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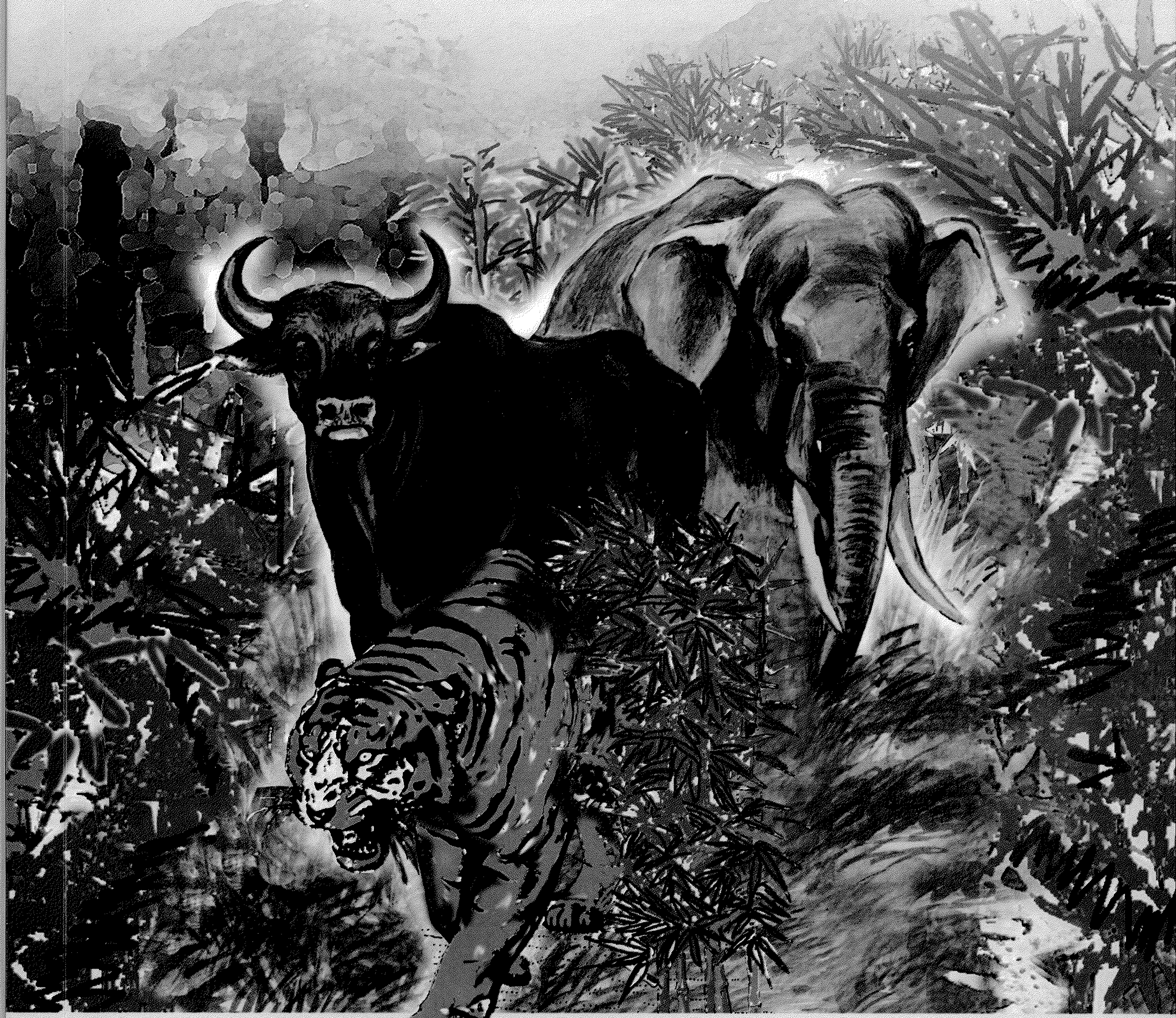

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Preliminary Studies

Frank Momberg and Hunter Weiler (eds.)

With contributions from:
Ramesh Boonratana, Marcus Hardke, Chheang Dany, Ken Serey Rotha, Roth Bunthouen, Uch Seiha, Som Sitha and Prum Sovanna

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Fauna & Flora International - Indochina Programme
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I. INTRODUCTION

Frank Momberg, Hunter Weiler, Marcus Hardke

BACKGROUND

This conservation status report of the Cardamom Mountains forms a part of FFI's Cambodia strategy for integrating effective wildlife conservation with post conflict recovery activities in ways which will benefit both wildlife and people.

One of the significant effects of the civil war in Cambodia was the devastation of forests and wildlife. In many areas anarchic logging practices resulted in massive habitat loss. People and wildlife were lost through guerrilla activities and the millions of land mines throughout the country. In the post-war quest for economic recovery, with increasing pressure for unsustainable resource extraction, the process of raising environmental concern and implementing protective policies has just begun.

Until last year most forest areas, with the exception of the Northeast, were inaccessible due to security risks. Only a few surveys have been conducted in the Northeast (Desai and Vuthy, 1996, Timmins and Soriyun, 1998). Since 1998 FFI has resumed fieldwork in Northeast and Southwest Cambodia in collaboration with the Cambodian Wildlife Protection Office. The recent significant improvement of the security situation due to cessation of violence and crack-down on anarchic logging practices, followed by the new forestry sector loan agreement between the World Bank and the Cambodian Government, has created a momentum and significant opportunities for reviewing the current protected area system and developing management systems for at least 10 protected areas nationwide (Chay Samith, pers. comm. 1999).

This report combines the results of several different efforts to present as complete a picture as possible of the current wildlife status in the Cardamom Mountains of southwestern Cambodia. This region has been off-limits for research for about 20 years, due to war and political instability. The only wildlife field survey previously conducted in the Cardamom Mountains and documented was an ornithological expedition in 1944. (Engelbach 1952) A recent review of all information pertinent to the status in Indochina of tiger, elephant, gaur and banteng from the period 1988-1997 had only very limited data for the Cardamom Mountains Region (Duckworth & Hedges 1998).

In 1998, CAT-Cat Action Treasury, through the Wildlife Protection Office, organized an interview survey of 150 hunters, covering the 13 provinces of Cambodia most likely to have intact large mammal populations. This survey included 31 hunters in Koh Kong and Pursat Provinces, which encompass much of the Cardamom Mountains Region. The results of this survey indicate that the Cardamom Mountains Region is the most important area in Cambodia from the perspective of biodiversity and large mammal populations. Tiger Conservation Workshops were conducted by CAT/WPO in March and April 1999 to present the results of the interview survey to province and district officials and obtain their ideas on conservation initiatives. At these workshops, officials agreed to permit and facilitate field access to the region. (Weiler et al. 1998)

In March 1999, FFI with support from ARA and CAT conducted a flight survey to determine the extent and impacts of logging activities to the forests of the Central Cardamom Mountains. The aerial survey confirmed that much of the heart of the Cardamom Mountains was free of roads and logging activity. Despite the on early onset of the rainy season and

generally poor road network, a decision was made to follow-up immediately with a biological field survey. It was decided to travel to the Port of Koh Kong by sea and then proceed as far as possible on the new logging road towards the Veal Veng District boundary. The FFI/WPO biological survey took place in April in the general area of the Koh Kong/Pursat Province boundaries.

Also in April, the UN and various NGOs conducted a Refugee Needs Assessment in the Veal Veng District of Pursat. FFI and representatives of the Ministry of Environment participated. The plan was planned to assess 21 villages. Access from Pursat PC to Veal Veng District was impossible, so the team travelled to Battambang Province and attempted to reach the villages of Veal Veng District from the northern boundary. However, this too proved impossible, and families from only four villages were interviewed.

In late May and early June, CAT/WPO conducted another hunter interview survey as a follow-up to the tiger Conservation Workshops. A total of 20 hunters in Koh Kong Province were interviewed from five districts.

This report is divided into three major sections, covering the Field Survey, the Interview Surveys and Workshops, and the Refugee Needs Assessment. Overall conclusions and recommendations for the protection of the forests of the Cardamom Mountains are then presented.

OVERVIEW OF THE CARDAMOM MOUNTAINS REGION

The Cardamom Mountains are part of the bioclimatic region of the coastal and mountain areas of the Southwest. The temperatures are generally high with little seasonal variation. Humidity is also high to very high, though a cold season exists at higher altitudes (>800 m) where the temperature of the coldest month is less than 20° C (e.g. Bokor). The Mountains of the Southwest consist of the Greater Cardamom Range (Mt. Samkos/*Phnum Samkos*, Central Cardamom Mts./*Phnum Kravanh*, Mt. Aural/*Phnum Aural*) and the Elephant Range (Kirirom & Bokor). {see Gubler, J 1935; Biscons-Ritay 1942; Martin 1997}[1].

The approximate northern boundary of the Cardamom Mountains Region is the northern boundaries of the Districts of Veal Veng and Kravanh in Pursat Province. North of this line the landscape transitions from sparsely populated highlands to densely populated lowlands in Battambang Province and eastern Pursat Province. On the northern steep slopes the forest cover gradually changes from evergreen forests on the upper slopes, semi-deciduous on the lower slopes to dry deciduous forest in the foothills and plains.

The western boundary of the region is the boundary along the west edge of the District of Veal Veng and the District of Mondul Sema in Koh Kong Province, which forms the Thailand/Cambodia border along the narrow sliver of Thailand between Cambodia and the sea that extends almost to Koh Kong PC. A paved highway runs the entire length of the Thai side of the border and ends at a international casino just inside Cambodia.

On the south, the region is bounded by lowlands and foothills in the northern portions of Koh Kong, Botum Sokor, and Sre Ambel Districts where they transition into the central Cardamom Mountains in Thmar Bang District.

[1] As the authors differ in whether to include Mt. Aural (Phnum Aural) in the Cardamom Mountain Range or not, this report refers to the Cardamom Mountains as the mountain range that include the 'Central Cardamom Mountain complex" (Phnum Kravanh) and the Mt. Samkos mountain complex, while the 'Greater Cardamom Mountain Range' includes Mt. Aural. The same confusion exist for the elephant range, some authors include the Kirirom plateau, some exclude it.

On the east, the central Cardamom Mountains are separated by a watershed from the related Phnum Aural, midway along the boundary between Pursat Province and Kampong Speau Province. Phnum Aural is the highest point in Cambodia, at 1771 meters. The Phnom Aural Wildlife Sanctuary, 2536 km^2 large, forms the eastern end of the Greater Cardamom Mountains Region.

The Cardamom Mountains consist of two quite distinct mountain complexes. The central Cardamom Mountains are orientated from northwest to southeast. The southwest side of the divide is a long gradual slope drained by long rivers that flow to the sea. The largest of these rivers, from northwest to southeast, are Stoeng Russei Chrum, Stoeng Kep, Stoeng Tatai, and Stoeng Chhay Areng. The northeast side of the divide is a short steep slope drained by short rivers that flow into the Pursat River and then into the great Tonle Sap Lake.

The Mount Samkos complex is in the shape of an inverted "L", beginning just north of Koh Kong PC and trending north through Mondul Sema and Veal Veng Districts before abruptly turning east along the Battambang Province border. The Stoeng Metoek flows north to south along the entire western edge of the complex, ending in a long estuary just north of Koh Kong PC. By contrast, all of the tributaries draining the mountain complex enter the Stoeng Metoek at right angles, flowing from east to west. The entire Stoeng Metoek drainage complex, beginning somewhat north of the estuary, is within the 3338 km^2 Mount Samkos Wildlife Sanctuary. Mount Samkos has an elevation of 1717 meters.

Between the Mount Samkos complex and the central Cardamom Mountains is an enormous basin complex, also in the shape of an inverted "L". The southern portion of the basin complex ends in the estuary of the Stung Russei Chrum (The River of Many Bamboo), and drains the southeast portion of the Mount Samkos complex and the northwest portion of the central Cardamom Mountains. The northern portion of the basin complex is separated from the southern by a narrow mid-elevation ridge that connects the extreme northern extension of the central Cardamom Mountains with the extreme eastern base of Mount Samkos. This is the only highland connection between the two mountain complexes, but does provide a basis for calling the entire highland area the Cardamom Mountains. The term Cardamom Mountains Region describes a broader area that includes the basin complex and also lowland and mid-level areas associated with the central Cardamom Mountains. North of the dividing ridge, the basin is drained by the Pursat River, which gathers tributaries from the eastern and northern portions of the Mount Samkos complex, and the northeast slope of the Central Cardamom Mountains. The Cardamom Mountains have the highest rainfall in Cambodia, and thus is a critical watershed for both the Gulf of Thailand and the Tonle Sap Lake. (see map 1)

The vegetation of the Cardamom Mountains consists of lowland evergreen forest, medium altitude evergreen forest, semi-deciduous forest, dry deciduous forest, lowland and medium altitude forests on limestone, pine forests, and montane grasslands. Especially species rich and probably the most diverse formation in Cambodia are the evergreen forests of the southern foothills and lower slopes. These forests are most threatened by logging and agricultural conversion. The medium altitude evergreen forests are likely to have many endemic plant species and likely to feature an unusual compliment of bird and other animal species. (Ashwell 1997).

The altitudinal gradient of 300-1700 meters and the outstanding variation of habitats as well as occurrence of highly endangered species such as Elephant, tiger, gaur, banteng, possibly rhino and Khiting Vor as documented in this report may qualify the Cardamom Mountain Region as World Heritage Site.

THREATS TO THE BIOINTEGRITY OF THE CARDAMOM MOUNTAIN

The new logging road that will complete the connection between Koh Kong and Pursat PCs next year passes through both portions of the basin complex. The approximately 21 villages in the newly created Veal Veng District are almost entirely in the northern basin. Ou Soam is the only known village in the southern basin portion of Veal Veng District. Ou Soam was the northernmost point reached by the Field Survey Team, and is the approximate current endpoint of the new road. As reference, Ou Soam is located just north of the intersections of the boundaries of Thmar Bang, Mondul Sema, and Veal Veng Districts, and therefore somewhat north of the center of the Cardamom Mountains Region.

Until the very recent past, the vast mountainous hinterland between Koh Kong PC and Pursat PC was a virtually inaccessible wilderness, entered by only hunters and forest product collectors. The orientation of Koh Kong PC was to the sea and its products, and then later up the new highway along the edge of the mountains to Thailand. The orientation of Pursat PC was to the lowland irrigated rice complexes, the Tonle Sap fisheries, and the highway Thailand/ Phnom Penh highway. There was a complex of small isolated villages in the northern basin in Pursat Province, and a few shifting cultivation villages in the Stoeng Russei Chrum valley and other isolated areas. During the war years, the region became a major refuge area for the Khmer Rouge. The Khmer Rouge lived in the Veal Veng district close to the Thai border from 1979 to 1984. Some of the most savage fighting of the war took place in this area. Hundreds of people died and many villages were abandoned during this period.

As the war came to an end, logging operations began to penetrate the wilderness. New roads were constructed. Most of the logging was anarchic resulting in a suspension in 1999. The Khmer rouge agreed to come over to the Royal Government. A new Veal Veng District was created from the western half of the old Kravanh District. Hundreds of refugees returned to Veal Veng in 1998 and 1999 from refugee camps in Battambang Province and Thailand.

Hunting and illegal wildlife trade also accelerated after the war with hunters and traders from Pursat, Koh Kong and Thailand penetrating the area to hunt endangered species such as tigers, Elephants, Bears, gaur and banteng. Large quantities of monitor lizards, turtles, deer, and wild boar are extracted from the Central Cardamom Mountains. Increased collection of Kresna wood (Aquilaria spp.) led to a fast decline of this species. NTFP collection is also accompanied by opportunistic hunting.

The Cardamoms Mountain Region is still one of the largest and most varied undeveloped natural regions in Southeast Asia. However, it is poised for rapid and substantial changes. A

Samkos Wildlife Sanctuary.) Other high-priority rivers for hydroelectric dams are the Stoeng Russei Chrum and the Stoeng Chhay Areng. However, from an environmental and economic perspective, the first priority for a hydroelectric project in southwestern Cambodia is located in the Elephant Mountains of Kampot Province (Personal communication, Clive Hughes, Policy Advisor, Ministry of Industry, Mines and Energy.)

