

Tortoise and Freshwater Turtle Conservation in the Cardamom Mountains, Cambodia

**A Conservation Project funded by the
BP Conservation Program**

and carried out by the

Cambodian Turtle Conservation Project

**Final Report
Phnom Penh, January 2005**

**Written by
Som Sitha, Chey Koulang and Sun Yoeun**



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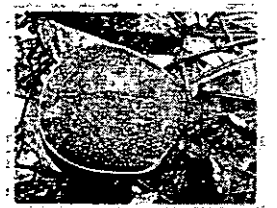
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Preface

Tortoise and Freshwater Turtle Conservation in Cardamom Mountain project, implemented by Cambodian Turtle Conservation Project (CTCP) is a first project conducting research about chelonian in Cambodia with objectives of conserving these globally threatened species through researching, education and environmental awareness about the ecological knowledge, attitudes, values, commitment for action, and ethical responsibilities for the rational use of resources and for sound and sustainable development.

The project was run by a group of students from the Department of Environmental Science of the Royal University of Phnom Penh (RUPP) and funded by British Petroleum Conservation Programme based in London and with technical support from Conservation International. The project was implemented in the Central Cardamom Protected Forest, where there are a lot of threats to turtle and tortoise species. This project was to find out the distribution, composition abundances, habitat occurrence, and threats to these species and produce publicity reports to all stakeholders.

In the past, people did not understand about the conservation and the importance of turtles and tortoises. They only think these are good for food, business, medicines, and pet. No matter what parts of these species people call waste, they take all for their needs. Chinese nation is the main market and is full of turtle markets importing and exporting to and out of these countries. According to some estimates, as many as 15 million turtles are traded annually in the region, most of these ending up in China (Asian turtle crisis).

In the last decade in Cambodia and the Central Cardamom Protected Forest (CCPF), there is no exact data about the species that are found there, just a little bit of information from local people but no scientific records. Some information came from confiscations by local authorities of turtles that were to be exported to local markets or to neighboring countries.

After this publication, we hope that the report will strongly benefit all chelonian researchers as their documentation in their next projects and join together to protect these rare species so that people will get to know about the importance of wildlife conservation as their sustainable resources for the next generations.



Executive Summary

This report focuses on the activities and results from field research on freshwater turtle and tortoise species, conducted within and around the Central Cardamom Protected Forest (CCPF), southwest Cambodia. This project was run by Sitha Som, Koulang Chey, and Yoeun Sun from March 2004 to February 2005, funded by BP Conservation Program.

This project was to study the species composition, distribution, habitat occurrence, and relative abundance of tortoises and turtles; to identify turtle and tortoise conservation priorities and raise awareness among local communities about them; assess the importance of Cardamom Mountains for turtles and tortoises conservation in Cambodia and the Indo-Burma Hotspot; to assess the level of current threats to them; to produce peer-reviewed publications from the research data; to provide recommendations for turtle and tortoise conservation, and to strengthen capacity of students from the Royal University of Phnom Penh (RUPP).

The methods used to assess species composition, species occurrence, distribution and relative abundance in this project were interviews, trapping, and timed searches. The research identified six globally threatened and one near threatened species of turtle and tortoise, some of which other scientists had never recorded in the Cardamom Mountains, and one of them never recorded alive in Cambodia before. However, according to the interviews there should be more than 9 species of turtles and tortoises in South West Cambodia, so there are more that may be found in the area.

Of these seven species we found, we captured 30 live turtles and tortoises by trapping or with timed searches, and found many more alive or as shells in local villages (see below).

Turtles and tortoises found, either alive or as shells (numbers we caught are in brackets)

English Name	Scientific Name	No of individuals	IUCN status
Asian leaf turtle	<i>Cyclemys dentata</i> complex	55 (9)	Near Threatened
Asiatic softshell turtle	<i>Amyda cartilaginea</i>	22 (7)	Vulnerable
Elongated turtle	<i>Indotestudo elongata</i>	14 (2)	Endangered
Giant Asian pond turtle	<i>Heosemys grandis</i>	10 (3)	Vulnerable
Asian box turtle	<i>Cuora amboinensis</i>	10 (6)	Vulnerable
Impressed tortoise	<i>Manouria impressa</i>	5 (1)	Vulnerable
Black marsh turtle	<i>Siebenrockiella crassicollis</i>	2 (2)	Vulnerable
Total		118 (30)	



The surveys found that there are many threats to turtles and tortoises by local communities and outside traders. Threats occurring in the area include villagers taking dogs into the forest while collecting forest products such as resin, kresna, or farming, or actively going into the forest specifically to find turtles and tortoises. To prove these we found many shells and some captive animals in villages, and rangers also seized many shells and animals from traders attempting to carry them past the ranger post.

Significantly, local people are poorly educated due to low access to schools and conflict in the previous decades, so they are not aware of conservation activities or the importance of conservation to their lives. We feel there should be activities that will give them education and training about wildlife and how to conserve it.

In conclusion, the CCPF should be considered a priority area for turtle and tortoise conservation due to the high number of species and animals that are found in the area. However, they are threatened and there should be more control to stop the collection of turtles and tortoises from the wild for food, pets, and traditional medicine. If there is no urgent action to conserve these species, they will be extinct in the wild in the near future.



Acknowledgements

We, the Cambodia Turtle Conservation Project, would like to gratefully thank **David Emmett**, CI Wildlife Biologist, as our mentor for his active support in training on research techniques, report writing, and him actively joining in our early research activities. We also would like to give many thanks to **Anthony Simms**, CI's research manager, for his great effort during our project for helping training activities such as GPS use, First Aids, Icom use. We are strongly grateful to **Annette Olsson** for her generous performance by offering help and advice on getting to start writing report, revising report and other valuable help.

None of the work would have been possible without the commitment and support of **Mr. Oum Saven**, CI Deputy Director and **Mr. Sar Rao**, Central Cardamom Protected Forest Conservation Program Manager (CCPF-CP) for his kind cooperation by assisting rangers to join with our team during the surveys. We would like to express our grateful thanks to the lecturers in Department of Environmental Science of the Royal University of Phnom Penh, that have educated us to get Bachelor degree and especially to **Mr. Seak Sophat**, Deputy Head of Department of Environmental Science, for sharing his valuable time to support and give a lot of good advice to our project.

We also give many thanks to **Douglas Hendrie** and other people working for Asian Turtle Conservation Network (ATCN), for publishing our results onto the website (www.asianturtlenetwork.org).

We would like to express our thanks to **The British Petroleum Conservation Programme** for financial support to run this project and grateful thanks to **Marianne Dunn**, **Robyn Dalzen**, and other staff who are active in providing some ideas and process of the project and publishing our results onto the website (www.conservation.bp.com). We also thank to **Idea Wild** that donated a canoe to the project to conduct field surveys.

We specially thank **David Ashwell**, CI country director-Cambodia, **Jake Brunner**, Regional director for their kindly support by providing office to us for writing report and storing our field equipment. Regardful thanks are also owed to the many people working in CI office who, despite severe hardships, were unfailingly friendly and supportive.

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Acronyms and Abbreviations

a.m.s.l	above mean sea level
ATCN	Asian Turtle Conservation Network
BP	British Petroleum
⁰ C	Degree Centigrade
CABS	Center for Applied Biodiversity Science
CCPF	Central Cardamoms Protected Forest
CCWS	Cardamom Mountain Wildlife Sanctuary
CI	Conservation International
CITES	Convention International in Endangered Species of Wild Fauna and flora
Cm	Centimeter
CTCP	Cardamoms Turtle Conservation Project
DD	Data Deficient
Ex	Extinct
EW	Extinct and the Wild
FCMR	Forestry crime monitoring and reporting
FCMUs	Parallel Forest Crime Monitoring Units
FFI	Fauna and Flora International
GCF	Global Conservation Fund
GIS	Global Information System
GPS	Global Positioning System
ha	hectare
IUCN	International Union for Conservation of nature (the world Conservation union)
Kg	Kilogram
Km ²	Square Kilometer
LC	Least Concern
MAFF	Ministry of Agriculture, Forestry and Fisheries
mm	Millimeter
MoE	Ministry of Environment
NE	Not Evaluated
NGOs	Non- Governmental Organization
NTFP	Non-timber Forest Products
RGC	Royal Government of Cambodia
RUPP	Royal University of Phnom Penh
Sq	Square
SSC	Species Survival Commission
TCF	Turtle Conservation Fund
TCM	Traditional Chinese medicine
TFTSG	Tortoise and Freshwater Turtle Specialist Group
TRAFFIC	Trades Recodes Analyses of Fauna and Flora in Commercial Trade
TSA	Turtle Survival Alliance
UN	Union nation
UNDP	United Nation Environment Program
UTM	Universal Transverse Mercator
WCS	Wildlife Conservation Society
WWF	World Wide Fund for Nature

IUCN categories of threat are abbreviation as follows:

CR	Critically Endangered	VU	Vulnerable
EN	Endangered	NT	Near Threatened



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INTRODUCTION

1. Cambodia

1.1 General Information:

Cambodia, Kingdom of Cambodia is bordered on the west by Thailand, on the north by Laos, on the east by Vietnam and to the south by the Gulf of Thailand. Its size is 181,035km² with 13.12 million people. 94% of the population are ethnic Khmer, 4% are Chinese, 1% Vietnamese, 1% other nationalities. Most of the people speak Khmer, other languages spoken are English and French. Religion is 95% Buddhist and others are Muslim and Roman Catholic (Ray, 2003). Topographically, the country is dominated by the Mekong River, which cuts a swathe through the country from north to south; the large fish-filled Tonlé Sap (Great Lake); the Elephant and Cardamom Mountains in the southwest, the Dangrek Mountains along the Thai border; and the Eastern Highlands in the northeast. Most Cambodians live on the fertile central plains of the Mekong-Tonlé basin.

1.2 History

Very little is known about prehistoric Cambodia, although archeological evidence has established that prior to 1000 BC, Cambodians subsisted on a diet of fish and rice and lived in houses on stilts, as they still do in some places today. From the 1st to the 6th centuries, much of Cambodia belonged to the Southeast Asian kingdom of Funan, which played a vital role in developing the political institutions, culture and art of later Khmer states. However, it was the Angkorian era, beginning in the 8th century, which really transformed the kingdom into an artistic and religious power.

Forces of the Thai kingdom of Ayudhya discharged Angkor in 1431, leaving the Khmers plagued by dynastic rivalries and continual warfare with the Thais for a century and a half. The Spanish and Portuguese, who had recently become active in the region, also played a part in these wars until resentment of their power led to the massacre of the Spanish garrison at Phnom Penh in 1599. A series of weak kings ruled from 1600 until the French arrived in 1863. After some gunboat diplomacy and the signing of a treaty of protectorate in 1863, the French went on to force King Norodom to sign another treaty, this time turning his country into a virtual colony in 1884.



Following the arrival of the French, a relatively peaceful period followed (even the peasant uprising of 1916 was considered peaceful). In 1941 the French installed 19-year-old Prince Sihanouk on the Cambodian throne, on the assumption that he would prove suitably pliable. This turned out to be a major miscalculation as the years after 1945 were strife-torn, with the waning of French colonial power aided by the proximity of the Franco-Viet Minh War that raged in Vietnam and Laos. Cambodian independence was eventually proclaimed in 1953, the enigmatic King Norodom Sihanouk going on to dominate national politics for the next 15 years before being overthrown by the army.

In 1969 the United States carpet-bombed suspected communist base camps in Cambodia, killing thousands of civilians and dragging the country unwillingly into the US-Vietnam conflict. American and South Vietnamese troops invaded the country in 1970 to eradicate Vietnamese communist forces but were unsuccessful; they did manage, however, to push Cambodia's leftist guerillas (the Khmer Rouge) further into the country's interior. Savage fighting soon engulfed the entire country, with Phnom Penh falling to the Khmer Rouge in April 1975.

The Khmer Rouge was the French name for the communist organization which ruled Cambodia from 1975 to 1979. The organization's official names were Communist Party of Cambodia and later the Party of Democratic Kampuchea. The Khmer Rouge is generally remembered for its violent rule in which many people died.

Over the next four years the Khmer Rouge, under Pol Pot's leadership, systematically killed an estimated two million Cambodians (targeting the educated in particular) in a brutal bid to turn Cambodia into a Maoist, peasant-dominated agrarian cooperative. Currency was abolished, postal services were halted, the population became a work force of slave labourers and the country was almost entirely cut off from the outside world. Responding to recurring armed incursions into their border provinces, Vietnam invaded Cambodia in 1978, forcing the Khmer Rouge to flee to the relative sanctuary of the jungles along the Thai border. From there, they conducted a guerilla war against the Vietnamese-backed government throughout the late 1970s and 80s.

A 1978 invasion by Vietnamese armies drove the Khmer Rouge into the countryside and touched off almost 13 years of civil war. This regime led to exploitation of Cambodian resources such as damaging illegal logging activities throughout the country and strip mining for gems in the western region along the border with Thailand. These activities resulted in habitat loss and declining biodiversity (e.g. destruction of mangrove swamps which threatens natural fisheries), soil erosion, water pollution (in rural areas, most of the population does not have access to potable water), and declining fish stocks because of illegal fishing and overfishing (Cambodia, 2004).

The 1991 Paris Peace Accords mandated democratic elections and a ceasefire, which was not fully respected by the Khmer Rouge. In mid-1993, UN-administered elections led to a new constitution and the reinstatement of Norodom Sihanouk as king. The Khmer Rouge boycotted the elections, rejected peace talks and continued to buy large quantities of arms from the Cambodian military leadership. In the months following the election, a government-sponsored amnesty secured the first defections from Khmer ranks, with more defections occurring from 1994 when the Khmer Rouge was finally outlawed by the Cambodian government. UN-sponsored elections in 1993 helped restore some semblance of normality and the final elements of the Khmer Rouge surrendered in early 1999 (Cambodia, 2004).

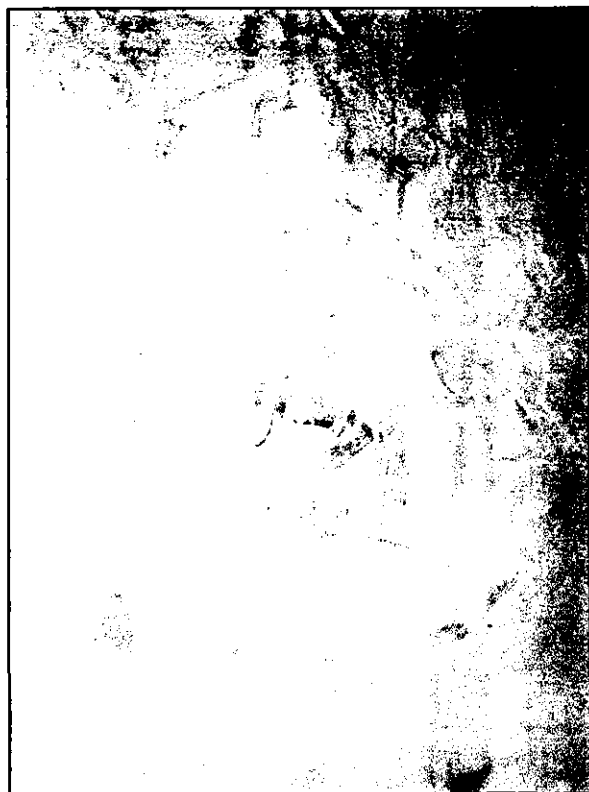


Future stability is tied to improving the country's long-suffering economy, eradicating the entrenched culture of corruption, reducing the size of the military and answering the troubled question of royal succession (Cambodia Lonely Planet, 2000).

1.3 The History of Conservation in Cambodia

"Cambodia is one of the great game lands of the world. Considering the number and distribution of big-game animals, one is led to believe that parts of northern, eastern, Southwestern Cambodia are second only to the African game lands in game abundance. As expedition members stumbled through acres of elephant tracks and watched herds of banteng, water buffalo or Eld's deer sweeping across parkland in billowing clouds of dust, it was not only evident that an effort should be made to preserve this phenomenal paradise of hoofed mammals, but that factors responsible for this distribution and concentration should be encouraged." Biologist Charles H. Wharton wrote these words in 1957. Around that time, most of Cambodia and surrounding areas of Southeast Asia were "filled with abundant wildlife." This was the land of the legendary kouprey (*Bos sauveli*), only discovered by western scientists in 1937, as well as many other of the planet's most charismatic species of animals - including elephants, tigers and rhinos (WWF-Cambodia, 2004). As recently as 50 years ago, large numbers of some of the world's most magnificent wildlife species lived in Cambodia. There were Asian elephant, tigers and rhinoceros. Kouprey, gaur, banteng, and wild water buffalo made Cambodia one of the richest places in the world for wild cattle species (WWF-Cambodia). There were many deer species, including the now endangered Eld's deer, hog deer, sambar and several species of muntjac. Some visitors to Cambodia at that time said that only Africa had a greater variety, and larger numbers, of large mammals than Cambodia.

Figure 1: Photograph of large turtle carved at Angkor Wat about 1,000 years ago



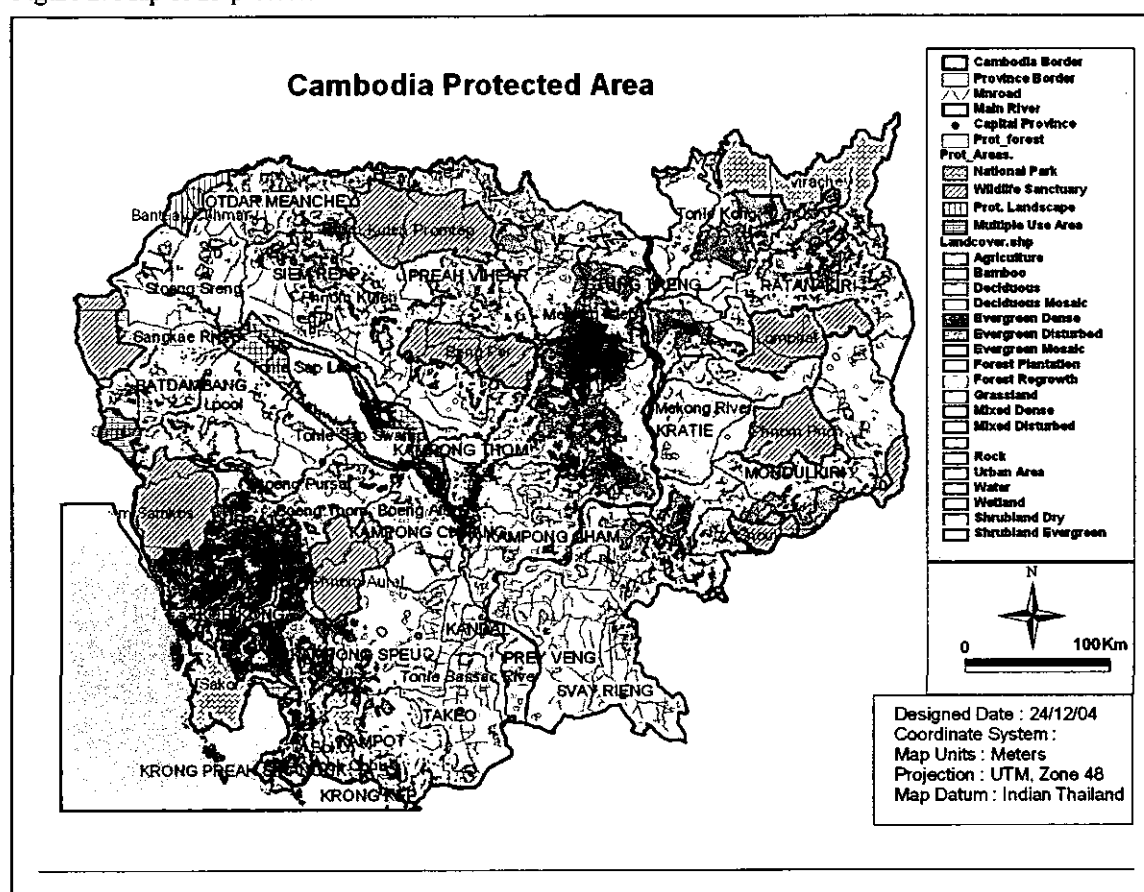
Long ago, Cambodia was known as a large empire country within the world. Looking to the Angkor Wat period we can see that there were conservation activities in Cambodia even then. During that time the empire of Cambodia was full of Asian elephants. This important animal was used by people for building temples, in all wars, in transportation, and in agriculture. A lot of other animals were also kept or protected by people at that time. To confirm this we can see the statues of elephants in the walls of many temples around Angkor Wat and the other 108 temples across the whole country (Hean Chheang, 1987). Also today we can still see carvings of turtles at Angkor Wat, and people respected and protected them because of their religious importance, see figure 1. The carvings on temples show us that wildlife conservation and use came to Cambodia long ago.



From 1963-1964 the creation of protected areas as national parks became popular after seeing that the condition of natural resources in Cambodia was becoming a problem. Unfortunately, this effort was stopped during Khmer Rouge 1970s. Cambodia gradually became poorer in conservation. Cambodia had once been known as rich in wildlife, forest, and other natural resources but now had become a country with serious biodiversity loss. It changed the ecology of wildlife and some species are now possibly completely extinct like the kouprey, and extinct in Cambodia like the rhino (Hean Chheang, 1987).

In 1993, twenty-three protected areas were designated in categories under Royal Decree (in Khmer Reach Kreth) by the King Norodom Sihanouk, covering 3,273,200 ha, over 18% of the country's total area, see figure 2. They comprised seven national parks, 10 wildlife sanctuaries, three protected landscapes, and three multiple-use areas (Daltry, 2002).

Figure 2. Map of 23 protected areas in Cambodia



In 2002, three additional conservation areas were designated for biodiversity conservation purposes. His Majesty King Norodom Sihanouk's Royal decree declared these national protected forests to be: 1) the Central Cardamoms Protected Forest in Koh Kong and Pursat, 2) Chheb in Preah Vihea in northern Cambodia, and 3) Koh Nhek to the west of Monduliri (Daltry, 2002).

Also, three important wetland areas that have value in conserving natural ecosystem for wildlife habitats of birds, reptiles, and mammals have been designated as RAMSAR sites. These are Boeng Chhmar, Koh Kapei and surrounding areas, and the Mekong close to the Lao border.



Besides these protected areas, to help preserve natural resources, the Royal Government of Cambodia established wildlife regulations such as:

- Forest law
- Kret No. 33, March 1987 on fishery management
- Regulation on supreme system and Cambodian legal code, September 1992
- Preah Reach Kret No. 1296-36, issued in December 24 1996, which declared law focusing on environmental protection and natural resource management
- Article 5 & 6 of Bra Kas No. 1563, 1996, on prohibition of wildlife hunting and trading in all aspects
- Bra Kas No. 1563 on wildlife trade banning for all species in the country
- Declaration No. 3837 on stopping wildlife trade
- Forestry concession management decree, February 2000Forestry community decree, December 2003
- Decision on preparation and implementation of forestry administration, November 2003

Cambodia also signed an agreement with the international convention on biodiversity in June 1992 at the international earth conference talking about Environmental Problem in Rio de Janeiro. Cambodia have signed CITES (Convention on International Trade in Endangered Species of Wild Fauna and Flora). Also, Cambodia has joined the RAMSAR Convention.

1.4 Threats to Conservation

The biggest threat to Cambodia's natural environment is the logging frenzy which reduced the country's forest coverage from 75% in the mid-1960s to just 49% in mid-1993 - and with the government constantly strapped-for-cash, there's little reason to believe that the stripping of such assets will come to a halt soon. The number of national parks is slowly growing, but with illegal logging as rife as legal concessions, no tree in Cambodia is safe. The parks under severe threat include Bokor, on the south coast; Ream, near Sihanoukville; Kirirom, outside Phnom Penh; and Virachay, bordering Laos and Vietnam. A number of endangered species which are elsewhere extinct are thought to be hidden in the more remote habitats, including elephants, tigers, leopards, rhinos, gibbons, bats, turtles, tortoises, and crocodiles. (Cambodia, 2004. lonely planet).

Over the past centuries and decades, until the 1920s, Cambodia has faced a lot of civil war and wars with border countries. Cambodia has had serious problems due to the destruction of natural resources through illegal deforestation, fragmentation, and hunting by Cambodians and people from neighboring countries for the national and international wildlife trade.

