Wild Water Buffalo	Bubalus amee		T	**NS**
8	Tiger	Panthera tigris	I	T	R
9	Leopard	Panthera pardus	I	T	NS
10	Asiatic Black Bear	Ursus thibetanus	I	T	R
11	Sun Bear	Ursus malayanus	I	T	R
12	Brow-antlered Deer	Cervus eldii	I	T	R
13	Hog Deer	Axis porcinus	I	T	NS
14	Marbled Cat	Pardofelis marmorata	I	T	
15	Asian Golden Cat	Catopuma temminckii	I	T	
16	*Mouse* Deer	Tragulus napu		L	S
17	Sambar	Cervus unicolor		T	0
18	Common Muntjac	Muntiacus muntjak		T	0
19	Jungle Cat	Felis chaus	II	N	
20	Dhole	Cuon alpinus	II	L	**NS**
21	Eurasian Wild Pig	Sus scrofa		T	O
22	Asiatic Jackal	Canis aureus	III	L	NS
23	Fishing Cat	Prionailurus viverrinus	II	T	R
24	Slow Loris	Nycticebus coucang	II	L	S
25	Pileated Gibbon	Hylobates pileatus	I	T	**NS**
26	Sunda Pangolin	Manis javanica	II	T	S
27	Common Palm Civet	Paradoxurus hermaphroditus	III	L	S
28	Crab-eating Mongoose	Herpestes *urva*	III	N	
29	Silvered Langur	Semnopithecus cristatus	II	N	
30	Long-tailed Macaque	Macaca fascicularis	II	T	S
31	Pig-tailed Macaque	Macaca nemestrina	II	L	S
32	East Asian Porcupine	Hystrix brachyura		L	R
33	Indian Giant Flying Squirrel	Petaurista philippensis		N	NS
34	Sunda Colugo	Cynocephalus variegatus		N	NS
35	Burmese Hare	Lepus peguensis		L	R
36	Clouded Leopard	Neofelis nebulosa	I	T	NS
		Reptile			
1	Water Monitor	Varanus salvator	II	L	S
2	Common Monitor	Varanus bengalensis	I	T	S

continued..

Appendix 1. continued..

NO	Common Name	Scientific Name	Cites	Trade	Hunting
3	Reticulated Python	Python reticulatus	II	T	R
4	Asiantic Rock Python	Python molurus	II	T	R
5	Burmese Python	Python curtus		N	
6	Monocellare Cobra	Naja tripudians		T	R
		Bird			
1	Sams Crane	Grus antigone	II	T	NS
2	Greater Spotted Eagie	Aquila clanga	II	N	NS
3	Green Peafowl	Pavo muticus	II	T	R
4	Spot-bellied Eagle Owl	Bubo nipalensis	II	L	NS
5	Brown Fish Owl	Ketupa zeylonensis	II	N	NS
6	Red-headed Vulture	Sarcogyps calvus	II	T	NS
7	White-rumped Vulture	Gyps bengalensis	II	T	NS
8	Mountain Hawk Eagle	Spizaetus nipalensis	II	N	
9	Changeable Hawk Eagle	Spizaetus cirrhatus	II	N	
10	Crested Serpent Eagle	Spilomis cheela	II	N	
11	Black Eagle	Ictinaetus malayensis	II	N	
12	Chinese Sparrowhawk	Accipiter soloensis	II	N	
13	Shikra	Accipiter badius	II	N	
14	Brahminy Kite	Haliastur indus	II	L	NS
15	Black Kite	Milvus migrans	II	N	
16	Eastern Marsh Harrier	Circus spilonotus	II	N	
17	Peregrine Falcon	Falco peregrinus	I	N	
IS	Black Baza	Aviceda leuphotes	II	N	
19	Barn Owl	Tyto alba	II	N	
20	White-bellied Woodpecker	Dryocopus javensis		N	
21	Great Slaty Woodpecker	Mulleripicus pulverulentus		N	
22	Laced Woodpecker	Picus vittatus		N	
23	Pacific Swallow	Hinmdo tahitica		N	
24	Banded Kingfisher	Lacedo pulchella		N	
25	Large-billed Crow	Corvus macrorhynchos		L	NS
26	Racket-tailed Treepie	Crypsirina temia		N	
27	House Crow	Corvus splendens		N	NS
28	Vernal Hanging Parrot	Loriculus vemalis	II	T	NS
29	Blossom-headed Parakeet	Psittacula roseata	II	T	
30	Alexandrine Parakeet	Psittacula eupatria	II	T	
31	Silver Pheasant	Lophura nycthemera		L	NS
32	Siamese Fireback	Lophura diardi		L	
33	Red Junglefowl	Gallus gallus		L	S
33	Chinese Francolin	Francolinus pintadeanus		L	
35	Scaly-breasted Partridge	Arborophila chloropus		N	NS
36	Great Hombill	Buceros bicomis	I	T	NS

continued.....

Appendix 1. continued.. ...