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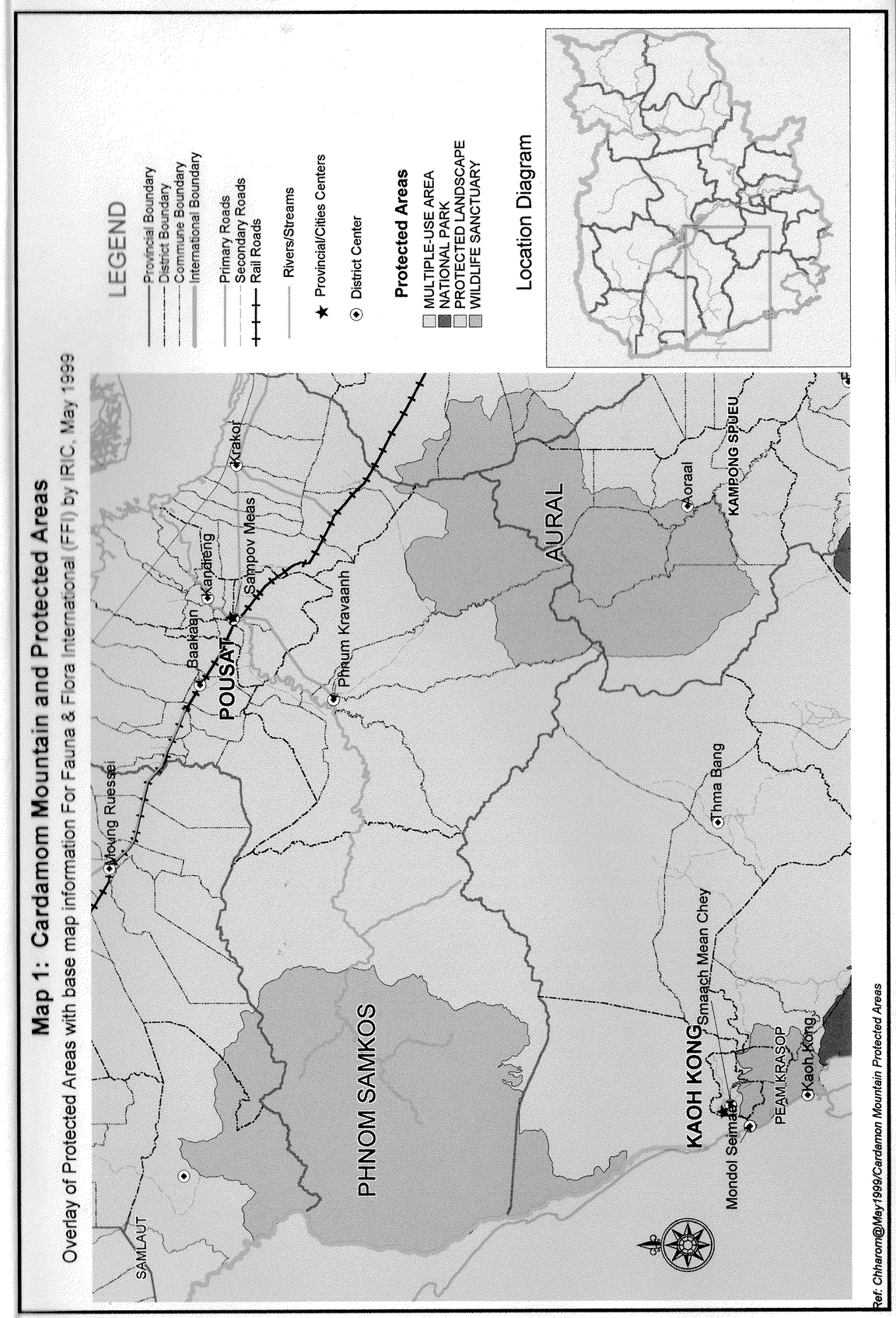
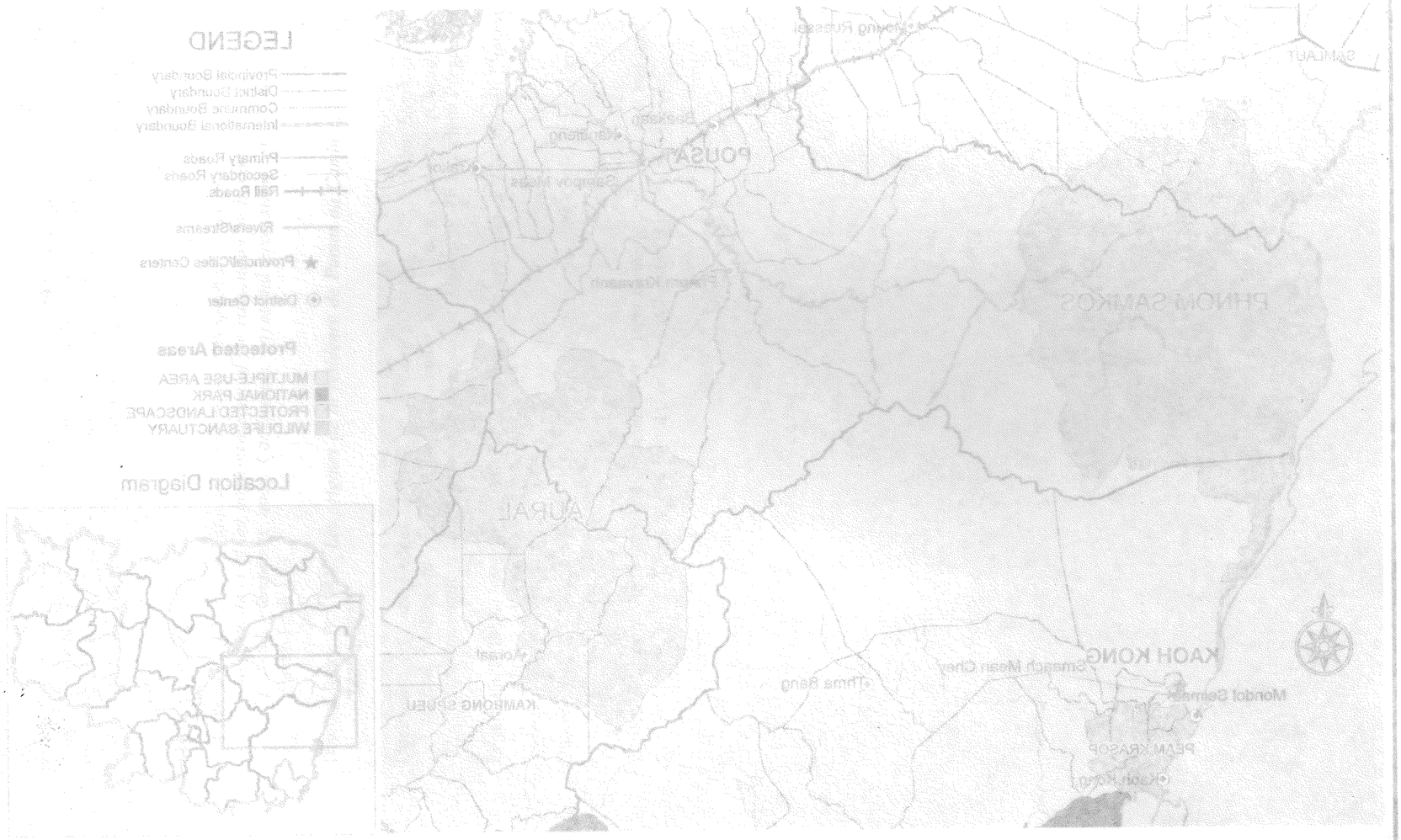


Map 1: Cardamom Mountain and Protected Areas

Overlay of Protected Areas with base map information For Fauna & Flora International (FFI) by IRIC, May 1999



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II. A preliminary wildlife survey in the Cardamom Mountains region of Southwestern Cambodia

Ramesh Boonratana PhD.
with contributions of Chheang Dany, Som Sitha and Prum Sovanna

1. INTRODUCTION

1.1 Background

From a biological perspective, almost nothing is known about the Kravanh[2] Range in south-western Cambodia (figure 1). Alhough some information was recently made available through hunter interviews (Weiler *et al.*, 1998; Nowell *et al.*, 1999), no wildlife surveys have ever been conducted in this region, primarily because of security reasons. The area has been off-limits to foreigners for almost 20 years, being a former Khmer Rouge stronghold. Species inventory is, however, an important prerequisite for wildlife and habitat management, as well as helping to determine the full value of a forested area. Furthermore, such information is needed to assist in the planning of a nationwide biodiversity conservation strategy and programme. This report describes the first survey of its kind for the Kravanh Range, and aims to contribute to meeting these needs.

The Kravanh Range is located in northern Koh Kong and western Pursat Provinces, and, together with the adjoining forested areas, covers approximately 880,000 ha (David Ashwell and Frank Momberg, pers. comm..). Contiguous to this are the 333,750 ha Phnum[3] Samkos and the 253,750 ha Phnum Aoral Wildlife Sanctuaries, which form the 'Greater Kravanh'. Thus, together they comprise the largest block of intact forest in the country. Video footage from an aerial survey conducted in April 1999, shows extensive forest cover. Furthermore, the Kravanh and Dom Rei[4] Ranges and their associated mountains form the most extensive mountainous area in Cambodia, with elevation generally exceeding 1,000 m amsl[5] (Weiler & Ashwell, in prep.).

Parts of the area, including Phnum Aoral Wildlife Sanctuary have been subjected to logging. Yet a large part of the northern Koh Kong and western Pursat Provinces, including the Phnum Samkos Wildlife Sanctuary, remain densely forested (Weiler *et al.*, 1998). Logging in the area would appear to have been selective (pers. obs.). Current logging practice in Cambodia usually comprises felling of large-sized and high-grade trees during the first logging season, followed by lesser-sized and lower-grade trees in the following seasons (Chheang Dany, pers. comm.). However, more extensive logging of the larger diameter emergent species (e.g. *Dipterocarpus* sp.) has had a heavy impact on these species, with almost no mature trees left standing over large areas (David Ashwell, pers. comm.). The entire Cardamom range (except the Phnum Samkos and Phnum Aoral Wildlife Sanctuaries) is under logging concession (Frank Momerg, pers. comm.), however logging activity in the area has currently ceased following a decree issued by Prime Minister Hun Sen in January 1999, which called for a nationwide halt until a complete review of logging policies and concessions has been undertaken. (Hunter Weiler, pers. comm.). This decree also included a ban in wildlife hunting and trade. Additionally, road construction in the area ceased in April 1999 due to unfavourable weather. A list of current logging concessionaires for Cambodia is given in appendix I.

2 Kravanh = Cardamom.

3 Phnum = Mountain.

4 Dom Rei = Elephant

5 amsl = above mean sea level

1.2 Fauna

Large mammals that are reportedly present include the Asian elephant (*Elephas maximus*), gaur (*Bos gaurus*), banteng (*Bos javanicus*), khting vor[6] (*Pseudonovibos spiralis*), tiger (*Panthera tigris*), and leopard (*Panthera pardus*) (Weiler *et al.*, 1998; Weiler & Soriyun, 1999; Nowell et al., 1999).

1.3. Habitat Types

Vegetation is mainly represented by lowland, medium altitude and montane evergreen forest (Ashwell, 1997), and is apparently the densest in the country (Weiler *et al.*, 1998). Although no floristic inventory was carried out during this survey, cursory observations suggest a significant degree of local variation in the vegetation. Stands of mixed deciduous forest, clumps of bamboo forest (which appeared to be natural in origin), and open rocky/grassy meadows form a mosaic of habitat types (pers. obs.), possibly by virtue of its physiography (see section 1.4). Among the legumes, *Parkia* sp. seem to be common and widespread. Phenological observations showed a leaf flush at the start of this survey, possibly a result of the continuous rains that the area had been experiencing for several weeks prior the survey. About halfway through the work, it was estimated that 20-30% of the trees were flowering. By the time the participants left the area (13 May), approximately 40% of the trees were flowering, and approximately 30% were fruiting (pers. obs.).

A botanical team lead by Ashwell conducted a five-day floristic assessment around the same base camp, after the wildlife survey team departed from the area. They observed that strictly riparian formations were located in close proximity to the larger rivers. Wet forest, with varying amounts of bamboo in an otherwise woody understorey were observed adjacent to the riparian areas and in other wet gullies, which might be quite extensive where low-lying areas are large. On sloping areas it gives way to a more diverse lowland forest formation which extends over much of colluvial slopes. The canopy of this formation is 25-30 metres high, being generally dense except along roads and tracks where recent logging was obvious. Where there is an abrupt break in the slope, usually at the base of mesa-like hills, this lowland formation rapidly gives way to a vine-bamboo mixture with isolated trees. This disposition appears to reflect heavy moisture originating from the base of the cliffs or steep slopes of the mesas. This pattern is believed to be quite old rather than reflecting recent logging, although the role of older disturbance cannot be discounted (David Ashwell, pers. comm.).

1.4 Landform and Drainage

Landform is generally undulating in the lowlands, followed by gradual to steep rises towards the mountains in the interior. Although the mountain ranges are generally orientated from northeast to southwest, there appears to be a lack uniformity in the landform. Geologically, the area comprises largely of uplifted Mesozoic sandstone, and to a limited extent, feature significant areas of volcanic rocks, with the soils being mainly acid lithosols, planosols, and coastal complex (Ashwell, 1997). Recent observations (David Ashwell, pers. comm.) showed that the area generally comprised heavily eroded sandstone sediments, with the original sediments represented as mesa-like formations of 600-700 m amsl. These tended to be associated with major ridges descending from the main range of the Kravanh Range. The V-shaped valley floors are generally at 400-500 m amsl, so local relief is in the vicinity of 200 m, having no floodplain. The main waterways are fast-flowing and perennial, with the drainage generally running from northeast to southwest.

1.5 Climate

Climatically, the site is classified as falling within the coastal and mountain area of the south-west, which is one of the three major bioclimatic regions recognised for Cambodia (Fontanel,

6 khting vor is also known as the spiral-horned ox. Currently, however, the name khting vor has taken precedence, hence will be used in this report.

1972). The main feature of this region is high temperature with little seasonal variation. Humidity and rainfall range from high to very high, with annual rains often exceeding 3,000 mm (Ashwell, 1997), the largest in Cambodia (Weiler *et al.*, 1998). The wet season generally runs from June to September and the dry season from December to March, with lighter "Mango" rains[7] between March and June. This year, however, saw heavy rains from April.

1.6 Human Settlements

There is one commune within the area surveyed, O'Soum (figure 2), with a population of 982 individuals from 192 households. The O'Soum Commune comprises four contiguous villages located on the northern bank of Stoeng[8] O'Soum. These villages are Phum[9] Chai Look, Phum Ken Dal, Phum Veal Veng and Phum O'Soum. Villagers take three full days to hike to Koh Kong PC[10], and four full days to return. The inhabitants practice shifting cultivation, with a rotation every 2 to 3 years, and grow mainly rice, which is cultivated only once a year. Other crops grown include jackfruit, tapioca and banana. The villagers reported that they were stripped of their possessions during the Pol Pot regime, and were forced to move elsewhere but returned after the Pol Pot regime. They also reported severe rice shortages. When asked what they believed was needed to overcome the problem, the village elders unanimously answered 'buffaloes', for tilling their lands. Currently, only ten households have buffaloes. Buffaloes cost between USD140-170 per animal, a price beyond the means of most inhabitants. Although lacking in buffaloes, the residents are not lacking in firearms. Every adult individual observed going to the fields in the morning was armed with an AK-47 assault rifle. There is another settlement, Phum Russei Chrum, reportedly comprising 30 households and located by the Stoeng Russei Chrum. The exact location is, however, uncertain but is possibly in the valley between Phnum Bang Kohr and Phnum Kimseng-Phnum Chamkar Kaoh (figure 2).

1.7 Access

The area is accessible both from Koh Kong PC in the south and Veal Veng District of Pursat Province in the north by a recently completed logging road that runs north-south through the area. The road also passes through the O'Soum commune of Veal Veng District (figure 2). Construction work on this road began in 1996, and reached the O'Soum Commune from the South in February 1999. Several settlements and clearings (for subsistence cultivation) were observed along the initial part of the road, close to Koh Kong PC. There were no other settlements observed along the road until O'Soum Commune. Access is currently limited to off-road vehicles during the dry season. It was estimated that it would take seven to eight days, with overnight stays *en route*, to hike the whole length of the logging road.