Unfortunately, much of Cambodia's wildlife has been destroyed in the last 40 years, mostly because of too much illegal hunting for trading of animals and their parts for Chinese traditional medicine, decoration, food and other purposes. The kouprey, Cambodia's national animal, the rhinoceros and the hog deer may have already become extinct in the country. Tigers, elephants, wild water buffalo, Eld's deer, and many tortoise and turtle species are also extremely highly threatened with extinction in Cambodia in the next few years, and populations of many other species are now very small and might also disappear in the future unless immediate action is taken (WWF-Cambodia 2004).

Wildlife trade is now becoming an extremely serious threat to all animals in the wild in Cambodia. The main worry of conservationists is increasing levels of illegal wildlife trade



activity, even though Cambodia has the wildlife regulations to punish people who commit wildlife crimes in order to do business. Most of the rare and globally threatened animals such as elephants, tigers, bears, pangolins, lorises, gibbons, tortoises and turtles are valuable in trade for hunters, poachers, and middle-men. For example, one turtle in the region, the box turtle *Cuora trifasciata* is worth more than \$1,000 and up to \$3,000 per kg because it is believed in China that they have medicinal cancer-curing properties. Many animal species are exported by traders from Cambodia to international markets such as China and Taiwan through Lao and Thailand and large amounts end up in Chinese markets through Vietnam (MoE, 1998-2002).

Wildlife trading of animals of mammals, birds and reptiles is not only for food but is also for decoration, traditional medicine, and the pet trade. This also uses local and international trade. The main problems are that all traders put high prices on the rare and threatened wildlife that has the most international demand. Add to this poor law enforcement and the fact that there are many poor people and poorly educated people in the country, especially the indigenous people who are living in the rural areas that are rich in biodiversity. This all means that many people are interested in wildlife hunting and sell wildlife to middle men who bring them to market (MoE, 1998-2002).

2. Rationale

The distributions of many species are uncertain owing to a lack of records and because almost no records exist for wild tortoises or turtles. Almost all information is from traded confiscated animals. Because turtles are so extensively traded in the region, most records now come from the animals in trade. Although mainland Southeast Asia has long been regarded as a hotspot of chelonian diversity (van Kijk *et al.*, 2000), the turtle and tortoise fauna of Laos, Cambodia, and Vietnam (formerly known as French Indochina) remains poorly known. Decades of civil unrest, political instability, and military conflict have largely prevented fieldwork, and Cambodia become a source for animals rather than a destination or transfer country for trade. Specimens obtained from markets and workers in Cambodia usually originated from that country which has led to confusion on species distributions within the country, with serious biological, conservation, legal, and regulatory implications. Little information is available on the occurrence and distribution of chelonians. The reason is little scientific research and an unstable country (Stuart *et al.*, 2001, Stuart and Timmins, 2000, Touch *et al.*, 2000, Hendrie, 2000).

The Asian turtle crisis

Research throughout the region has shown that Asia's turtles are being systematically extirpated from nature to feed the insatiable demand from export markets. According to some estimates, as many as 15 million turtles are traded annually in the region, most of these ending up in China. In the last decade, industrialization in China has provided new-found wealth which has generated increased demand for expensive foods and traditional medicines made from turtles. This has caused a dramatic increase in the organized and opportunistic collection of turtles from the wild, greatly depleting the numbers of many species and creating the so-called "Asian turtle crisis." Of the estimated 90 species which are native to the region, sixty-seven are classified as threatened through habitat loss and collection for trade (IUCN, 2004), up from 33 in 1996.

The Central Cardamoms Protected Forest was created in 2002 to join Samkos and Aural Wildlife Sanctuaries, after cancellation of concession logging signed by Prime Minister Hun



Sen. Since that time conservation activities have started to provide evidence to national and international partners to get involved in the area. Even with the involvement of many organizations there are some problems still present in those areas such as illegal logging and hunting, wildlife trading, and other activities caused by local people and outsiders. Also there is still a lack of research in that area in different habitats and only few groups of animals and species were surveyed and identified. Significantly, turtles and tortoises are under studied with just very few information of these species available. Reports from local people and CI rangers show turtles and tortoises are under illegal trading and hunting in the Central Cardamom Mountains and some of them are brought to markets around the areas such as Koh Kong market close to the Thai border.

3. Aims and Objectives

The overall aim of the project was to develop and implement long-term tortoise and freshwater turtle research and conservation within and around the Central Cardamoms Protected Forest (CCPF). The objectives were to assess the status of tortoise and freshwater turtle species, identify critical habitats, and identify conservation threats and priorities.

Specifically, the objectives were as follows:

- To increase research capacity of the Royal University of Phnom Penh (RUPP). In particular, to draw on experience of science research techniques from regional experts.
- To survey the species composition, distribution, habitat preference, and relative abundance of tortoises and turtles within and around the CCPF.
- To assess the level of current threats to tortoises and turtles in and around the CCPF.
- To identify turtle and tortoise conservation priorities in and around the CCPF, and to raise awareness among local communities about them.
- To assess the importance of the Cardamom Mountains for tortoise and turtle conservation in Cambodia and the Indo-Burma Hotspot.
- To produce peer-reviewed publications from the research data.
- To provide recommendations for turtle and tortoise conservation.

4. Project Description

The project started in March 2004 with financial support from the BP Conservation Programme, London, England and technical support from Conservation International (CI) - Cambodia. We were also helped with equipment, for example we received a canoe from Idea Wild who is an organization that helps support equipments to research projects around the world. More significantly, the project had strong technical support and implementation from the Royal University of Phnom Penh.

The project was conducted in and around Central Cardamom Protected Forest (CCPF) in southwest Cambodia. The project focused on community surveys- both formal and informal interviews, and on field surveys-both wet and dry seasons.

The team: Previously there were six students who were studying in Environmental Science from the Royal University of Phnom Penh (RUPP). They had helped in community surveys in some villages in Tmar Bang district. The surveys aimed to find out the present, threats, get



a rough idea of species composition, and find out rough distribution of the species in the Central Cardamom Protected Forest before going into the preliminary research in the areas.

Now there are three people conducting BP survey, the others went to work for other NGOs in the same environmental field. So the Team Leader is Sitha Som, and the other team members are Koulang Chey and Yoeun Sun.



Chapter II

BACKGROUND**1. The Cardamom Mountains**

The Cardamom Mountains are located in Southwest Cambodia, largely in the two provinces of Koh Kong and Pursat but with a small area in Kampong Speu province. The Cardamom Mountains are divided into three protected areas. The Central Cardamom Protected Forest – CCPF (402,000 ha) lies between the two wildlife sanctuaries: Phnom Samkos to the west (339,000 ha), and Phnom Aural to the east (245,000 ha). The entire Cardamom Mountains represents one of Mainland Asia's last remaining great wildernesses. This area holds immense national and global biodiversity value, provides critical watershed functions for the country, and has potentially important cultural significance. A new study also demonstrates that the majority of the area is unsuitable for legal logging under Cambodia's Forest Harvest Code of Practice. Since 2000, Flora and Fauna International (FFI) and Conservation International (CI) have been working to preserve the Cardamom Mountains.

On 1st November 1993, Phnom Aural and Phnom Samkos were officially established as Wildlife Sanctuaries by His Majesty King Norodom Sihanouk as part of a royal decree to create a system of twenty-three protected areas in Cambodia. In 2002, the Royal Government of Cambodia (RGC) placed the Central Cardamom Mountains under legal protection as a Protected Forest and cancelled the timber concessions covering the area.

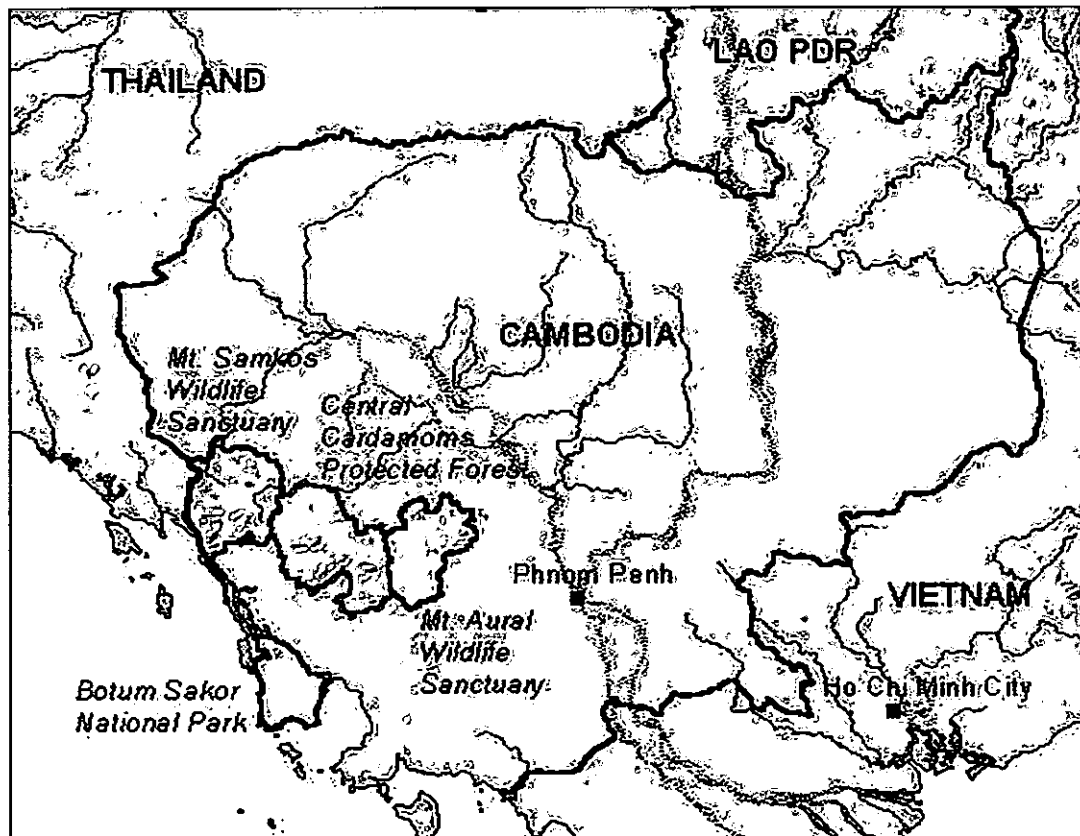
In 2000, with support from the Global Conservation Fund (GCF), a team of international and Cambodian scientists led by FFI carried out the first-ever biological survey of the Central Cardamoms. The survey identified species not previously recorded in Cambodia or Indochina. Of particular significance was the discovery of a large population of Siamese crocodiles, previously thought to be extinct in the wild. News of this discovery was reported in the New York Times, London Daily Telegraph, Time Magazine and Far Eastern Economic Review (Conservation International, 2004).

In addition to encouraging the legal protection of the Central Cardamoms, CI has been working with the Royal Government of Cambodia (RGC) since 2001 to protect the area's biological resources from the ground up. CI Cambodia staff helped the government to design and implement a protection system for the park. Ranger teams now regularly patrol the Central Cardamoms forest to safeguard it from illegal hunting, logging, and land clearing. CI Cambodia is collaborating with WildAid to extend protection across former logging concessions that link the Central Cardamoms to the coast."



The geography of south-west Cambodia is dominated by the Cardamom Mountains which stretch across a distance of 200 kilometres eastwards from the Thai border, and northwards toward the Tonle Sap Lake from the Gulf of Thailand. An extensive coastal hinterland lies to the south of the ranges and the Elephant Mountain Range lies along the coastline to the southeast of the Cardamom Mountains. The valley of the Sre Ambel / Prek Kampong Som River separates these two mountain ranges. See figure 3 for map.

Figure 3. Map of Protected Areas associated with the Cardamom Mountains in South-west Cambodia



1.1 Biological Value

The Cardamom Mountains are cloaked in a variety of natural habitats depending on variation in altitude, aspect, history, geology, and hydrology. The most abundant formation is tropical lowland evergreen forest, much of which appears to be in primary condition

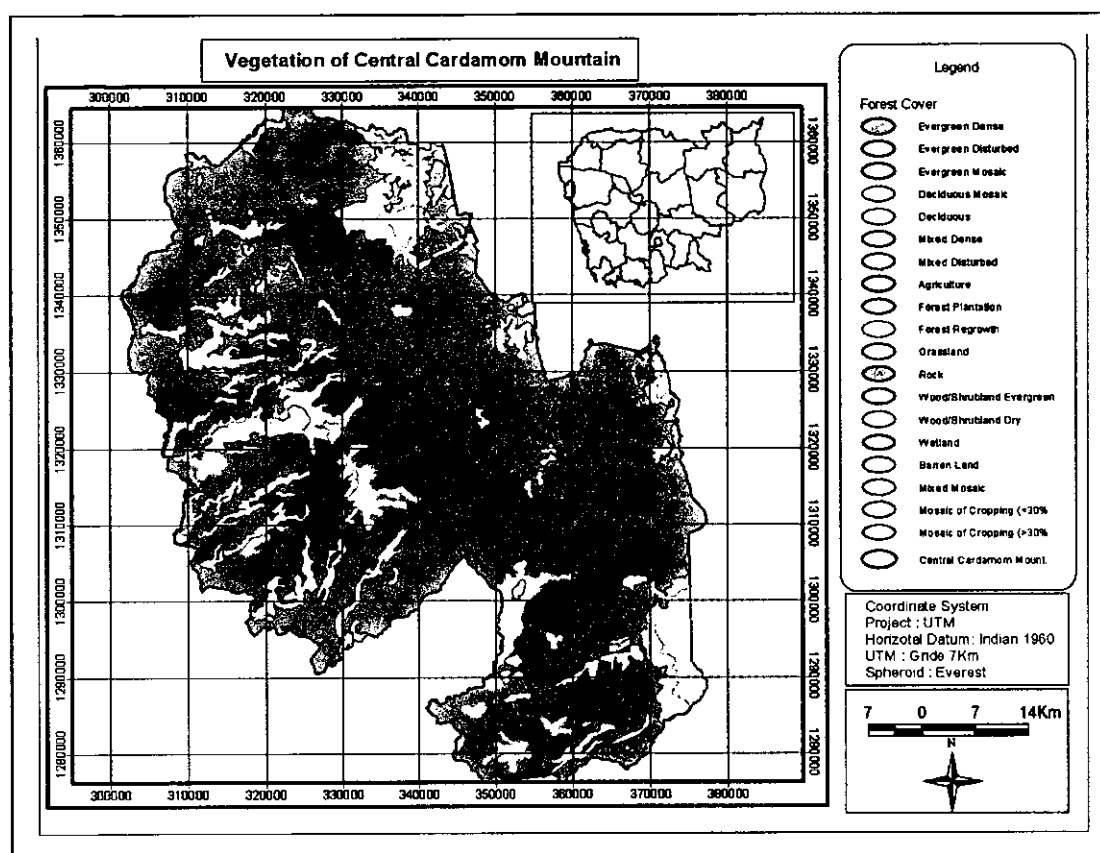
The basis for biological justification for the creation of the Cardamom Mountains Wildlife Sanctuaries and the Central Cardamoms Protected Forest lies in the character of its major forest formation, the diversity of their flora, and the role these habitats play in hosting a wide array of fauna including a number of species of international conservation significance. Previous survey have confirmed that some species were found in the Cardamom Mountains such as the Indochinese tiger, Asian elephant, Asiatic wild dog, Gaur, Southern serow, Pileated gibbon, Siamese crocodile, elongated tortoise, spiny-breasted frog, chestnut-headed partridge, Great hornbill, and Green peafowl.



1.2 Vegetation

The Central Cardamom Protected Forest is composed of hill evergreen forest, lowland evergreen forest, open deciduous forest, pine forest, grassland and wetlands, see figure 4. Outside of the mountains, a complicated network of rivers flows through the Southern Cardamoms with many large estuaries where fresh water mixes with salt water. Water is present everywhere in this area, thus fostering lush vegetation and a multitude of forms of life. Because of its diversity of vegetation environments, caused this region become a home to a mosaic of ecosystems and supports a great number of important wildlife species (Chheng Dany, *et al*, 2002).

Figure 4. Showing the distribution vegetation of Central Cardamom Protected Forest



1.3 Geography and geology

The Cardamom Mountains of Southeast Cambodia span more than one million hectares (over 10,000 km²) and comprise chiefly of the Mount Samkos massif, the Central Cardamom Mountains, and the Mount Aural massif. This region extends northwards to the Veal Veng and Kravanh districts in Pursat province, with the Northern slopes of Mount Tumpor extending into Battambang province. To the south it extends towards the gulf of Thailand. To the east it encompasses Mount Sokor and Sre Ambel districts. The western boundary is around the Thai-Cambodian border.



The highest points in this range are Mount Samkos at 1717 m above sea level (a.s.l), and Mount Aural, Cambodia's highest mountain at 1771 m a.s.l. This ancient range comprises largely uplifted grey, yellow or pink Mesozoic sandstone, but some of the highest peaks are formed from plutonic igneous rocks such as granite and rhyolitic basalt. The granite rocks of Mount Aural cover some 1500 km² (Ashwell, 1997; Daltry & Momberg, 2000).

1.4 Climate

Cambodia has three seasons during the year. The rainy, monsoon season lasts from May to October. From November to January is cold and dry, and February to April is the dry and hot season. The seasonal variations in temperature are small, ranging between 21 to 35 degrees Celsius during the day. The coastal and mountain areas of south-western Cambodia constitute one of Cambodia's three major bioclimatic regions (Fontanel, 1972). The climate is generally monsoonal, with rainfall being largely derived from the south-west monsoon between May and early October. The average temperature per year is 27.5°C, maximum average temperature per year is 30.9°C and minimum average temperature per year is 24.1°C with the hottest month in April is 29.4°C and coldest month in October is 26.6°C. The average temperature of the coldest month of areas above 700-800 metres in elevation is less than 20°C, while those in lower elevations are typically greater than 20°C. During the colder months (January and February) the temperatures, particularly at higher elevations can drop below 12°C during the night (Chheang Dany *et al*, 2002).

The Cardamoms are likely to be the wettest areas within Cambodia as they extract moisture from the monsoon winds. It appears likely that the CCPF receives up to or more than 4,000 mm rainfall annually as the southern slopes of the range induce orographic rainfall from the monsoon winds after they pass over the Gulf of Thailand. The Val d'Emeraude (Emerald Valley) in Phnom Bokor has the highest recorded annual average rainfall of 5,384 mm. and 223 raindays per year (Dy Phon, 1981).

1.5 People's Livelihood

The interview in March 2004 by BP team showed that most of the people are dependently living on natural resources in the forest. This region is an area where people meet some serious problems such as malaria, lack of daily food, low access of national education, and lack of health service. These problems always bring people into poverty and the death rate is higher and the average life expectancy is lower than the urban areas. The main occupations of local people in Cardamom Mountains are non-intensive farming through clearing forest land, and another job is fishing and hunting for selling and daily food. Some people go to forest to collect resin to support their livelihood through selling.

1.6 Threats

New roads have been constructed, are under construction, or are planned in Cardamom Mountains. In 2002, a new road - Route 48 - was completed, which bisects the southern part of the mountains linking Thailand to Phnom Penh. This road has opened up the area for the first time - prior to this Koh Kong was only accessible from Phnom Penh by boat and twice-weekly by light plane. This is causing an influx of settlement and industry in the area, which threatens ecology and biodiversity.



Further infrastructural developments will provide illegal loggers, poachers, and migrants with increased access to Cardamom Mountains, thereby facilitating the extraction and exploitation of natural resources, and further fragmentation of the forest. In addition, road construction and upgrade also increases the incidence of land clearance and encroachment along either side of the road for settlement by local communities and migrants.

Also, there are future plans to construct other roads in and around the CCPF both in Koh Kong and Pursat provinces such as a road from Promoy to O'som planned by a Chinese company which wants to build a hydroelectricity dam South of O'som.

Also, there is little access to education for local people and most of them have low knowledge and awareness of conservation of natural resources. This can lead to difficulties for conservation activities as people always go hunting, poaching, and logging.

1.7 Timber extraction

Legal logging in the CCPF ceased in 2001 and since that time there have been relatively few problems with illegal cutting. Across the Cardamom Mountains this situation is quite different: in many areas, including parts of Phnom Aural and Phnom Samkos Wildlife Sanctuaries, illegal logging is quickly fragmenting and degrading habitats.

In 1999, in response to the alarming rate of illegal logging and wildlife exploitation in Cambodia's forests and protected areas, a Forestry Crime Monitoring and Reporting (FCMR) programme was established to monitor and track forest crimes from initial detection to final resolution. Parallel Forest Crime Monitoring Units (FCMUs) were established within both MoE and MAFF to build the capacity and infrastructure for proper monitoring and reporting of violation.

Given that a moratorium on logging concessions remains in place, the timber markets are fed by many small illegal mills operating around the country. Much of the logging in the Cardamom Mountains is small-scale, using portable sawmills and oxcarts, although larger sawmills also exist. There is a real danger that continued illegal timber extraction will cause the Cardamom Mountains to be fragmented into "islands", separated by logged areas, agricultural land and settlements.

In terms of biodiversity and ecological integrity, this has severe negative implications because the varieties of distinct habitats within the Cardamom Mountains have close ecological associations, so the loss or damage of one is likely to have deleterious effects on others.

1.8 Previous Surveys

To be clearer about the Cardamom Mountains, there were some surveys in and around CCPF to be identified the status of the areas in monitoring planning and conservation activities. Since before the area was put into protected forest till now there were several surveys occurring the Cardamom Mountains.

Relatively little on-the-ground biological work has occurred in South West Cambodia to date, largely owing to the lack of roads, and significant health and safety risks, especially between



1975 and the late 1990s, when the forests were largely under Khmer Rouge control. Birds have received more attention than other wildlife, with several ornithological expeditions during the first half of the 20th Century (Swan *et al*, 2002). Since peace came to Southwest Cambodia in 1999, there has been a sudden upsurge in research activity here.

In 2000, FFI implemented the first biological assessment of the CCPF. In 2001 to present FFI have been researching Siamese crocodiles, gibbons and elephants within the Cardamom Mountains. Conservation International (CI) carried out a rapid biological assessment ("mini-RAP") within a logging concession adjacent to the CCPF in 2002. In 2003 WildAid facilitated a biological assessment of the southern Cardamom Mountains region. A small portion of this work focused in and around CCPF. Ongoing, Dr. Jim Sanderson (CI) has conducted a number of camera trapping activities, starting work in the Cardamom Mountains with the 2000 FFI surveys. When Jim has not been available volunteer staff has continued the camera trapping program (Daltry & Traeholt, 2003).

2. Turtle distribution and status in the world

2.1 History of turtles

Tortoises and Freshwater Turtles have managed to survive the upheavals of the last 200 million years, including the great extinction episode that eliminated the dinosaurs. They have been extremely successful, colonizing both marine, fresh water and terrestrial environments. As Romer (1966) pointed out early in the twentieth century, their "remarkable defensive armor" no doubt played a large part in their effectively surviving "all the vicissitudes which have swamped most of the reptilian groups"- including, we now believe, the giant asteroid that wiped out the great dinosaurs (Klemens, 2000).

There is a deep ignorance on the part of the general public towards turtles. Think back to the very first thing you probably learned about turtles: "the turtle carries his house on his back wherever he goes." It's difficult to imagine how any animal that carries its home with it should have specific habitat requirements when seeking a new place to settle down (Klemens, 2000).

But now, after a rich heritage extending far longer than almost any other vertebrate group, turtles are in trouble. The combination of habitat destruction or severe deterioration, due to the expansion of human activities, and heavy exploitation, either intentionally or incidental to the harvest of other species in the same habitat, has adversely affected at least two-thirds of the turtles species. Although still common in many places, as a group turtles are no longer safe, whether they inhabit terrestrial, freshwater, or marine ecosystems (Klemens, 2000).

2.2 Turtle distribution in the world

There is today approximately 300 species of living freshwater turtles and tortoises worldwide. They are distributed over 7 major geographic regions, see table 1. Of these, almost 200 species are listed as threatened according to the 2004 IUCN Red List of Threatened Species. However, not all of the world's turtles and tortoises have been assessed yet, and more species may turn up on the list when they are. Some species not yet identified are probably already on the brink of extinction. The Red List is updated periodically as new assessments lead to adjusted threatened



status determinations. This is a direct responsibility and on-going task of the IUCN, Species Survival Commission (SSC), and the Turtle and Freshwater Turtle Specialist Group (TFTSG).

Table 1: Worldwide distribution of turtle and tortoise species. (Source TCF, 2000)

No	Region	No of species
1	North America	48
2	Central America	35
3	South Africa	61
4	Mediterranean	10
5	Australia	26
6	Asia	90
7	Southeast Asia	Approximately 73

During the recent decades, these species have been facing many serious problems that can lead to them going extinct in the next few years if there is no immediate conservation action, because of the market demands in national and international trades, especially in East Asia (Moll, 1989). Large quantities of all turtle and tortoise species are annually exported from one country to another in order to use as food, souvenirs, and especially for traditional Chinese medicine (Moll, 1989).