37	Wreathed Hombill	Aceros undulatus	II	L	NS
3s	Oriental Pied Hombill	Anthracoceros albirostris	II	L	NS
39	White-rumped Shama	Copsychus malabaricus		N	
40	Emerald Dove	Chalcophaps indica		L	
41	Oriental Turtle Dove	Streptopelia orientalis		L	R
42	Spotted Dove	Streptopelia chinensis		L	R
43	Red Collared Dove	Streptopelia tranquebarica		L	R
44	Barred Cuckoo Dove	Macropygia unchall		L	
45	Indian Roller	Coracias benghalensis		N	
46	Dollarbird	Eurystomus orientalis		N	
47	Hill Myna	Gracula religiosa	II	T	
48	White-vented Myna	Acridotheres grandis		L	
49	Collared Falconet	Microhierax caerulescens	II	N	
50	Black-collared Starling	Stumus nigricollis		L	
51	Oriental Magpie Robin	Copsychus saularis		N	
52	Crested Treeswift	Hemiprocne coronata		N	
53	Scarlet Minivet	Pericrocotus flammeus		N	
54	Small Minivet	Pericrocotus cinnamomeus		N	
55	Stork-billed Kingfisher	Halcyon capensis		N	
56	White-throated Kingfisher	Halcyon smymensis		N	
57	Black-capped Kingfisher	Halcyon pileata		N	
58	Pied Kingfisher	Ceryle rudis		N	
59	Black-naped Oriole	Oriolus chinensis		N	
60	Black-hooded Oriole	Oriolus xanthomus		N	
61	Maroon Oriole	Oriolus traillii		N	
62	Greater Adjutant	Leptoptilos dubius		T	R
63	Lesser Adjutant	Leptoptilos javanicus		T	R
64	Painted Stork	Mycteria leucocephala		L	
65	Milky Stork	Mycteria cinerea	I	T	
66	Asian Openbill	Anastomus oscitans		L	
67	Black-headed Ibis	Threskiomis melanocephalus		T	
68	White-shouldered Ibis	Pseudibis davisoni		T	
69	Giant Ibis	Pseudibis gigantea		T	NS
70	Glossy Ibis	Plegadis falcinellus		T	
71	Black-necked Stork	Ephippiorhynchus asiaticus		T	
72	Woolly-necked Stork	Ciconia episcopus		T	NS
73	Darter	Anhinga melanogaster		L	
74	Grey Heron	Ardea cinerea		L	NS
75	Great-billed Heron	Ardea sumatrana		N	NS
76	Great Egret	Casmerodius albus	III	N	
77	Little Egret	Egretta garzetta		N	
78	Cattle Egret	Bubulcus ibis	III	N	

continued.. ...

Appendix 1. continued. ...

79	Chinese Pond Heron	Ardeola bacchus		L	
80	Pacific Reef Egret	Egretta sacra		N	
81	Little Heron	Butorides striatus		N	
82	Cinnamon Bittern	Ixobrychus cinnamomeus		N	
83	Yellow Bittern	Ixobrychus sinensis		N	
83	Spot-billed Pelican	Pelecanus philippensis		L	NS
85	Great White Pelican	Pelecanus onocrotalus		L	NS
86	Great Cormorant	Phalacrocorax carbo		L	
87	Indian 'Cormorant	Phalacrocorax fuscicollis		L	
88	Little Cormorant	Phalacrocorax niger		L	
89	Northern Pintail	Anas acuta	III	N	
90	Lesser Whistling-duck	Dendrocygna javanica		L	NS
91	Common Teal	Anas crecca	III	L	
92	Cotton Pygmy-goose	Nettapus coromandelianus		L	
93	common coot	Fulica atra		L	
93	Watercock	Gallicrex cinerea		1	NS
95	White-breasted Waterhen	Amauromis phoenicurus		L	
96	Common Moorhen	Gallinula chloropus		L	
97	Grey-headed Lapwing	Vanellus cinereus		L	
98	Black-crowned Night Heron	Nycticorax nycticorax		N	
99	Common Snipe	Gallinago gallinago		N	
100	Purple Swamphen	Porphyrio porphyrio		L	NS
101	Lesser Coucal	Centropus bengalensis		L	NS
102	Greater Coucal	Centropus sinensis		L	NS

I = listed in CITES appendix 1; II = listed in CITES appendix 2; III = listed in CITES appendix 3
T = species in trade; L = species transported for local uses; N = species not in trade or local uses
NS = Not Successfully Killed; R = Rarely Killed; S = Sometime Killed; 0 = Often Killed

Appendix II. Tiger distribution interview form.

Interviewer: ....
Occupation: .....
Date: .....

Interviewee: . . . ..._.___.. .....
Occupation: ....
Village:, ...Commune: .....
District: ..... Province: .....

Part I: Present. Status. Abundance of Animals:

1- Do these animals occur in your areas ? No ☐ Yes il

2- Are its numbers: High ☐ Low ☐ Medium ☐

3- Is its status: Stable ☐ Threatened ❑ Endangered ☐

4- Are these animals in your area?

Elephant	Low ☐	Medium ☐	High ❑	Not sure ☐
Rhino	Low ☐	Medium ☐	High ☐	Not sure ☐
Tiger	Low ☐	Medium ☐	High ❑	Not sure ☐
Leopard	: Low ☐	Medium ☐	High ☐	Not sure ☐
Golden cat	: Low ☐	Medium ☐	High ☐	Not sure ☐
Clouded leopard	: Low ❑	Medium ☐	High ☐	Not sure ☐
Black bear	: Low ☐	Medium ☐	High ☐	Not sure ☐
Sun bear	: Low ☐	Medium ☐	High ☐	Not sure ☐
Marbled cat	: Low ☐	Medium ☐	High ❑	Not sure ☐
Fishing cat	: Low ☐	Medium ☐	High ☐	Not sure ☐
Leopard cat	: Low 3	Medium ❑	High ☐	Not sure ☐
Jungle cat	: Low ☐	Medium ☐	High ☐	Not sure ❑
Wild dog	: Low ☐	Medium ❑	High ☐	Not sure ☐
Jackal	Low ❑	Medium ☐	High ☐	Not sure ☐

continued.....

Appendix 2. continued.....

Kouprey	: Low ☐	Medium ☐	High ☐	Not sure ☐
Buffalo	: Low ☐	Medium ☐	High ☑	Not sure ☐
Khting vor	: Low ☐	Medium ☐	High ☐	Not sure ☐
Banteng	: Low ☐	Medium ☐	High ☑	Not sure ☐
Gaur	: Low ☐	Medium ☐	High ☑	Not sure ☐
Elds deer	: Low ☐	Medium ☐	High ☐	Not sure ☑
Schamburg's deer	: Low ☐	Medium ☐	High ☐	Not sure ☐
Serow	: Low ☑	Medium ☐	High ☐	Not sure ☐
Sambar	: Low ☐	Medium ☐	High ☐	Not sure ☐
Barking deer	: Low ☐	Medium ☐	High ☐	Not sure ☐
Giant muntjac	Low ☐	Medium ☐	High ☐	Not sure ☐
Binturong	: Low ☑	Medium ☐	High ☐	Not sure ☐
Lesser mouse deer	Low ☐	Medium ☐	High ☐	Not sure ☐
Greater mouse deer	: Low ☐	Medium ☐	High ☐	Not sure ☐
Sarus Crane	: Low ☐	Medium ☐	High ☐	Not sure ☐
Giant Ibis	: Low ☐	Medium ☐	High ☑	Not sure ☑
Greater adjutant stork	: Low ☐	Medium ☐	High ☐	Not sure ☐
Lesser adjutant stork	: Low ☐	Medium ☑	High ☑	Not sure ☐
Black necked *stork*	: Low ☐	Medium ☐	High ☑	Not sure ☐
Red headed vulture	: Low ☐	Medium ☐	High ☐	Not sure ☐
Grey headed vulture	: Low ☐	Medium ☐	High ☐	Not sure ☑

continued.....