1.8 Objectives

- To conduct a preliminary general wildlife survey with emphasis on large mammals in the Kravanh Range and the surrounding forested areas;
- To provide practical training of three WPO[11] personnel in general wildlife survey techniques.

2. METHODS

2.1 Initial Preparation and Personnel

Whilst awaiting the permission from the Koh Kong Governor to conduct the survey, a one-day reconnaissance trip by four-wheel drive vehicle was carried out on the logging road to

7 A period of lighter rains that often occur in the region prior to the rainy season and coincide with the ripening of the mango fruit.

8 Stoeng = River

9 Phum = Village

10 PC=Provincial Capital

11 WPO = Wildlife Protection Office, Department of Forestry, Ministry of Agriculture, Forestry and Fisheries.

assess conditions. Considering the unfavourable state of the road (due to incessant rains), it was decided to hire a logging truck to transport participants, equipment and supplies as far up the road as possible.

Altogether, there were 14 participants (appendix II) with the first six forming the nucleus. The large number of people was unavoidable, due to security reasons. It was necessary to employ five armed security guards to ensure the core participants' safety, and to point out areas where anti-personnel mines were known to be buried. Also, retaining the logging truck in case there was a need for an emergency evacuation, meant that there were two additional participants, the driver and his assistant.

2.2 Surveys

General wildlife surveys with emphasis on large mammals were carried out from one base camp and three sub-camps (figure 2). The base camp was established at an abandoned logging camp by the Stoeng Sala Munthun (11°45'53.4"N/103°16'15.1"E). The sub-camps were located at the Stoeng Kon Chor (11° 49'58.3"N/103°14'28.7"E), by the Stoeng Russei Chrum (11° 55' 49"N/103° 13' 55"E), and at the O'Soum Village (12° 04' 34.9"N/103° 15' 33.2"E).

Animal presence was recorded based on sightings and/or other evidence (vocalisations, scats, tracks, etc.). No trapping was carried out. It is relatively difficult to sight wildlife in dense tropical forests, hence emphasis was laid on gathering information through indirect evidence. Scats and tracks were sketched, described, measured and aged. Scats were also given a cursory analysis to record their contents, which might provide information on the animal's feeding ecology and behaviour. Furthermore, the presence of prey species was occasionally determined from analysis of carnivore scats. The presence of all species and/or the evidence of their presence was noted on data recording sheets (appendix III). Basic information included date, time, species, evidence, and location. Additional information on wildlife presence was opportunistically gathered through interviews with villagers, NTFP[12] collectors and the Yourysaco logging company security guards.

Abandoned or active campsites encountered were investigated for any remains of wildlife consumed. Specimens such as skulls, horns and plaster casts of tracks were also collected as future reference material. Such items also serve as important museum pieces and conservation education/awareness materials. Besides recording information on wildlife, observations on human activities and impacts in the forested areas were also made, and similarly recorded onto data sheets[13] (appendix IV). Locations of important sightings were determined through 1:50,000 maps and compass, and where feasible, a GPS[14] unit (Garmin 12XL) was used.

Surveys were primarily carried out on foot, during the day. This involved the thorough patrolling of the main logging road, skidder tracks, and trails. Using existing roads/tracks and animal trails has proven to be effective in covering large areas in tropical rainforests (Boonratana, 1997a & b; 1998a, b & c). Furthermore, the chances of sighting an animal or its signs are higher when patrols are carried out along existing and roads/tracks and animal trails. During patrol surveys, team members would simultaneously search for wildlife and evidence of its presence.

Speed of travel when carrying out patrols was maintained at 40 to 60 minutes per kilometer, with regular pauses of at least a minute to scan the immediate surroundings. This was undertaken to reduce the chance of missing cryptic animals or animal signs. Surveys usually

12 NTFP = Non-timber forest product

13 Wildlife and human/habitat impact data recording sheets have been translated into the Khmer language for use by the WPO personnel.

14 GPS = Global Positioning System

began between 0700 to 0730 and teams returned to camps between 1500 to 1630hrs. Thus, an average of eight kilometres was covered on each route by each team.

Survey routes initially focused on the main logging road. Then, using the main logging road as a baseline, the skidder roads leaving this road were surveyed. Other routes, usually trails along ridges and waterways, were determined from 1:50,000 topographic maps (Maps Nos. 5632 I, II, III, & IV; 5633 II & III; Edition 1-TPC, Series L7016). Such routes normally took the shape of irregular loops, originating and terminating at camps.

2.3 Training

Local capacity building was another important objective of this survey. Although time was limited, a full day was spent at the WPO office in Phnom Penh on briefing and preparing the staff for wildlife surveys and for the trip. Further knowledge was imparted on an individual basis while collecting actual data in the field. Lessons given during the one-day 'classroom' training comprised:

- Recording Techniques:
  - i. note-taking, sketches & measurements;
  - ii. using wildlife & human activity data recording sheets;
  - iii. specimen collection: plaster casts, scats, skulls, snares;

- Wildlife Observation:
  - iv. survey routes;
  - v. presence/absence;
  - vi. species identification & use of field guides;
  - vii. indirect evidence (tracks, scats, vocalisations, etc.)
  - viii. speed of travel & precautionary measures.

3. RESULTS

3.1 Area Surveyed

Including replicate routes, a total distance of approximately 312 km was covered on foot in 117 man-days, or in 13 field days.

3.2 Wildlife

A list of wild fauna recorded during the surveys is shown in appendix V. Altogether, 41 non-volant terrestrial mammal and 35 bird species were recorded. Some are, however, provisionally listed for want of more conclusive evidence. It should be noted that no trapping for small mammals was carried out. Also, there were more bird species observed than that recorded, but the participants were inexperienced at bird identification.

Note: Information obtained through interviews although described here, should nevertheless be interpreted with care by the reader. For example, one sub-team on a night survey, reported seeing a dhole along the main logging road, 4 kms south of the base camp. A security guard on that team almost shot the animal with a rocket-launcher. However, description of this 'dhole' was closer to that of a domestic dog. This suspicion was later confirmed when the dog arrived at camp a few days later.

Brief Account of Some Species[15]

- Asian Elephant (Dom Rei): No evidence was found during the surveys. Interviews, however, indicated that this species is found in the upper reaches of Stoeng Kon Chor and Stoeng Russei Chrum. Some NTFP collectors reported that elephants were observed a few years ago near the current base camp before the existence of the logging road. There was also an anecdotal report that rattan collectors had observed two tigers chasing a young elephant in the Russei Chrum area about two years ago. Sawk, a security guard participating in this survey, reported seeing a dead elephant 'several' years ago along the Stoeng Sala Munthun. Away from the Kravanh Range, elephants are reported to occur about a day's hike to the north-east of O'Soum Commune and in the Phnum Samkos Wildlife Sanctuary. All interviews suggested that elephants have become rare over the last three years. Conversely, Weiler and Soriyun (1999), based on workshop presentations and hunter interviews in Koh Kong and Pursat, suggested that the Kravanh Range together with the Dom Rei Range and Phnum Aoral form the most important elephant range in Cambodia. They estimated the area to hold a population of 300 individuals. This might be true, given that our survey was limited in coverage and was of a short duration. Weiler and Soriyun (1999) further reported that elephant hunting is intense in western Pursat, with organised gangs, funded by Thai merchants, using high-velocity elephant guns with telescopic sights.

- rhinoceros sp. (Rumieh): There is an unconfirmed report of a villager from Phum Ptieh Moui seeing two animals together in 1994, in the Phnum Mateh (west/west-north-west of Phnum Khmaoch[16]). Also, village elders of O'Soum Commune remembered their fathers talking about rhinoceros being present in the upper reaches of Stoeng Kon Chor.

15 Cambodian names of the animals are given in parentheses beside their vernacular name. Scientific names can be found in appendix vi..

16 Khmaoch = Ghost

- gaur (Khting): This animal is also called Khting Pokpak by residents of the O'Soum Commune, meaning a bovid with a large dewlap. Several sets of fresh tracks were observed on the ridge north of Russei Chrum (figure 2)[17] crossing the logging road. The shape and size of the tracks conform to that of gaur. There were also smaller sets of tracks which could possibly have belonged to young gaurs. Conversely, they could have been made by the khting vor (see below). The tracks, when followed led to two small watering holes. All reports through interviews indicate that this is one of the areas where gaurs are known to occur. Other areas where gaurs reportedly occur are in Phnum Kon Chor and Phnum Praah, both located one and two days' hike respectively to the east-south-east of O'Soum Commune. They are similarly reported from Phnum Mateh and Phnum Tumpooa (north-east of Phnum Khmaoch).

- banteng (Tun Sao): No direct evidence was encountered. All interviews suggested that this species is rare throughout the Kravanh Range and adjoining areas. Some NTFP collectors, however, reported seeing one close to the Stoeng Russei Chrum in 1998. Interviews also suggested that chances of finding banteng is greater at Phnum Praah and Phnum Khamaoch. Conversely, interview data from Momberg (see chapter VI) and Weiler *et al.* (1998) indicate that banteng are scattered throughout Koh Kong and Pursat in medium numbers in suitable areas of habitat. There are two pairs of banteng horns at O'Soum Commune, with one pair supposedly belonging to a male and the other to a female. They are used for ceremonial events. Their origins could not be ascertained as their owner was absent.

- Khting vor: A few sets of smaller tracks observed along with those made by gaurs on a mountain ridge, continuous with Phnum Bang Kohr, about 1 km north of the Russei Chrum sub-camp (figure 2), could possibly belong to this species (see section on gaur). Reports (see below) describe this animal as being buffalo-like in features, possibly the size of a young buffalo. Hence it could be expected for the tracks of the khting vor to be similar to those made by gaur and buffalo, but very likely smaller than either. The khting vor also reportedly travel with groups of gaur and banteng. Furthermore, there are reports of the animal being seen in this region (Russei Chrum area). Although this evidence is far from conclusive, nevertheless it cannot be dismissed. Another set of tracks, smaller than gaur's but larger than sambar deer's tracks, was observed about 2 km north of the Russei Chrum base camp. The two clearer tracks measured 12 x 11 cm and 11 x 11 cm (length x breadth).

  Chan, a participant, along with his companion saw two khting vor in the valley to the west of the 'possible tracks' in February this year. They spent about 2-3 minutes observing the animals before they (Chan and Companion) were seen, following which the animals immediately fled. Chan and his companion described the animals as foraging on a hillside, close to a dry stream in possibly mixed deciduous forest. The Russei Chrum area is one of the main areas reported by the O'Soum Commune inhabitants for this species. Trophies of this animal were kept at the commune until the arrival of Pol Pot's army. Jen Noy, another participant, reported seeing tracks of this species close to Stoeng Kon Chor possibly in October/November 1998. Sawk, another participant, reported coming across a dying young khting vor in the Russei Chrum area in April 1998, during the road construction. It is not clear what happened to that animal. He further reported observing tracks possibly of this species on a ridge (Phnum Bang Kohr?), about two hours hike from Phum Russei Chrum towards the O'Soum Commune. It was

17 Figure 2 merely indicates where evidence of key species were encountered, and not the number of individuals. There is, however, an exception with regard to pileated gibbon. The locations refer to individual groups.

sighted in 1996 at Ketong Rum in the Phnum Mateh area by a resident of O'Soum Commune. Another resident of the O'Soum Commune reported that the last known sighting of the ox (to his knowledge) was in Phnum Mateh in 1998. Besides these areas, this species is reported to occur at Phnum Tumpooa, Phnum Bakan (within the Phnum Samkos - Phnum Khmaoch complex) and Stoeng Tachan (south of O'Soum).

Descriptions of this animal based on reports are given in Weiler and Ashwell[18] (in prep.). Interviews during this survey yielded information on the animal's description which was consistent with Weiler and Ashwell's (in prep.) findings, while some information was new. Summarising interviewees' information, the khting vor has a general appearance that of a buffalo, possibly standing about 130cm at shoulder height. Besides the horns, other differences include a slimmer body, slender and longer head, more robust neck, and a hump and dewlap. Its skin colour is dark grey to greyish black to black, with dirty brown or whitish brown stockings below the hock and knee. On the chest, just below the neck, there is a wide whitish brown band.

'Khting vor', meaning bovid with liana-like horns, is one of the several Khmer names for this ox. Other names include 'khting slak', leaf or leaf-eating bovid; 'khting si puoh', snake-eating bovid (Dioli, 1997); 'khting preng', oily-skinned bovid (Weiler *et al.*, 1988); and 'khting pus', cobra-eating bovid (Weiler *et al.*, 1988). In Vietnam, it is known as 'linh duong', meaning forest antelope.

Some of the anecdotal reports suggest that this animal feeds on snakes by spitting them down from a tree. Also, that the dung is similar to that of gaur, with the exception that it contains snake bones.

- Common muntjak (Chlou): This species was sighted and/or heard daily on almost all routes surveyed, during both day and night. One animal was observed just 10-15km from Koh Kong PC. Similarly, tracks were regularly encountered. This animal is possibly common and definitely widespread. There were, however, more sightings and signs of this species to the south of the base camp, possibly because of greater food availability (soft woody saplings of secondary growth and grasses).

- Sambar deer (Praah): Like the common muntjak, tracks of sambar deer were frequently observed on all routes surveyed, suggesting it has a widespread distribution. Tracks were, however, most common in the Russei Chrum area. Residents of O'Soum Commune recognise what could be two variations of the sambar deer. According to them, 'Praah Sabao' is the smaller of the two, and with brown coating. 'Praah Saman' is supposedly bigger, has a black coating, and more tines on the antlers. Conversely, Praah Saman could possibly refer to the Schomburgk's deer. In the Thai language, Saman means Schomburgk's deer. There is a need for further clarification.

- Serow (Keh): O'Soum villagers reported this species being present towards the steep karst mountains of Phnum Samkos Wildlife Sanctuary, particularly at Phnum Tumpooa.

- Wild pig (Chrou Prai): Although reportedly common and widespread, signs of this species were rarely observed. This possibly suggests a seasonal migration, very likely in close association with the fruiting patterns observed (section 1.3). Seasonal migrations of bearded pigs (*Sus barbatus*) corresponding to phenological patterns have been reported in northern Borneo (Boonratana, 1997a). Most of the pig signs observed were towards the Russei Chrum area.

18 Readers are recommended to refer to Weiler and Ashwell (in prep.) for further information regarding this species.

- tiger (Khla Thom): A set of clear tracks was observed along the side of the logging road about 2km south of the base camp. One sub-team reported two sets of tiger tracks, about 2.5km to the north-east of base camp, close to the Stoeng Sala Munthun. The same sub-team also reported another set of tracks along the logging road, 1km south of the base camp. One of the security guards, Sawk, reported seeing a tiger walking along the road across one of the checkpoints, one late evening (c. 1900h) in February 1999. Sawk also reported, that in November 1998 along with about a dozen other workers, seeing in broad daylight, a tiger chasing after a wild pig along the road, about 8km north of the base camp. Mr. Low, the Deputy Commune Leader of O'Soum, reported that until about two years ago, tigers were fairly common. He further reported that until about the same time, 20 tigers had been caught in snares specifically set for them. Skin and bones were collected and sold. Away from O'Soum the popular method for hunting tiger is placing shot prey animals (macaques and deer spp.) on anti-personnel mines. Weiler and Soriyun (1999) similarly reported the use of anti-personnel mines and dead monkeys for hunting tigers.

Weiler *et al.*, (1998), based on hunter interviews, estimated that there are 200 individuals in Koh Kong Province and another 200 individuals in Pursat. A latter estimate, similarly based on hunter interviews, placed the figure at between 162-217 tigers for the the total Kravanh range (Nowell *et al.*, 1999). Given the sheer size of the forest cover, the latter estimate could possibly hold true, but with current and past hunting pressures, the actual figure could be much lower than this. Further surveys are needed to confirm the animal's true status. A gaharu wood trader in Koh Kong PC reported that the last known tiger attack on a human was in 1993/94 on a gaharu-wood collector at Phnum Koh Kong. Conversely, hunters' reports in Weiler *et al.*, (1998) showed a very high incidence (>70) of tiger attacks on humans in the mid 1990s. A cross-check of information is clearly needed to verify the situation concerning man-eating tigers.

- Leopard (Khla Rokhan): One unclear print about 2km south of the base camp could possibly belong to this species. Under field conditions, it often is difficult to distinguish smaller tiger tracks with adult leopard tracks. In general, although all interviewees replied that this animal is present in the area, none had seen one in recent years.