Turtle conservation activities are now being carried out all over the world and intend to preserve these endangered species. All the species have been classified into categories of the IUCN Red List, see table 2. The categories of threatened species included on the Red List are: Extinct, Extinct in the Wild, Critically Endangered, Endangered, Vulnerable, Near-Threatened, and Data Deficient. Categories of species not included on the Red List are: least Concern and Not Evaluated.

There are very few species of turtles and tortoises worldwide that can be considered relatively common and not presently at risk. But even those more common species are under the same global pressures as the threatened species but with more robust populations perhaps they are able to absorb greater adverse impacts before suffering declines (Turtle Conservation Fund, 2002).

Table 2. Tortoise and Turtle species listed in the IUCN Red list. Source: TCF, 2002

Listed and Threatened Species (Species and Subspecies)	No. of Species	Percentage of Species in the World
Extinct (Ex)	8	2.7%
Extinct in the Wild (EW)	2	0.7%
Critically Endangered (CR)	24	8.0%
Endangered (En)	49	16.3%
Vulnerable (Vu)	64	21.3%
Near Threatened (NT)	40	13.3%
Least Concern (LC)	1	0.3%
Data deficient (DD)	12	4.0%
Globally Threatened Species	200	66.7%
Species not Listed		
Not Evaluated (NE)	100	33.3%
Total	300	100%



2.3 Threat Factors to tortoise and turtle species in the world

Trade

The increasing trade of tortoises and freshwater turtles is now the main reason for the rapidly dwindling numbers. Thousands of tortoises and freshwater turtles worldwide are yearly caught from the wild in order to supply the traditional Chinese market and restaurants, especially in countries such as China, Japan, Taiwan, Hong Kong, and South Korean (Asian Turtle Trade Working Group, 1999).

Habitat loss

a. Land clearing and deforestation for farming

This has always occurred in most of the areas in the world, but with increasing populations in rural areas depending on natural resources as their annual revenue, this problem is increasing.

b. Deforestation

To make more income, people start to run businesses with logging concessions or small businesses. For example, in Cambodia there are a lot of concession companies that started running during the 1990s. These activities have destroyed many hectares of forest that was living habitat for a lot of wildlife. Deforestation is causing many problems to natural areas such as flooding, drought, and changed living habitats for wildlife.

c. Mining

Mining close to beaches, the edge of the rivers and lakes to take sand for construction and some other demands is contributing to the loss of turtle habitats. It changes the ecosystem of the lake or river or beaches and can change the level or quality of the water, which seriously can destroy the natural habitats (Moll, 1999).

d. Dam Building

Most of the turtles live in lakes or rivers, and hydroelectricity dams are always built across lakes and rivers. This can cause a serious problem to animals because of the permanent damage to the area and frequent change to water levels in such areas.

e. Water Source Pollution

Pollution of water sources from factories, agricultural activities and waste from urban areas pose a high level of threat to natural habitats and the animals depending on these, including turtles.

Local Use

According to Chinese belief turtle and tortoise meat are the sources of protein for human's body in the entire world, especially for local people. All turtles and tortoises people meet or catch during their walk in the forest or fishing, they are always kept and eaten or sold to middle men to bring to markets. This is also the key factor reducing the numbers of turtles and tortoises. (Asian Turtle Trade Working Group, 1999).

Road Construction across forest

All animals and tortoise and turtle need an area to live and walk for finding food and water and living condition for their body (Nicholson, 1999). Construction roads across the path way of animal cause impact to these species because cars, trucks, bus, people always travel pass the road



and they can kill all animals that travel pass the roads, especially tortoises and turtles (Boarman, 1992).

2.4 IUCN Listed turtles and tortoises

Turtle Conservation Fund (TCF) showed the first listed document describing about the 25 most threatened species in the world to mention on turtle crisis. This list is depending on the IUCN Red List and the general census of the three partner organizations of TCF called Centre for Applied Biodiversity Science (CABS), a part of Conservation International, Tortoise and Freshwater Turtle Specialist Group (TFTSG) and Turtle Survival Alliance (TSA) of IUCN. **Twelve of the 25** endangered turtle species are present in Asia, 2 species in South Africa, 3 in Madagascar, 1 in Mediterranean, 2 in Australia, 2 in South America, 1 in Mesoamerica, and 2 in United State. 21 species of 25 endangered species of turtles are present in the 25 Biodiversity Hotspots worldwide. See box 1.

Box 1. The 25 most threatened species of turtles and tortoises worldwide

1. Royal terrapin (*Batagur baska*), Southeast Asia.
2. Burmese roofed turtle (*Kachuga trivittata*), Myanmar
3. Striped narrow-headed softshell turtle *Chitra chitra*, Southeast Asia
4. Vietnam leaf turtle *Mauremys annamensis*, Vietnam.
5. Roti snake-necked turtle *Chelodina mccordi*, Indonesia.
6. Southern speckled padloper totoise (*Homopus signatus cafer*), south Africa.
7. Chinese three-striped box turtle (*Cuora trifasciata*), Northern Vietnam and China.
8. Yangtze giant softshell turtle (*Rafetus swinhoei*), China and Vietnam
9. Arakan forest turtle (*Heosemys depressa*), Myanmar.
10. Madagascar big-headed turtle (*Erymnochelys madagascariensis*), Madagascar.
11. Burmese star tortoise (*Geochelone platynota*), Myanmar.
12. Yellow-blotched map turtle-*Graptemys flavimaculata*, United States.
13. sulawesi forest turtle-*Leucocephalon yuwonoi*, Indonesia
14. Painted terrapin-*Callagur borneoensis*, Southeast Asia
15. Flat-tailed tortoise-*Pyxis planicauda*, Madagascar
16. Geometric tortoise-*Psammobates geometricus*, south Africa
17. Philippine forest turtle- *Heosemys leytensis*, Philippine Islands
18. Egyptian tortoise-*Testudo kleinmanni*, S.E. Mediterranean
19. Western swamp turtle-*Pseudemydura umbrina*, Australia
20. Mary river turtle-*Elusor macrurus*, Australia
21. Dahl's toad-headed turtle-*Batrachemys dahli*, Colombia
22. Abingdon Island tortoise/ Galapagos tortoise-*Geochelone nigra abingdoni*, Galapagos Islands
23. Central American river turtle-*Dermatemys mawii*, Central America
24. Bog turtle-*Clemmys muhlenbergii*, United States
25. Ploughshare tortoise-*Geochelone yniphora*, Madagascar, (National Geographic news, May 15 2003).



3. Turtle distribution in Asia

According to a report released by TRAFFIC, Wildlife Conservation Society (WCS), Worldwide Fund for Nature (WWF), and other conservation groups. With three-fourths of Asia's freshwater turtles now listed as threatened, and over half considered endangered

Asia has the most species area as well as having the greatest percentage of threatened species, with more than 75% critically endangered, Endangered, or Vulnerable, and 91% included in the IUCN red List as it is the geographic region that warrants the highest priority actions if we are to avoid losing species in the near future. In Southeast Asia, there are over 50% of the turtle species are now listed as either endangered or critically endangered (IUCN Red List, 2004).

The group of turtle specialists called TFTSG have studied and showed a great result with a great strategy. The group always focuses on the turtle threat through trading in Asian markets. Many members from the group joined a national workshop talking about turtle crisis held in Phnom Penh in 1999. TFTSG and other participants recommended to all countries in Asia need to be careful on turtle export and import through the borders to make sure no more species of turtles and tortoises face in instinct in the near future and all the turtle species have at least on appendix II of IUCN Red List (UNDP, 2001).

The reasons that pushed turtles and tortoises onto the IUCN Red List are:

- 1/ nearly all the turtle and tortoise species are now caught for selling and trading.
- 2/ more than 60% face serious problems through illegal hunting and sell to markets.
- 3/ Official officers who are in charge of controlling turtle export and import lack stopping measures from illegal trading and they are still inaccurate in identifying the species (UNDP, 2001).

3.1 The Asian turtle crisis

Research throughout the region has shown that Asia's turtles are being systematically extirpated from nature to feed the insatiable demand from export markets. According to some estimates, as many as 15 million turtles are traded annually in the region, most of these ending up in China. In the last decade, industrialisation in China has provided new-found wealth which has generated increased demand for expensive foods and traditional medicines made from turtles. This has caused a dramatic increase in the organised and opportunistic collection of turtles from the wild, greatly depleting the numbers of many species and creating the so-called "**Asian turtle crisis.**" Of the estimated 90 species which are native to the region, sixty-seven are classified as threatened through habitat loss and collection for trade (IUCN, 2004), up from 33 in 1996.

Despite global recognition of the Asian turtle crisis, efforts to protect Asia's turtles have been slow to develop. Weak governmental laws, minimal trade control, misguided or insufficient enforcement activities, corruption, low awareness at all levels, traditional attitudes towards turtles, few national experts or willing researchers, and a host of other factors severely constrain progress. Moreover, loss of habitat due to logging, forest clearance for agriculture, and conversion of wetlands to rice-fields places surviving wild populations under additional pressure.



3.2 Southeast Asia

Southeast Asia represents the largest regional market for freshwater turtles and tortoises in the world. In particular, this is due to cultural beliefs regarding the health benefits of eating turtle meat and the use of turtles as medicines. What was once a domestic trade has now become a large-scale business, mostly with mainland China. In some countries (e.g., Thailand and Vietnam) turtle populations appear to have been significantly affected, although a lack of data on the status of turtle populations in these areas hampers detailed analysis. Increased trade with China appears to be related to recent changes in currency convertibility, the rapid economic growth of Southern China, and the increased demand for traditional Chinese foods and medicines (Jenkins, 1995)

High human population densities and habitat loss have severely affected turtle populations. In many areas habitat loss has historically been compounded by exploitation of turtles for subsistence purposes. Today, the import and export of turtles for food and medicinal purposes is becoming increasingly important, and a large and complex trade in turtles has emerged. This trade deserves special mention due to the significant impacts it is presumably having on wild populations. Large numbers of turtles from throughout Indochina are shipped through Vietnam to supply that demand. Within China turtles are used for a wide variety of medicinal purposes and for food. The level of markets in the whole regions is mostly performed in illegal trading from one country to another (Thorbjarnarson, 2000).

3.3 Traditional Chinese Medicine

"A billion people in China, formerly constrained from regular consumption of luxury foods like turtle by lack of cash, are wielding new-found economic power. Ross Perot might describe the 'giant sucking sound' of millions of turtles being wrenched from their habitats in Laos, Cambodia, Bangladesh, Vietnam, Malaysia, and Indonesia to meet the insatiable demand and high prices offered by Chinese markets." *Peter C. H. Pritchard, Chelonia Institute*

Great quantities of turtle shell are used as an ingredient in Traditional Chinese Medicine (TCM). For example, Taiwan declared that 940 tons of hardshelled turtle bone and 200 tons of softshell turtle bones were imported from 1992 to 1998; prices remained stable throughout this period. The great majority of turtle bone used in TCM prescriptions is plastron. This use of plastron is based on centuries of traditional custom, tracing back to a time when available quantities of turtle shell led to a preference among TCM practitioners for roast plastron bone that had been used in divination ceremonies. A participating TCM scientist, however, argued that there is no difference in utility and efficacy between plastron and carapace bone. Acceptance and use of both plastron and carapace bone would reduce the number of turtles required to make a certain amount of TCM prescriptions by at least 50%.

Current TCM research also suggests that there is no difference in the pharmaceutical effects of bone from animals produced in farms compared to animals captured in nature. Farm production of turtle bone for TCM or as a by-product from farming for consumption appears feasible. Finally, herbal or other ingredients may be identified through continuing TCM research as



alternatives to turtle bone. Gaining acceptance for such alternatives among TCM practitioners and pharmacists, who work in a very old and stable tradition, will be critical to success. If these alternative ingredients can be harvested sustainably, they represent an encouraging possibility to eliminate or at least reduce the demand for turtle bone. Whether western industrial pharmacology or homeopathy can contribute alternatives to prescriptions containing turtle bone should be explored in a culture-sensitive dialogue between the various interest groups. These groups include the TCM establishment, the pharmaceutical industry, turtle and other conservationists, and consumer groups.

Pharmaceutical properties of turtles claimed by some traders, such as the reputed cancer-curing effects of the Three-striped Box Turtle-*Cuora trifasciata*, should be examined and tested scientifically. If turtles do possess such properties, industrial synthesis of the active compounds, alternative herbal medicine, and turtle farming should be explored to reduce the demand for animals from the wild. If such claims are ill-founded, a publicity campaign should be launched together with TCM practitioners to provide the general public with accurate information.

3.4 Turtle trade in Asia

In December 1999, TRAFFIC, WWF and The Wildlife Conservation Society (WCS), brought together 40 regional turtle experts from 16 countries, primarily within East and Southeast Asia, to discuss the problem of trade in Tortoises and Freshwater Turtles in Asia in a workshop held in Cambodia. This Summary takes a look at the conclusions of the workshop and presents some recommendations to address this worrying trade. Two main types of trade in turtles occur in Asia. One is a high-volume, commodity-type trade in turtles or turtle parts for consumption; the other is the pet trade, which involves smaller numbers of animals, and often smaller animals, with high individual value. From a conservation perspective, the consumption trade can be further divided into the trade in commercially farmed turtles and the trade in turtles captured from nature. Each of these trade segments gives cause for concern, but the mass exploitation of wild-caught turtles for consumption is the more significant.

Figure 5: Turtle caught for consumption.





3.5 Consumption Trade

The trade in turtles for consumption generally originates in the source countries of Southeast and South Asia and ends in the consumer countries of East Asia. A certain proportion of turtles captured, in some locations a substantial proportion, is consumed locally for subsistence and in the restaurant trade, but the greater portion of capture is exported. Traded turtles represent a luxury food, not a source of protein for the poor.

In general, all turtles encountered will be collected and traded but softshell turtles are preferred because they fetch a higher price per kilogram, which may be six times the price of lamb or chicken in India. Small softshells are preferred over large animals, because they have a higher proportion of cartilage and gelatinous skin, the most valuable part, see figure 5. In addition, small whole softshells are preferred as restaurant servings, compared to parts of a large animal. Overall, almost every species is traded; only a very few Asian turtle species have not (yet) been reported in trade; these are exceptionally rare and in some cases probably extinct species.

A recurring pattern is for collection and export operations to become established at a particular location, collecting turtles through an extensive network of trappers, hunters and middlemen. Collection efforts and capture and export volumes increase rapidly, reach a peak and then decline as accessible populations become depleted and collectors need to venture into new, more distant areas. There is also a corresponding decline in the average size of animals that are traded.

Almost every available transport route between source and consumer countries is used but transport by air is preferred, because the quality and survival rate of the traded turtles is optimal.

In addition to live turtles as food, turtle shell is also traded to supply the Traditional Chinese Medicine trade, see figure 6. These shells are usually by-products from the consumption of turtles, but there have been some reports of the specific collection of turtle plastron, after which the rest of the animal was discarded (Jenkins, 1995) or perhaps used as food in crocodile farms. The amount of turtle shell imported to Taiwan alone exceeds 100 metric tons per year, and the total trade may add up to several times this amount.

Figure 6. Turtle shells for trade, confiscated by CI rangers.



Turtle shell is also used for the production of turtle jelly, a glue-like residue produced by long-term boiling of turtle shells and concentrated by evaporation. There are indications that jelly is also manufactured outside East Asia in Indonesia and perhaps other source countries and exported as a high-value, low-volume, product where it is impossible to check the composition, with associated problems for customs inspections as well as consumer concerns about genuine content.



3.6 Pet trade

The collection of turtles as pets is an entirely different trade issue. The preferred species in the pet trade from Asia are rare and unusual species, such as Australian snake-necked turtles (genus *Chelodina*) and Pig-nosed Turtles, *Carettochelys insculpta*. In addition, hatchlings and juveniles of other species from throughout the region are traded internationally in large numbers. Because pet turtles have a particular value per specimen, pet traders prefer small specimens which are easier and cheaper to ship.

The total numbers of Asian turtles traded specifically as pets are difficult to estimate, because their proportion is so small compared to the massive numbers of Red-eared Slider (*Trachemys scripta*) hatchlings in the trade and data are rarely collected on a species-by-species basis. The market for the relatively expensive Asian species and very expensive Australasian species is limited and partly illegal, but still involves hundreds to thousands of individuals for certain species per year, and may be significantly higher for hatchling Pig-nosed Turtles.

Because prices in the pet trade are directly related to the rarity of a species, the pet trade poses a particularly significant risk to rare species. Meanwhile, captive breeding of such species as pets becomes less attractive economically because of the 'four-inch-rule' imposed by the European Union, the United States and Canada, making the import of hatchlings or juveniles under 10 cm shell length illegal, thus forcing the pet trade to deal in larger, wild-collected animals.

Nearly all transport occurs by air, although some shipments are transported by land and sea routes to the main centres of the pet trade in Jakarta, Singapore and Bangkok. From these locations most animals are brought into the global pet trade, while a proportion of the animals are sold in the local pet trade. Correspondingly, these cities are also the main distribution points for the mass trade in other exotic species, (i.e. birds, mammals and other reptiles) for the Southeast Asian domestic pet market.

In recent years, there has been a high-profile trade in turtles known or thought to represent new species. Such animals, usually known only from very few individuals, fetch prices of several hundred to several thousand US dollars per animal. It has generally been assumed that this high-end pet trade in potentially new species was a matter of traders' agents picking out unusual animals from large shipments of food turtles. There are, however, indications that traders also send agents to the remote source area to purchase rare turtles from the local villagers. This not only causes the depletion of the target species but also other chelonian species as the locals often cannot tell the turtle species apart. Once the links are established, the trade continues until yet another source area has been vacuumed of its turtles.

3.7 Effects of Trade on Native Turtle Populations

The paucity of trade data, natural history data and particularly long-term status data makes it difficult to judge the effects of trade on native turtle populations. It is clear, though, that trade is at least a contributing factor in the decline of most species, and in many cases it is the main cause. The workshop participants spent two evenings evaluating the current conservation status of the region's tortoises and freshwater turtles, and recommended that, of 84 species evaluated, 63 species should be considered as threatened following the IUCN Red List criteria; trade was a factor in the threatened assessment for 52 species.



4. Turtle and tortoise distribution in Cambodia

Because of Cambodia had long time of civil unrest, political instability, and military conflict, these caused barriers of biodiversity researches in these important areas. There are about 12 different species of freshwater turtles and tortoises confirmed to be present or thought to be present in Cambodia, see box 2.

Box 2. Turtle and tortoise species likely confirmed in Cambodia.

1. Big-headed turtle-*Platysternon megacephalum*: Cambodia not confirmed but possibly found in mountain regions.
2. Magrove terrapin-*Batagur baska*: Cambodia in Mekong and Tonle Sap basins-confirmed extinct; Sre Ambel system in Koh Kong province.
3. Asian box turtle-*Cuora amboinensis*: in the whole country
3. Asian leaf turtle-*Cyclemys atripon*: known in the whole wetland areas in the country.
4. Giant Asian pond turtle-*Heosemys grandis*: in lowland and small hill
5. Yellowed-headed temple turtle- *Hieremys annandalii*: in lowland.
6. Malayan-snail-eating turtle- *Malayemys subtrijuga*: in all lowland in the country.
7. Black marsh turtle-*Siebenrockiella crassicollis*: in lowland.
8. Red-eared slider turtle-*Trachemys scripta elegans*: Introduced species. Found in Tonle Sap Lake and should be elsewhere.
9. Elongated tortoise-*Indotestudo elongata*: in lowland and hills.
10. Impressed tortoise- *Manouria impressa*: In high altitude areas.
11. Asiatic softshell turtle-*Amyda cartilaginea*: in proper habitat in the country.
12. Asian giant softshell turtle-*Pelochelys cantorii*: in lowland area.



Chapter III

METHODS

1. Training

Before starting the project, CI's skilled staff provided training to six students from the Royal University of Phnom Penh including us, the three core team members. The training focused on:

1. Tortoise and turtle identification, handling, marking, and survey protocols, see figure 7 a.
2. Emergency response, 1st Aid, disease diagnosis (eg. malaria) and medication.
3. Map reading, navigation, GPS, radio, see figure 7 b.
4. Communications, basic field-craft, and safety.
5. Budgeting and financial management.
6. Cultural awareness.
7. Data entry and basic GIS.

Figure 7, a and b. Team receiving training from CI staff in turtle research methods and general use of maps, compass and GPS.





Other training and support

Douglas Hendrie, WCS Asian Turtle Coordinator, has helped the Cambodia BP team with our project and training. We have had meetings with him, sent the reports and results to him, and we got back some recommendation and comments. For example, we sent him photographs of turtles that we were not sure to identify, and he would help us to identify them and teach us identification methods.

Significantly, we (the BP team) successfully passed on our research techniques to a lecturer from university of Loa PDR, who is going to conduct a field research about the impressed tortoise *Manouria impressa* in the coming year (see Appendix 7 for trip summary). He not only joined the theory of the research but also actively performed in practical surveys and was present when we successfully found one impressed tortoise.

2. Community surveys

Before starting the tortoise and turtle surveys, structured interviews with local people were held. Interviewees represented a cross-section from the local community. Specifically, surveys targeted hunters, conservation rangers, Commune chiefs and other local authorities, NTFP extractors, Aloewood collectors, wildlife traders, fishermen, and farmers.

The surveys were used to gather turtle and tortoise information about the type and level of threats such as (i) hunting, (ii) local consumption of turtles and tortoises, (iii) wildlife trade; and other information such as (i) potential areas to survey, (ii) species composition, (iii) relative abundance, and local knowledge about species ecology, see figure 8.

Figure 8: Team member undertaking interview.



We created questionnaire papers for recording information from local people. See: Appendix 1 for questionnaire. We also used a guide book (Cox *et al.*, 2001), as well as photo sheets of 15 different species of tortoises and turtles that could be present in the area. These photo sheets were showed to people to make turtle identification easier, see table 3.

Table 3: List of turtle and tortoise photo sheets used in surveys.

Species codes	Khmer name	Common name	Scientific name
A	Kan Theay Ahsi	Asiatic softshell turtle	<i>Amyda cartilaginea</i>
B	Andoek Sor Say	Mangrove terrapin	<i>Batagur baska</i>
C	Andoek Bet Mok Snouk Khmao	Asian box turtle	<i>Cuora amboinensis</i>
D	Andoek Som Nhi	Giant Asian pond turtle	<i>Heosemys grandis</i>



E	Andoek Kra Bei Kbal Loeung	Yellowed-headed temple turtle	<i>Hieremys anandalii</i>
F	Andoek Prich	Elongated tortoise	<i>Indotestudo elongata</i>
G	Andoek Toek Kal Banla Pi	Impressed tortoise	<i>Manouria impressa</i>
H	Kan Theay Kbal Kangkep	Asian Giant softshell turtle	<i>Pelochelys cantorii</i>
I	Andoek Kbal Thom	Big-headed turtle	<i>Platysternon megacephalum</i>
J	Andoek Som Chhmol	Asian leaf turtle	<i>Cyclemys dentata</i> complex
K	No Khmer name	Madagascar spider tortoise	<i>Pyxis arachnoides</i>
L	Andoek Ka ek Khmoa	Black marsh turtle	<i>Siebenrockiella crassicollis</i>
M	Andoek Sakal or Andoek Sre	Malayan snail-eating turtle	<i>Malayemys subtrijuga</i>
N	Andoek Snouk Teap	Malayan flat-shelled turtle	<i>Notochelys platynota</i>
O	Andoek Som Banlar Pluv	Asian giant tortoise	<i>Manouria emys</i>

We also asked local people about the shells in the villages and took pictures or asked people for the shells to prove the finding. We did not offer to buy the shells.

We were essentially careful with our community surveys because interviews with local communities provided strong evidence of the presence of some species in an area. However, mis-identifications could occur as some people were not aware of local variations in colour or size within species, or they might confuse photographs and species names. Also, they might not distinguish between species that were last seen many years ago, or species seen in other areas. Further evidence to the interviews, we selected a *spider tortoise* (in bold in table above) that is living in Madagascar, Africa, to test people whether they were good at identifying turtle and tortoise species or were just guessing.

3. Shell collection

Figure 9. Turtle shells collected from village.