Appendix 2. continued.....

Part 11: Information about interviewee:

1- How much of your time do you spend hunting? Full time ☐ Part time ☐
2- How much time do you spend in the forest in a year?. ....
3- How many year have you been doing this occupation?. ....
4- How much of your livelihood depends on this occupation? ....
5- Describe forest areas where you spend most of your time?. ....
....
....
....

Part III: Interview about tiger:

1- Do you ever seen a tiger? Yes ☐ No ☐ How many times ☐
- When was the most recent time? .. .... .Where?. . .

2- Have you ever seen the tiger footprint? Yes ☐ No ☐ How many times ☐
- Where was the most recent time? .... __ .. ..
How do you know it was the tiger footprint?,. ....
....
....
....

3- Have you ever found wild animals killed by tiger in the forest?

Yes Cl No ☐ How many times ☐

- When was the most recent time? (Describe)
....
....
....

4- Have you ever seen tiger feed on animals caught in hunter snare?

Yes ☐ No ☐ How many times ☐

- How do you know it's a tiger and not another carnivore? (Describe)
....
....
....
- When was the last time this happened that you know about?
....
....

continued.....

Appendix 2. continued.....

5- Do tigers eat livestock from local Villages? Often ☐ Sometime ☐ Rarely ☐

- When was the last time this happened that you know about?

.....
.....
.....

- What is the value of livestock lost to tigers?

.....

6- How many case do you know where people were attacked by tiger?

.....
.....
.....

7- Summary: List all incidents involving tigers, which happened in this area over last year

.....
.....
.....

8- Can you estimate how many tigers are in your area?

.....
.....
.....

- How do you know this numbers?

.....
.....
.....

- How many Male ☐ Female ☐ Cubs ☐

9- Describe the best place for tiger in your area, what make this place good?

.....
.....
.....

10- Are the tigers: Increasing ☐ Stable ☐ Declining ☐

Why?, ...
.....
.....

continued.....

Appendix 2. continued.....

11- How many people in your area try to catch tiger?

.....

.....

.....

- How many tigers were killed around here last year?

.....

.....

- Are tigers caught in snares set for other animals? Yes ☐ No ☐

- Methods for catching tigers.

.....

.....

12- Do people trade tiger or tiger product in your area? Yes ☐ No ☐

- How much can you sell a tiger for?

.....

.....

.....

- Has the price changed over the last five years?

.....

.....

.....

- Are tigers hunted for Cambodians or for foreigners?

.....

.....

.....

Appendix III. Hunting interview form.

interviewer name: ..... Interviewee name. .....
Date: ..... Occupation:. .....
Village:. ..... .Commune:. .....
District: ..... .Province:. .....

Part I. Distribution records for rare Cambodian species:

1- Schomburgk's deer. Does this deer occur in your area? Show how it is different from
Hog Deer, Sambar Deer, Eld's deer. Present _____Absent - Some deer Occur, but not sure if this one

2- Javan rhino. In the past, did rhinos occur in this area? _ _ _Yes _____NO
How many years ago? ____Are there any rhinos in your area now? Yes ____No
Have you heard about rhinos still living in any other in Cambodia? Where? When?
.....
.....

3- Malayan Tapir. In the past, did Tapir occur in this area? __ Yes ____No
How many years ago? Are there any rhinos in your area now? ____Yes ____No
Have you heard about Tapir still living in any other place in Cambodia? Where? When?
.....
.....

4- Primates.

Present Absent Pileated gibbon High _ _ Medium_ Low __
_____Some occur, but not **sure** if this species

Present Absent Buff-checked gibbon High __Medium _ _ Low ___
_____Some occur, but not sure if this species

____Present _ _Absent White-handed gibbon High Medium __ Low ___
_____Some occur, but not sure if this species

____Present _ _Absent Black-shanked langur High __M e d i u m Low _ _
_____Some occur, but not sure if this species

____Present Absent Slow loris High __ Medium Low ____
_____Some occur, but not sure if this species

Present __ Absent Pygmy loris High __M e d i u m Low ____
_____Some occur, but not sure if this species

continued.....

Appendix 3. continued.....

5- Pangolin. Does this animal occur in your area? -Present __ Absent
High _ Medium Lou

6- Khting Vor. Does this animal occur in your area? __ Present __ Absent
High ____ Medium __ Low

7- Giant Muntjac. Does this animal occur in your area? __ Present __ Absent
High __ Medium __ Low

8- Lowe's Otter Civet. Does this animal occur in your area? - Present __ Absent
High __ Medium __ Low Some occur ____, but not sure if this species

9- Oweston's Palm Civet. Does this animal occur in your area? __Present ____Absent
High __ Medium Low

IO- Spotted Linsang. Does this animal occur in your area? _ _Present - Absent
High __ Medium Low

11- Hairy-nosed otter. Does this animal occur in your area? _ _Present Absent
High __ Medium Low __ Some occur ____, but not sure if this species

Part 2. Questions about the tiger in your area in 1998:

1- Did you or anyone you know see tiger around here last year? __ Yes ____ No

Altogether, how many times were tigers seen last year? . ...
Notes on the approximate dates and locations where seen:
.....
.....
.....

2- Did you or anyone you know see tiger footprints around here last year?
_____Yes _____No
Altogether, how many times were tigers seen last year? .. ..
Notes on the approximate dates and locations where tigers were seen:
.....
.....
How do you know these were tiger and not leopard footprints?
.....
.....

continued.....