- clouded leopard (Khla Rokhan Popok): Interviews suggested that this animal is rare but can be found along the Stoeng Russei Chrum, its headwaters, and the hills associated with this waterway.

- Golden Cat (Khla Leuang Mieh): One possible track was observed in the Russei Chrum area, north-east of the Russei Chrum sub-camp. O'Soum residents reported that this animal can be found in the Russei Chrum area.

- Fishing Cat (Khla Trai): A double imprint found by the Stoeng Sala Munthun could have belonged to this species. Interviews in O'Soum suggested this species could be found along the Stoeng Russei Chrum.

- Leopard Cat (Chmao Prai): Tracks of this species, although not common, were widespread from south of the base camp to close to O'Soum Commune.

- dhole (Chkai Prai): Tracks and scats that could be identified with certainty showed that this species is both common and widespread, which was consistent with reports obtained through opportunistic interviews. More signs were, however, observed to the south of the base camp, possibly due to higher presence of prey animals (see section on common muntjak). This species could currently be the top predator in the area, now that tiger appears to be rare (see above). Scats analysed contained hairs of sambar deer, common muntjak, ferret-badger and several

unidentified rodents. Grasses were commonly found in the scats, and all scats were found in the middle of the logging road and trails, an observation similarly made by Boonratana (1998a) in Lao PDR[19]. Village elders of O'Soum Commune reported that this species travels in pairs.

- Asiatic Jackal (Chor Chork): Although interviews suggested that this species is common and widespread, nobody had seen one in recent years. Similarly, several canid tracks smaller than dhole's that were observed could not confirm the presence of this animal due to the presence of domestic dogs. The species is, however, reported to travel in a small pack.

- Asiatic Black Bear (Khla Khmum Khmal): Recent and old feeding signs and claw marks of bears were not uncommon throughout the area. One clear fresh track was observed by the side of the logging road about 2km south of the base camp. Another smaller track close by, which was similarly fresh, could possibly have belonged to a young Asiatic black bear. Claw marks on trees (indistinguishable from Malayan sun bear) were often seen on *Parkia* sp. trees.

- Malayan sun bear (Khla Khmum Thom): Claw marks on trees were indistinguishable from those of Asiatic black bear. Clear tracks observed suggested that this species has a widespread distribution and is possibly more common than the Asiatic black bear. Two young animals (an infant and a juvenile) held in captivity were observed at a hotel in Koh Kong PC, and another sub-adult was observed in a pig farm, also in Koh Kong PC. These animals were reportedly from the forests contiguous to the Kravanh Range.

- pileated gibbon (Torrch): Gibbons were surprisingly common (figure 2). Vocalisations were heard daily throughout the areas surveyed, except when it rained continuously in the mornings. There were probably more gibbon groups than were recorded as some areas were surveyed in the afternoon[20]. A group of three individuals was briefly observed about 3km east-north-east of the Stoeng Russei Chrum sub-camp. They comprised two buffy individuals and one black individual. Captive infants and juveniles were infrequently observed in Koh Kong PC and Phnom Penh.

- Silvered Leaf Monkey (Soua Priam?): O'Soum villagers described the Soua Priam as grey-black crested monkeys with long tails and orange(?) babies, travelling in groups of 20-30 individuals. Considering this description, there is a tendency to assume that this species could be the silvered leaf monkey. However, further investigations are needed to confirm this.

- Pig-tailed Macaque (Soua Ong Kut): One small group was observed close to the road about 1.5km south of the base camp. Another group of at least nine individuals was observed about 3km north-east of the Stoeng Russei Chrum sub-camp.

- Long-tailed Macaque (Soua Keh): Observed on two occasions. First was by the Stoeng Sala Munthun, close to the base camp. There was at least two juveniles and three adults in the group. The second observation was at the base camp and comprised seven individuals. Fresh prints were also seen along the logging road about 4km south of the base camp.

- Stump-tailed Macaque(?): Descriptions through interviews suggested that this species is present. Conversely, their descriptions of a macaque with a very short tail possibly misled the author into thinking this species to be present, when in fact the description may easily have referred to pig-tailed macaques.

19 PDR = People's Democratic Republic.

20 Gibbons do not duet on rainy mornings and in the afternoons.

- Slow Loris (Nyee): This species is reportedly present in the area. There is a captive animal at the Yourysaco workers' camp. One of the security guards accompanying us also carried a dead (smoked) specimen with him for 'medicinal' purposes.

- Wreathed Hornbill: One bird was spotted at the Stoeng Kon Chor, and there were three different sightings of three individuals about 3km north of the base camp. These sightings are highly likely of the same birds.

- Oriental Pied Hornbill: One group of c.7-8 birds were observed in a fruiting tree (species unknown) about 3km north of the base camp. This species was also observed at Stoeng Kon Chor.

3.3 *Habitat/Human Impacts And Threats*

- Wildlife Poaching: Evidence was observed in all areas surveyed to varying degrees. Guns, snares, and anti-personnel mines are the most common methods employed. Gunshots, particularly to the north and south of the base camp, were commonly heard throughout the survey. Spent AK47 rifle cartridges were frequently seen along the main logging road and side skidder roads. One active snare intended for large mammals was found about 3-4km north-west of the Russei Chrum sub-camp. O'Soum residents frequently use snares to trap large mammals (section 3.1.1). They and several other interviewees also reported placing poached macaques and deer species on anti-personnel mines, specifically intended for tiger. Abandoned campsites and temporary shelters yielded the presence of feathers and bones. Some of the identifiable remains included common muntjak, larger mousedeer, jungle fowl and crested serpent eagle. The security guards participating in the survey had a leg of the lesser mousedeer, a smoked slow loris and hog-badger's fat among their personal effects, apparently for 'medicinal' purposes. On one occasion, some hunters brought a poached common muntjak to the base camp, and shared the meat with some of the participants[21]. On another occasion, a participant brought back for personal consumption some jungle fowl eggs he found during a survey.

- Wildlife Trade: Most of the wildlife captured or shot to supply the restaurants and fresh markets in Koh Kong PC were reportedly obtained mainly to the south of Stoeng Kon Chor, because access is easier. In and around O'Soum, wild meat is consumed locally, but animal parts (e.g. tiger bones and skin) are sold to Koh Kong PC and Kravanh DC[22]. Wildlife traders from Thailand reportedly come in to Koh Kong PC almost monthly to purchase wildlife products. In Koh Kong PC, live captive animals observed included the Malayan sun bear, pileated gibbon, yellow tree monitor and partridges. Trophies were also reportedly sold to Trat Province in Thailand. Away from the Kravanh Range, there is a major wildlife market at Phum Srei Klong, in Kompong Speu Province. Animals on sale included sambar deer, common muntjak, wild pig, mousedeer, and civet species.

- Logging: Although logging activity has temporarily ceased, some tree cutting activity was observed in the O'Soum area, presumably for local use.

- NTFP[23] Collection: The main NTFP collected in the area include gaharu wood/krishna wood, rattan, bamboo and a liana known as 'ooa rormiet', which is processed in the forest to produce a yellow powder that is sold to Vietnamese traders for USD50. per kilogram for use in traditional Chinese/Vietnamese medicines. There was a large group of 'ooa rormiet' collectors (c. 30 individuals) close to the base camp. In their camp they had a machine to grind up the liana into small pieces. Several pits were dug in the area and covered with thick plastic sheeting, forming 'tanks' where the ground lianas were treated with sulphuric acid. A lorry transported the cut lianas to their factory camp. In addition to 'ooa rormiet', thick bundles of rattan were observed throughout the length of the main logging road waiting to be transported out of the area.

- Forest Clearance: There were several new areas being cleared for shifting agriculture. These were around O'Soum area and in the forest towards Koh Kong PC.

- Domestic Dogs: There were several animals at the checkpoints, with the NTFP collectors, and farmers. Although not a serious threat at the moment, these dogs could easily become feral, posing a serious threat to the wildlife.

- Refugees: The refugees that fled Cambodia to Thailand during the unrest are now returning and about 5,000 are being resettled in western Pursat Province (Hunter & Soriyun, 1999). These people represent a potential threat to wildlife and habitats. With little else to do and being socio-economically under-privileged, these returnees clear forested areas for agriculture and hunt wildlife for both subsistence and sale.

- Unexploded Ordnance: There are several areas within the Kravanh Range where anti-personnel mines are present, posing a serious threat to both people and wildlife.

3.4 *Training*

The one-day classroom training and preparatory briefing was a not without significant difficulties. This was partly a result of the attitudes of the WPO staff, and partly a lack of understanding of the English language. One participant at the one-day session commented that it was not necessary to have the training and briefing, but wished to proceed immediately to the field, even though he had no prior field experience. The same participant also commented, while in the field, that it was not necessary to conduct the survey. Instead, he suggested that the area be gazetted as a protected area, followed by the purchase and release of animals into the area being a better solution. Also, a senior WPO official who briefly attended the one-day session even suggested that the participants should be armed, to shoot any tigers and snakes that they may chance upon. These comments reflect the WPO's general attitude and limited comprehension about wildlife and conservation[24]. Among the WPO participants in the survey, only one showed any interest in learning and actively participated in the survey. On return to Phnom Penh, some hours were spent explaining to two of the WPO participants how to complete the recording sheets and establish a filing system of records. Also, a specimen record book was introduced to them, whereby specimens (trophies, skins, snares, plaster casts, etc.) collected could be systematically recorded.

3.5 *Miscellaneous*

At the end of the field trip, some of the core participants had a meeting with Mr. Youth Puthong, the Governor of Koh Kong Province and de-briefed him on the survey activities and findings. The meeting ended on a positive note with the governor extending an open invitation to the participants to return and conduct more surveys in the Kravanh Range.

21 Two sub-teams were away at Stoeng Kon-chaw and Stoeng Russei Chrum at this time, leaving seven participants behind.

22 DC = District Capital

23 NTFP = Non-timber forest product

24 Please note that this section does not in any way intend to reflect or mar their personalities, but merely highlight the shortcomings of WPO staff in general, which the author strongly feels is a major issue to be addressed if conservation in Cambodia is to be achieved.

4. DISCUSSION

4.1 General

The primary aim of this project was to conduct a first-ever preliminary general wildlife survey, with emphasis on large mammals, in the Kravanh Range of south-western Cambodia. The secondary aim was to provide some capacity-building to the WPO staff in field data collection techniques. Although the project faced several obstacles that included bureaucratic formalities, inexperienced field team, and unfavourable weather, the project nevertheless managed to provide a glimpse into the rich biological diversity of the extensively forested Kravanh Range. Results of the survey and some aspects of the area, methodology, capacity-building were presented in the earlier sections. In this section the survey results and observations are briefly discussed. Recommendations are made in section five.

4.2 Surveys

Quantity and quality of data collected were limited, as most of the participants lacked the necessary expertise and experience for wildlife surveys and field work. General fear of tigers, snakes and leeches restricted most participants to the main road.

Significant finds regarding mammals, through sightings, signs and opportunistic interviews, are the presence of elephant, gaur, banteng, khting vor, tiger, dhole, Malayan sun bear, Asiatic black bear, and pileated gibbon. Other species of significance reported by interviewees as being present are leopard, clouded leopard, and Asiatic jackal. Further information is, however, needed to confirm their presence.

The density of the species could not be assessed, as this survey was limited in time and coverage, particularly when the sheer size of the Kravanh Range and its associated forested areas is considered. Only in the case of the pileated gibbons was there any indication of species density. Results show that pileated gibbons are abundant but whether this is indicative or not of the Kravanh Range gibbon population as a whole needs further investigation. However, considering that the gibbon records were obtained close to the main logging road, it is possible that the density of gibbons in the forested areas not surveyed would be similar, if not higher.

Within the area surveyed, there appears to be an increase in evidence of wildlife in the Russei Chrum area, which is consistent with the interviewees' reports. Reports also pointed to the Phnum Samkos WS as the area with the highest density of larger mammals, with khting vor appearing to be particularly notable in this respect.

4.3 Threats

Hunting seems to be the immediate threat to wildlife in the area. Although there is a Prime Minister's decree issued which bans the hunting and trade in wildlife, it is not sufficiently enforced. In the long-term, logging and shifting cultivation, if carried out unchecked, is likely to pose serious threats to both wildlife and habitat. Furthermore, logging will allow easier access into the area for hunting and settlement. Collectors of 'ooa rormiet', rattan and gaharu wood also have destructive impacts. Besides collecting unsustainably, they also undertake poaching.

4.4 Training

Training of individuals in wildlife survey techniques is difficult when they have had limited or no prior field experience and understanding of wildlife conservation. There appears to be limited comprehension of conservation concepts apart from a desire to save the animals, but

without knowing why, what to save or how to approach the work. Furthermore, given that this project is short and that its primary aim was to conduct a wildlife survey, little attention could be given to training the staff. Training and capacity building of individuals for field work combined with wildlife surveys requires a 2-3 month continuous and intensive program before basic responsibilities could effectively be undertaken. Even then, reinforcements are likely to be needed at every three months interval for the first 18 months, followed by six-monthly intervals for the following three years (Boonratana, 1997b, 1988a, b & c; 1999). However one WPO participant did manage to gain more from the training, due mainly to his own personal interest and diligence.

Simply training staff in survey techniques alone is insufficient. It must initially be preceded by a series of lectures and discussions on the basics of conservation, including conservation of natural resources, wildlife ecology and behaviour, conservation biology, protected areas and protected area management. Following this, staff should be trained in the use of maps and compass, planning, and management. Only then should staff be introduced to survey and data recording techniques. Equipped with this knowledge, trainees should immediately proceed to the field and put their newly acquired knowledge to practice. On return from the field, they should be trained in data compilation and report write-up, using the data gathered from the trip. Several more similar trips and write-up sessions must be continuously carried out to provide staff the much-needed exposure, experience and confidence to fulfil their duties and responsibilities well. Of equal importance is for the senior decision-making staff to attend the initial classroom training, in order to give them an understanding on the issues at hand, and of conservation needs.

5 RECOMMENDATIONS AND CONCLUSION

5.1 *Recommendations*

5.1.1 Surveys & Research

1. A wildlife survey should be repeated in the same area during the dry season, focusing on the Russei Chrum area.
2. Wildlife surveys should be carried out in areas not covered during this survey to provide a clearer picture of wildlife distribution in the Kravanh Range and information on relative abundance of key species. Focus, however, should be in the Phnum Samkos WS (Phnum Match and Phnum Tumpooa), and in the upper reaches of Stoeng Kon Chor and Stoeng Russei Chrum.
3. For short and/or intensive surveys such as this, there should be set criteria for selecting the participants, whether technical or non-technical. This would ensure that the participants themselves do not pose an obstacle to the survey, hence improving the quality and quantity of information. Among the more important criteria would be prior experience at field work , and interest in the subject.
4. The core participant numbers should be minimal, preferably comprising the biologist, one person from WPO and one from MoE[25].
5. Initiate a long-term study into the ecology and density of large mammals in the range, with focus on khting vor.
6. Conduct botanical surveys in the Kravanh Range.
7. Conduct socio-economic studies on settlements in and around the Kravanh Range.

5.1.2 Training/Capacity-building

1. A long-term capacity-building program should be designed for the relevant governmental agencies dealing with the conservation of natural resources in Cambodia. This program should span a minimum period of five years and have several components dealing with the aspects of conservation: field surveys, monitoring, law enforcement, protected area management, extension work, participatory conservation, organisational matters, education and awareness.
2. All field conservation efforts should include a component of training. If the effort is intensive and short, then training should be limited to the local counterpart who has prior field experience. If, however, the effort is of three months or more, then a more organised training component should be incorporated into that effort. Candidates need, however, be carefully screened so as to maximise the capacity-building efforts.
3. Candidates for training should include staff from WPO and MoE at both the central and provincial levels.
4. At the central WPO and MoE, there should be an externally funded long-term advisor to provide institutional capacity-building or to be able to draw upon the human resources from within and outside Cambodia to provide the different aspects of capacity-building.