During our interviews we always asked about shells of turtles or tortoises which could be in the villagers' houses. When we found shells we took photograph on the top (carapace) and bottom (plastron), if there were still plastrons present (they are often sold for medicinal purposes) as a proof of identification. Sometimes we asked if we could get the shells and sometimes people asked for money for the shells but to be in conservation we could not need to give money to people for the shells. See figure 9 for shells of the impressed tortoise *Manouria impressa*.



4. Turtle Trapping

Before trapping was started, agreements were made with local communities to ensure the safety of the traps and trapped animals.

The following bullet-points show the most important descriptions and activities of our methods:

- Traps were individually numbered and GPS recorded for monitoring purposes.
- To set the traps in the rivers and lakes we used a boat or canoe. It is easier to get around in a boat as there often is very dense vegetation along the water edge.
- Traps were baited with fish, fruit and aquatic plants. When baiting with fish, we either used fresh fish from the river, or tinned fish. If we used tinned fish, we did not open the tin but we made a hole in it so that the bait smell and oil came out. If we opened the tin, it was easy for small fish to eat the bait and the first turtle in the trap would eat all of the bait.
- Once positioned and set, traps were checked daily and re-baited as required.
- The trap-period was 10-15 days, to ensure the greatest chance of catching turtles that are present in the area.
- Each trap was placed in an area of shallow, flat water next to the bank, so that the top of the trap was out of the water. This was to ensure that the turtles could get to surface to breathe, so that we did not drown them. The traps would be tied to nearby trees to prevent Siamese crocodiles and large turtles or other animals pulling the trap into deep water, where caught turtles or crocodiles could drown.
- We used small traps, see figure 10. We also used big deep-water traps; see figure 11, designing with a 2-4m long chimney up to the top of the water. If a turtle went into the trap it could come up the top and breathe so that we did not drown it. These big traps were designed for putting in deep slow-moving water to catch soft-shell turtle and other deep water species.
- When we baited traps with fruit, we used a mixture of fruits – papaya, banana, jackfruit, and durian. These fruits were strong-smelling and broke up to release particles that would attract turtles.
- Each trap was baited with the same bait during the trapping session.
- We put the traps on the side of the river where the water was shallowest. It did not matter if we changed sides of the river when we placed the traps, as long as they were about 50-150m apart from each other.
- Traps in rivers were kept about 150 metres apart from each other because the water was moving to downstream and brought the smell with it. In lakes the traps were placed 50-100 metres apart from each other because in lakes the water was still so the smell couldn't spread so far.
- According to the different habitats setting the traps were different, too. we sometimes placed traps in random system if the lake was small or there were many good locations for traps.



Figure 10: Small turtle trap

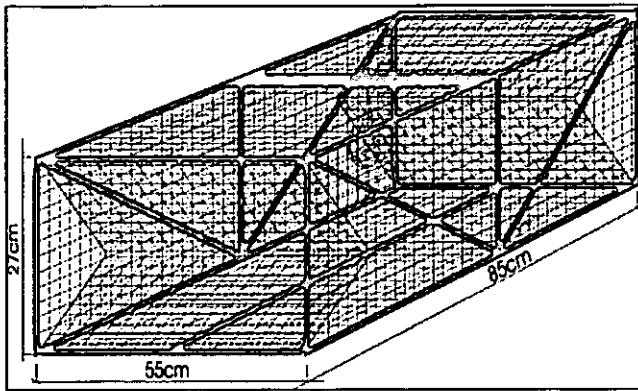
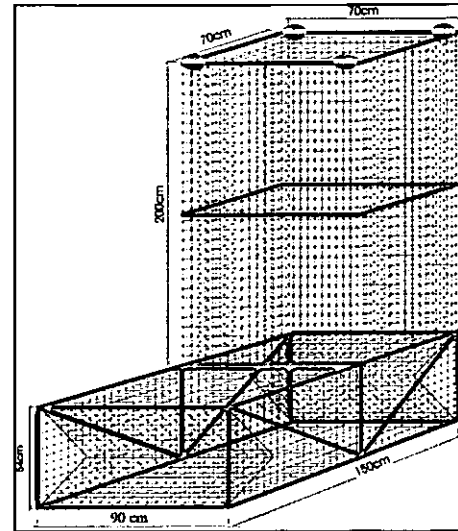


Figure 11: Large turtle trap



5. Tortoise Surveys

Rather than setting up transects through the forest, the surveys consisted of timed searches in one general direction, randomly chosen. During these searches the team walked in a fixed direction along roughly parallel routes looking for tortoises, turtles, tracks, and feces. Every search was timed using a stopwatch, and searches were conducted both during the days and nights according to habitats, seasons, and targeted species. Each team member walked approximately 5-10 metres apart from the next depending on the density of the vegetation. The team needed to walk slowly. The key was to ensure that the area was thoroughly searched and no tortoises were missed and to avoid snakes. The numbers of participants were at least 3 people and to minimize observer variation, the 3 core BP team members were used for all surveys, see figure 12. To make sure there were no turtles missed, we used one to three village hunting dogs trained to find turtles and tortoise to roam between and around the participants. During each trip we did timed searches at least 4-6 days in different habitats where we considered to be the best places for tortoises and turtles.

Figure 12. Team doing tortoise timed search in Areng Valley.



Each day we spent approximately walking in the forest and marshes at least 1-3 hours for searching tortoises. To identify the distributions and threats to tortoises and turtles from one area to another we multiplied the total hours of searching and the total of participants and the results were men-and dog-hours. At the end we will find the results between one to another habitats.



6. Handling and Marking turtles

When we trapped a turtle, we removed it carefully from the trap. Many species could bite, and large softshell turtles (e.g. *Amyda cartilaginea*) can cause serious injury, so extreme care was taken.

When a turtle was captured in a trap, the trap was lifted from the water and placed either onto the boat or onto the riverbank. The top of the trap was opened and the turtle was picked up by the sides or back of the shell or body. We ALWAYS wore thick gloves. If the turtle was a soft-shell turtle, we were careful as the head can extend a long way, and it could twist around to try and bite us.

Then the turtle was placed in a numbered soft cotton bag for transportation. So we needed to record the trap number and bag number for each turtle. We re-baited and closed the trap, and put it back in the water. When all the traps had been checked and re-baited if necessary, we carefully carried the turtles back to camp. We ensured that the turtles were not left in the sun, or they might get too hot and die.

We used a data sheets for recording all data on timed search and trapped turtles to make sure no information was missed. See Appendix 2 for data sheets. 3.7 *Specimen Identification (Measuring, Identifying and Marking turtles)*. When a tortoise or turtle was found in traps, the date, time, time taken to find it, locality (determined with Garmin-12 GPS or E-trex Venture), habitat, microhabitat, altitude, weather, and air temperature was recorded. These keys were very important to identify the species. The tortoises or turtles were identified to species using the field guides Cox *et al.*, 2001; Stuart *et al.*, 2001.

7. Trapped and Searched Turtles and Tortoises

When the turtle had been and caught and brought to camp, it needed to be measured. The length of shell must be recorded, and the sex and age of the turtle would be recorded whenever possible.

After measuring, the turtle was photographed. The photos should show both the top and the bottom of each turtle, and the head to provide confirmatory evidence of species identifications, see figure 13. Empty shells were also photographed and measured, and collected and retained whenever possible. At least one DNA sample (tail-tip, blood sample, or shell fragment) was taken for each tortoise and turtle species, in case there were doubts as to the validity of species identifications.

Figure 13: Example of specimen (Asian box turtle *Cuora amboinensis*) photographed above and below.





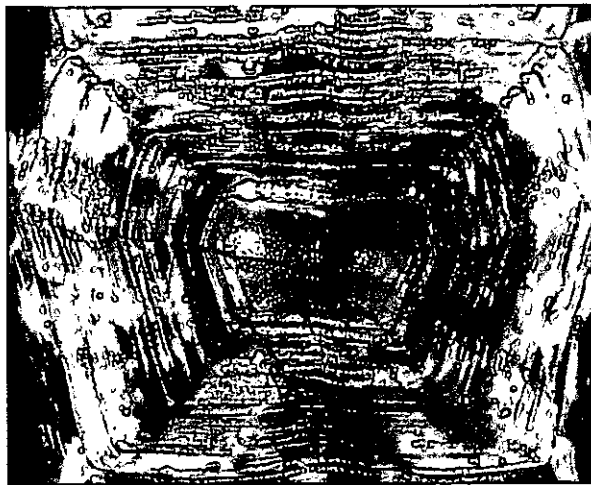
When the turtle had been measured, photographed and identified, it was uniquely marked, so that it could be identified if recaptured. This meant that we could recognise any turtle we caught more than once. This gave us information on the numbers of turtles, as it stopped us counting the same turtle twice. It also helped us to understand their movements. For example, did they move a long way in the river, or were they territorial and live in the same area? If we caught the same turtle in different traps, we would learn more about their behaviour.

To mark turtles so that we could identify individuals, we had to mark every turtle differently. To do this, we used a special numbering system. See Appendix 3 for numbering code.

We marked the first turtle with the number 1 by cutting a piece off the shell on the scute (scale) on the shell that corresponds to the number 1 on the picture. The second turtle is marked by cutting a piece off the scute on the shell that corresponds to number 2. The third turtle is marked by cutting a piece off the scutes on the shell that correspond to 1 and 2. This is because we add the numbers up, so $1+2=3$.

We continue this for every new turtle we catch so, for example, the 15th turtle will be marked by cutting the scutes that correspond to number 10, number 4 and number 1 ($10+4+1=15$).

Figure 14: A scute with rings showing the age the turtle



In timed search for tortoises and turtles its behaviour was recorded (i.e. resting head in, resting head out, walking, feeding, fighting (male-male), mating (male-female), or nesting). In addition, its age was estimated by counting the number of growth rings on the scutes, see figure 14, and its sex was determined based on differences in shell morphology (shape) and tail size. The straight-line carapace length was recorded using calipers or measuring tape, and a unique mark was given to each individual by notching marginal

scutes of the carapace, thereby ensuring that recaptures are recognized. Every tortoise and turtle was photographed above and below to provide confirmatory evidence of species identifications. Empty shells were also photographed and measured, and were collected and retained whenever possible. At least one DNA sample (shell fragment or blood sample) was taken for each tortoise and turtle species, in case there are doubts as to the validity of species identifications.

8. Description of the survey sites

All the surveys were in areas inside or nearby the Central Cardamom Protected Forest. We thoughtfully chose many different habitats with different vegetations. The selected areas were evergreen forest, semi-evergreen and wet forest, montane forest, pine forest, and marshes for tortoise timed search. For trapping we surveyed both moving and still water (rivers, streams, lakes, and ponds). The surveyed places were from low to high altitudes (180m to more than 1,300m), see table 4 and Appendix 9. We did surveys both in rainy and dry seasons. This



was the main key to find out the variation of living species and the density and behaviour of turtles and tortoises.

Table 4. Description of survey sites

Survey site	Dates of survey	Altitude	UTM	Habitats
Areng Valley (dry season)	23 rd Mar-5 th Apr 2004	180-240m	0343076E/1287020N	Semi-evergreen forest, dry forest, grassland
Areng valley (wet season)	23 rd Aug- 3 rd Sep 2004)	200 m	0341986E/1286719N	Semi-evergreen forest, dry forest, grassland, bamboo
Khnanng Loak	23 rd Sep-5 th Oct 2004	1,200-1,300 m.	0353672E/1307005N	Semi and evergreen forest, permanent wet forest, grassland
Veal Veng	26 th Oct-09 Nov 2004	500-600m	0310203E/1331415N	Grassland, surrounded by semi-evergreen forest
Sre Praing	3 rd Dec-17 th Dec 2004	560m	0344052E/1286562N	Grassland, semi and evergreen forest, and bamboo.

3.10 Field Equipment

The right equipment for field research is very useful for every project and implementers. In this project we used many types of equipment. See Appendix 4 for list of equipment.



Chapter IV

SURVEY RESULTS

After one year of the research in CCPF using turtle traps and timed searches we found good results that can fit into conservation activities.

Before starting field research we did interviews with local people in four communes such as Tmar Doun Pov, Reusey Chrum, Tatai Leu, and Chum Noab. The total numbers of interviewees were over 50. After that, based on the interview results, we did the turtle trapping and tortoise searches in Areng valley both rainy and dry seasons, on the top of mountains in evergreen forest, in Veal Veng marsh and Srepraing. We used 165 traps in four different habitats (see: appendix 5). The total numbers of trap-nights were 2,194.

During the trips we also did timed searches (see: appendix 9) using team members, local guide and village hunting dogs. The total numbers of timed searches were about 475 men-and-dog hours.

We found 4 different species of turtles in traps (Asian leaf turtle, giant Asian pond turtle, Asian box turtle, and Asiatic softshell turtle). In timed searches we caught 4 different species of turtle and tortoises (Asian leaf turtle, Asian box turtle, Elongated tortoise, and black marsh turtle). Furthermore, we found 3 different species of turtles and tortoises in villages in the forest (Asiatic softshell turtle, impressed tortoise, and giant Asian pond turtle) of which we found 5 live juveniles of Asiatic softshell turtles. In total we found 30 live individuals of 7 species of turtles and tortoises in traps, timed searches, and villages. See Appendix 7 for detailed information on each species. Additionally, we found 88 shells of turtles and tortoises in many different villages.



1. Community survey

15th Mar-21st Mar 2004

The community survey data have been analysed, and showed some very interesting results. The interviews found that most local people are entirely reliant on natural resources such as resin extraction, fishing and chamkar (non-intensive agriculture). Hunting activities are actively happening in the areas mostly caused by local people and outsiders. Also, we found that the villagers say there are fewer tortoises and turtles in the survey areas now than compared to the last few decades (1980s and 1990s).

Villagers looked at photographs of different tortoise and turtle species and told us that up to nine tortoise and turtle species used to be found in the area. Some species are apparently still there, but some have disappeared or are only found rarely or in remote places. They said there are still a lot of Asiatic softshell turtles (*Amyda cartilaginea*; Vulnerable – IUCN, 2004), Asian leaf turtles (*Cyclemys dentata* complex; Near Threatened), Elongated tortoises (*Indotestudo elongata*; Endangered), and Malayan snail-eating turtles (*Malayemys subtrijuga*; Vulnerable). They also said they had never seen some species, such as Madagascan spider tortoises (a species that we added to test villagers), impressed tortoises, Asian giant tortoises, and big-headed turtles.

Figure 15. Juvenile softshell found in village

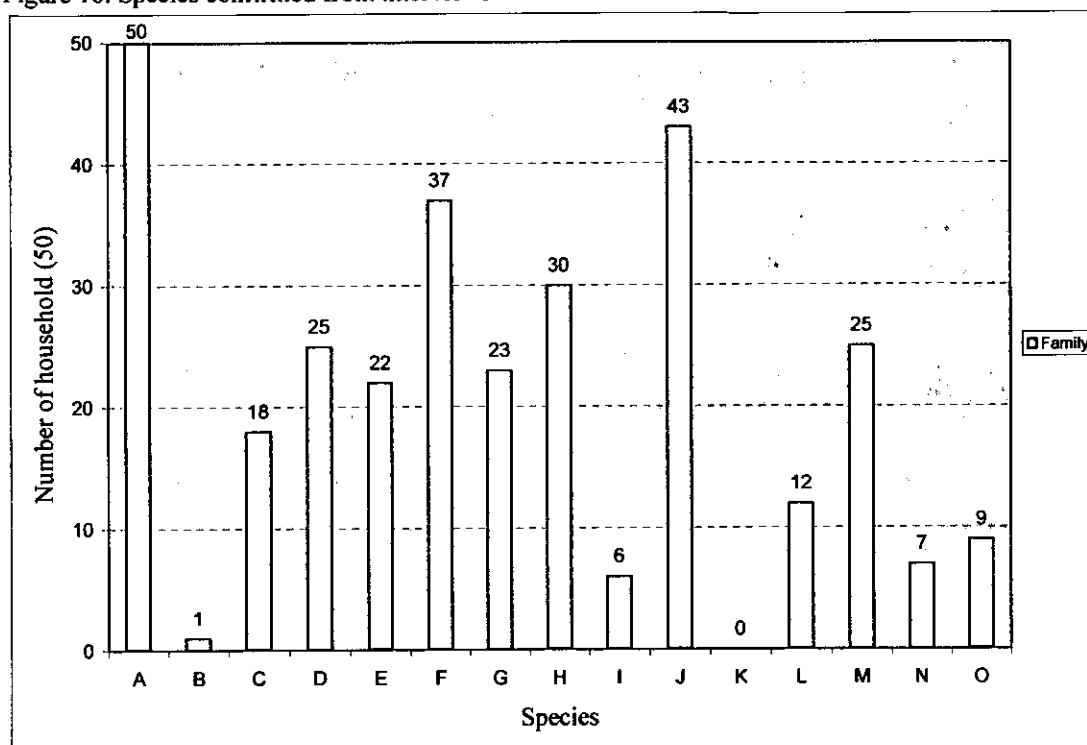


During the community surveys we found five live juvenile Asiatic softshell turtles that villagers had caught and were keeping in their houses, either for food or to sell, see figure 15. In addition, during the interviews we found six shells in the villages: two were shells of the Elongated tortoise, two were the Giant Asian pond turtle and two were the Asian leaf turtle. We took photos of all of them and were given some of the shells, which were identified to the species level by Doug Hendrie (WCS Asia Turtle Conservation).

The preliminary results of the interview-based surveys carried out in the Central Cardamom Mountains showed that more than 90% of the interviewees (N=50 households) confirming the presence of *Cyclemys dentata* complex, over 85% confirmed the presence of *Amyda cartilaginea* and over 70% confirmed the presence of *Indotestudo elongata*. We found all of these species during our surveys, showing that the village data can be reliable, see figure 16.



Figure 16: Species confirmed from interviews



For A-O see page 25

The interview-based surveys also suggested that other species may be present in the area as well. Between 50-90% of the local interviewees reported *Pelochelys cantorii*, *Malayemys subtrijuga*, and *Heosemys grandis* as being other species native to the area. We found the shells of *Heosemys grandis* out of the field trips. Much fewer numbers of interviewees suggested that *Manouria impressa*, *Cuora amboinensis* and *Hieremys annandalii* could be found there as well.

1.1 Threat factors

Trading

Trading activities are a serious threat that caused the number of tortoises and turtles in the Cardamom Mountains to become lower and lower. Previously, this area was a popular place for traders to come and collect shells and meats of wild turtles and tortoises from local villagers to sell at markets around the area.

The buyers always came and persuaded people to catch wild animals and sell to them. Most of them came from Chipat, Koh Kong, Areng, and Phnom Penh. They bought all parts of turtles and tortoises including softshell turtles- mostly the juvenile ones less than 5 kg which they could keep in house until they become bigger and then they took them to restaurants. Most juvenile softshell turtles were bought to supply restaurants. See table 5 for price of turtle parts.



Table 5: Trade prices for turtles and tortoises. Information from interviews.

Price of softshell turtle		
Range/species	Weight (kg)	Cost/kg
1	0.5-2.5	\$3- \$4
2	2.5-3.5	\$2-3\$
3	3.5-4.5	\$1
4	>5	<\$1
Price of turtle		
Species	Price of shell/kg	Price of plastron/kg
Asian leaf turtle	\$ 0.3	\$1
Elongated tortoise	\$ 0.3	\$0.5
Malayan snail-eating turtle	\$0.7	\$0.7

Habitat loss

In the past the Cardamom Mountains were known for a rich presence of wildlife, especially turtles and tortoises. But the last three decades of civil wars caused this isolated area to become degraded and fragmented. Deforestation and local population increase are the main cause of losing habitats. Forest was cut down. Furthermore, during the time of forest cutting a lot of the workers were dependants on the food from the forest including turtles and tortoises.

Table 6: Traditional Uses of Turtle and Tortoise

Species	Parts of body	Uses
<i>Cyclemys dentata complex</i> (Asian leaf turtle)	Alive	Pet
	Plastron	To make people stronger
	Meat	Food
<i>Geoemyda spengleri</i> (Asian box turtle)	Alive	Pet
	Plastron	To make people stronger
	Meat	Food
<i>Siebeanrockiella crassicolis</i> (Black marsh turtle)	Alive	Pet
	Plastron	medicine for women after pregnant
	Meat	Food
<i>Heosemys grandis</i> (Giant Asian pond turtle)	Alive	Pet
	Plastron	To make people strong
	Carapace	To use as the bold
	Meat	Food
<i>Manouria impressa</i> (Impressed tortoise)	Alive	Pet
	Plastron	To make person stronger, put it in the rice container to avoid the insects from eating rice

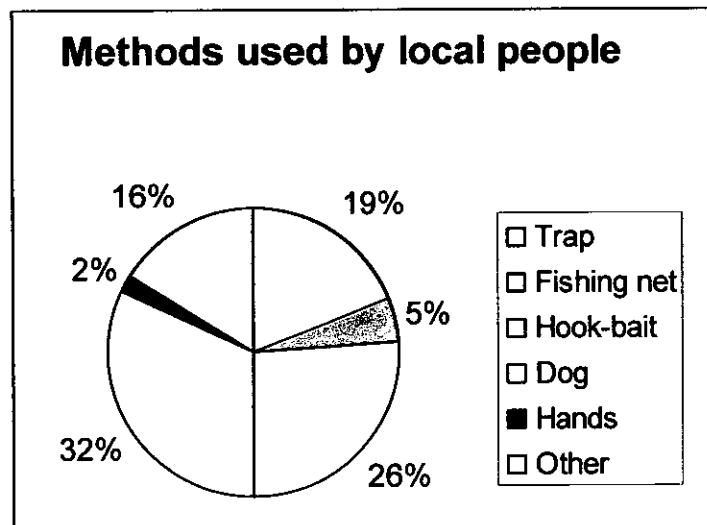


		rice
	Spur	To recover woman after child birth
	Carapace	To cure person from poison
	Meat	Food
<i>Amyda cartilaginea</i> (Asiatic softshell turtle)	Alive	Pet
	Plastron	To cure lung disease ***?
	Meat	Food
<i>Indotestudo elongata</i> (Elongated tortoise)	Alive	Pet
	Carapace	Trade for souvenir
	Plastron	To make person stronger
	Meat	Food

1.2 Methods used for catching turtle

Referring to illegal catching animals with proof from the interviews showed that some people use dogs and snares, fishing nets, line-hooks, fishing snares, and head torches to catch tortoises and freshwater turtles. Sometimes, they burn the fields to find concealed turtles and tortoises, see figure 17.

Figure 17: Methods used by local people to catch tortoises and freshwater turtles.



2. Trip 1 - Areng Valley, dry Season

23rd Mar-5th Apr 2004

We caught four Asian leaf turtles in the traps in the marshy area - one adult and three juveniles. They were uniquely marked and had traditional Buddhist inscriptions written on the shell to provide additional protection in case they were caught by villagers. We caught no turtles in traps in the lakes or Areng River although we caught lots of fish and even a large water-snake (*Homalopsis buccata*). Villagers said that traders had caught many softshell turtles in recent years so the remaining turtles were scared of baited traps. We found turtle hooks in the Areng River which were baited and put out to catch softshell turtles. Villagers



also told us that turtles were easier to trap in the wet season. A small number of our traps were damaged. One appeared to have been bent open by either a crocodile or a big softshell turtle and others were damaged from the top of the trap where it was out of the water. We put large live-traps on the bank next to the damaged turtle traps and used the same bait, and caught three common palm civets and a water monitor lizard.

One live Elongated tortoise was found on a dirt-track in lowland evergreen forest, and was photographed and released. This species is endangered, so it was good to find as it is an important species to protect.

3. Trip 2 - Areng Valley, wet season

23rd Aug- 3rd Sep 2004

3.1 Turtle Trapping

Thirty-one traps were put in a marshy lake and a section of the Areng River. Thirteen traps were put in the river and eighteen traps were put in the lake close to the river. We spent 5 days trapping turtles, from 25th to 30th August 2004. We caught one Asiatic softshell turtle (*Amyda cartilaginea*) in trap 14 close to the river in a flooded backwater. The baits in this trap were fish and insides of chicken. On the fifth day we recaptured this softshell in the same trap with the same baits. We had never caught this turtle species in trap before.