Appendix 3. continued.....

3- Have tigers hunted livestock or people around here last year? ____ Yes _ _ No
Describe when, where, what happened:
.....
.....

4- Did anyone kill any tigers around here last year? ____ Yes ____ No
How many tigers were killed?
.....
.....

Part 3. Questions about hunting and wildlife conservation:

(this section between the **s only for people you have not interviewed before. If you already interviewed them then we already have this information in the database)

**
Please describe and draw your hunting territory on the map.

How many years have you hunted in this area?
.....
How many years have you been hunting altogether?
.....
How much of your time (%) do you spend hunting?
.....
How many days in the year? ..
**

1- Please list ALL the species you try to hunt in the forest. For each one, put down if you catch it
(0). Often, (S). Sometimes, (R). Rarely, or (N). Tried to, but never caught.

List all mammals, birds and reptiles:

Species name	Catch it	Species name	Catch it
_____	__O __S __R __N	_____	O __S __R __N
_____	__O __S - R - N	_____	O __S __R __N
_____	__O __S __R __N	_____	0 _ S _ R _N
_____	__O __S __R __N	_____	0 - S - R - N
_____	__O __S __R __N	_____	O __S __R __N
_____	__O __S __R __N	_____	O __S __R __N
_____	__O __S __R __N	_____	O __S __R __N
_____	__O __S __R __N	_____	O __S __R __N
_____	__O __S __R __N	_____	O __S __R __N

continued.....

Appendix 3. continued . . . . .

_____	_O_S_R_N	_____	O_S_R_N
_____	_O_S_R_N	_____	O_S_R_N
_____	_O_S_R_N	_____	O_S_R_N
_____	_O_S_R_N	_____	O_S_R_N
_____	_0_S_R_N	_____	O_S_R_N
_____	_O_S_R_N	_____	O_S_R_N

3- Are there any animals, which you don't try to hunt, because there is some kind of tradition against it? Please name the species (if any) and describe the traditions or stories about them.

.....
.....
.....

Do you still follow these traditions? __ Yes __ No

3- The meat you bring back: do you __ Keep it all for food _ _Keep some. sell some or
____ sell most or all?

4- How important is hunting for you and your family? Very ____Somewhat __ Not very. What % of your livelihood depends on hunting?

.....

5- **Do you** teach your children how to hunt? __ Yes __ No. Why or why not?

.....
.....

6- What different hunting methods do you use? Check all that you use.
____gun - d o g s ____ rope traps ____ steel traps with jaws (**Tiger Team, please list all the choices you know from your experience**) How many traps do you set out?

How **many** days do you wait in between checking them?

.....

The last time you checked them, how many animals did you catch?

.....

7- If you sell your meat or other wildlife products to a dealer from the big town, do you think that the prices he gives you are fair and reasonable? _ _Yes ____No
Please give some examples of the prices for different species.

.....
.....

continued.....

Appendix 3. continued.....

S- Do you know what is the government's current policy on hunting? __Yes ____No
Please describe what you know about it.
.....
.....
.....
Do you ____agree or -disagree with it?
Do you think the policy should be changed? ___Yes ___No. What changes would you like to see?
.....
.....
.....
9- Do you know what it means, " wildlife conservation"? ____Yes ____ No
Plea-se describe what you think it means.
.....
.....
.....
Do you __ agree or __ disagree with it?

IO- Do you think the wild animals in your area have -increased -decreased ____stayed the same over the last 5 years?

If you answer decrease, are you worried about this situation? ____Yes ____ No

STATUS OF THE TIGER AND ITS CONSERVATION IN CAMBODIA. SUN HEAN, 2000. MS THESIS, UNIVERSITY OF MINNESOTA. FIGURES 1-13

FIGURE 1. GEOGRAPHIC LOCATION OF CAMBODIA (P 4)

FIGURE 2. DIVISION OF CAMBODIA INTO GRID CELLS (2 X 2 KM2) FOR THE STUDY (P 22)

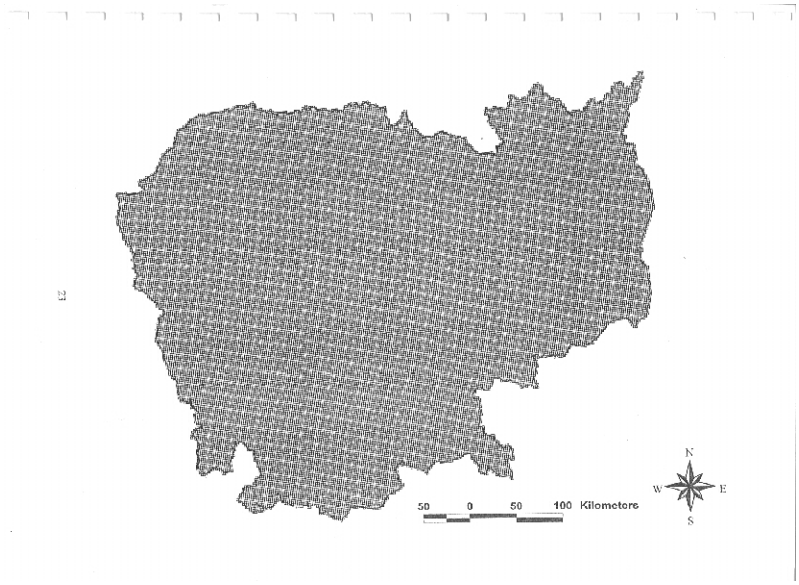

FIGURE 3. PREY DISTRIBUTION (p 26)