5.1.3 General

1. WPO and MoE need to coordinate and streamline their objectives and activities. Wildlife protection is currently the responsibility of the WPO, and MoE has the overall responsibility for development and management of protected areas (Ashwell, 1997). Preferably, there should be just a single body to protect, conserve, manage and develop wildlife and protected habitats within Cambodia.
2. Cambodia needs to strictly enforce the ban on wildlife hunting and trade. Issuing a decree alone means little, if steps are not taken to put the decree into effect.
3. Wildlife hunting and trade would significantly reduce if demand was removed. Hence, law enforcement activities should focus on restaurants, markets and international border crossings. Penalties should be severe and part of the fines (as incentives) should go to the individual/individuals involved in bringing the offenders to justice. The percentage should be high enough to prevent enforcement officers from receiving bribes from the offenders.
4. Looking at the broader picture, international co-operation, particularly with Thailand, Lao and Vietnam, is needed to clamp down on the cross-border wildlife trade. These countries similarly need to enforce laws pertaining to the wildlife trade.
5. Communes and villages in and adjacent to viable forested areas and protected areas should be involved in conservation activities (whether short-term or long-term) in their area. Preferably, however, they could be designated as 'guardian' communes or villages with extension assistance, in return for their compliance of mutually-agreed-upon rules and regulations regarding the use of natural resources. Also, they would need to provide the work force to patrol and protect their designated areas.
6. Specialists in sustainable logging should be hired to monitor and guide the logging concessions, once logging is again operational in Cambodia. Funding should come from the logging concessionaires, varying in accordance to the size of their concession, which could provide an externally managed 'pool'.
7. Government officials, in particular from WPO and MoE, should refrain from consuming wild meat of protected species or from protected areas. Otherwise, education and awareness will have little meaning and enforcement would draw animosity from the general public.

5.2 *Conclusion*

Given lack of field surveys in the Kravanh Range prior to this and that the survey was short and faced numerous obstacles, it nevertheless yielded several significant finds on wildlife, habitats, threats, and conservation needs, and was carried out without any untoward incident. Furthermore, interest in the range has been stimulated. One short botanical survey was immediately carried out after the wildlife survey by an IUCN/MoE plant assessment team and it is expected that there will be many more surveys in the Kravanh Range once the weather and roads are favourable.

The Kravanh Range, with its large contiguous tract of forest, important watershed, key wildlife species, and being relatively sparsely populated by humans, deserves serious attention and effort to protect and conserve it. By the same virtues, it is expected that the range would hold a high biodiversity. Considering the threats it is facing, conservation efforts need to be immediately planned and executed in order to prevent a great loss not only to Cambodia but globally.

25 MoE = Ministry of Environment.

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III. Tiger conservation workshops and hunter interviews in Koh Kong and Pursat Provinces.

H. Weiler, Roth Bunthoeun & Uch Seiha

Introduction

In 1998, CAT- Cat Action Treasury organized a national survey of hunters to gather information on tiger and other large mammal distribution in Cambodia. The hunter interviews were conducted through the Wildlife Protection Office of the Ministry of Agriculture, Forestry, and Fisheries. The preliminary results of this survey were reported in Weiler, *et al.* in 1998. A more detailed analysis of tiger distribution and estimated numbers was published by Nowell *et al.* in 1999. A more in-depth analysis of the entire hunter survey is in preparation.

Based on the 1998 survey, funding was obtained from the EXXON Save the tiger Fund through the National Fish and Wildlife Foundation to conduct three follow-up programs by CAT and WPO. These programs were to prepare and publish a detailed report, conduct a series of tiger conservation workshops for officials at the province and district level, and carry out a second round of hunter interviews to gather further information on wildlife status and hunter attitudes towards conservation.

The 150 hunter interviews in 1998 were conducted in 13 provinces. After analysis of the interview results, a decision was made to conduct workshops in six key provinces: Kratie, Stung Treng, Mondulkiri, Preah Vihear, Koh Kong and Pursat. These workshops were conducted February-March 1999. WPO also participated in a Wildlife Trade Control Workshop in Ratanakiri in May organized by the Ministry of Environment.

Following the workshops, a second round of hunter interviews were conducted in May/June 1999 in three critical wildlife areas: Kratie/Mondulkiri, Siem Reap/Preah Vihear, and Koh Kong. This effort was coordinated with the FFI/ARA/CAT/WPO Field Survey in Koh Kong/Pursat and the UN Refugee Needs Assessment in Pursat. The results of these latter two efforts are documented in separate chapters in this volume.

This report briefly summarizes and integrates the results of the 1998 hunter interviews, 1999 workshops, and 1999 hunter interviews specifically for Koh Kong and Pursat Provinces. Emphasis is placed on 1999 information, since the results of the 1998 survey have been analyzed in two previous reports. A separate report on all six Cambodia workshops and another on all of the second-round hunter interviews in Cambodia are in preparation.

The selective information presented here is an attempt to present a representative picture of both the attitudes of officials and hunters and the general status of wildlife in the Cardamom Mountains Region. Presentation of this information does not necessarily mean that the authors agree with the attitudes or accept as proven fact the accuracy of the wildlife reports. However, the authors believe the presented information is an accurate summary of the most important conservation attitudes and the most significant wildlife reports that bear consideration in developing future conservation programs in Koh Kong/Pursat and planning and conducting future wildlife surveys in the Cardamom Mountains Region. The views of local officials and local hunters are sometimes secondary considerations when international organizations work with national governments to develop wildlife conservation programs. The authors believe that local officials and hunters should be primary factors in not only developing but in implementing such programs.

METHODS

Survey of Hunters in Koh Kong/Pursat Provinces, March 1998

Using a five-page questionnaire, Cambodian Forestry graduates with thesis work on traditional hunting methods interviewed pre-screened experienced hunters. A map was prepared at each interview showing the area hunted. Combining the individual hunter maps of the 31 hunters surveyed in Koh Kong and Pursat Provinces produces a map covering most of the Cardamom Mountains Region, including the Mount Samkos complex and also some associated lowland and mid-level areas. Evergreen forest predominates, but there are significant mixed forest areas in the north, specifically in Veal Veng District. Despite this variation, the entire area is one interconnected block of contiguous wildlife habitat. See Figures 1 and 2.

Survey of Hunters in Koh Kong Province, May-June 1999

The strategy for conducting the second round of hunter interviews differed in important respects from the first round. A decision was made to focus on three critical core regions for large mammals in Cambodia, identified as a result of the first round interviews in 13 provinces. The core regions are Siem Reap/Preah Vihear in the Northern Plains, Kratie/Mondulkiri in the Northeast, and Koh Kong/Pursat in the Cardamom Mountains Region. The interviews were conducted in May/June. Do to an early rainy season, access to western Pursat was extremely difficult. A decision was made to concentrate on Koh Kong Province. Interviews were conducted in western Pursat during related efforts discussed in separate sections of this volume: the Field Survey and the Refugee Needs Assessment. Combining the results of all three efforts provided a much broader picture of the conservation status of the Cardamom Mountains Region. Seven additional hunters were interviewed in the course of setting up the Koh Kong workshop. These were special interviews to obtain information on man-eating tigers and khting vor. No structured form was used. Relevant information obtained from the special interviews is reported in this section.

A different questionnaire was developed for the second round. There were three sections in the Hunter Interview Form. Part I dealt with distribution of rare Cambodian species. Part II contained questions about tiger in the hunter's area in 1998. Part III contained questions about hunting and wildlife conservation. This report selectively presents some of the more interesting and significant results of the survey in an attempt to present a summary overview of wildlife status and conservation attitudes in the Cardamom Mountains Region from the point of view of the hunters themselves.

Twenty hunters were interviewed in of Koh Kong Province. (Only one of these hunters was also interviewed in 1998.) As was done in 1998, a detailed map was developed showing each individual hunter area. These areas include portions of all six districts in Koh Kong Province. (Most of these areas overlap portions of two or more districts.) All areas are within one contiguous forest in or adjacent to the Cardamom Mountains, so the results of the interviews are presented in a summary manner to develop a general impression of the area. It should be kept in mind that each hunter identified the exact area he hunts, so not all generalizations are applicable to all parts of the region.

RESULTS

Survey of Hunters in Koh Kong/Pursat Provinces, March 1998

General

The elephant densities in the Cardamom Mountains Region are the highest reported in Cambodia. High elephant densities are reported by 29 of 31 hunters. The lead author subjectively estimates a potential 300 elephants remain in the Cardamom Mountains Region, based on the 1998 and 1999 interviews and workshops and consideration of the size and quality of the habitat (Weiler and Men Soriyun 1999). The reported densities of tiger and elephant fall off significantly in the adjoining Phnom Oral, Elephant Range, and Pailin Regions, further reinforcing that the Cardamom Mountains Region is of special significance.

Herds of gaur and banteng are reported in low to medium numbers, but only for scattered sub-areas of suitable habitat. Eight of 31 hunters report the presence of the enigmatic khiting vor. Further information on khting vor is presented in the 1999 workshops and hunter interviews sections. sambar and barking deer, key tiger prey, are reported in uniformly high densities from the Cardamom Mountains Region. Other species reported in consistently high densities are black bear, sun bear, wild dog, clouded leopard, and fishing cat.

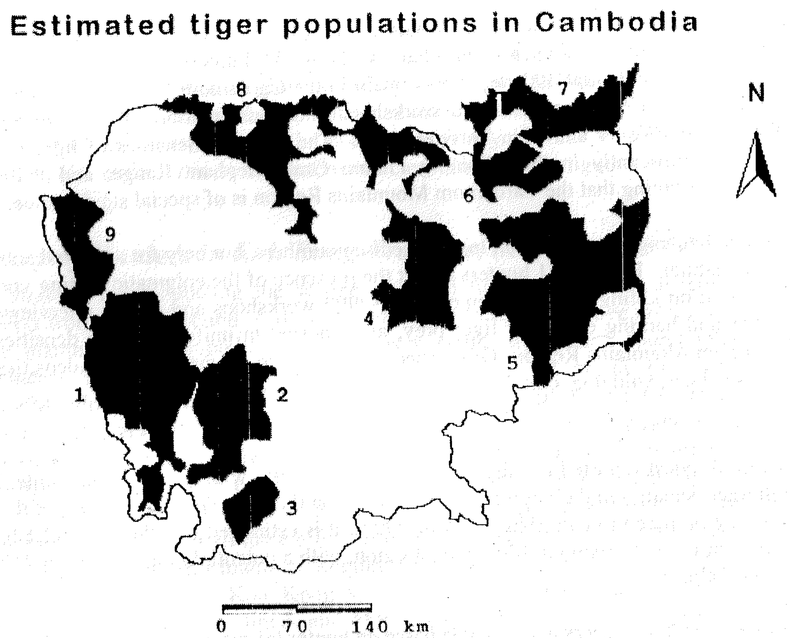
tiger

This area has the highest reported density of tigers in Cambodia, with twenty-three hunters reporting high tiger densities and eight reporting medium. In the most detailed analysis of the 1998 hunter survey prepared to date (Nowell *et al.* 1999), it is estimated that there are 11,846 km2 of tiger habitat in the Cardamom Mountains Region, with a potential range of 162 to 217 adult tigers. See Table 1.

Table 1. Estimated number of tigers in Cambodia based on hunter interviews. Averages of relative abundance estimates by hunters were converted to estimates of average potential tiger densities. Two scales were used for potential tiger densities: zero to a high of 1.5 resident adult tigers per 100 km^2, and zero to two resident adult tigers per 100 km^2. See figure 1.

Region (n interviews)	Avg tiger abundance (scale 0-3)	Area in km2	Density scale zero to 1.5 Resident adult tigers/100 km^2		Density scale zero to two resident adult tigers/100 km^2	
			Estd. density	Estd. no. tigers	Estd. Density	Estd. no. tigers
1. Cardamom Mountains (31)	2.74	11,846	1.37	162	1.83	217
2. Phnom Oral (9)	1	6,079	0.50	30	0.67	41
3. Elephant Mountains (12)	1.33	2,176	0.66	14	0.89	19
4. Kampong Thom (11)	0.82	5,794	0.41	24	0.55	32
5. South of Sre Pok (37)	1.95	14,971	0.98	147	1.3	195
6. Northeast Buffer (8)	0.88	5,082	0.44	22	0.59	30
7. Virachey (12)	2.08	4,787	1.04	50	1.39	67
8. Northern Plains (17)	1.18	10,736	0.59	63	0.79	85
9. Pailin (16)	1.25	3,771	0.62	23	0.83	31
Totals		**65,242**		**535**		**717**

Figure 1. Distribution of nine estimated tiger populations (described in Table 1). Forest areas shown are more than 10 km distant from villages. Most of these areas (approx. 85%) were covered by our survey. Also included are other relatively remote forest areas (approx. 15%) where tigers are likely to occur but no interview data was available.



Seeing tiger

- 100% of people interviewed have seen tigers
- On average, they have seen a tiger 4.2 times
- Lacking information on how recently these tigers were seen

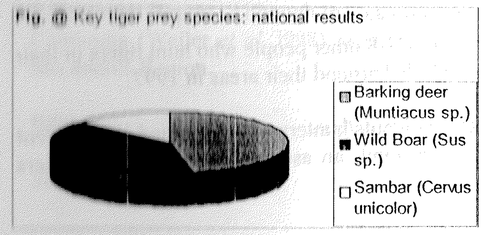
Seeing tiger tracks

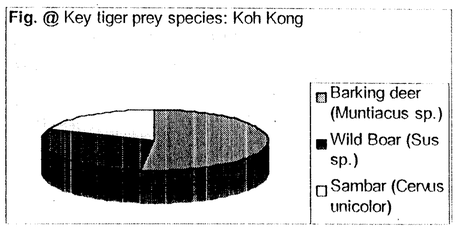
- 100% of people interviewed have seen tiger tracks
- People say they have seen tracks an average of 12.1 times
- Lacking information on how recently tracks were seen

tiger kills of prey

- 100% of people say they have seen wild animals killed by a tiger in the forest
- These people say they have seen this, on average, 2 times
- Lacking information on how recently this was seen

The tiger-killed prey species reported were overwhelmingly barking deer, wild boar, and sambar deer. These are the same primary prey species reported killed by tiger from all Cambodia provinces surveyed, respectively 43.3%, 36.7%, and 12.2% (Fig. @). There was some regional variation in %, but the rank order remained constant. For example, Koh Kong Province specifically reported 52%, 29%, and 19% (Fig. @).





Tiger predation on livestock

- Only 14% of the hunters interviewed say this sometimes happens.
- No information on how recently these incidents occurred, but several cows and domestic buffalo were reported killed.

Man-eating tigers

- 77% of hunters interviewed said they knew of incidents in which people were attacked and killed by tigers.
- People said they knew about an average of 8 cases, involving an average of 14 people.
- Due to the notoriety of man-eater news, it is certain that many people are reporting the same stories.
- Man-eating was reported from all districts. Most of these incidents appeared to involve chance encounters between tigers and lone hunters, soldiers, guerillas, woodcutters, and Krasna wood collectors.
- The Cardamom Mountains Region is the only Cambodia location reporting a significant man-eating tiger problem
- Additional details were obtained in the 1999 interviews and are reported in that section of this report.

Best places for tigers

- 100% of interviewed people say the best places for tigers are those with good forest
- A large majority also say the best places have good wild prey populations

Perceived tiger population trend

Trends perceived by the hunters were quite mixed. In Koh Kong district, half of the hunters think the tiger is declining, and half think it is increasing. In Botum Sakor District and Sre Ambel District, all hunters interviewed said declining. In Kiri Sakor District, all hunters said increasing. Most people in Mondul Sema District said increasing; most people in Thmar Bang District said declining. Overall for the entire Cardamom Mountains Region in Koh Kong and Pursat Provinces, 58% of hunters think the tiger tigers is decreasing and 42% increasing.

Of hunters characterizing the tiger as declining, in Koh Kong Province 46% say it is because of hunting, 15% because of war, and 11% because of deforestation. (In an interesting contrast, 68% of government officials in Koh Kong and Pursat, interviewed separately in a parallel survey conducted by the same team, felt tiger decline was because of deforestation, and 38% because of war.)

tiger hunting

On average, Koh Kong/Pursat hunters say they know 7-8 other people who hunt tigers in their general area. On average, they say 14 tigers were killed around their areas in 1997.

There is obviously a high potential for the same incidents/hunters to be reported by different respondents. (Without taking this potential into account, an astounding total of 577 tigers were reported killed in Cambodia in 1997.)

tiger trade

100% of people in Koh Kong/Pursat say there is tiger trade. They say the average price of a tiger is US$ 1,000. They do not give a separate price for tiger bone as is done in other parts of Cambodia. Everyone says the price has increased by three times over the last five years. Thailand was most commonly identified as the trade destination (48%), also Phnom Penh, China and Sre Ambel town. (Sre Ambel is the capital of the District by that name, a major seaport, and the only town in Koh Kong Province linked to Phnom Penh by paved highway.)