3.2 Tortoise Timed Searches

We chose three different areas for turtle and tortoise timed searches: the forest near Veal II, forest and veals near Tatai Leu, and forest and veals in Areng. We searched for a total of 17 hours and 50 minutes with 6 people and one hunting dog – a total of 107 man-hours. In Areng we did searches for approximately 65 man-hours in semi-evergreen forest and marshland look for elongated tortoises, black marsh turtles, and other reptile species. In Veal II we conducted our searches in the marshland and some parts of the evergreen forest for about 24 man-hours. In Tatai Leu we did timed searches in lowland evergreen forest for about 18 man-hours. On the 25th August in Areng Valley we found one black marsh turtle - *Siebenrockiella crassicolis* underneath tree roots close to the river. The hunting dog found it. On 29th August 2004 we caught one more black marsh turtle in a flooded grassy marsh field about 300 meters altitude. Furthermore, during our timed searches in these areas we also found many lizards and snakes, some of which have never been recorded in the Cardamoms before.

3.3 Captive Specimens

During this survey, we talked to some local villagers in Areng and we found the carapaces of two elongated tortoises - *Indotestudo elongata*. One was a large shell, 30.6cm long, and the other was 19.4cm long. We also found the carapace of one Asian leaf turtle - *Cyclemys dentata* complex. Its size was 19.1cm. We had a look on the leaf turtles shell and found that this had been eaten recently. Our team retained the two *Indotestudo elongata* shells.

More significantly, when we came back from the field survey there were local people in Areng who told us about information about an impressed tortoise – *Manouria impressa* - (size 32cm) and a Giant Asian pond turtle *Heosemys grandis* - (39.8cm, 8kg), Appendix 3.



A villager's dog found the impressed tortoise during their journey up the mountains for extracting resin in Khnang Sral. The tortoise was found in Khchum Khlar village, a small village about 5 km from Areng village. A villager's caught the giant Asian pond turtle dog in the Areng valley during the night while walking in lowland forest. After taking the tortoise from the village we brought her to Phnom Penh because we couldn't release her in the lowland forest as she is used to living up in montane forest. We have kept her in Phnom Penh in good condition by giving her some natural foods such as bamboo and mushrooms, which she was eating. We took her back and released her during the next trip, when we surveyed montane forest. As for giant Asian pond turtle we took this vulnerable species, which we worked out to be approximately 26 years old, and released her in the River Touch, far from any villages.

4. Trip 3- Khnang Louk, wet season

23rd Sep-5th Oct 2004

4.1 Informal Interview

Before going up the mountain, we interviewed some villagers at Chamna village to find some information about our target area, and they said some turtle and tortoise species are present there such as elongated tortoise, impressed tortoise, Asian giant tortoise, and Asian leaf turtle. Also, one local guide said he used to catch impressed tortoise there and still had a shell in his home (we showed him the impressed tortoise we had to confirm if it was the same species as the ones he had found).

4.2 Tortoise Timed Searches

We did tortoise timed search in different habitats such as grassland, plateau areas, steep areas, and wet evergreen forest. The survey area was located in two different provinces (Koh Kong and Pursat) where we hoped to find tortoises. These areas ranged from 800 to more than 1200 metres. In 4.5 days searches we conducted transect walks searching for tortoises for approximately 20 hours with seven people and one (not good) dog - a total of 160 man-and-dog hours. Searching with an unsuccessful hunting dog we found nothing, but we found many places where there was good montane forest and a lot of mushrooms that impressed tortoise like eating (we know this because we collected some of them and gave to the impressed tortoise we had with us, and she ate about 0.5 kg of the mushroom).

4.3 Tortoise Feeding Behaviour

We were surveying the feeding behaviour of the impressed tortoise, and will present this in a short scientific paper.

5. Trip 4- Veal Veng Marsh, dry season

26th Oct-09 Nov 2004

5.1 Turtle trapping

We spent 11 days (28th Oct-07th Nov 2004) trapping turtles. On the first day of trapping we caught one Asiatic softshell turtle-*Amyda cartilaginea* in trap 05 in stream along the waterway. The baits in this trap were fruits but there was a half piece of fish inside the trap. It was the second time for BP team catching this species.



5.2 Tortoise timed search

We did timed searches in different habitats such as grasslands; plateau, mountain stream, and semi-evergreen forest. In these searches we totally spent 5 days searches in the days and 2 nights (3-hour in total). So in 5-day and 2 night searches we conducted transect walk for searching tortoises and turtles with 4 men and 3 dogs for approximately 15 hours and 48 minutes- a total 105.48 men-and-dogs hours. In November 01, 2004 in the morning we found one Asian leaf turtle-*Cyclemys dentata* complex hiding under semi-evergreen forest far from a stream (about 50 meters).

5.3 Informal Interview

Along the ways to Veal Veng marsh we also did some interviews with local people who are living closely to and depending on the forest at O'Som, O'Thkov, and Chung Ruk villages. Most of interviewees said that there were some species of turtles and tortoises are being living there. The species used to be found in the areas are *Cyclemys dentata* complex, *Manouria impressa*, *Indotestudo elongata*, *Heosemys grandis*, *Amyda cartilaginea*, *Cuora amboinensis*, and *Siebenrockiella crassicollis*. More significantly, most of them said impressed tortoises were common species in the areas.

During the interview, we found a lot of kinds of shells at their house such as impressed tortoises, Giant Asian pond turtles, Asian leaf turtles, and elongated tortoises. We took with us two shells of impressed tortoises from different villages, two shells of Giant Asian pond turtles that both of them were newly eaten, and two Asian leaf turtles. Along the ways back to Phnom Penh at Pramoy, a capital district of Veal Veng, we found a live big softshell turtle in a villager's house. This species is being kept for selling for food. We also asked about the price and they said it cost 40 dollars. We also asked people about the methods and the seasons that they used to catch turtles and we found that the best methods were the using of turtle dogs, fishing bait-hooks, and using torches during the night.

6. Trip 5- Srepraing, dry season

3rd Dec-17th Dec 2004

6.1 Turtle trapping

All of the traps were put in the small marshy lakes and section of the river. Eighteen traps were put in along the river and twelve traps were put in the lakes close to the river. We spent 10 days started from 6th Dec 2004 to 16th Dec 2004 to trap turtles and tortoises and we caught 11 turtles. The first day of trapping, we trapped two Asian Leaf Turtles- *Cyclemys dentata* complex in trap 29 with baits of chicken and fish that we put in the small lake. And the next day, two Asian leaf turtles – *Cyclemys dentata* complex were caught in the same trap 29 and also in trap 18. After that day we started to mix bait together between baits of Chicken, fish, and fruits. In the fourth day of trapping we caught two turtles; one was Asian leaf turtle in trap 18 and one Asian box turtle in trap 19. In Fifth day of trapping we caught two Asian box turtles in different traps (traps 05 and 15). Sixth day of trapping we trapped a big Giant Asian pond turtle- *Heosemys grandis* in trap 10. It is the first time we caught this species in a trap, and one of the first times this species has been found in the wild in Cambodia by a research team. On the eighth day we trapped two more Asian box turtles in trap 29 and trap 18. Also there was one Asian box turtle that was caught twice in different traps (first day in trap 19 and second day in trap 17).



Also, we caught one big water monitor in trap 28 and one small toad in trap 4. This means that our traps are good enough capacity to catch some reptile and amphibian species.

6.2 Tortoise timed search

We did timed searches in different vegetation of habitats such as grasslands; plateau areas, mountain stream, semi-evergreen forest, veals, and pine forest. These areas ranged from 550 to 600 meters. We conducted transect walks for tortoises and turtles with 4 men and 1 dog for approximately 20 hours and 15 minutes and we searched for part of each day for 8 days. So we totally searched 101.25 men-and-dog hours in the trip. In the first day, we found an Asian box turtle *Cuora amboinensis* near the camp, about 100 meters away, walking in grass.

7. Summary of field-trips

In conclusion, according to field survey results, we found seven different species in the CCPF. These species are Asiatic softshell turtle, black marsh turtle, Asian leaf turtle, Asian box turtle, Asian giant pond turtle, impressed tortoise, and elongated tortoise. Furthermore, during this year research we found many species of reptile and amphibian that some of them have never been recorded in Cambodia (see appendix 6).

Asiatic softshell turtle: These species are living in the protected forest mostly in the rivers where there is deep water and where it stretches along through forest far from villages. These areas include Areng valley both up and downstream, marshy Veal Veng, around O'som, and Pramoy. Also, this species was confirmed from the local people to be occurred in Tatai Leu, Stoeng Kep rivers around Tmar Bang and Stoeng Russey Chrum. We found juveniles in local houses for raising and eating for food in Tmar Bang, Chumnoab, Areng valley, O'som, and Pramoy (See: appendix 9).

This species is classified as Vulnerable in IUCN Red List.

Black marsh turtle: These species we found only during timed searches in Areng Valley in the wet season. Also, according to community surveys in 4 different communes (Resey Chrum, Tma Doun Pov, Chum Noab, Tatai Leu) there were confirmed that they are the common species in the survey areas. These species are now threatened by local community because people catch them for food and medicines, especially popular as medicine for women after having baby (See: appendix 9).

It is classified as vulnerable in IUCN Red List.

Asian Leaf Turtle: This species was widely found all the surveyed areas in the CCPF. This means that it is still abundant in all habitats such as lakes, streams, river, and marshy areas. Both interviews and field surveys confirmed about this abundant and distribution of species. Even though it is still common in the forest in all habitats, if there is no action for controlling illegal catching among local people and outsiders it will become rare and may disappear in the near future (See: appendix 9).

It is currently classified as near threatened in IUCN Red List.

Asian Box Turtle: This species was found only in Srepraing habitat and it seems to be abundant in this area because we trapped and found a lot during the surveys in dry season.



Adding to this finding, there was evidence from one local villager in O'Takov village that he just caught and released one of this species in marshy Veal Veng a few days before we did searches there (See: appendix 9).

This species is confirmed to be vulnerable in IUCN Red List.

Asian Giant Pond Turtle: This species was found alive in two different areas in Areng Valley and Srepraing in the North of O'som. As for Veal Veng and O'som we found fresh shells that had just been eaten a few days ago. We found a lot of shells in many different places in O'som, Areng village, Chumnoab, Tatai Leu, Tmar Bang, Pramoy, and Chamnar. So these are evidence that this species is present in these areas (See: appendix 9).

This species is classified as vulnerable in IUCN Red List.

Impressed Tortoise: This species was found in Khnang Sral mountains around Areng Valley by local Kresnar collector with his dog during his walk in the forest and we confiscated this species and released her back into the forest. It is the first time we found a live one in Central Cardamom Mountains and in Cambodia. More significantly, we found a lot of shells in O'som and villages around Veal Veng marshes and people there said this species is still common in their areas. Some of the shells were newly eaten because there was fresh blood in the bottom of carapaces (See: appendix 9).

This species is classified in IUCN Red List as Vulnerable but it is highly threatened and has a very patchy distribution.

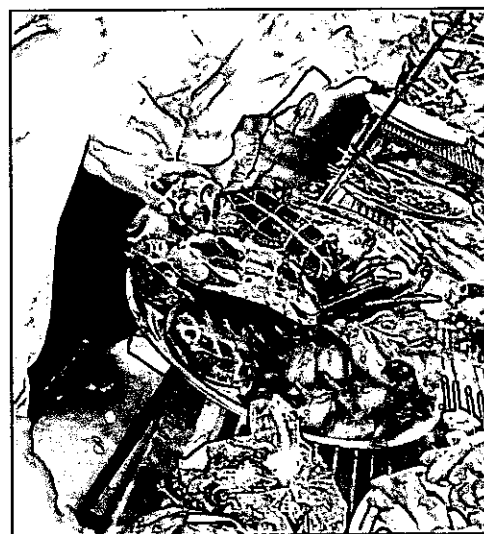
Elongated tortoise: Elongated tortoises were found in the forest around Tmar Bang. It was also strongly confirmed from villagers in Areng, Chumnoab, Tatai Leu, Tmar Bang, O'som, Veal Veng, Pramoy – all the places we went with finding a lot of shell in the villages. It is now becoming more threatened in the wild due to catching for food and medicine by local people (See: appendix 9).

It is classified as endangered species in IUCN Red List.

8. Market Surveys

In additional to the field surveys we also did some search in the markets in Phnom Penh city and we found that there were a lot of live turtles for sale for food, raising, and medicines. These were mostly snail-eating turtles-*Malayemys subtrijuga*, black marsh turtle-*Siebenrockiella crassicolis*, Asian box turtle-*Cuora amboinensis*. We also went to a resort, a large temple area, in the north of Phnom Penh and we found that there were two stalls selling cooked Asian box turtles and snail-eating turtles, see figure 18. Some of these turtles were with eggs. This kind of market is common throughout Cambodia.

Figure 18: Turtles for sale at market stall.





Chapter V

DISCUSSION

Areas and findings

1. Trip 1: Areng valley, dry season

This Areng valley has presently been met a lot of threats to all kind of animals especially turtles and tortoises because a lot of people always go fishing in and around the valley both lakes and the stretch of river where we did surveys. The most threats during the year were probably in the dry season because this season the water is often low and easy for fishing.

According to community survey and what we found during the survey were that local people always used fishing hooks and traps both small and big ones to trap fish and turtles. So these should be a key serious to turtles there.

Even though we caught no Asiatic softshell turtle but there should be this species there because we saw a broken fishing net cause by this species and people also mentioned about this presence, too.

The reason we trapped no turtle in the lakes maybe because there were a lot of fishing there and be aware that when people caught turtles during their fishing they have never released them back.

The two lakes (Bor Bos Thom and Bor Bos Toch we did not catch any turtles but there should be softshell turtle and turtles there because the lakes are quite deep (2 metres depth) and we saw live crocodiles and crocodile's dung there. Also, Bor Bos Thom seemed like nobody went there because of afraid of crocodile and a bit far from villages.

2. Trip 2: Areng valley, wet season

Our results show that the marshes and river in the Areng valley are significantly important sites for many globally threatened aquatic turtle species, but that hunting by villagers with dogs and fishing hooks is seriously threatening the long term survival prospects for these species.



Our results also show that the elongated tortoises are nearly all disappeared from lowland forest near to villages in the Areng valley. Villagers who need food and money for their living have caught them for food, medicine and trade. In the Areng and Chumnoap villages, we found turtle and tortoise shells of elongated tortoises, one of which was recently killed (in the past 3 or 4 months), but we spent 65 man-hours looking in forest in the Areng valley with a hunting dog and found no elongated tortoises. The villagers mentioned that the only reason they take dogs with them into the forest is to catch animals, especially for finding turtles and tortoises.

The impressed tortoise we found would have been eaten if we had not taken it, even though it is an extremely rare species in that area. It may be that this species is under a great deal of hunting pressure in some areas.

Based on the interviews with the villagers, there may be 2-3 more turtle species still to be found in the Cardamoms.

3. Trip 3: Khnong Loak, wet season

Montane areas are very important for tortoises and turtles especially impressed tortoise and elongated tortoise. Villagers from Chamna found elongated tortoises and impressed tortoises in the mountains and to prove this, some villagers still have shells of them at Chamna village collected from the mountains.

During this trip, we can conclude that the areas are being severely threatened through poaching because we saw a lot of groups of hunters, kresna and resin collectors, and some illegal logging parties from Chamna and Kravanh. The military policemen caught four hunters and loggers along the path. The people usually enter the forest without taking their own food. The ones we met just took rice and then needed to find food from the forests, such as easily-caught or shot wild animals like red muntjac, sambar deer, wild pigs, and tortoises and turtles.

We found fewer people near Chamna, but there were more people when we got closer to Kravanh, so we recognized that there was a greater threat to tortoises near Kravanh and that they need to be more conserved.

Those areas nearer to Kravanh are rich in pines, deciduous forests, bamboo grass, and mushrooms that are good habitats for elongated tortoises. We also saw some mounds in the bamboo grass where elongated tortoises often hide.

4. Trip 4: Veal Veng, dry season

According to informal interview there should be more impressed tortoises and elongated tortoises there and to prove this we found a lot of shells and we also took two of them with us. There should be *Cuora amboinensis* in and around Veal Veng marshy because we found two shells and took them with us. Furthermore, there was a local people in O'Thkov village caught and released a juvenile Asian box turtle just a day before we went there. We importantly found that the areas are under threat because local people and outsider always go fishing and to forest for tapping resin with dogs and dogs are dangerous animals for turtles and tortoises. Remarkably, a local people told us that he just ate one Giant Asian pond turtle caught by his dog during his fishing in the forest. From interviews, we notably found that there were some good habitats for turtles to live in the north of O'Som, South of O'Thkov and around Pramoy.



5. Trip 5: Srepraing, dry season

Our results showed that these areas were very important habitats for turtles and tortoises especially Asian box turtles, Asian leaf turtles, and Giant Asian pond turtle. Also, this area could be a significant area for impressed tortoises because we found a lot of shells and we also took two of them with us from local people in O'som village. On the other hand, we importantly found that the areas are being under threat because local people and outsiders from Kravanh always went fishing, shocking and tapping resin with dogs, and dogs are dangerous animals for turtles and tortoises. Also, people burn the veal to make it easy for hunting wild animals around there and they usually enter the forest without taking their own food so they need to find tortoises and turtles or other wildlife to eat.

We found that people living in O'som village are a bit far from the area and had a difficult footpath to go there but we recognized that there was still a threat to tortoises and turtles and wild animals like muntjac, sambar deer, and wild pigs because we saw a magazine of a gun in the veal, so they need to be more conserved. We also saw some mounds in the bamboo grass where elongated tortoises maybe hide in and around there.



Chapter VI

CONCLUSION, RECOMMENDATIONS, AND NEXT STEPS

Conclusion

1. Cambodia

We can conclude that Cambodia is currently facing a serious degradation on environmental issues such as pollution, deforestation, wildlife hunting, mining, and other activities. Also, the lack of updated information of wildlife in the whole regions in Cambodia are still a problem that needs to be corrected through more study to make sure we have enough data and put it into control and management planning. Comparing to other projects which have studied different species and topics and similar places, this project shows that we had good results from the field surveys because the project found a lot of turtles and tortoises including old and fresh shells. These animals are very difficult to find and study so we achieved our result. We would want to catch more in the future but it will require a lot of work and we will need to focus on the habitats and areas that we now know are the best for tortoise and turtle species.

2. Central Cardamom Mountain Protected Forest

The results from the surveys show that the CCPF is a very rich conservation hotspot area in Southeast Asia for biodiversity with good forest and vegetation and priority habitats for wildlife. It is a very important site for tortoises and turtles because it has at least seven species and it has quite high abundance of species. If we had studied in Vietnam or Thailand we might not have found any live turtles or tortoises in the wild because studies have shown that wild populations have got to be very small now and many species are extinct in the wild in most places (D. Emmett, pers comm.).

3. Threats

Even though we still find a lot of turtles and tortoises compared to other projects that confirmed the area as rich in biological diversity, this remote protected forest is still facing a lot of illegal activities done by local people and outsiders to support their lives such as poaching using guns, snares, commercial logging equipped with chainsaws, and increasing



annual non-intensive farming. The threats to turtles and tortoises need to be stopped or the seven species we found will go extinct in the area.

4. Community Interview

According to both formal and informal interviews we found that most of local people are poor and they mostly depend on getting income from natural resources such as extracting resin, collecting aloewood, finding NTFP, fishing, feeding domestic animals for food and selling wildlife and domestic animals and rice and vegetables to local and outsiders. These show that the villagers are the key threats to all animals in the wild, especially turtles and tortoise species.

There are not any serious threats to turtles or tortoises from loss of forest or forest habitat destruction because there is at least 1 million hectares of forest in the area. The forest is empty because of collection and hunting. That is the big threat.

Adding to these problems the populations of people are increasing in the area and their needs are also increasing and at the same time the natural resources gradually become degraded. Furthermore, there are outsiders that come to villages and buy all kind of NTFP's including wildlife parts.

As an example, local rangers recently seized two full sacks of turtle and tortoise shells including the shells of impressed tortoises from around Pramoy and O'som, and confiscated a full sack of live adult Asiatic softshell turtles from Areng valley. If this trade continues, there will be problems in the near future.

Recommendations and next steps

1. Research

More surveys should be done in lowland and montane evergreen forest in the Cardamom Mountains further away from villages and footpaths, to assess the status of the endangered elongated tortoise and to find areas with high numbers that can be protected or incorporated into core management areas and enforcement activities.

We should survey montane evergreen forest to assess the distribution and status of the impressed tortoise.

We should survey more marshes and wetlands in the Cardamom Mountains and outside the CCPF down towards the sea for aquatic turtles, as more study is needed to see which species are present and to identify the species' distributions and status. Wetlands are highly important habitats for many animals, not just aquatic turtles, so management activities and plans should include their protection.

We should look for the big-headed turtle, as some villagers described it exactly without seeing photos and this species is endangered and never before found in Cambodia.

We should look for the other turtles species that the interviews showed are in Southwest Cambodia, including the giant softshell turtle *Pelochelys cantorii* and the yellow-headed temple turtle *Hieremys annandalii* because these species are both endangered. We should look outside of the Cardamom Mountains for these species because they need deep rivers and



lowland water. The same is true for the vulnerable snail eating turtle *Malayemys subtrijuga* that the interviews showed to be in the area.

2. Threats

After our researches in Central Cardamom Protected Forest we found that there are still a lot of hunting activities by local villagers in and around the areas. We found that villagers' dogs are a big threat to many kinds of animal species, especially to tortoise and turtle species because they are able to find animals that are hiding. So keeping dogs out of the forest would help a lot the conservation of tortoises and turtles and other species.

We found hunting to be happening both during both the dry and rainy seasons but there was more hunting in the dry season, so at this time of the year there are most serious threats to turtle and tortoise species. This is because this during season it is easy for local people to go to forest and for all the streams, lake, rivers, and ponds are start to empty. Then it is easy for people and dogs to find turtles and tortoises.

So it would be an advantage if CI's rangers do more patrol during this period. Also the rangers need to be better at identifying confiscated turtles because we found that they sometimes release them into the wrong habitat, such as elongated tortoises being released into rivers.

The BP turtle team will produce a poster and T-shirts in February and March 2005 to pass on education messages to the local villages, but more education will need to be done, especially in schools and villages communes.

We would also recommend that the rangers get trained in turtle identification and what to do to make sure that confiscated turtles and tortoises are properly released safely.

We also found that people burn the fields during dry season in and around Central Cardamom Protected Forest to make their footpath, catch turtles, do Chamcar (slash-and-burn farming), and make it easier to shoot wildlife. So this is a serious threat to wildlife not only small animals but also big animals including gaur, sambar deer, muntjac deer, and wild pigs.

CI's rangers should do more patrol in and around the areas both dry and rainy seasons because most people always go fishing and collecting resin with dogs and bring back turtles for their food. We recommend that turtle research should be used to get results that the rangers can use to help protect and conservation of these tortoises and turtles.

3. General Education

According to the survey we found that most of people are illiterate with low knowledge about the environment because most of the villages have no proper schools or teaching. So there should be general and environmental education about the importance of wildlife and the importance of conservation, especially turtle conservation. If we can do this, these people will be aware of what we have done and what they have got, and can help us to protect the wildlife instead of us working against them.

It would be best if we can offer local people some training about animals and turtle farms and raising turtles to help earn more money for their livelihood. These activities will reduce the



local people from finding the animals in the forest for food and be an advantage to the community. This will be difficult but we think that if we do not let turtles escape and do not set up a lot of trade in turtles it could work.

4. Turtle Farming

There should be a community program working close to local people and train them about advantages of turtles and tortoises and raising animals. Maybe this is the best way because it can stop people collecting animals from the wild and they can earn some more money for their livelihood and give knowledge to local people about further environment problems. This is a good way to conserve wildlife.

5. Networking and Communication in the turtle community

Asian Turtle Conservation Network

The Asian Turtle Conservation Network (ATCN) is a non-profit consortium of people, projects and institutions based within the Asia region and actively working to conserve Asia's turtles. Established in 2003, to help develop and promote turtle conservation efforts in Asia, particular emphasis is placed upon providing a means to share information and improve communication amongst those of us working with turtles in the region. The website includes brief profiles of all major turtle projects and efforts underway in the region, an online turtle reference library, the latest news relevant to turtles (updated weekly), and an online field guide to Asian turtle species (ATCN Website).

There are about 30 research teams or people in the region that send their project results to ATCN. This includes the BP project. Then the ATCN puts it all into a monthly bulletin and sends it back to each of the research projects. This bulletin also goes to over 400 turtle specialists around the world, including the people on the IUCN Specialist Group. So our project results get sent monthly to all the World's best turtle scientists.

See Appendix 8 for example of bulletin with section on the BP Cambodian Turtle Conservation Project, and see ATCN website for all bulletins.