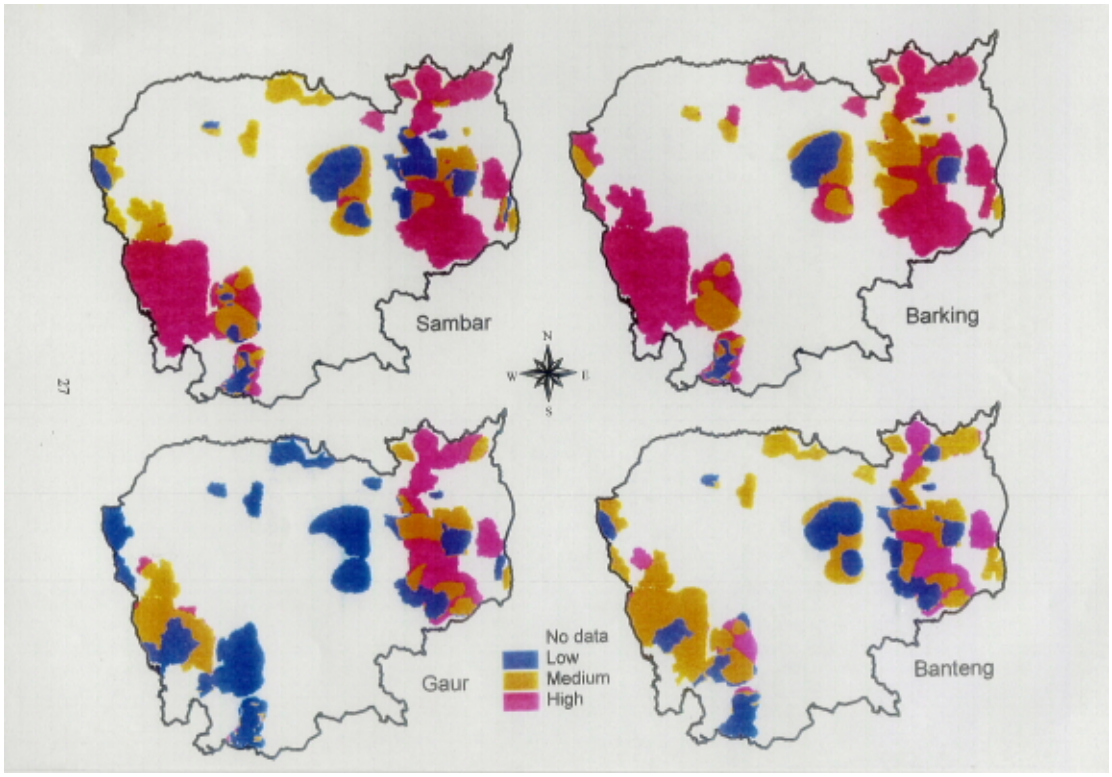

FIGURE 4. FOREST COVER TYPES (p 30)

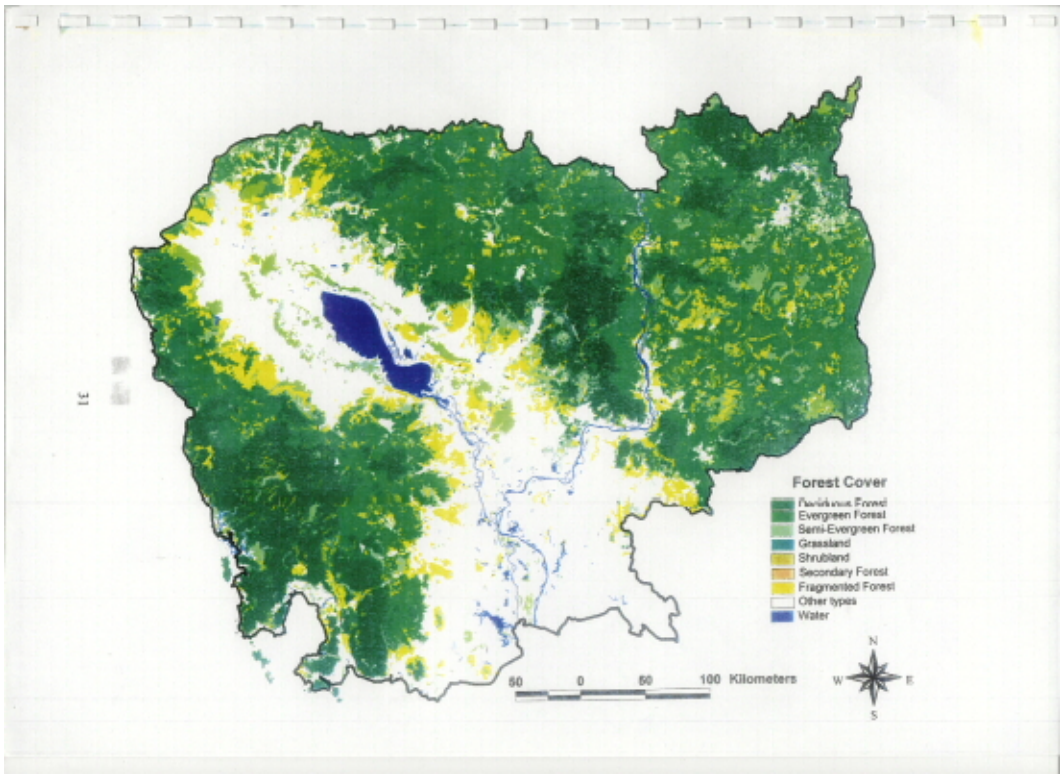

FIGURE 5. HUMAN IMPACT BUFFERING (p 32)