Survey of Hunters in Koh Kong Province, May-June 1999

Rare Cambodian mammals

Regarding rare species, 11 were listed on the interview form.. Schomburgk's deer, Javan rhino, Malayan tapir, and khting vor were the only very large mammals on the list. No information was obtained in the interviews for Schmomburgk's deer or Malayan tapir. (The other species on the list were various primates and other obscure small mammals, to be discussed in a future report.)

khting vor

khting vor were reported by all four hunters from Mondul Sema District, on the southern edge of the Mount Samkos complex. Two hunters in the central portion (Thamar Bang District) of the Cardamom Mountains also reported the presence of khting vor. One claims he saw a khting vor in 1998. Furthermore, two militiamen in the Special Interviews reported they had seen khting vor in the central Cardamom Mountains. They both live in Thmar Bang District and confirm that the khting vor is still present. They described the animal as grey and dark and smaller than a buffalo. (They also said it eats poisonous snakes and thorny vines, which is also what hunters from eastern Cambodia, northern Cambodia, and Vietnam report. The consistency of the legend is striking.) These reports are consistent with and reinforce information from the 1998 interviews, in which eight hunters reported khting vor in the Cardamom Range. It appears that the central Cardamom Ridge in Thmar Bang District and the Mount Samkos area of Mondul Sema and Veal Veng Districts are the most likely place in the world that this animal is presently found. No scientist has yet seen this animal, and no photo exists. It is only known form hunter reports and from sets of horns which have been brought out of the forest. (See Weiler and Ashwell 1999 for further details.)

Javan rhino

One hunter reported sighting a rhino in 1997 in a river valley in Thamr Bang District, near the crest of the Cardamom Mountains and the Koh Kong/Kampong Speau Province boundary. He is a highly experienced hunter and says he saw the animal at a range of 30 meters. He also found the grass impression where the rhino had been resting and numerous distinctive tracks. The rhino was near a small pond. This report is particularly intriguing because in 1995 the Wildlife Protection Office received several reports of a small population of rhino from Kampong Speau Province, near the Koh Kong border. Further investigation was conducted, and the reports seemed credible (WPO personal communication 1999.) Also, several Forestry Department personnel say that Khmer Rouge defectors report small numbers of rhino in the Cardamom Mountains (Personal communication, Ty Sokun, Director General 1999).

Furthermore, two reports of rhino are documented in the Veal Veng Refugee Needs Assessment Report. Although the lead author has previously characterized rhino as extinct in Cambodia (Weiler *et al.* 1998), it is certainly possible that a few survive in the Cardamom Mountains Region.

tiger

Seeing tiger

- 75% of hunters saw tiger in the last year and described the most recent encounter in detail
- 65% of hunters saw a tiger one or two times
- 25% of hunters saw a tiger three to six times

Seeing tiger Tracks

- 100% of hunters saw tiger tracks within the last year
- 85% saw tiger tracks many times
- 15 % saw tiger tracks 2-6 times
- 70% distinguished tiger tracks from leopard tracks by size only
- 20% offered no explanation on how to distinguish tiger tracks from leopard tracks

It appears that 90% of hunters can't tell a leopard track from a tiger track for certain.

tigers killed

- 50% of hunters reported tigers were killed in their area within the last year
- 35% reported one tiger killed
- 15% reported three to six tigers killed
- One hunter reported two leopards killed

Man-eating tiger: Information from May-June 1999 hunter survey

A tiger killed two Krasna wood collectors in 1998, at 3:00 pm at in the forest near Kbal Chhai Veal 1 in Mondul Sema District. The tiger was killed at 5:00 pm. Their colleagues took the corpses back to the village.

A tiger attacked several people in 1997 while they were patrolling at Number 1 waterfall, Damnak KHLA, Kbal Chay in Knoh Por Area near the gulf waters in Mondul Sema District.

One man was killed by a tiger in 1998 in Thmar Bang District, Tatay commune, Dong Village while he slept in the forest.

Man-eating tiger: Information from March 1999 special interviews

Five knowledgeable Krasna wood collectors and two militiamen were interviewed. Man-eating by tigers was common between 1994 and 1997, and peaked in March-May 1997.
Most victims were Krasna wood collectors, woodcutters, and a few Khmer Rouge guerillas, killed while sleeping in their hammocks, usually around 9pm or 4am.

A total of around 55 people were killed in Koh Kong Province. Over 100 people total were killed within the larger area extending into Pursat and Kampong Speau Provinces.
These estimates were arrived at from discussions with other Krasna wood collectors during meetings in the forest. Some interviewees had no numbers but confirmed there were a lot of man-eating tigers operating during this period.

This new information is fully consistent with the 1998 interview information, which indicated man-eating tigers were widely active throughout the greater Cardamom Mountains Region during the 1990's.

Species hunters try to catch (all individual lists combined)

Mammals
Banteng, sambar deer, barking deer, mouse deer, wild pig, black bear, sun bear, serow, wild dog, hog badger, porcupine, slow loris, Whitehanded gibbon, crab-eating macaque, hairy-nosed otter, pangolin, rabbit, civet, fishing cat

(Hunters say they prefer smaller animals because they are easier to carry out. None of the twenty hunters interviewed listed tiger or elephant as species they hunt.)

Birds
Red jungle fowl, Northern pintail, lesser whistling duck, peafowl, great hornbill, helmeted hornbill, oriental pied hornbill, pompadour green pigeon, parakeet, barred cuckoo dove

Reptiles
Black spitting cobra, rock python, monitor lizard, crocodile

(Crocodile were not species listed on either the 1998 or 1999 interview forms. However, crocodile are widely reported from certain stretches of some of the major rivers of Koh Kong and from certain ponds and lakes in Koh Kong and Pursat.) .

Species protected by traditions against hunting

- Monkey and gibbon: Killing brings children disease
- Slow loris: Killing brings bad luck and depression to family
- Elephant: Killing brings bad luck to family
- tiger: Killing brings depression, bad luck, children and wife disease
- Wreathed hornbill: Killing brings bad luck
- Fish eagle: (Always seen in pairs.) Killing brings divorce

Only 35% of hunters describe one or more of these traditions

Hunting methods

- 90% of hunters use guns
- 80% of hunters use rope snares and traps
- 60% of hunters employ dogs
- 10% of hunters use steel traps

It is important to note that gun control measures have just begun to be employed in 1999. The high percentage of hunters reporting gun use significantly overstates the current situation. Most hunters reported during interview discussions that local authorities had withdrawn many hunters' guns during the first half of 1999.

Disposition of wildlife harvest

- 80 % keep some wildlife and sell some
- 15% of hunters keep all for the family
- 5% of hunters sell most
- 65% of hunters think they receive a fair price for wildlife from town dealers

Importance of hunting to family

- 85% say hunting is somewhat important to self and family
- 5% say hunting is very important
- 10% say hunting is not very important

All of the hunters surveyed work most of the time on a farm or plantation, and use hunting to supplement their meagre lifestyle. None are professional hunters.

- 80% do not teach their children to hunt

Hunting is characterised as very hard and not offering as many benefits as farming and logging. Weapons have been confiscated, and there is not as much wildlife these days anyway.

Wildlife trends in the Cardamom Mountains Region

- 100% of hunters say wildlife has decreased in their area over the last 5 years
- 90% of hunters are worried about this situation

Government policy on hunting

- 60% of hunters say they know the current law
- 30% say hunting of large mammals such as elephant, tiger, and gaur is banned
- 20% correctly said that all catching and killing of wildlife is prohibited

When the law was explained, 65% said the policy should be changed, primarily to allow subsistence hunting of common small mammals such as Sambar deer, Barking deer, Wild boar, and Monitor lizard.

- 100% of hunters allowed themselves to be photographed while being interviewed by a Wildlife Protection Office official.

Wildlife conservation knowledge

- 100% of hunters have no formal education
- 45% of hunters said they know what wildlife conservation means

They described it mainly in terms of protecting wildlife as a future food source and allowing the next generation to know wildlife. One hunter described conservation as protecting wildlife when populations are too low and catching wildlife when populations are too high.

- 85%of hunters agreed with the concept of wildlife conservation after it was explained

All hunters interviewed agreed to cooperate with the Wildlife Protection Office in the future as guides for wildlife surveys and as information sources.

Tiger Conservation Workshops

Koh Kong Tiger Conservation Workshop, 25 March 1999

Thirty-six key province and district officials attended this workshop, such as governors, forestry directors, and police chiefs. All six districts in Koh Kong Province were represented. Presentations were made by both WPO and CAT on the results of the 1998 survey, the importance of wildlife conservation, and international aspects of tiger conservation. Then province and district officials reported on the status of tiger and other wildlife in each district. In general, it was reported that tigers are declining, and are still taken by hunters and soldiers using a variety of techniques.

Thmar Bang District encompasses the central Cardamom Mountains portion of Koh Kong Province and is where the 1999 field survey was conducted. The Thmar Bang District Governor estimates about 40 tigers in the district, but acknowledges this is a guesstimate and requests a formal survey to determine a more accurate number. In Mondul Sema District, which includes the southern reaches of the Mount Samkos complex, the Governor reported tigers were numerous until 1979, but declined thereafter.

The Military Commander for Koh Kong Province lived in the Cardamom Mountains for 19 years as a guerrilla fighter. He has seen khting vor in the mountains and reports they are still found there. The Environmental Officer for Koh Kong Province pointed out that there is no staff, management, or any other kind of official presence in the Mount Samkos Wildlife Sanctuary, the largest in Cambodia.

Officials formed two discussion groups. Each addressed two questions: Why conserve tiger, and how should it be done? The tiger was deemed important as part of the world heritage, a symbol of power, a representation of moral conviction and Khmer civilisation and a national treasure, a factor in a healthy environment, and a source of medical and health research benefits and traditional medicine. (The latter belief was expressed at several other workshops and indicates that tiger bone is considered to have medical benefits in Cambodians culture as well as Chinese.) It was stressed that it was important to conserve the tiger so that the next generation will know the tiger. The tiger was also considered important in making tourism more attractive and in attracting foreign aid from wildlife organisations.

A variety of conservation measures were recommended. Education at schools, pagodas, state institutions and of the public and people living near the forests was viewed a particularly

important. Education was specifically recommended by means of radio, TV and posters. Strict enforcement of wildlife laws was stressed, as well as the prevention of illegal logging in wildlife sanctuaries. Research in known tiger areas was proposed, leading to the creation of additional wildlife sanctuaries. There was a consensus that soldiers, police and technical authorities must "know the interest of wildlife three times more than local people." There was agreement that mines must be cleared from the forest to protect the wildlife and to allow authorities to enter and properly manage key areas, illegal weapons must be collected, and wildlife trade must be stopped.

Pursat Tiger Conservation Workshop, 6 April 1999

Participating in the workshop were 43 province and district officials. Three districts were represented: Kravanh, Veal Veng, and Krakor. From Kravanh District, the Governor reports a variety of wildlife, but unfortunately much illegal hunting by machine guns, boom snares, pit traps, etc. The wildlife trade is quite active. Many hunter groups are supported by soldiers and rich and powerful men. The Governor outlined a number of measures were needed to bring the situation under control: progress in agriculture, finding hunters jobs, cracking down on wildlife trade, and setting up a corruption-free law enforcement system.

The Veal Veng Governor reports much hunting as well, particularly for tiger and elephant. The problem is acute because of the remoteness of the area, lack of knowledge of tiger benefits, support for hunter gangs by traders, widespread availability of guns, booms and mines in the forest, deforestation in the wildlife sanctuary, lack of law enforcement and easy selling of tiger bone and elephant tusk. (Veal Veng is a new district, created in 1999 from the western half of the old Kravanh District.)

The Veal Veng Police Chief added that Thai merchants were supplying hunter groups with modern high-velocity magnum elephant guns with telescopic sights, capable of dropping an elephant at the 300 to 500 meter range. tiger are taken by placing mines under monkey carcasses. He implicated the military in supporting illegal hunting. He felt better intelligence was needed on the highly secretive and well organised hunter groups and supported jail terms for illegal hunting.

The Krakor District Governor said that wildlife was in decline after 20 years of civil war combined with continued anarchy by soldiers, militia and hunters. The presence of many wildlife shops compounds the problem, and many traders support the hunters. (Krakor District adjoins the Cardamom Mountains Region.)

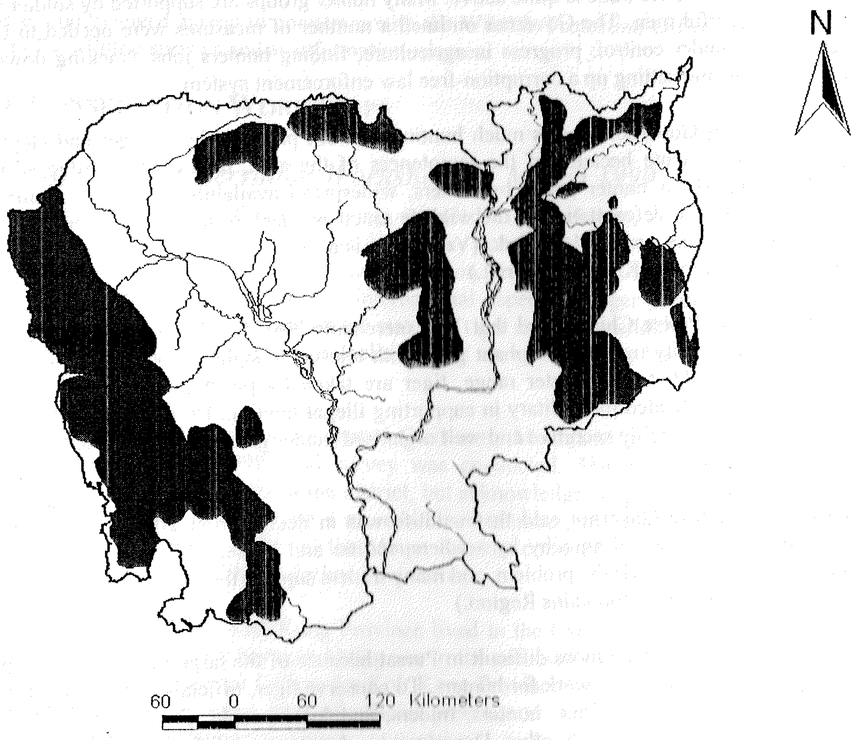
tiger conservation is made more difficult in Pursat because of the large number of very poor people and the lack of other work for hunters. To conserve tiger, officials stressed the need to educate soldiers, militia, police, hunters, traders, and local people. Forestry Officers were encouraged to cooperate with other Departments. Awareness of traders and hunters by requiring thumbprints was recommended to help stop the killing and buying of wildlife. Crackdowns on wildlife shops and cooperation with conservation NGO's was emphasised.

The officials concluded in their group discussions that tiger conservation was important because tigers are declining and they want to save the tiger for the next generation. They saw tigers as having commercial value by attracting international aid and extending the tourist sector of the economy. When there are substantial numbers of tigers in the forest, officials thought they should be considered for a source of medicine. They agreed that to conserve the tiger is to conserve other wildlife and the forest itself forever, that the tiger is an important symbol of power and Asian culture, and that conserving the tiger means that agriculture will have to be more developed. The officials agreed that tiger conservation is an important part of being an honourable country in the world.

Specific recommendations were to set up law enforcement immediately, allow no logging concessions in the wildlife sanctuary, clearly mark the wildlife sanctuary border, and actually regulate and mange the sanctuary.

Wildlife programs should be integrated into school studies. Additionally, a media wildlife extension program was recommended. Various rich, powerful, and armed men must be convinced to cease supporting illegal logging, hunting and trading. Forest officers have to strongly carry out the law and fully cooperate with police, military police, and soldiers. There should be cooperation with other countries on tiger management.

Figure 2. Distribution of hunting territories where hunters reported tigers present (total 56,000 km^2)



Conclusion

The 1998 and 1999 CAT-Cat Action Treasury/Wildlife Protection Office hunter surveys and special interviews revealed that perhaps the most significant wildlife population in Cambodia is in the Cardamom Mountains Region. However, this wildlife is declining due to hunting and deforestation. The hunters interviewed expressed a keen interest in working with the government to develop a wildlife conservation program. This interest should be followed up on. The over 50 hunters surveyed in the region have a wealth of irreplaceable information on the forest and its wildlife.