The preliminary results from our project activities have been shown in all bulletins by ATCN and also on the Asian Turtle Conservation Network (ATCN) website (www.asianturtlenetwork.org), and we received some bulletins from ATCN as well. We will continue to provide support and information to this network, to share the results of our research with other people who are working with turtles and tortoises in the region



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Appendix 1: Turtle and Tortoise Questionnaires

Pre-survey

- Politely introduce the group and outline why you are in the Cardamoms and the village.
- Ask the person whether they would be willing to be interviewed.
 - The interview will take about 1 hour.
 - Their name is not required.
- The information provided will be very helpful to the student turtle research project (not related to CI's enforcement work).

Survey Record

Survey Number: _____ Date/Time of Interview: _____
 Village: _____ Commune: _____

Family Information

Sex: ☐ M ☐ F Age: _____ Single: ☐ Y ☐ N Widow/widower ☐ Y ☐ N
 Divorce: ☐ Y ☐ N
 Number of family members in this household:
 Head of household: ☐ M ☐ F Number of children in household: Male Female
 Were you born here? ☐ Y ☐ N When did you return (after war)? _____

Observation ☐ Very poor ☐ Poor ☐ Medium ☐ Rich ☐ Other

Turtle and Tortoise Survey

Show the person the photo sheets and work through the following questions:

Species Composition

1. Which turtles are present in this area?

☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐

- If not on photo sheet describe appearance, where found, still present? Are there many around?

Relative Abundance

- Seed exercise: give all the seeds to the person and tell them to place them onto the photos of turtles they have in the forest. The amount of seeds placed on each picture has to represent how many of that kind of turtle is around relative to the others. More beans = more turtles.

Species and number of seeds:

☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐

Abundance

1. Are there some turtles that you used to see but now do not? ☐ Y ☐ N



Which turtles did you used to see but now do not?

☐ ☐ ☐ ☐ ☐

2. Why are these turtles not around now?

3. Using the seeds to please indicate how many turtles were around in each of the years. (30 beans)

1975

1997

Present

Species Distribution

1. Can you name the places find each kind of turtle? Where are they MOST easy to find?

Spp	PLACES FOUND	BEST LOCATIONS

Ecology

1. For each kind of turtle, please explain where it is usually found (habitat), what it eats (food), when it lays eggs (nesting season), and where it lays eggs (nest location).

S P P	HABITAT	FOOD	NESTING SEASON	NEST LOCATION

2. Do you see more turtles at certain times of the year?

☐ Y ☐ N



3. What time of year do you see the most turtles? Why do you see more turtles?

Spp	TIME OF YEAR	REASON FOR SEEING MORE

Local Use

1. Does your family sometimes collect turtles?

☐ Y ☐ N

2. How many people collect turtles in your family? Who are they?

3. Does the person who collects turtles go to the forest specifically looking for turtles or is it done secondary to other activities?

Specifically for turtles

Secondary activities.

Both

Explain:

4. Have you ever released turtles?

☐ N☐ Y

Why? _____

5. Why does your family collect turtles?

Personal

Trade

Food

Medicine

Food

Medicine

Other

.....

6. What do you collect the most? (30 beans)

Adult turtles

Juveniles

Eggs

Dead Turtles

Shells

Other

Explain:

7. Do you collect all the eggs from a nest?

☐ Y ☐ N

If "NO", how many eggs do they usually leave? Why?

8. How do people catch turtles?

Dog

Bait + Hook

Trap

Net

Other

Explain:



9. Which catching methods are best or used the most?

Spp	METHODS

10. How many turtles does your family collect each month?

0	0-5	6-10	11-20	20+
---	-----	------	-------	-----

11. Which kinds of turtles do you collect the most? (Rank the photos of each species, from most to less.)

--	--	--	--	--	--	--	--	--	--

12. What time of year do you collect most turtle?

13. What are 3 most preferred types of turtles? Why?

Spp	REASON FOR BEING MOST PREFERRED

14. Does your family rely on turtles for food?

Y	N
---	---

Hunting

1. Do people from outside (Rursat, Kravanh, Kamong Speu/Aural, Chi Phat, Koh Kong) collect turtles in your area?

Y	N
---	---

2. Which outsiders collect the most turtles?

3. Do outsiders collect more turtles than local people?

Y	N
---	---

4. Which turtles do the outsiders collect most?

5. Do outsiders collect juveniles and eggs?

Y	N
---	---



6. What do they do with the turtles they collect?

Trade

1. Do people in your village sell turtles?

☐ Y ☐ N

2. Who buy the turtles?

3. Where do the buyers come from?

4. How often do they come?

5. What happens to the turtles they buy?

6. Do they prefer certain kinds of turtles?

☐ Y ☐ N

- If 'Yes' what species do they prefer?

7. Do they also buy eggs or juveniles?

Eggs

☐ Y ☐ N

Juveniles

☐ Y ☐ N

8. What do they use the eggs or juveniles for?

9. How much do they pay? (Adults, juveniles, eggs, shells, etc)

Spp	COST				
	Adult	Juvenile	Eggs	Shell	Other (explain)



10. Do they purchase dead or alive turtles?

Dead

Alive

Both

11. Of the turtles that get caught, what happens more?

Turtles get sold
to businessmen

Local people
use turtles

Other Threats

1. Have you ever found turtle dead after burning grass or forest?

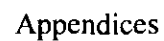
Y

N

- Rarely/ a lot?

2. Have you ever caught turtles in your nets when fishing?

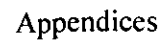
- Rarely/ a lot?



Trap Location Data Sheet

Name of wetland (river, lake, marsh):

[illegible]



Survey start date:
End Date:

Location:
Weather:

[illegible]



Tortoise Timed Search Data Sheet

Specimen #	1	2	3
GENERAL INFORMATION			
Date:	05 th Dec 04		
Time:	2.30pm		
Time on stopwatch:			
UTMs - Easting:	0314806		
UTMs - Northing:	1349166		
HABITAT INFORMATION			
Habitat:	Grassland/ Stream.		
Microhabitat:	Grassland		
Altitude (m):	563		
Weather:	Sunny		
Temperature (°C):	18 °C		
TORTOISE INFORMATION			
Species:	Asian box turtle		
Tortoise behaviour:	Walking		
Tortoise age:	7 years		
Sex:	Female		
Length (cm):	19cm		
Mark code:	01		
Photo number:			
DNA number:	01		

KEY

Habitat: lowland evergreen, dry deciduous, pine, grassland, montane evergreen (>800m), wetland (lake, marsh, river)

Microhabitat: On leaf litter, in grass, under log, in mud, on bare earth, etc.

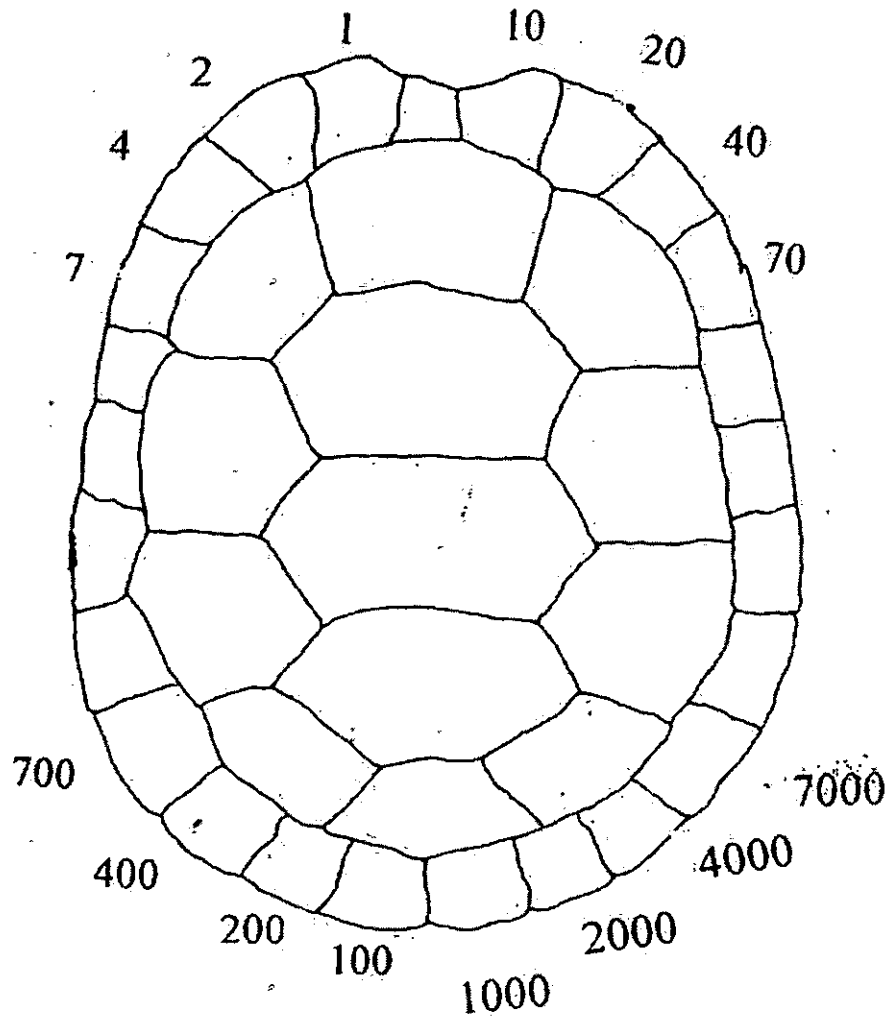
Weather: Raining or dry, cloudy or sunny, windy or still.

Tortoise behaviour: Resting head in, resting head out, walking, feeding, combat (male-male), mating (male-female), or nesting.

Age: Number of growth rings on scutes.



Appendix 3: Turtle Marking System





Appendix 4: Field research equipment list and camping and personal equipment

Field Research Equipment List

<i>Science equipment</i>	<i>Uses</i>
Digital camera and memory card	128Mb+
GPS	
Satellite phone and spare battery (and list of emergency telephone numbers)	It's good to have it during in the forest
Stopwatches	For timed searches – waterproof if possible
Torches and spare bulbs	Using at night
Batteries - AA, AAA, and D	For torches, GPS, camera, icom, etc
Maps	1:50,000 if possible
Compasses	Easy to find direction
Whistles	In case of emergency
Pocket knife	Useful for cutting rope, make food, etc
Binoculars	For seeing animal far for direction
Weighing scales	1kg, 5kg, and 10kg if possible
Callipers	30cm if possible
Tape measures	For measuring animals
Thermometer	For air temperature
DNA tubes containing buffer	EDTA or 90% alcohol
Dissecting kit	Including scalpel, forceps, scissors, mounted needles, syringes
Specimen labels	To keep animal specimen
Clippers or small saw	For notching scutes
Cloth bags	For temporary storage of turtles and tortoises, or to collect other animals as necessary
Thick gloves	For handling softshell turtles
Chloretone and euthasol euthanasia solution	To euthanize reptiles and amphibians
Formalin	For preserving voucher specimens
Waterproof containers	1 - 5 litre, for specimen storage
Turtle traps	The size and number will be dependent on the species and site
Roll of marker tape	To tag traps, paths, etc
Bait	Bananas, papaya, jackfruit, durian, chicken, fish
Field guides and reference material	To identify species
Data sheets, photo sheets	To record species
Waterproof notebooks	Searching is mostly in the wet area
Pens, pencils, permanent markers	Noting, writing, etc



Camping and personal equipment

<i>Camping equipment</i>	<i>Uses</i>
Hammocks	Sleeping
Tarpaulins	For covering hammocks and food storage area
Mosquito nets	For preventing disease cause by mosquito
Blankets and/or sleeping bag	To make body warm and preventing mosquito
Rope and string	For hammocks, tarpaulins, tie traps, etc)
Cooking equipment	Pots, bowls, mugs, cutlery, washing-up bowl, sampoo, etc
Water-collection and storage containers	15-litre buckets or jerry-cans for cook and washing
Small gas bottle and stove-head	Optional, based on logistical constraint, good to use in rainy season
Shovel head	For digging rubbish pits and toilet
Machetes	For cook and cutting rope
Cigarette lighter	For cook, and making fire
Candles	Light at night
<i>Personal equipment</i>	
Waterproof jacket and trousers	Good for using in wet season, preventing insect bite.
Strong walking boots	For preventing snake bite, easy to walk up the montane, etc
3-5 changes of clothes	Depending on time in forest
Leech-proof socks	Preventing from leech and insects bite
Strong, large backpack and smaller day-pack	Putting clothes, book, and equipment
Medical kit	Basic first-aid kit, plus malaria tablets
Food canister	For carry lunch
Water bottle	At least 1 litre, though 2 litres is ideal
Water purification tablets	Treating disease in water
Toiletries	Toothbrush, toothpaste, razor
Small towel	Washing body
Mosquito repellent	Applying on skin to protect mosquito
Hat	Protecting head during, etc
<i>Food – essentials</i>	
Rice	
Dried meat	fish, small shrimps, beef, shredded pork
Dried mushrooms and chillies	Keep fresh long time
Vegetables	'Hard' vegetables are best, such as onions, potatoes and cabbage)
Sauces	fish sauce, soy sauce, chilli sauce
Tea and coffee	Three-in-one coffee is easiest
Salt, sugar, spices, limes	For cook, many uses



Appendix 5: Trap location

Areng Valley, Dry season- traps along the river, March, 2004

Trap No	UTMs Easting	UTM Northing	Altitude
01	0315759	1288024	200
02	0345607	1288032	200
03	0345489	1287899	200
04	0345441	1287748	200
05	0345419	1287606	200
06	0345263	1287590	200
07	0345109	1287609	200
08	0344967	1287562	200
09	0344817	1287607	200
10	0344693	1287680	200
11	0344584	1287591	200
12	0344590	1287442	200
13	0344633	1287291	200
14	1344553	1287151	200
15	0344430	1287048	200
16	0344496	1286758	200
17	0344497	1286614	200
18	0344345	1286575	200
19	0344233	1286669	200
20	0344140	1286796	200
21	0344056	1286911	200
22	0344396	1287003	200
23	0344009	1287155	200
24	0344050	1287277	200
25	0343993	1287420	200
26	0343859	1287514	200
27	0343690	1287482	200
28	0343637	1287331	200
29	0343559	1287207	200
30	0343498	1287067	200
31	0343483	1286918	200
32	0343473	1286741	200
33	0343360	1286611	200
34	0343178	1286549	200
35	0343018	1286547	200
36	0342883	1286487	200
37	0342757	1286345	200
38	0342688	1286236	200
39	0342504	1286277	200
40	0342435	1286427	200

**Areng Valley, dry season- traps in lakes, March, 2004**

Trap No	UTM Easting	UTM Northing	Altitude
01	0344052	1286562	200
02	0343969	1286605	200
03	0343872	1286661	200
04	0343817	1286705	200
05	0343715	1286784	200
06	0343830	1286776	200
07	0343845	1286791	200
08	0343886	1286679	200
09	0343947	1286620	200
10	0344030	1286592	200
11	0344134	1286549	200
12	0344130	1286519	200
13	0343766	1286352	200
14	0343708	1286361	200
15	0344525	1286597	200
16	0343257	1286329	200
17	0343339	1286303	200
18	0343438	1286273	200
19	0343524	1286243	200
20	0343562	1286223	200
21	0343658	1286194	200
22	0343766	1286291	200
23	0343213	1286353	200
24	0343260	1286290	200
25	0343326	1286252	200
26	0343418	1286240	200
27	0343476	1286227	200
28	0343552	1286215	200
29	0344655	1286176	200
30	0344590	1286546	200
31	0344827	1287278	200
32	0344865	1287292	200

**Areng Valley, wet season- August 2004**

Trap No	UTM Easting	UTM Northing	Altitude
TRAP01	0341983	1286651	220 m
TRAP02	0342021	1286676	178 m
TRAP03	0341921	1286734	172 m
TRAP04	0341913	1286717	176 m
TRAP05	0341912	1286744	166 m
TRAP06	0341895	1286737	170 m
TRAP07	0341994	1286736	179 m
TRAP08	0342001	1286762	184 m
TRAP09	0342060	1286799	227 m
TRAP10	0341984	1286811	186 m
TRAP11	0341993	1286862	191 m
TRAP12	0342006	1286935	187 m
TRAP13	0342034	1286959	188 m
TRAP14	0341980	1287010	220 m
TRAP15	0342050	1286616	180 m
TRAP16	0342054	1286592	176 m
TRAP17	0342081	1286576	184 m
TRAP18	0342131	1286579	181 m
TRAP19	0341894	1286756	174 m
TRAP20	0341879	1286783	180 m
TRAP21	0341838	1286824	176 m
TRAP22	0341824	1286804	177 m
TRAP23	0341845	1286783	181 m
TRAP24	0341861	1286761	211 m
TRAP25	0341781	1286785	181 m
TRAP26	0341784	1286802	181 m
TRAP27	0341781	1286847	182 m
TRAP28	0341786	1286874	159 m
TRAP29	0341809	1286868	169 m
TRAP30	0342062	1286575	180 m

**Veal Veng marshy, dry season- November 2004**

Trap No	UTM Easting	UTM Northing	Altitude
Big TRAP 01	0309994	1331470	551 m
Big TRAP 02	0310058	1331717	553 m
TRAP 01	0310128	1331381	564 m
TRAP 02	0310033	1331420	538 m
TRAP 03	0310146	1331334	545 m
TRAP 04	0310016	1331236	546 m
TRAP 05	0309971	1331317	548 m
TRAP 06	0309954	1331362	549 m
TRAP 07	0309935	1331360	550 m
TRAP 08	0309926	1331466	550 m
TRAP 09	0309846	1331425	547 m
TRAP 10	0309840	1331479	547 m
TRAP 11	0309777	1331589	545 m
TRAP 12	0309667	1331621	545 m
TRAP 13	0309649	1331785	544 m
TRAP 14	0309556	1331865	545 m
TRAP 15	0309556	1331937	548 m
TRAP 16	0309236	1332019	543 m
TRAP 17	0309318	1332000	545 m
TRAP 18	0309334	1331964	548 m
TRAP 19	0309458	1331952	539 m
TRAP 20	0309493	1331944	542 m
TRAP 21	0309488	1331962	542 m
TRAP 22	0309481	1331994	543 m
TRAP 23	0309499	1332019	542 m
TRAP 24	0309534	1332045	542 m
TRAP 25	0309594	1332107	551 m
TRAP 26	0310007	1331504	550 m
TRAP 27	0310026	1331571	546 m
TRAP 28	0310037	1331612	553 m
TRAP 29	0310056	1331679	549 m
TRAP 30	0310093	1331724	550 m



Srepraing, December 2004

Trap No.	UTM-easting	UTM-Northing	Elevation – metres above sea level
01	0341983	1286651	220
02	0342021	1286676	178
03	0341921	1286734	172
04	0341913	1286717	176
05	0341912	1286744	166
06	0341895	1286737	170
07	0341994	1286736	179
08	0342001	1286762	184
09	0342060	1286799	227
10	0341984	1286811	186
11	0341993	1286862	191
12	0342006	1286935	187
13	0342034	1286959	188
14	0341980	1287010	220
15	0342050	1286616	180
16	0342054	1286592	176
17	0342081	1286576	184
18	0342131	1286579	181
19	0341894	1286756	174
20	0341879	1286783	180
21	0341838	1286824	176
22	0341824	1286804	177
23	0341845	1286783	181
24	0341861	1286761	211
25	0341781	1286785	181
26	0341784	1286802	181
27	0341781	1286847	182
28	0341786	1286874	159
29	0341809	1286868	169
30	0342062	1286575	180



Appendix 6: List of reptiles and amphibians found during the surveys, identified by David Emmett- wildlife biologist.

COMMON NAME	SCIENTIFIC NAME	IUCN STATUS	NEW RECORD FOR CARDAMOMS	NEW RECORD FOR CAMBODIA
REPTILES				
Siamese crocodile	<i>Crocodylus siamensis</i>	Cr		
Indochinese gliding lizard	<i>Draco indochinensis</i>			
Cardamom banded gecko	<i>Cyrtodactylus intermedius</i>			
Indo-Chinese water dragon	<i>Physignathus cocincinus</i>			
Water monitor	<i>Varanus salvator</i>			
Forest crested lizard	<i>Calotes emma</i>			
Horned tree lizard	<i>Acanthosaura armata</i>			
Garden fence lizard	<i>Calotes versicolor</i>			
Long-tailed lizard	<i>Takydromus sexlineatus</i>			
Speckled forest skink	<i>Mabuya macularia</i>			
Many-lined sun skink	<i>Eutropis (Mabuya) multifasciata</i>			
Olive tree skink	<i>Dasia olivacea</i>		*	*
Speckled leaf-litter skink	<i>Scincella reevesii</i>			
Streamside skink	<i>Sphenomorphus maculatus</i>			
Asiatic watersnake	<i>Sinonatrix percarinata</i>		*	*
Red-necked keelback	<i>Rhabdophis subminiatus</i>			
Striped keelback	<i>Amphiesma stolata</i>			
Pope's pit-viper	<i>Trimeresurus popeiorum/stejnegeri</i>			
Malayan pit viper	<i>Colloselasma rhodostoma</i>			
Puff-faced water snake	<i>Homalopsis buccata</i>			
Bocourt's water snake	<i>Enhydrys bocourti</i>		*	
Keeled slug snake	<i>Pareas carinatus</i>			
White-spotted slug snake	<i>Pareas margaritophorus</i>			
Grey cat snake	<i>Boiga ocellata</i>			
Mangrove snake	<i>Boiga dendrophila</i>			
AMPHIBIANS				
Berdmore's chorus frog	<i>Microhyla berdmorei</i>			
Dark-sided chorus frog	<i>Microhyla heymonsi</i>			
Ornate chorus frog	<i>Microhyla ornata</i>			
Common puddle frog	<i>Occidozyga lima</i>			
Black-spined toad	<i>Bufo melanostictus</i>			
Green-backed frog	<i>Rana erithraea</i>			
Stripe-backed frog	<i>Rana macrodactyla</i>			
Mortensen's frog	<i>Rana martenseni</i>	DD		
Millet's frog	<i>Rana milleti</i>			
Smith's frog	<i>Rana faber</i>			
Frog	<i>Rana sp</i>		*	
Koh Chang frog	<i>Limnonectes kohchangae</i>	DD		
Horned frog	<i>Megophrys sf auraleensis</i>			
Common treefrog	<i>Polypedates leucomystax</i>			
Chantaburi warted treefrog	<i>Theloderma stellatum</i>		*	
Treefrog	<i>Philautus sp</i>		*	
Spiny-breasted frog	<i>Paa fasciculispina</i>	Vu		



Appendix 7: Detailed information of turtles and tortoises

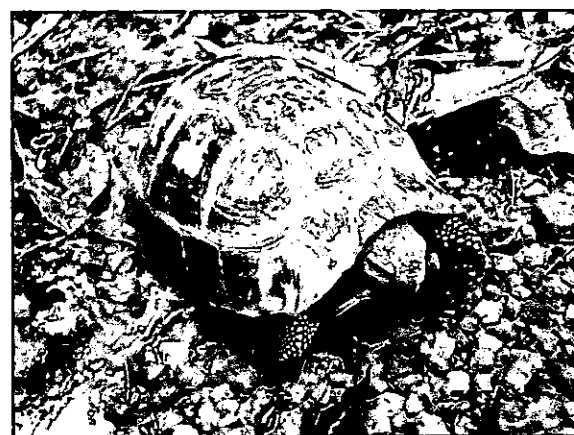
Khmer Name : Andoeuk Saom Nhi
Common Name : Giant Asian Pond Turtle
Scientific Name : *Heosemys grandis*
Synonyms : *Geoemyda grandis*
Vernacular Name : Andoeuk Sakal
Type : Turtle
IUCN Status : Vulnerable
Place found : Marshes in the Areng valley, Veal Veng
Habitat : Aquatic, streams and freshwater marshes at low to mid elevation.



Khmer Name : Andoeuk Ka-ek Kmao
Common Name : Black Marsh Turtle
Scientific Name : *Siebenrockiella crassicollis*
Vernacular Name : Andoeuk Ka-ek
Type : Hard Shell Turtle
IUCN Status : Vulnerable
Place found : Marshes in the Areng valley
Habitat : Aquatic. Slow moving or still bodies of freshwater at low elevations, such as ponds, canals, ditches, and swamps.



Khmer Name : Andoeuk Prich
Common Name : Elongated tortoise
Scientific Name : *Indotestudo elongata*
Vernacular Name : Andoeuk Prich
Type : Tortoise
IUCN Status : Endangered
Place found : Areng valley; hillside between Areng and Thma Bang; Veal II forest; Khnang Sral, Pramoy
Habitat : Terrestrial. Dry, open forest





A black and white photograph showing a large, light-colored, oval-shaped object, possibly a rock or a piece of debris, lying on a bed of dry grass and twigs. The object has a mottled, dark pattern on its surface. The surrounding vegetation is dense and dry, with many thin, brown stalks and leaves visible. The lighting is bright, creating high contrast between the light object and the dark, textured background.