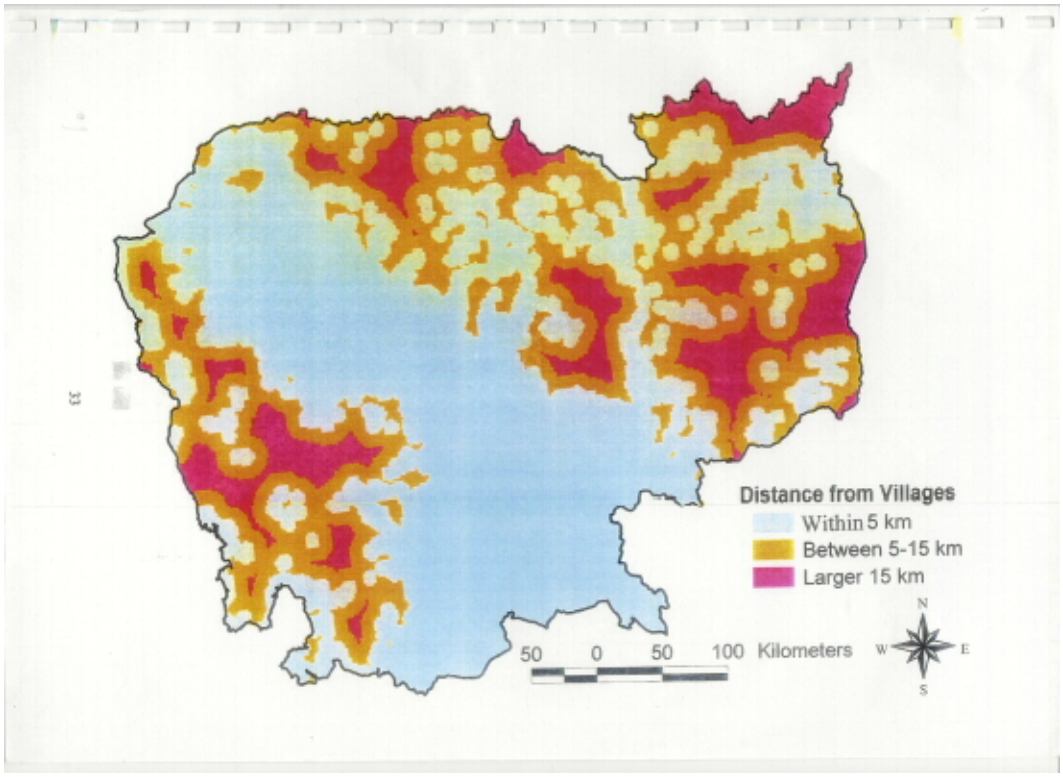

FIGURE 6. OVERALL PREY DISTRIBUTION (p 39)

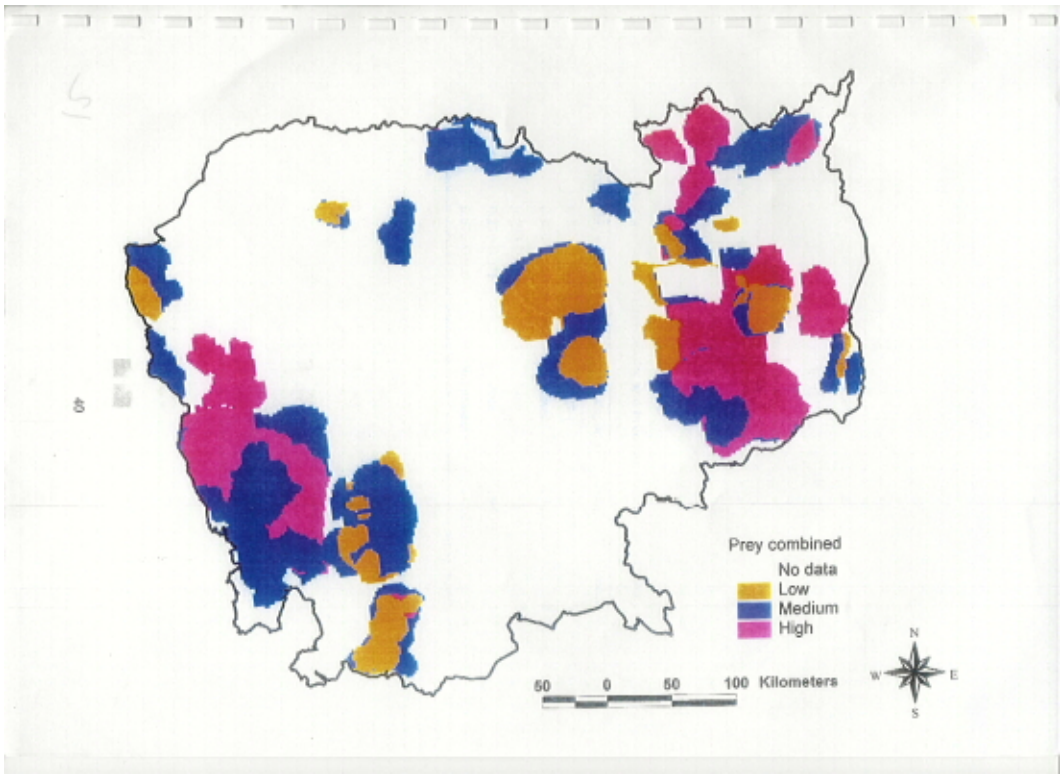

FIGURE 7. PREDICTED TIGER DISTRIBTUION INSIDE INTERVIEW AREAS (p 42)