Government officials from Koh Kong and Pursat attending the tiger conservation workshops were frank in their assessment of the severe problems facing wildlife in the Cardamom

Mountains Region. They proposed thoughtful concepts for developing a wildlife conservation program, and were enthusiastic about working with the Wildlife Protection Office, other government agencies and international organizations. Officials from both provinces were extremely helpful in arranging and expediting the interview surveys, the workshops, and the field survey. There is a genuine commitment to implementing a long-term program. Province and district officials support working with the hunters, both to capitalize on hunters' knowledge of the forest and its wildlife, and to provide hunters with alternative employment opportunities.

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IV. A needs assessment for integrating wildlife conservation with post conflict recovery in Phnom Samkos Wildlife Sanctuary (Cardamom Mountains)

Frank Momberg[26] *& Ken Serey Rotha*[27]

BACKGROUND

The pattern for international aid and support in post conflict areas has normally focused on the provision of emergency humanitarian aid. Infrastructure reconstruction and longer-term development support generally follow these initial phases, combined with a range of assistance for the return to peaceful civil society.

The initiation and resumption of activities related to environmental and biodiversity conservation are understandably considered secondary in terms of post crisis recovery. However post crisis conditions also create a special set of circumstances which represent both a threat and a significant opportunity for the conservation of nature and natural resources, which has a critical role to play in the long term sustainable development and recovery of a country in crisis.

The main (inter-related) threats to natural resources in post crisis environments are as follows:

- Opportunistic exploitation of natural resources (particularly timber and wildlife products) is often used to fund both fighting factions and governments. The loss of management control can set a precedent for future unsustainable use after the conflict period.
- Governments may look at natural resource exploitation as a quick means of generating badly needed revenue
- Communities may have become dependent on natural resource exploitation for survival; this situation can be made worse by the widespread ownership of firearms
- The post crisis reconstruction period, often characterized by weak and under-resourced government institutions, presents a window of opportunity for unscrupulous individuals and companies to exploit the lack of control and to continue illegal activities or to secure inappropriate concessions
- Resettlement schemes for refugees and displaced communities can lead to forest conversion and increase hunting pressure
- Emergency aid programs may unwittingly enable ongoing resource exploitation through provision of access and trade routes to inaccessible areas

These situations can also present significant opportunities for long term sustainable natural resource protection and management:

- This is the time when new policies and legal frameworks are established, which provide opportunities for integrating biodiversity conservation at an early stage
- Planning for regional development, land use and forest classification takes place, creating opportunities to integrate biodiversity conservation into planning processes
- The absence of entrenched government bureaucracies and strong business interests creates a historic chance for biodiversity conservation and protected area gazettement.
- Large areas of landscape have often been left undisturbed during periods of crisis; these continuous tracts of unfragmented habitat are of enormous value for the conservation of species with large home or migratory ranges. Protection of these areas at the earliest possible stage can avoid the continuous incremental damage which has led to the fragmentation and ultimate loss of these areas in many countries
- Deprived communities in affected areas can become positive agents for the sustainable management and use of natural resources on which they have depended. The transition from aid dependency to self sufficiency can, if well planned, include measures which provide positive support for sustainable relationships between communities and wildlife
- Environmental programs may present opportunities for local people to gain meaningful employment in remote rural areas as forest wardens, rangers or in the provision of goods and services for tourism

Building in good environmental practices at an early stage and closely integrated with other vital forms of aid and assistance has the potential to prevent many future problems and to contribute positively to post conflict recovery.

THE CAMBODIAN CIVIL WAR AND ITS ENVIRONMENTAL IMPACTS

One of the significant effects of the civil war in Cambodia was the devastation of forests and wildlife. In many areas anarchic logging practices resulted in massive habitat loss. People and wildlife were lost through guerilla activities and the millions of land mines throughout the country. In the post-war quest for economic recovery, with increasing pressure for unsustainable resource extraction the process of raising environmental concern and implementing protective policies has just begun.

Until last year most forest areas, with the exception of the Northeast, were inaccessible due to security risks. Only a few surveys have been conducted in the Northeast (Desai and Vuthy, 1996, Timmins and Soriyun, 1998). Since 1998 FFI has resumed fieldwork in Northeast and Southwest Cambodia in collaboration with the Cambodian Wildlife Protection Office. The recent significant improvement of the security situation due to cessation of violence and crack-down on anarchic logging practices, followed by the new forestry sector loan agreement between the World Bank and the Cambodian Government, has created a momentum and significant opportunities for reviewing the current protected area system and developing management systems for at least 10 protected areas nationwide.

NEEDS ASSESSMENT IN THE CAMBODIAN-THAI BORDER DISTRICT OF VEAL VENG (MT. SAMKOS WILDLIFE SANCTUARY)

Since 1974 the district of Veal Veng has been isolated from Cambodia, both geographically and ideologically. Until October 1998 the area was one of the last strongholds of the Khmer Rouge. Villagers had either to join the Khmer Rouge or flee from their homes to refugee camps on the Thai-Cambodian border or other provinces within Cambodia.

Only in Ou Soam did a group of households persist through the civil war. They retained a comprehensive local knowledge regarding natural resource management. This original local people as well as some of the returning refugees are *Khmer Daeum*, Khmer with a very traditional lifestyle and culture, who inhabited the Cardamom Mountains for centuries. They maintained a distinctive archaic Khmer dialect. Lowland Khmer call these mountain people Prong, Krom, or Kom depending on the region. (Martin 1997)

In 1996 the situation changed when Khmer Rouge leaders decided to stop fighting and to negotiate a settlement with the Royal Government of Cambodia. The soldiers defected and joined the Royal Cambodian Armed Forces. Many people returned from refugee camps in

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Thailand. Refugees and Ex-Khmer Rouge soldiers settled down in the Veal Veng district. After the 1997 coup the Khmer Rouge resumed fighting, once again moving many people into the refugee camps along the border. Only since the beginning of this year are refugees returning home and Khmer Rouge soldiers reintegrating into the Government Armed Forces. UNHCR provided the refugees with a start-up package of shelter, food, clothing and seeds, enough for the first months. Beyond that local communities need further emergency assistance and a comprehensive development program is needed to achieve reconciliation, which is why a group of UN agencies and NGOs conducted a 5 day needs assessment to identify the most important needs. FFI and the Ministry of Environment were invited by UNDP/CARERE to join the needs assessment team to integrate community development and biodiversity conservation as the entire western half of the Veal Veng district is located inside the Phnom Samkos Wildlife Sanctuary. A Rapid Rural Appraisal was conducted focusing on community development needs, the status of large mammal populations and potential and current threats to the environment.

The results confirm the outstanding biological importance of Mt. Samkos Wildlife Sanctuary with the most complete assemblage and abundance of large mammals documented so far in Cambodia. They also document the need for integrating community development as well as regional development (especially in forestry and infrastructure) with conservation.

A total of only 6 households from the villages of Sam Lanh Ler, Tompor, Along Riep and Ou Soam were interviewed, who all came together at a meeting in Sam Lanh Ler. Field time was limited to three days as a result of the early onset of the rainy season and the fact that only a few villagers were present. A further limitation was the fact that eight organisations wanted to interview the same limited number of villagers. The results can therefore not seen as being representative. Nevertheless it was possible to identify immediate development needs, provide an indication of the status of large mammals in Mt. Samkos and qualitative information on present threats.

Wildlife of Mt Samkos Wildlife Sanctuary (Veal Veng District)

The RRA interviews confirmed the occurrence of Elephants, tiger, banteng, gaur, dhole, Malayan sun bear, Asiatic black bear, sambar deer, barking deer and pileated gibbon, possibly rhino and Khiting Vor. Only one villager reported the recent sighting of a Khiting Vor in Mt. Khmouch. The largest concentration of large mammals was reported from Tum Por, Khmouch and Na Lai Mountains. rhino were sighted in Mt. Kmouch and Mt. Tum Por. Sighting of pileated gibbon were reported from Nai Lai Mountain (in 1999). The most common predator was the dhole, which occurred everywhere in large numbers. barking deer and sambar deer were reported as very common throughout the forest providing a good prey base.

Rhino

A villager from Tom Por reported a rhino being killed 20-25 years ago in the higher elevation of Pnom Tum Por. 1996/97 a Thai road construction team reported sighting a rhino in Phnom Khmouch (Ghost Mountain). End 1996 / beginning 1997 Aloe wood collectors from Kravanth district reported seeing a rhino in the plain between Phnom Khmouch and Phnom Tum Por.

Elephants

Groups of elephants migrate during heavy rain from Phnom (Mt.) Tum Por to the lowland close Tum Por village. Villagers from Tom Por and Along Riep reported large numbers of Elephants in Phnom Tum Por and Phnom Khmouch. Elephants also migrate between the two mountains The same is reported from Sam Lang Ler, where Elephants migrate in groups from the Na Lai mountain, which is part of the same mountain complex as Mt Tom Por, along

the Sam Lanh river to Bamboo thickets in the flat terrain close to the village. Elephants entered village gardens in April 1999 to raid bananas. Large numbers of Elephants are also reported from Phnom Khmouch.

Tigers

All villagers reported recent sighting of tigers (1999) in Phnom Tum Por and Phnom Khmouch. A villager of Sam Lang Ler saw 4 tigers at night in Phnom Krohom. A villager of Tum Por witnessed the killing of a baby elephant by a tiger in 1997. Villagers of Tum Por laid out a hunted pig on a land mine as a tiger trap in May 1999. The land mine exploded when the tiger tried to remove the bait. The two hunters heard the explosion saw the fleeing tiger and tried to shoot it. The tiger then charged one of the hunters, biting him on the backside (*sic*) and disappearing into the forest.

Clouded leopard

Only one villager reported a recent sighting (1999) of a clouded leopard in Phnom Tum Por.

Banteng and Gaur

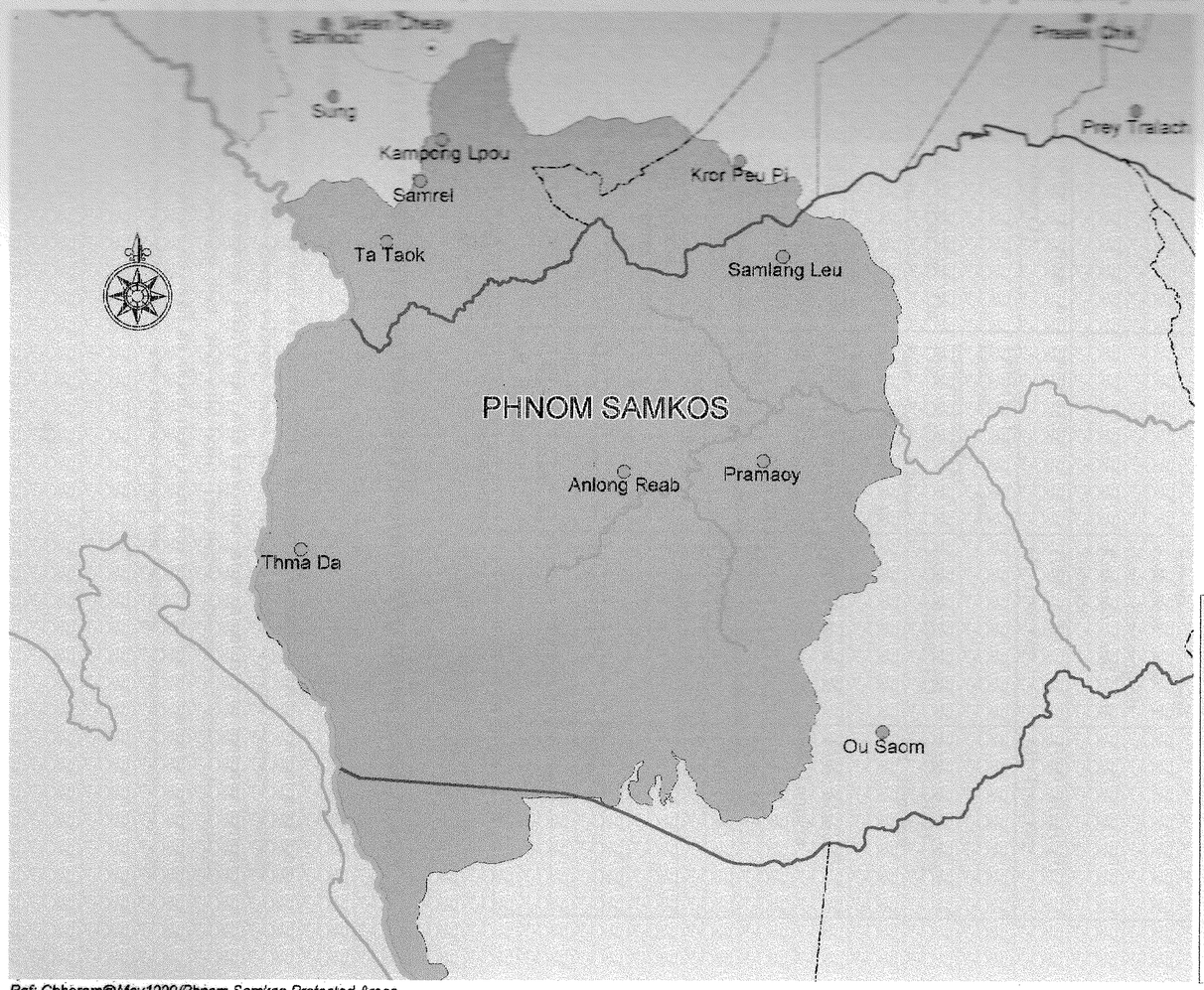
Sightings of several groups of 2-5 individuals of gaur were reported in at least 8 different locations. Phnom Tum Por was reported rich in gaur. banteng were reported to be abundant by all interviewed villagers with the exception of Ou Saom. banteng reportedly occurred in general in larger groups than gaur. Several groups, about 20 in total were sighted along the Sam Lang river in April 1999. The authors saw a gaur trophy on the market in Samlot district originating from Along Reap (Veal Veng district). On the way from Samlot to Krapeu Pi a motorbike with 2 banteng trophies passed by coming from Krapeu Pi in Veal Veng district. The motorbike driver, an ex Khmer Rouge soldier bought the trophies from hunters in Krapeu Pi.

Malayan Bun Bear and Asiatic Black Bear

Interview partners in all villages reported both species from occasional recent sightings of single individuals.