Khmer Name : Kantheay Ah see
Common Name : Asiatic Softshell
Turtle
Scientific Name : *Amyda cartilaginea*
Vernacular Name : kantheay Ka-ek
Type : Soft shell turtle
IUCN Status : Vulnerable
Place Found : Stoeng Areng and
associated
backwaters; Stoeng
Tatai; Veal Veng
marshes
Habitat : Aquatic. Most
water bodies, from
marsh and estuaries
to montane streams.





Appendix 8: The Asian Turtle Crisis *Bulletin*

Volume 1

News from around the Region

Issue 1

September 2004

The Asian Turtle Crisis Bulletin includes a brief summary of activities involving turtle conservation and research in the region that have been reported over the previous month through the Asian Turtle Conservation Network (ATCN). This bulletin is produced periodically by the ATCN and distributed electronically to individuals with interest in the Asian turtle crisis.

Cambodia

Cardamom Mountain Conservation Project

A ten-day turtle survey in the Areng Valley by students from Phnom Penh National University (BP Conservation Award winners) and David Emmett of Conservation International turned up the first verified record for *Manouria impressa* in Cambodia, along with a first record for the Cardamom Mountains for *Siebenrockiella crassicollis*. The usual assortment of *Cyclemys*, *Indotestudo elongata*, and *Heosemys grandis* also surfaced during the field survey, which involved trapping in the Areng River and timed transect surveys in evergreen forest and marshland.

The *Manouria impressa* was recovered from a local village in the Areng Valley, and had reportedly been found by a dog during an excursion by villagers into the mountains. One of the *Siebenrockiella crassicollis* was found on land adjacent a river, and the second in a grassy marsh.

See full survey report:

<http://www.asianturtlenetwork.org/shared/documents/4tortoisearchmethodspdf.pdf>

Indonesia

Jakarta Market Survey: Surveys in Jakarta pet markets in August by Rodrigo Vazquez (Bongi) documented nearly 2,300 turtles of 44 species. Half of the turtles were Indonesian native species, while the other half comprised of exotics including rare tortoises from Madagascar. The market monitoring program was supported with funds provided by the Cikananga Wildlife Rescue Center in Java.



Laos

Phouthone Kingsada returned from a three week field training course with Conservation International's Cardamom Mountain Conservation Project in Cambodia. Phouthone is interested in working with *Manouria impressa* in Laos, and attended the Cardamom training in order to strengthen his field survey skills. The training was jointly supported by the WCS-Cleveland Zoo Asian Turtle Conservation program and Conservation International, Cambodia.

Myanmar

Yadanabon Zoo Receives Another Burmese Roofed Turtle

In late August, an adult male Burmese roofed turtle (*Kachuga trivittata*) was turned into the Yadanabon Zoo by Mandalay University researcher, Thin Thin Khaing. The turtle was caught by a local fisherman in the vicinity of Lay Pin Village on the upper Dokhtawady River. The Yadanabon Zoo now maintains a group of seven living examples of this critically endangered turtle. Plans are to initiate a captive breeding program for the species at the zoo, and Gerald Kuchling will arrive in late November to help plan for expansion of the holding and breeding facilities at the zoo with support provided by grants from the TCF and TSA.

Vietnam

***Rafetus swinhoei* Survey Reveals a New Probable Site**

A third round of surveys was carried out in September focused on wetlands and lakes in Thanh Hoa, Yen Bai, and Phu Tho Provinces as part of efforts to identify sites where *Rafetus swinhoei* may remain in the wild. Peter Pritchard and members of the Vietnam Turtle Conservation Program team that includes WCS research coordinator Tim McCormack and Bui Dang Phong of Cuc Phuong National Park, investigated several new sites in three provinces. The most promising find was a lake in Yen Bai where locals believe the turtles can still be found. The Vietnam *Rafetus* Project team will focus follow up surveys on the Yen Bai site and another probable site discovered in February 2004 in Thanh Hoa Province.

The surveys were jointly supported by the Melbourne Zoo and Chelonian Research Institute (CRI). The TCF has provided a follow-up grant that will enable a national field biologist to be trained and work at both sites to verify if wild populations of *Rafetus* remain at either location before conservation measures are put in place and focus on protection.

***Pyxidea mouhotii* Radio Telemetry Study Update, Cuc Phuong National Park**

Tim McCormack (WCS Vietnam Program Turtle Research Coordinator) and his field team presently have 12 *Pyxidea mouhotii* fitted with transmitters in the study area. All but two of



the turtles are of local origin. During September, one of the turtles was lost (leaving 12 in the study), possibly stolen by a tourist of the park.

The study has been underway since June of 2003 and is supported the Humane Society International and a Rufford Grant.

TCC Park Coordinator Attends Second Round of Training in the US

Bui Dang Phong of the Cuc Phuong Turtle Conservation Center (TCC) headed off for a second month-long training course in the US focused on captive management and veterinary care of turtles. Phong is training with WCS at the Bronx Zoo and at their St. Catherine's Island facility in Georgia.

New Basking Tanks at the TCC

Hatchling basking tanks were completed with support from WVF Japan. The basking tanks consist of four small concrete enclosures with locking screen covers for *Indotestudo elongata* and *Heosemys grandis* hatchlings. The tanks were recommended by WCS veterinarian Bonnie Raphael during a recent training visit in order to provide scheduled periods of natural light for some of the TCC's many hatchlings, that are otherwise raised in a research building.

TCC Breeding Success This Year Yields *Cuora galbinifrons*

With the hatching season nearly complete, in 2004 the TCC has successfully produced hatchlings of species at the center. Planned efforts focused on *Cuora galbinifrons*, *Mauremys annamensis*, *Sacalia quadriocellata*, *Pyxidea mouhotii*, and *Sacalia quadriocellata*. The hatching of nine *Cuora galbinifrons* was the most notable success for 2004. This species has traditionally been difficult to breed at the center. Thanks to support provided by the Dutch Tortoise Society and input provided by Henk Zwartepoorte of the Rotterdam Zoo on incubation technique, as well as a new in situ nest box designed by Tim McCormack, the TCC has had its most successful hatching year at the center.

Of noted interest were opportunistic hatchings of *Ocadia sinensis* and *Siebenrockiella crassicolis*, the first at the TCC for each of these species.

Figures for the year include:

Species	Hatchlings	Notes
<i>Cuora galbinifrons</i>	9	
<i>Sacalia quadriocellata</i>	1	Only one clutch of two eggs discovered this year
<i>Indotestudo elongata</i>	30	
<i>Pyxidea mouhotii</i>	2	Hatching pending
<i>Mauremys annamensis</i>	8	Hatching pending
<i>Cyclemys pulchriata</i>	17	Hatching pending



<i>Cuora amboinensis</i>	26	
<i>Heosemys grandis</i>	82	
<i>Ocadia sinensis</i>	11	
<i>Siebenrockiella crassicollis</i>	1	
<i>Total</i>		

Trade Seizures Reported

Nghe An Province, Vietnam: Police stopped a bus on its way to Vinh City carrying wildlife including 277kg of turtles, representing nine species. The police suspect that the turtles came across the border from Laos, though based upon the species composition, it is probable that the shipment originated further south. The turtles, were turned over to Nghe An provincial authorities, and are currently awaiting disposition.

Species composition

Cuora amboinensis 4.4kg

Cyclemys sp. 44kg

Heosemys grandis 24kg

Hieremys annandalii 97kg

Malayemys subtrijuga 21.6kg

Pyxidea mouhotii 4kg

Siebenrockiella crassicollis 21kg

Indotestudo elongata 38kg

Manouria impressa 15kg

Cuc Phuong Forest Rangers Bust Hunter with Turtles, Vietnam: Forest rangers arrested two hunters after they were discovered in the forest with a bag of 11 *Pyxidea mouhotii*. The turtles had been collected beneath fruiting trees over a period of two days. Two of the turtles were fitted with transmitters and released as part of the radio telemetry home range and ecology study underway at Cuc Phuong. Three other juveniles will be released in October, while the remaining six adults will be maintained as breeding stock by the Turtle Conservation Center, as these represent turtles of known origin.

Trade Seizure on Sulawesi, Indonesia: Twenty one Jakarta-bound *Leucocephalon yuwonoi* were reportedly confiscated from a trader in Sulawesi September 11. The turtles were turned over to the Tasikoki Wildlife Rescue Center in North Sulawesi.

The Asian Turtle Conservation Network



For reports and other news-worthy notes of interest, visit the ATCN website at
www.asianturtleconservation.org

Contact information:

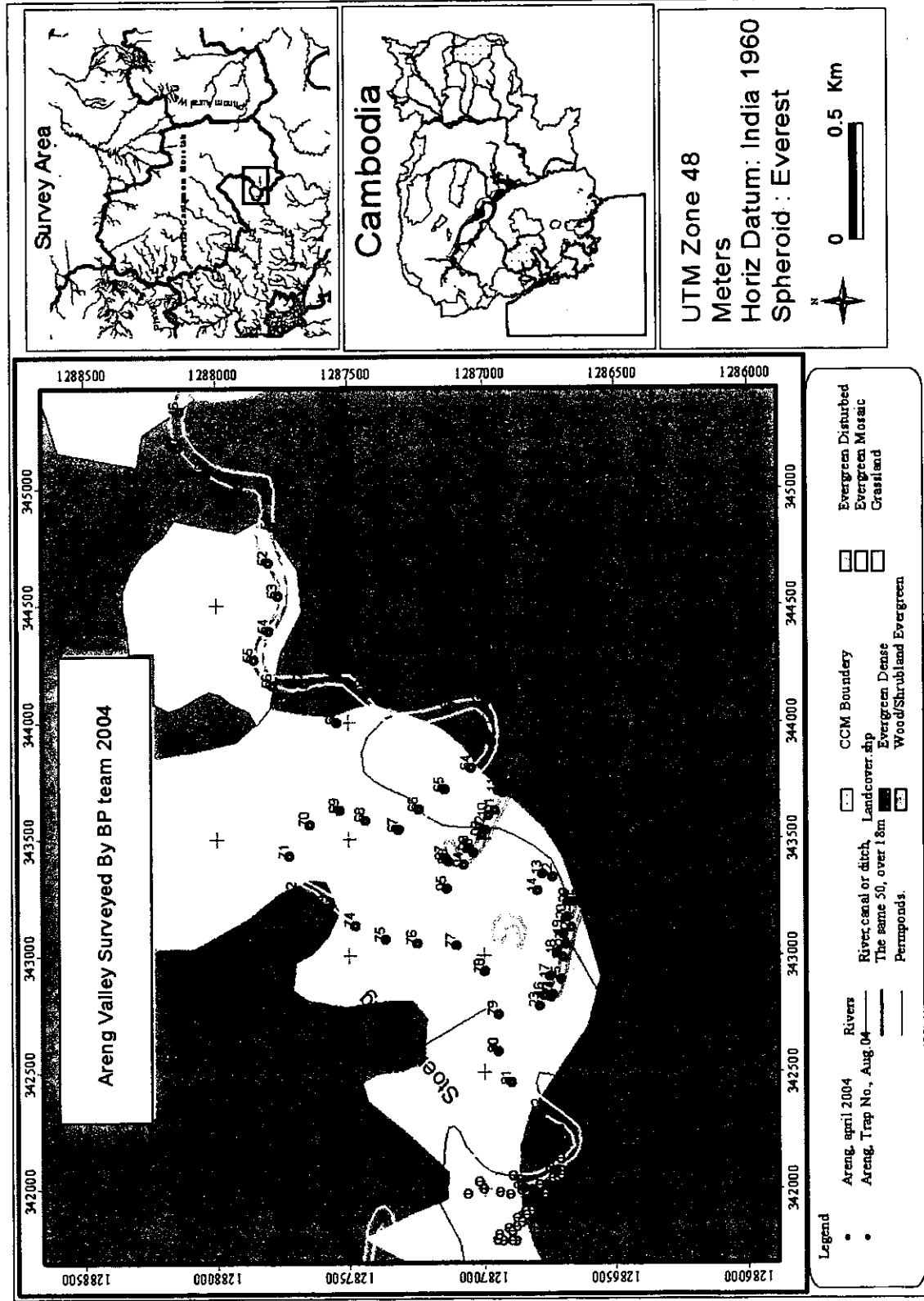
Asian Turtle Conservation Network

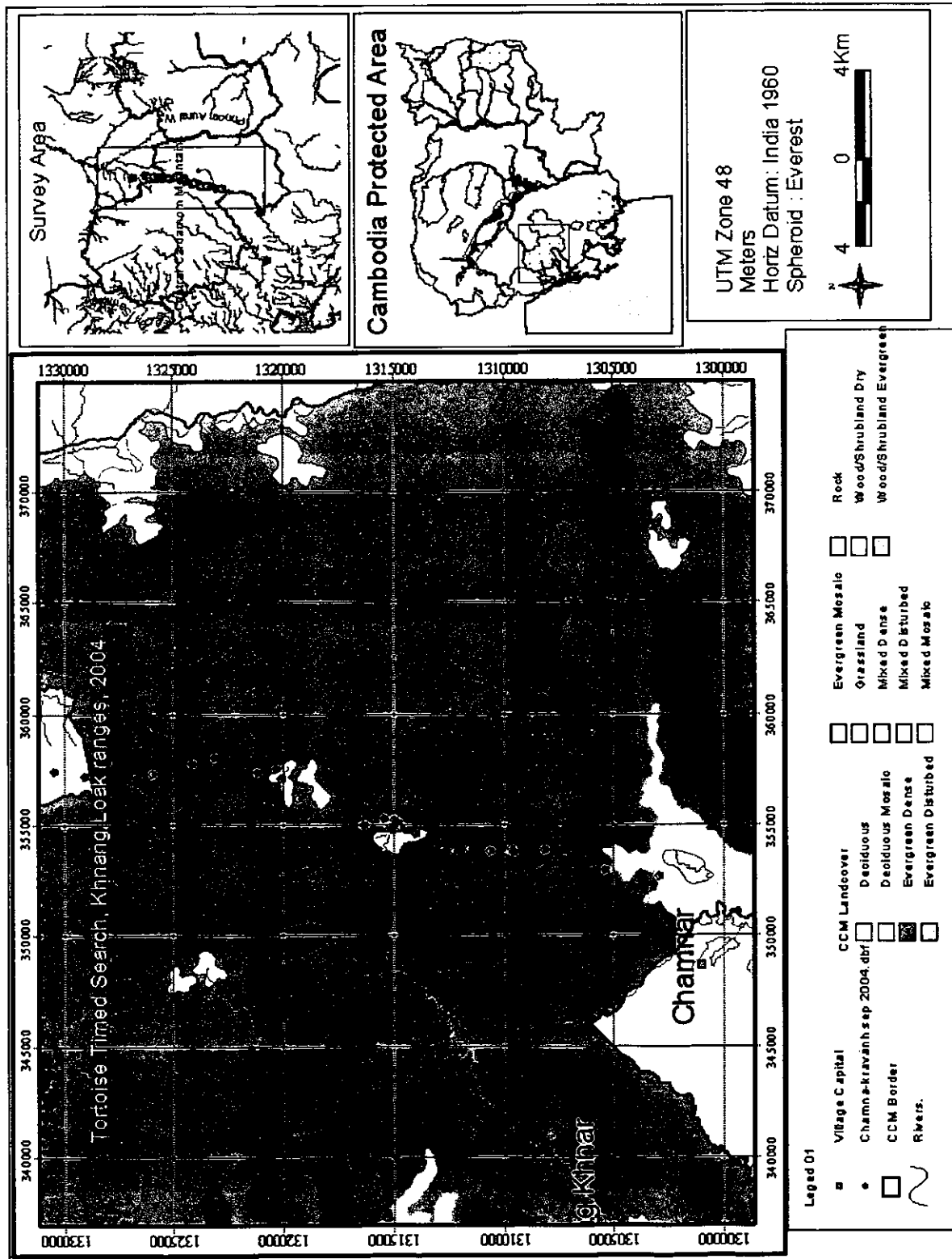
PO Box 222

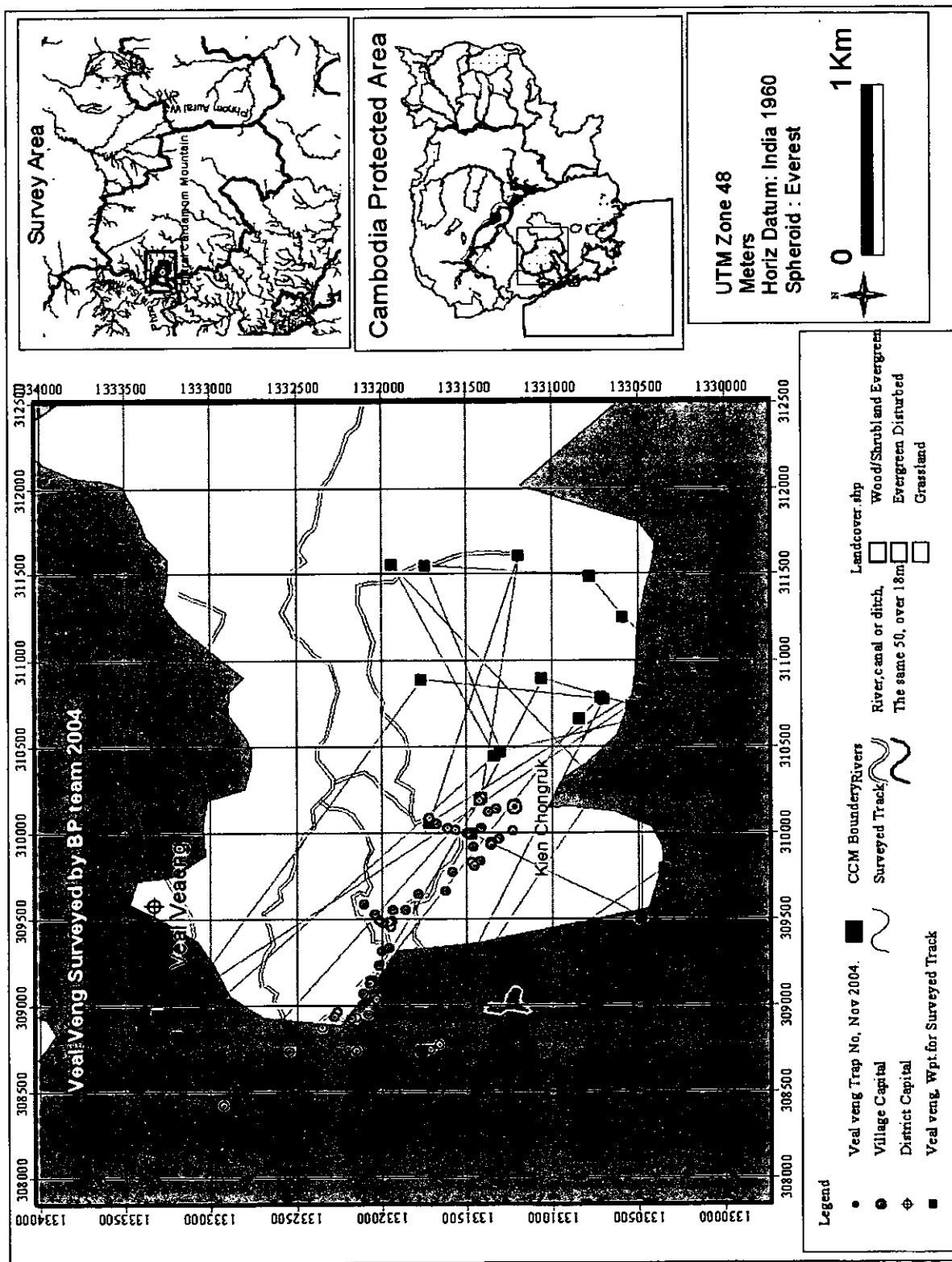
Hanoi, Vietnam

Appendix 9: Distribution maps

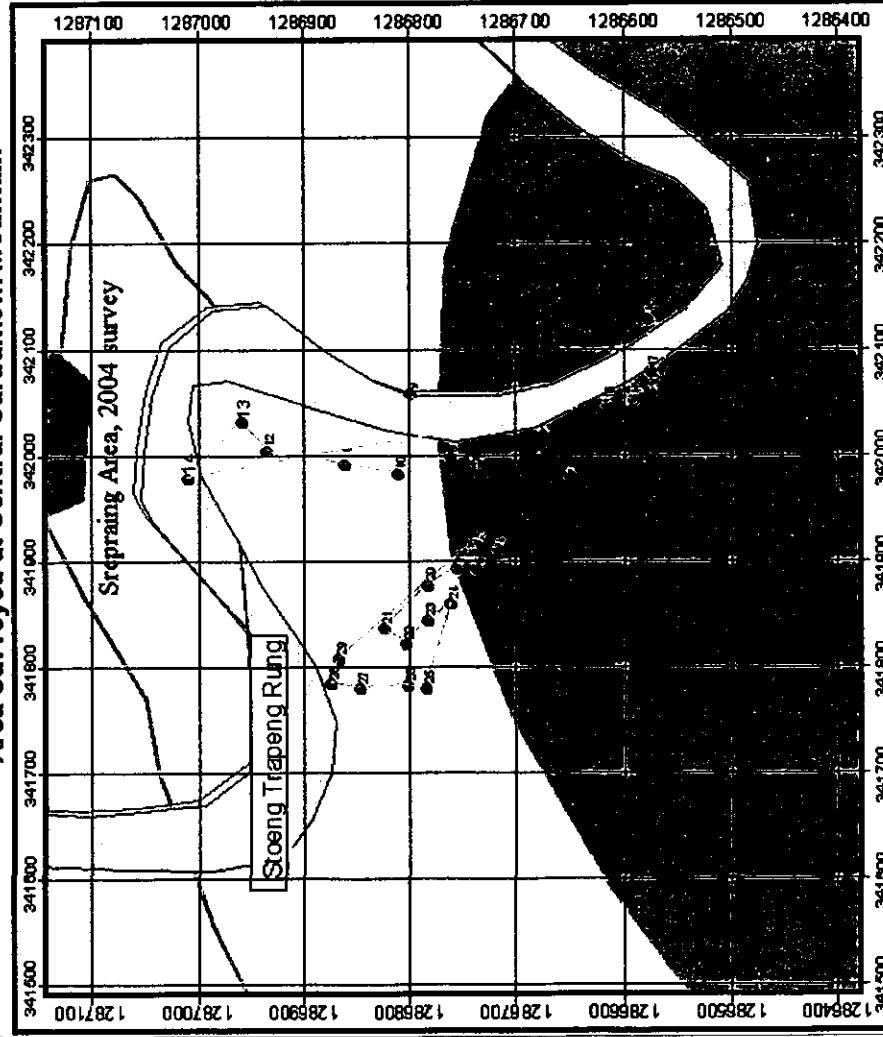
Survey areas







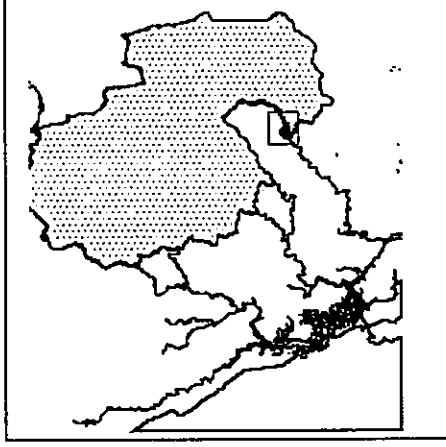
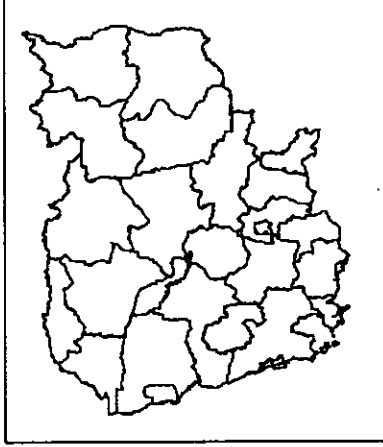
Area Surveyed at Central Cardamom Mountain