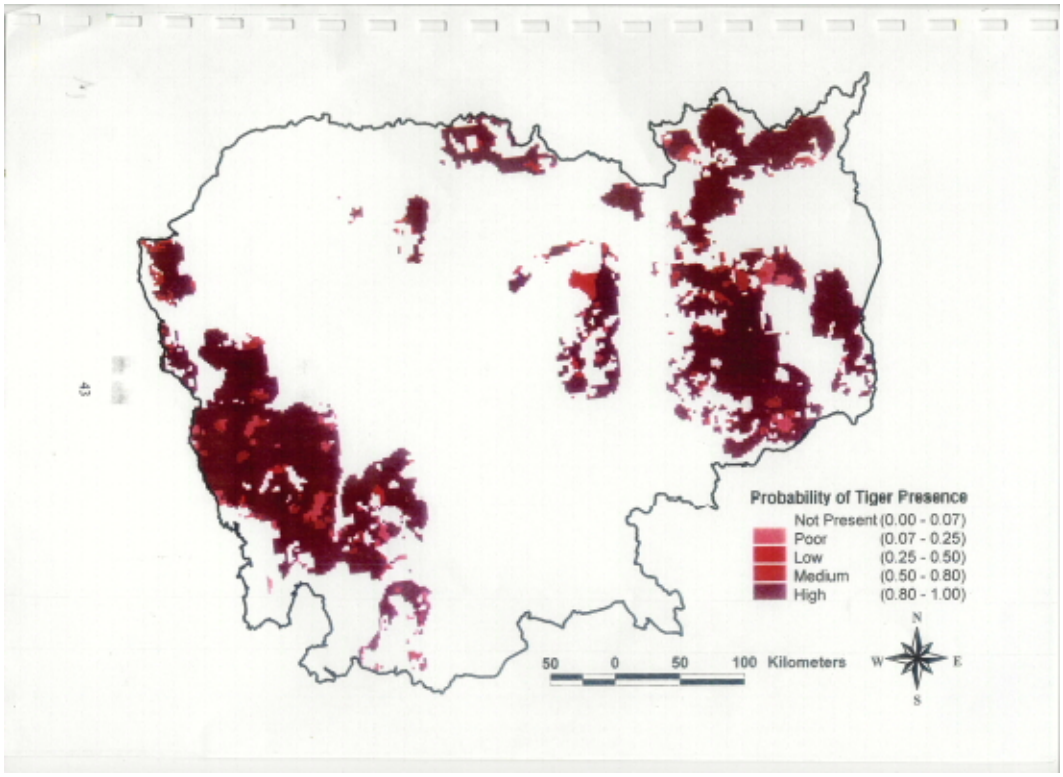

FIGURE 9. CURRENT PREDICTED TIGER DISTRIBUTION IN CAMBODIA (p 46)

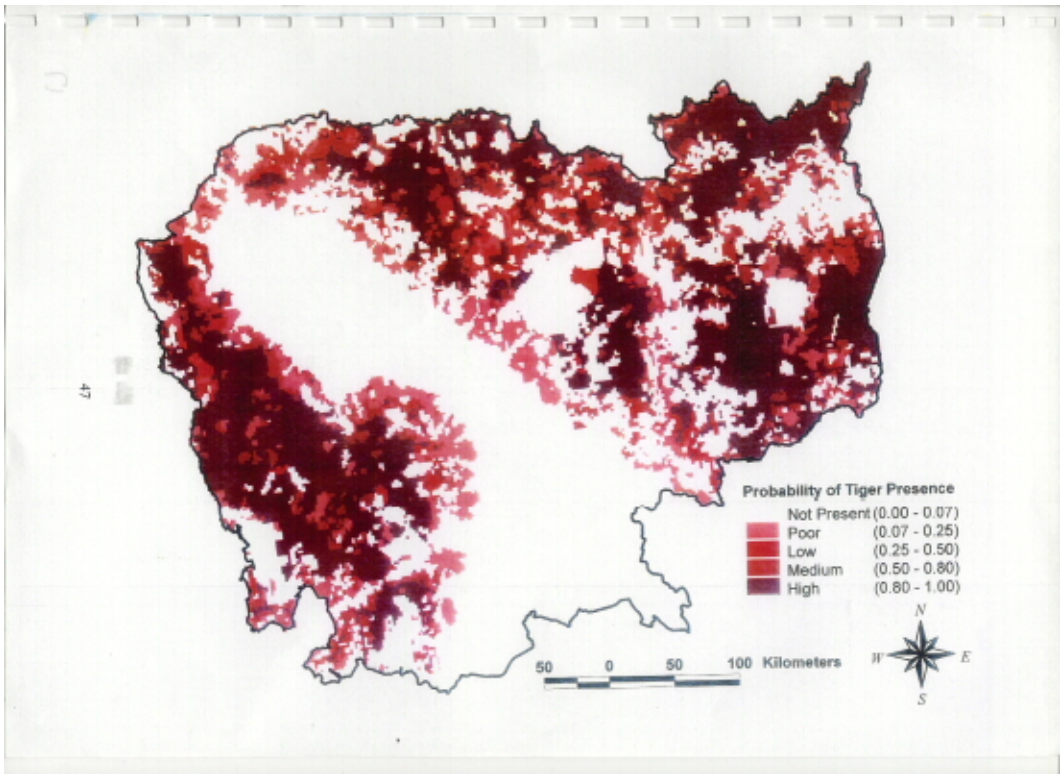

FIGURE 10. CAMBODIAN TIGER METAPOPULATION DISTRIBUTION (P 49)

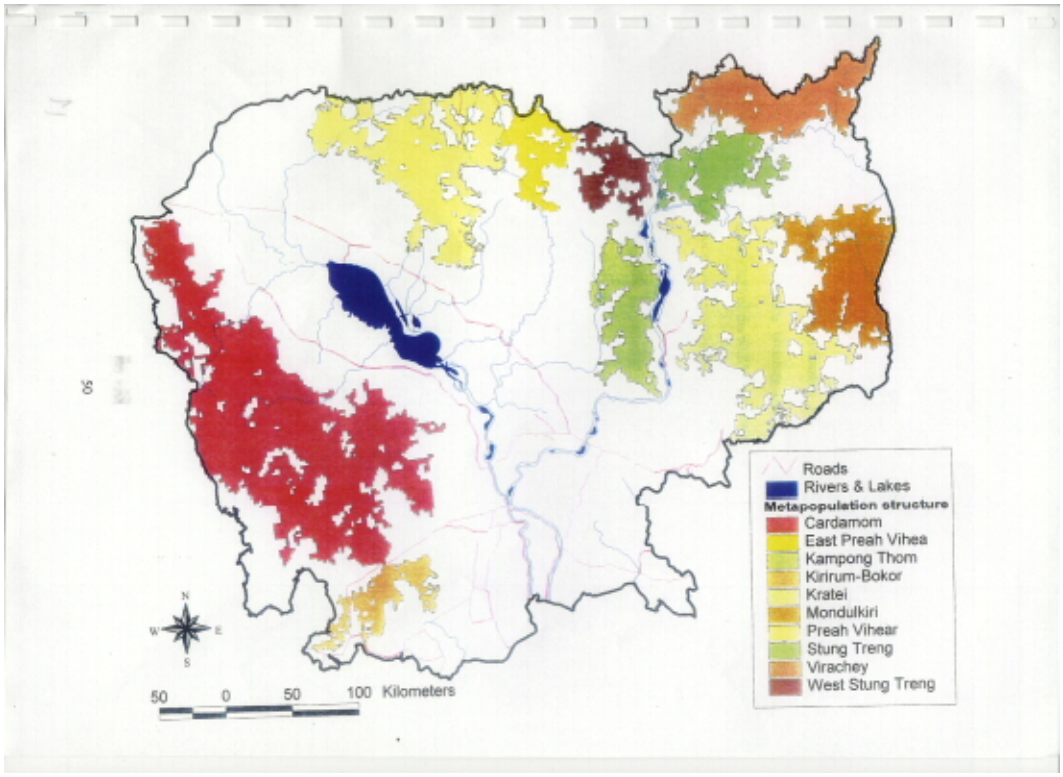

FIGURE 11. CONTRIBUTION OF PROTECTED AREAS AND FOREST CONCESSIONS TO TIGER HABITATS (P 52)