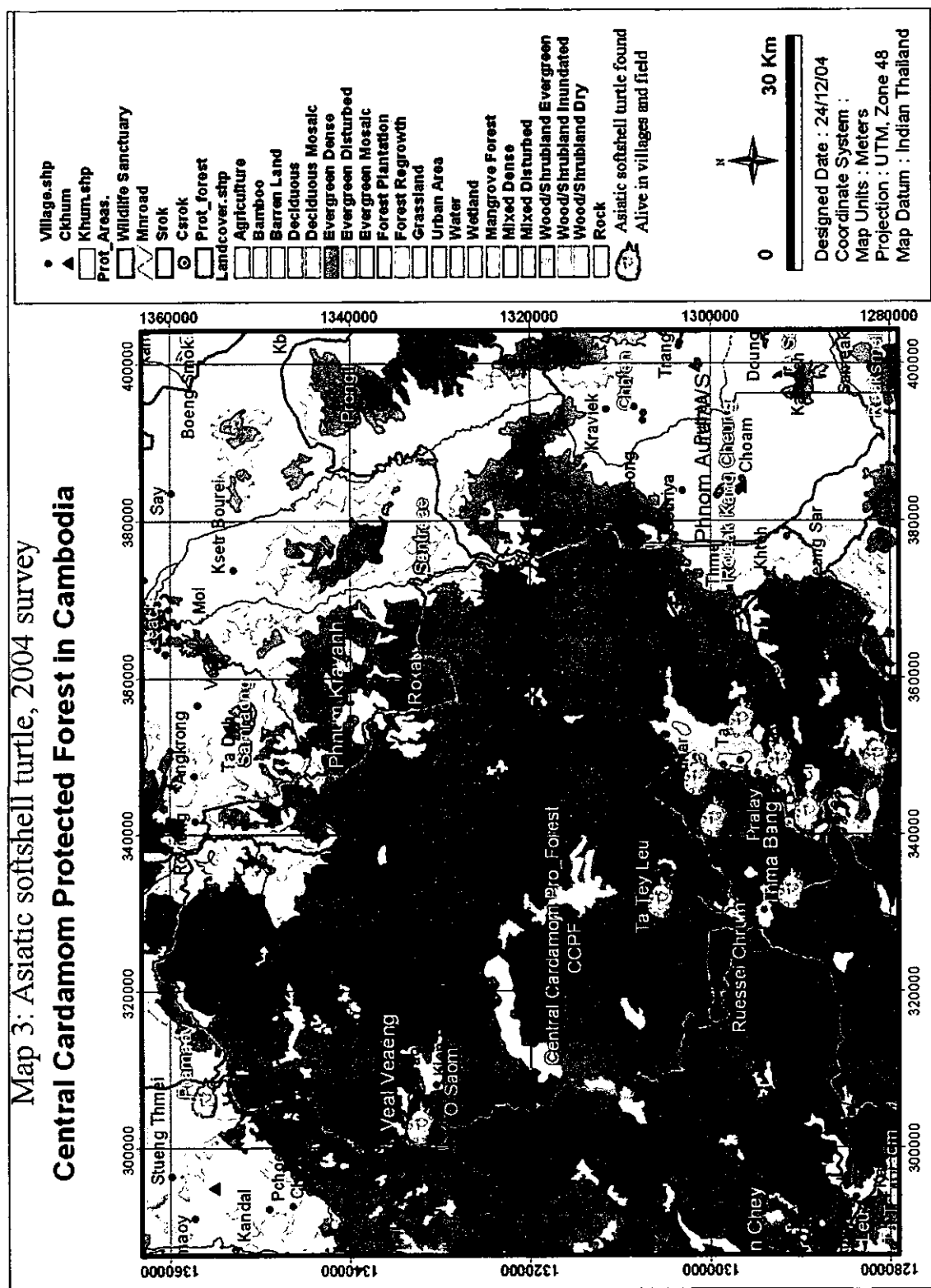
Legend

- Sirey Track
- Number of trap
- Stream
- Central Cardamom Mout.
- Forest Cover
- Evergreen Deciduous
- Woodland/Deciduous Evergreen
- Evergreen Monsoon
- Grassland

0.09 0 0.09 Km



Coordinate System
Project : UTM
Horizontal Datum: Indian 1960
UTM : Grid 7Km
Spheroid : Everest



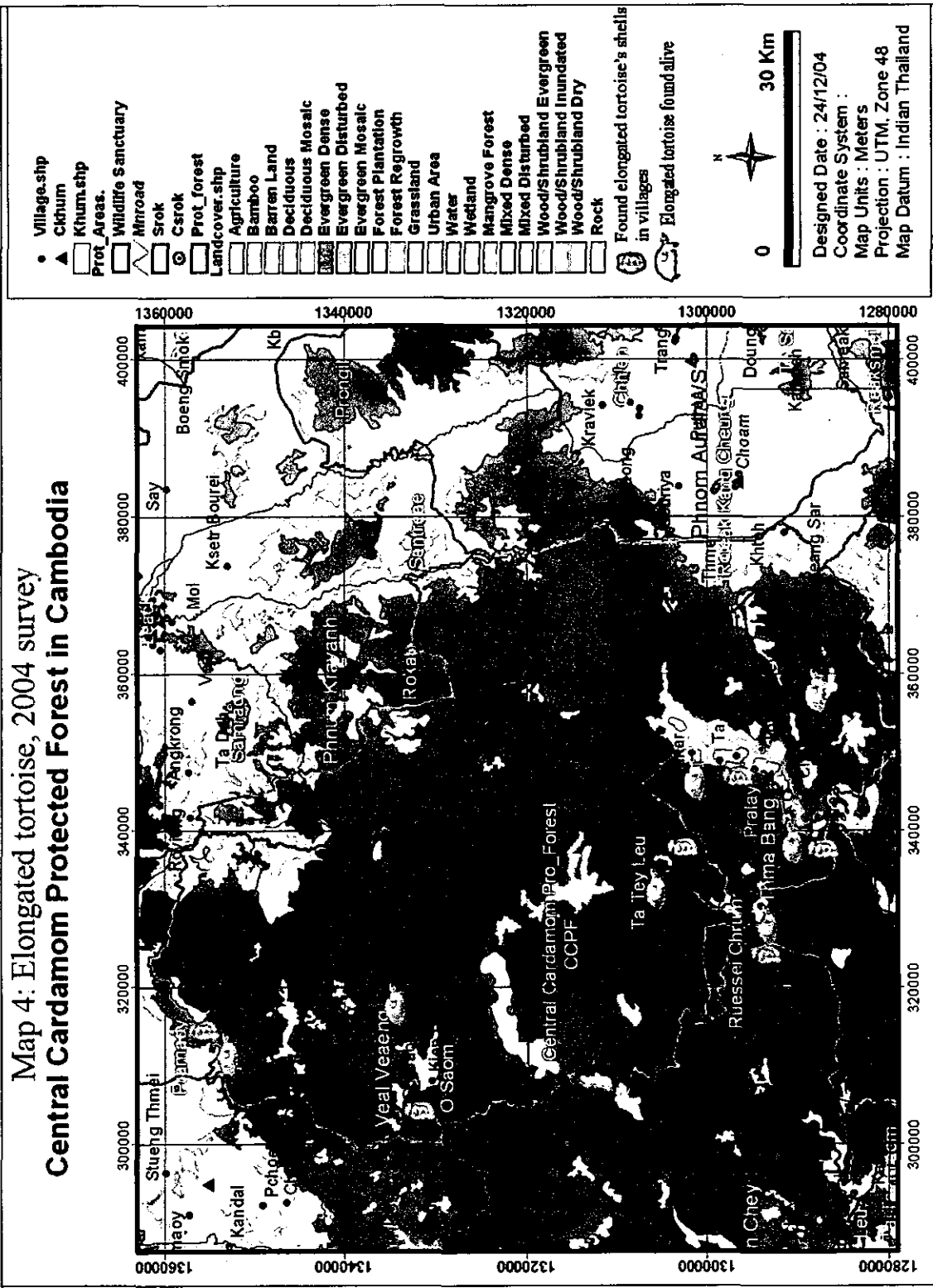
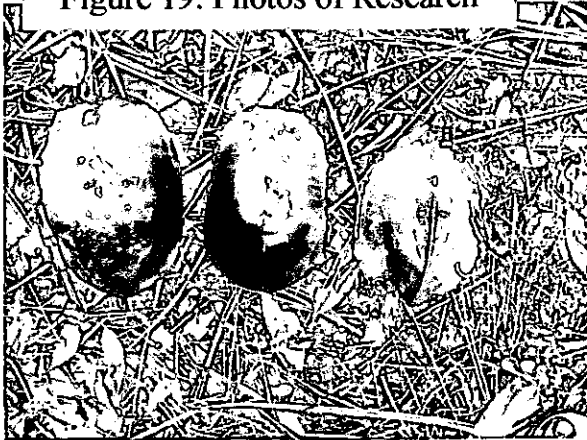
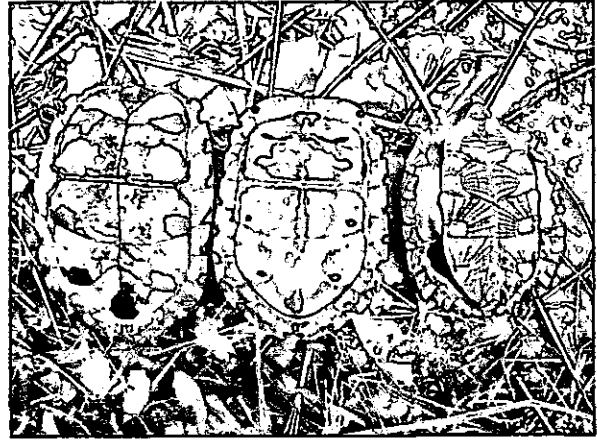


Figure 19: Photos of Research



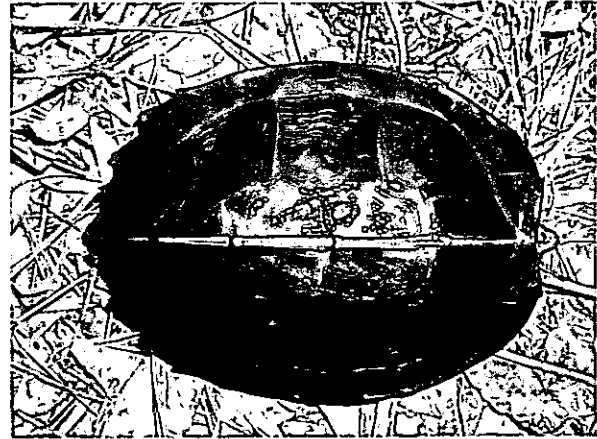
Two Asian box turtles and one Asian leaf turtle caught in trap at Srepraing, December 2004, photographs by Yoeun Sun



Two Asian box turtles and one Asian leaf turtle caught in trap at Srepraing, December 2004, photographs by Yoeun Sun



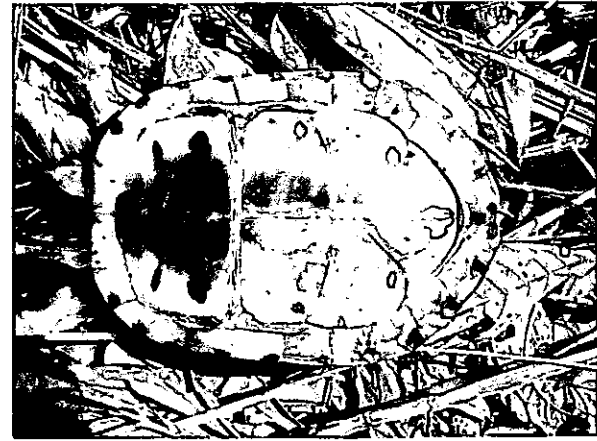
A young giant pond turtle caught in trap at Srepraing, December 2004, photographs by Koulang Chey



A young giant pond turtle caught in trap at Srepraing, December 2004, photographs by Koulang Chey



Asian box turtle caught in trap at Srepraing, December 2004, photographs by Koulang Chey



Male Asian box turtle caught in trap at Srepraing, December 2004, photographs by Koulang Chey



Black marsh turtle, *Siebenrockiella crassicollis*, found by dog at Areng Valley, August 2004, photographs by David Emmett



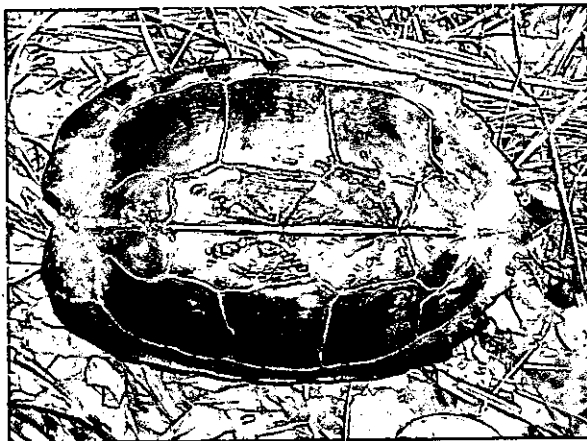
Black marsh turtle, *Siebenrockiella crassicollis*, found by dog at Areng Valley, August 2004, photographs by David Emmett



Impressed tortoise, *Manouria impressa*, caught by villager on the top Khnang Sral, August 2004, photographs by Sitha Som



Impressed tortoise, *Manouria impressa*, caught by villager on the top Khnang Sral, August 2004, photographs by Sitha Som



Adult Giant Asian pond turtle caught in trap at Srepraing, December 2004, photographs by Koulang Chey



Adult Giant Asian pond turtle caught in trap at Srepraing, December 2004, photographs by Koulang Chey



Asiatic softshell turtle caught by trap at Areng Valley, August 2004, photographs by David Emmett



Asiatic softshell turtle caught in trap at Veal Veng marsh, 2004. Photographs by Koulang Chey



Male and female Asian box turtles caught in traps at Srepraing, December 2004. Photographs by Yoeun Sun



BP team marking turtle at Areng Valley, August 2004. Photographs by David Emmett



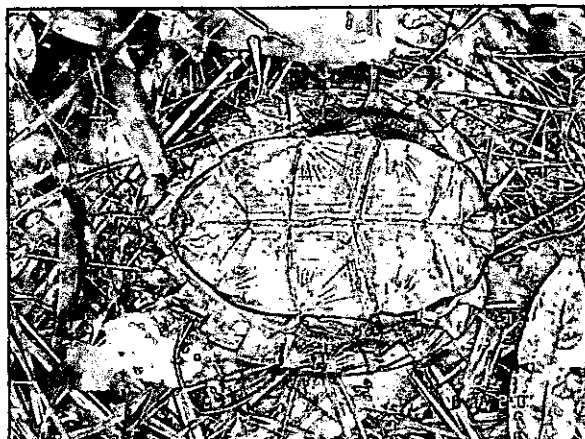
Asian box turtle caught in trap at Srepraing, December 2004. Photographs by Koulang Chey



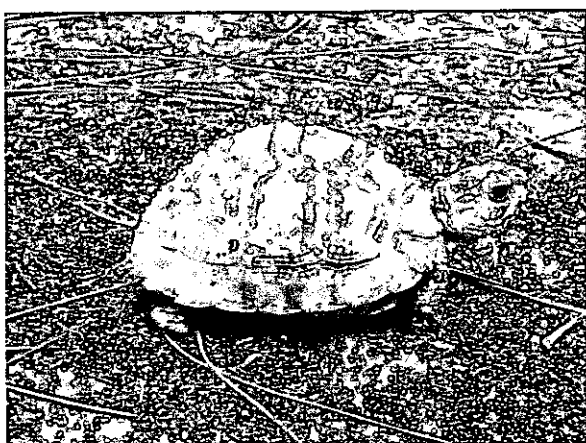
Asian box turtle found at the veal at Srepraing, December 2004. Photographs by Koulang Chey



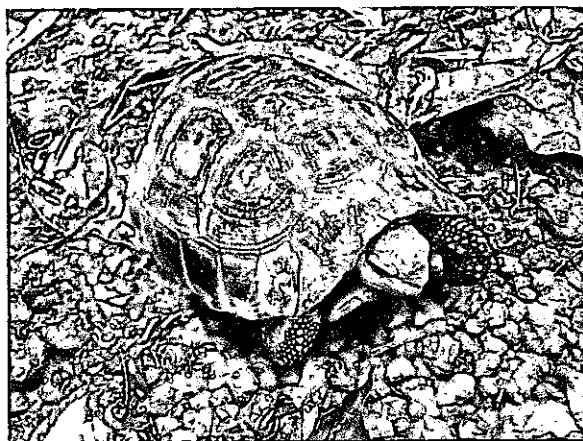
Asian leaf turtle caught in trap at Srepraing, December 2004. Photographs by Koulang Chey



Asian leaf turtle caught in trap at Srepraing, December 2004. Photographs by Koulang Chey



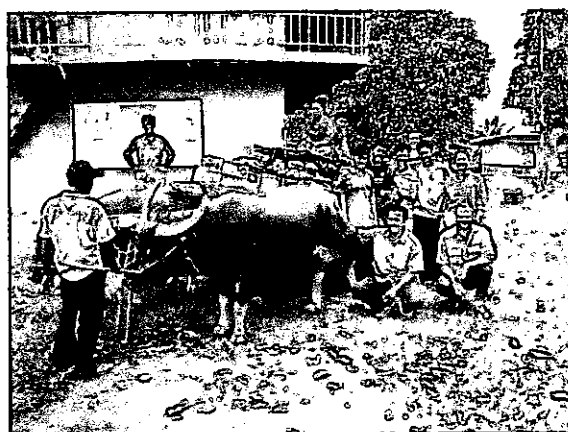
Young Elongated tortoise found at Veal Pi, March 2004. Photographs by David Emmett



Elongated tortoise found on the road Thmar Bang to Areng, April 2004. Photographs by Anthony Simms



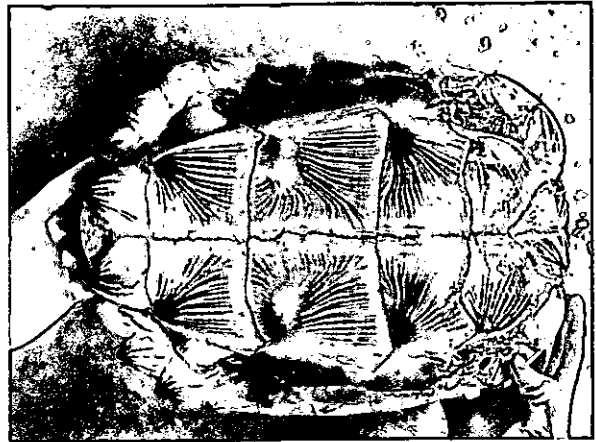
BP Team identifying the turtle species, Areng Valley, March 2004. Photographs by Annette Olsson



BP team, students, and CI staff with buffalo cart and equipment to field, Areng March 2004, Photographs by ranger.



Giant Asian pond turtle taken from the villager at Areng Valley, August 2004, photographs by David Emmett



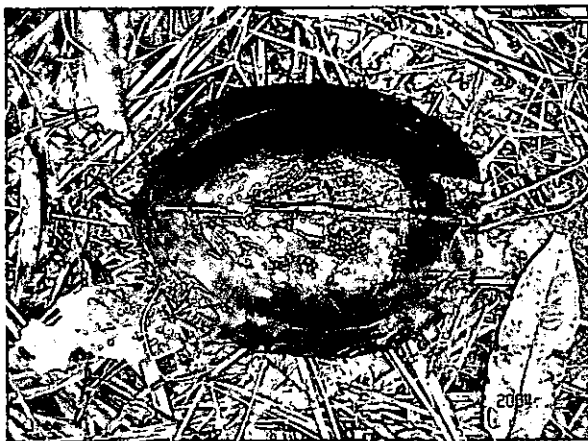
Giant Asian pond turtle taken from the villager at Areng Valley, August 2004, photographs by David Emmett



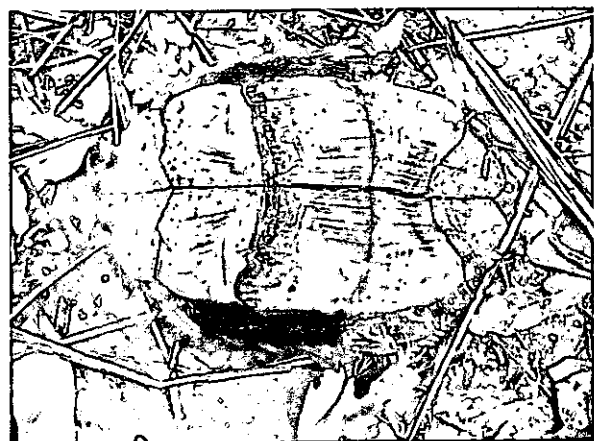
Releasing two Asian leaf turtles back at Srepraing, December 2004, photographs by Yoeun Sun



BP team measuring giant Asian pond turtle at Srepraing, December 2004, photographs by Sitha Som



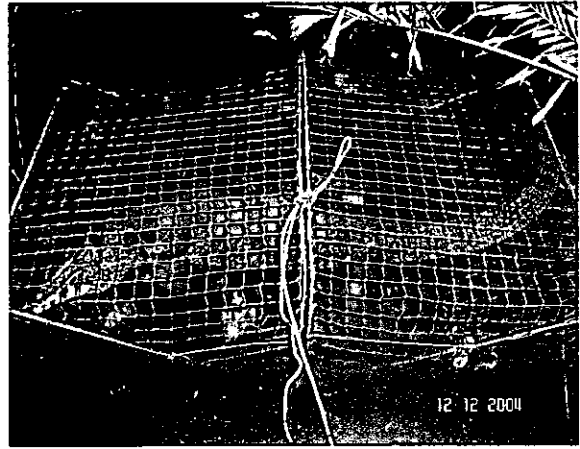
Asian leaf turtle caught in trap at Srepraing, December 2004, photographs by Sitha Som



Asian leaf turtle, full of eggs, caught by trap at Srepraing, December 2004, photographs by Sitha Som



BP team walking on the fallen tree across the stream at Veal Veng, November 2004. Photographs by David Emmett



Water monitor caught in trap at Srepraing, December 2004. Photographs by Yoeun Sun



BP team putting the trap at Srepraing, December 2004, Photographs by Koulang Chey



BP team carrying traps to put in Areng river, April 2004. Photographs by David Emmett



Turtle habitat, the place where we caught giant Asian pond turtle in the trap. Photographs by Yoeun Sun



River habitat at Veal Veng, November 2004. Photographs by Sitha Som



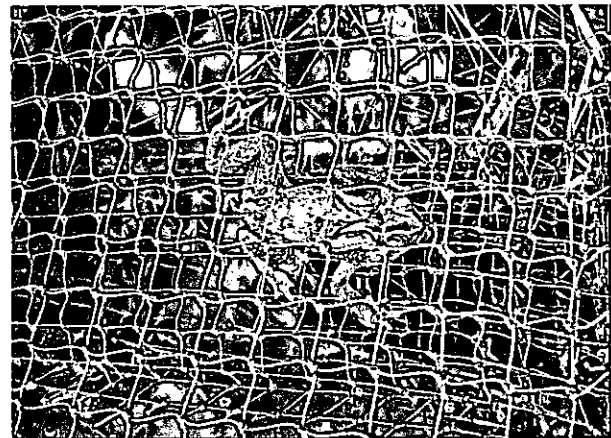
BP team caught giant Asian pond turtle in trap at Srepraing, December 2004. Photographs by Sitha Som



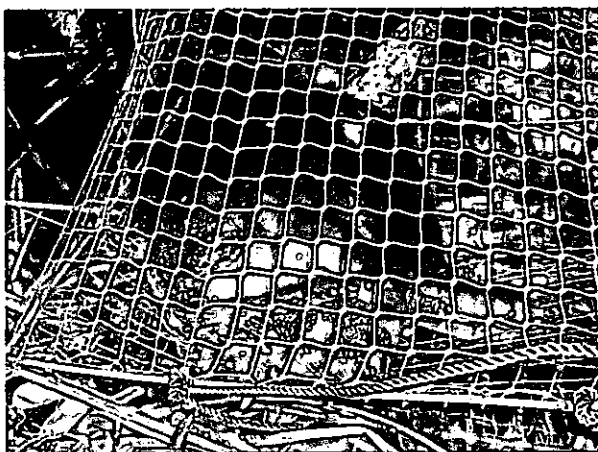
BP team carrying equipment and traps with local people to field, November 2004. Photographs by Yoeun Sun



BP team training activities about report writing, 2004, photographs by Annette Olsson



A toad entered the turtle trap at Srepraing, December 2004, photographs by Koulang Chey



Asiatic softshell turtle in the trap at Veal Veng, November 2004, photographs by Sitha Som



BP team on the motorbike up the mountane to Areng Valley, August 2004. Photographs by David Emmett