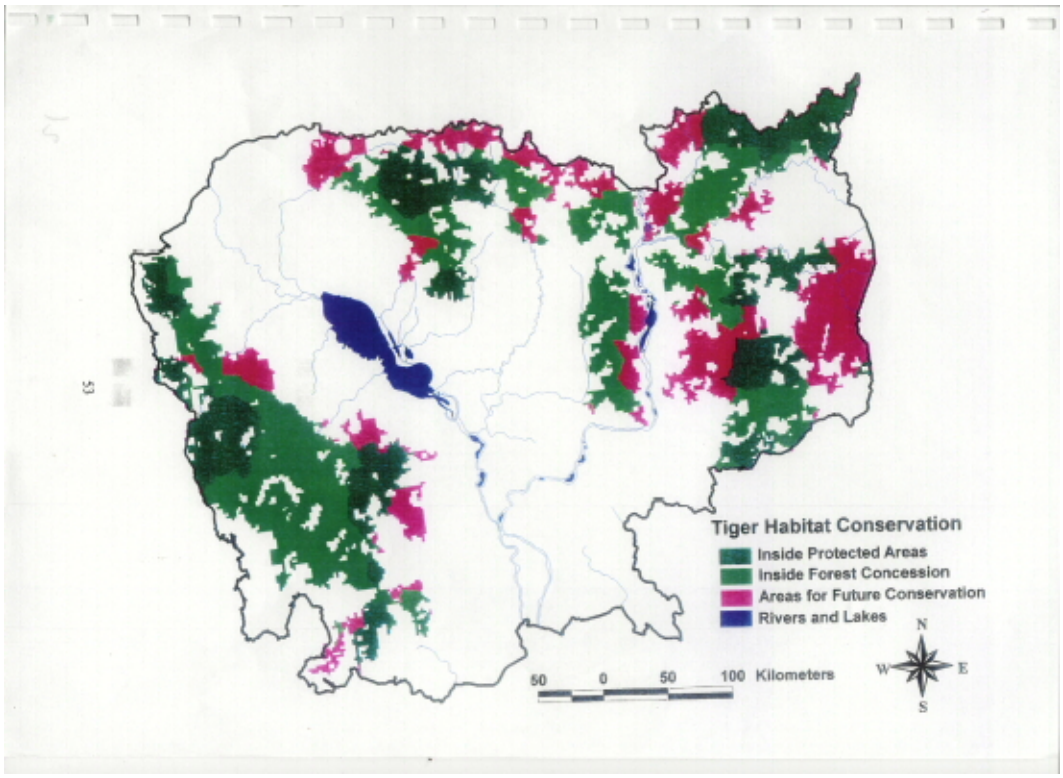

FIGURE 12. HUNTING INTERVIEW LOCATION (P 70)

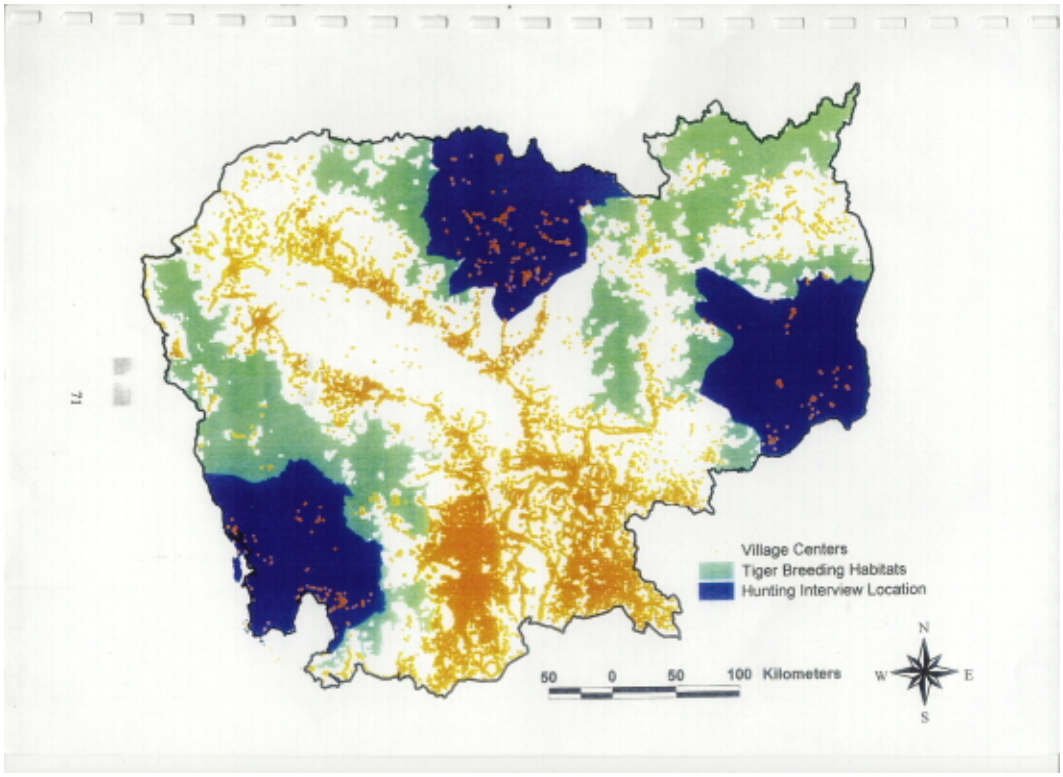

FIGURE 13. WILDLIFE TRADE MARKETS AND ROUTES IN CAMBODIA (P 75)