Map 2: Phnom Samkos Wildlife Sanctuary

Overlay of Protected Areas with base map information For Fauna & Flora International (FFI) by IRC, May 1999



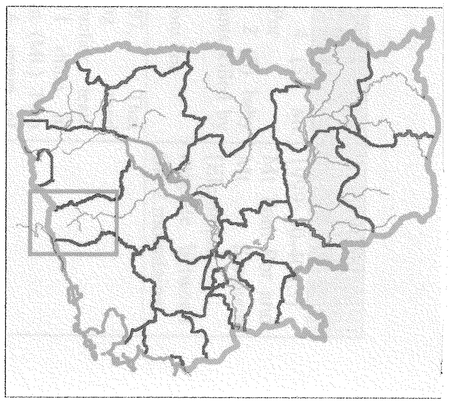
LEGEND

- Provincial Boundary
- District Boundary
- Commune Boundary
- International Boundary
- Primary Roads
- Secondary Roads
- Rail Roads
- Rivers/Streams
- Provincial/Cities Centers
- Districts Center
- Communes Centers

Protected Areas

- MULTIPLE-USE AREA
- NATIONAL PARK
- PROTECTED LANDSCAPE
- WILDLIFE SANCTUARY

Location Diagram



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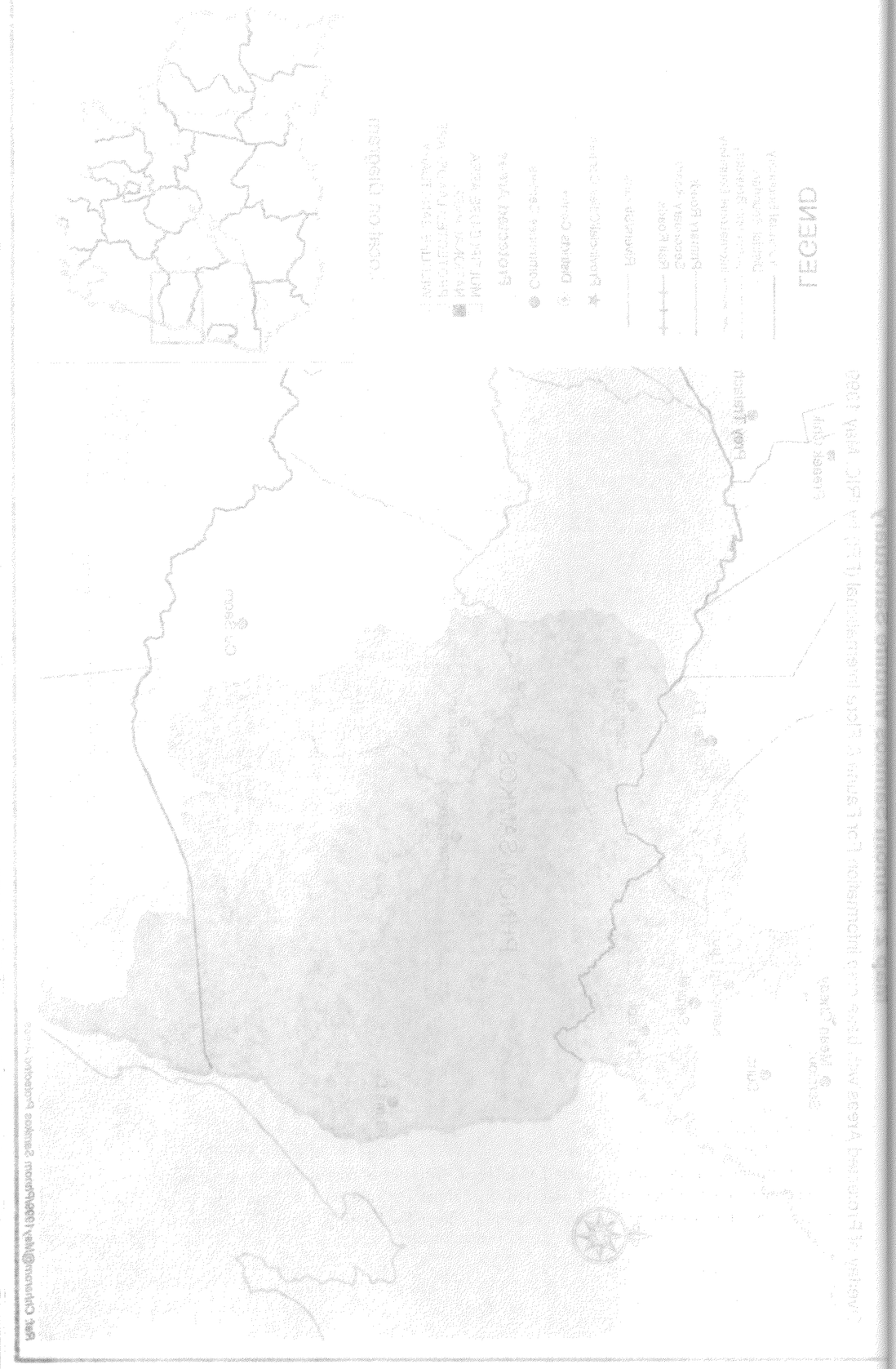

Table 2: Wildlife Sightings Recorded by Local People

Village / Species	Ou Soam	Samlang Leu	Toni Por	Along Riep
Elephant	Before 1970 close to village, now far away	1999: 15-35 (S), Mt. Na Lai & 5 km north of the village	1997: 4 (S), Mt Tom Por 1998: 2 (S) baby elephants killed by tiger Mt. Tom Por	1999: 30-40 (S) Mt Tom Por and Mt. Kmouch (Elephants migrate between the 2 mountains.
Rhino			1996/97, Thai logging road construction team saw 1 rhino in Phnom (Mt.) Tom Por. A group of Kresna wood collectors saw 1 rhino between Mt. Kmouch and Mt Tompor	
Tiger	1999: 1 close to village (T)	1999: 4 (S)	1998: 1 (S) Mt. Tom Por	1999: Many (?) Mt. Tom Por
Ehting vor	-	1999 (S, T) location and numbers unclear	-	-
Banteng	Not close to Ou Saom	1999: 20 (S) Sam Lang River, tracks close to village	1999: Present (T)	1999: Many (?) Mt. Tom Por
Gaur	1998: Tracks 10 km from village (Veal Muth Preah)	1999: 4 groups (2-4 indiv.) {S}	1999: Present (T)	1999: Many (?) Mt. Tom Por
Sambar	Many	Many (S,T)	Many (S,T)	Many (S,T)
Barking deer	Many	Many (S,T)	Many (S,T)	Many (S,T)
Sun bear	?	Present (S,T)	?	?
Black bear	1998: 1 indiv. Seen 100 meters from village	?	?	?
Dhole	Many	Many close to village	Many (S,T)	Many
Pileated gibbon	?	1995: 1 Group in Mt. Na Lai (S)	?	?

Key: (S) Seen (T) Tracks (?) Unconfirmed

Threats to the Biointegrity of Mt Samkos Wildlife Sanctuary

Hunting

Residents in all villages, as well as hunters from Thailand, Kravanh district, Pursat and Koh Kong (especially Thmo Bang village) hunt for wildlife trade. Target species include elephants, tigers, gaur, banteng, black bear, sun bear and large quantities of monitor lizards, turtles, sambar deer, barking deer, and wild boar. The needs assessment team encountered gaur and banteng trophies as well as dried deer meat for sale on local markets. Interview partners use guns, snares and traps, and employ dogs for hunting. Demobilization has just

started and weapons are being confiscated. It is expected that the use of guns for hunting will decline drastically. tigers are also hunted with wild boar placed on land mines.

NTFP collection

Few residents collect Kresna wood (only 1 interview partner). Kresna wood (*Aquilaria sp.*/ Aloewood) is collected by mainly by outsiders from Kravanh district, Pursat and Koh Kong. Kresna wood is declining in both quality and quantity due to over-harvesting. Most Kresna wood collectors are also engaged in opportunistic hunting during the expeditions. The number of Kresna wood collectors is declining. Local residents collect a species of liana for its medical properties (malaria treatment). The active substance is extracted in the neighboring Samlot district using hazardous chemicals.

Refugee immigration and land conversion

Most of the refugees who settled in Veal Veng district have cleared approximately 0.5-1 haof forest per household for upland fields. More refugees and other immigrants are expected to settle in this district. 50 families who lived in Ou'Saom prior to the war are planning to return from the neighboring Kravanh district. Most new settlements are located within and surrounding Mt. Samkos Wildlife Sanctuary. Current practice is shifting cultivation that will lead to subsequent clearing. All communities would prefer wet-rice cultivation but are lacking the agricultural tools necessary. Development assistance for wet-rice agriculture is urgently needed to avoid accelerated land clearance.

Road construction

The forest concessionaire You Ry Sako is currently constructing an all-weather logging road from Koh Kong to Kravanh to transport timber from its concession north of the central mountain range to its sawmill and portside in Koh Kong. The provincial government will extend this road to Pursat. The road from Battambang to Veal Veng district will be improved with a grant from AusAid to UNHCR/CARERE to enable access for relief and development assistance. These roads open access to Mt. Samkos Wildlife Sanctuary increasing threats such as in-migration and land clearance, poaching and illegal logging. The development of a reserve infrastructure is urgently needed for monitoring and law enforcement.

Illegal logging

Until the recent crackdown illegal logging operations were conducted by a Thai company in cooperation with Khmer Rouge militia. A logging road from Thailand extends all the way to the slopes of Mt. Tom Pir, close to the village of Sam Lan Ler. It is not impossible that some illegal logging activities continue along the border. According to local informants recent troop deployments to the border are linked to illegal resource extraction. Target species for illegal logging were the most valuable timber species with large diameter such as Nun (*Cochinchinesis* sp.), Nieng (*Dalbergia bariensis*), Being (*Pahudia* sp.), Koki (*Hopea* sp.), and Thung (*Pterocarpus pedatus*).

COMMUNITY NEEDS

Nutrition and Agriculture

When the refugees returned to Along Riep, Sam Lanh Ler, and Tom Por UNHCR provided a start-up package consisting of food, seed, cloth and shelter. Returning home, the refugees found their houses, wet-rice fields and gardens destroyed and their livestock lost. All interviewed refugee households expressed a lack of seeds (rice, beans, corn, vegetable, fruit trees). They all experienced that up to 50% of the rice seeds provided by UNHCR did not germinate. Additional food supplies will be necessary soon, as rice supplied by UNHCR will

only last until July 1999. All refugee households have just started a month prior to the needs assessment with clearing of upland fields for planting rice, corn and vegetables. All villages have potential areas for wet-rice fields but not the necessary agricultural tools for ploughing. Provided with ploughs and buffaloes villagers are able to establish rain-fed wet-rice fields by themselves.

Health and Education

No health service or schools exist in the district. The people of Ou Soam rely entirely on traditional medicine. Almost all people younger than 30 are illiterate. Few older people learned how to write and read during the Sihanouk regime. Child mortality is high. It is necessary to establish primary schools and health facilities and provide paramedical training for selected local people.

Immediate development assistance

As a result of the needs assessment AusAid granted US $ 100,000 to UNHCR/CARERE for immediate relief assistance in Veal Veng and Samlot districts. The assistance encompasses immediate food supplies, development of two schools and health centers in Krapeu Pi and Pramoy (Veal Veng district), and reconstruction of the road section from Samlot to Veal Veng district. Concern Worldwide will provide farm tools to Pramoy and Krapeu Pi villages. World Food Program will also assist with food and seed supplies.

INTEGRATING WILDLIFE CONSERVATION AND POST CONFLICT RECOVERY

FFI will cooperate closely with UNHCR/CARERE and Concern to ensure that development assistance provided to refugees will not have negative impacts to the biointegrity of Mt. Samkos Wildlife Sanctuary. It is necessary to develop an integrated conservation and development project for Mt Samkos Wildlife Sanctuary that integrates protected area management with community development. Development of wet-rice agriculture, agroforestry systems, community forestry and eco-tourism are possible development interventions in the buffer zone. Local people should participate from the very beginning in the development of the Wildlife Sanctuary. The reserve should provide employment for local people, especially for previous hunters as rangers.

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V. Protection of the Central Cardamom Mountains: Conclusions and Recommendations

Frank Momberg, Hunter Weiler, Marcus Hardke, Chheang Dany

JUSTIFICATION FOR PROTECTION

The studies presented in this report contain the most up to date information about the status and distribution of wildlife in the greater Cardamom region available so far. The report focuses mainly on very large mammals and key species typical for the evergreen forests of Southwest Cambodia. The combination of specific, long term interview data received from locals /officials, a flight survey and scientific fieldwork gives a clear impression about wildlife, habitat quality and the socio-economic situation in the area. Further studies are, of course, necessary, but the picture is clear enough to show the conservation value of the region and demonstrate an urgent need for activities that ensure sustainable use and protection of the forest of the Cardamom Mountain Range.

The Cardamom Mountain Range is one of the most important watersheds in Cambodia forming the divide between the coastal and Tonie Sap/Mekong catchments. The watershed protection is important for the marine fisheries south and inland fisheries north of the divide. The in-land fisheries of the Tonle Sap are amongst the most productive in Southeast Asia. External costs caused by logging such as erosion, flooding, destruction of highly productive fisheries of the Tonle Sap lake and coastal zone and impacts to the wet-rice plains southwest of the Tonle Sap could by far outnumber any revenues from logging. Disturbances of the Cardamom Watershed could lead to severe economic losses for the Cambodian people.

The Central Cardamom Mountains contain lowland and medium altitude evergreen forests up to 1500 meters. The area to the north of the divide includes mixed deciduous forests. The southeastern area contains unique pine forests, which are restricted to small penepleins and exposed ridgelines that are likely to feature an unusual assembly of birds and other animal species. The lowland and medium altitude forests are the most species-divers formations in the country with a high number of endemic plant species (Ashwell 1997). The aerial survey observed evidence of logging operations in the lowlands and the lower southern slopes along the main streams, while it also confirmed that large intact block of pristine evergreen forest and undisturbed canopy remain in the Central Cardamom Mountains north and south of the Koh Kong / Pursat provincial boundary and in the Mt Samkos complex near the Thai border.

The Central Cardamom Mountains contains most likely the highest concentration of large mammals in Cambodia (see Chapter III). The recent field survey conducted by WPO and FFI in April / May 1999 confirmed the presence of highly endangered large mammals such as tigers, elephants, banteng, gaur, and pileated gibbon (see chapter II). Interviews, as part of the needs assessment, further underline the outstanding biological importance of the Cardamom Mountains (see chapter IV). Hunter interviews and provincial workshops conducted by WPO and CAT document that the Cardamom Mountains are the most important Elephant range remaining in the country. (Hunter Weiler & Men Soriyun 1999, see chapter III). The Cardamom Mountains also contain the highest concentration of tigers in Cambodia, possibly Indochina with estimated numbers of 162-217 tigers based on hunter interviews (Nowell *et al.* 1999). The findings were reinforced by the recent WPO/FFI field survey that documents tiger tracks in the area (see chapter II). The WPO/CAT second round of hunter interviews in May 1999 also reinforced the results of previous hunter interviews that the Central Cardamom

Mountains is the only area in Cambodia where two of the world's most endangered large mammals, Khting Vor and Javan rhino might prevail (see chapter III, IV).

History of protected area gazettement in the Cardamom Mountains

Between 1906 and 1950 a total of 173 forest areas were designated as 'reserve forests' by the French colonial government, accounting for 3,875,166 hectares. They were inventoried and classified as production forests, protection forests and national parks. Six areas were designated as wildlife sanctuaries accounting for an additional 2,232,700 ha. The central Cardamom Mountains (Phnom Kravanh) was one of the wildlife sanctuaries with 280,640 ha and 5 assigned rangers. In 1975 McNeely designed a protected area network for the entire lower Mekong basin. For Cambodia a protected area network of 8 national and two trans-boundary reserves were proposed, among them the Cardamom Mountains Reserve covering the entire Central Cardamom Mountains stretching from the Thai border to the Elephant Mountains. In the 'Review of the Protected Area System of the Indo-Malayan Realm' the Phnom Kravanh reserve was proposed with a total area of 2806 km² with an altitudinal gradient of 100-1563m based on the previous colonial reserve. The reserve received the highest priority score of any protected area in Cambodia and was rated one of the 7 most important protected areas of Indochina (MacKinnon 1986). The Royal Decree (Reach Kret 1993) that designated Cambodia's current protected area system did unfortunately not include the Central Cardamom Mountains (Phnom Kravanh).

A proposal for a new 'conservation forest' for biodiversity conservation and watershed protection

The Department for Forestry and Wildlife (MAFF) and FFI are proposing to exclude the Central Cardamom Mountains from logging (See provisional boundaries, map 5). The area would be managed as conservation forest[28] that forms a wildlife corridor between Phnom Samkos and Phnom Aural wildlife sanctuaries. The Ministry of Agriculture, Forestry and Fisheries would manage the conservation area as part of the national forest.

The current ban on illegal logging practices and review of forest concessions is possibly the last historical chance in Cambodia to protect this important watershed with global biodiversity importance. The proposed area (see map 6) has a total area of 336,575 ha which until the end of 1998 has been divided up among forest concessions (116,660 ha Samling, 100,637 ha CAT, 82,391 ha Silverroad, 34,057 ha Superwood, 2,830 ha TPP). None of the concessions have yet started logging in the Central Cardamom Mountains; neither have any of these concessions been cancelled or modified so far. Concessions might either be cancelled or concession contracts renegotiated to exclude actual logging within the conservation forest. Also based on the new forest use classification currently being developed, areas important for watershed protection might be excluded from logging. FFI and WPO will continue biological survey work in the coming dry season starting in January 2000 to help develop appropriate, scientific boundaries for the conservation forest.

Even with the current logging ban and forest concession review the establishment of sustainable forest management will need at least a few years time; meanwhile degradation might continue. Although final boundary demarcation needs further scientific justification and community participation, the Central Cardamom Mountains Conservation Forest should be

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[28] Chapter 7, article 50 of the draft new forestry law (MAFF, 1. Draft 27.8.1999) regulates the establishment of Protected Forests: (1) "In case the Royal Government feels that any part of a national forest is of special environmental, scientific or cultural importance, or any other importance, it may declare such part of the national forest as a protected forest." The term 'conservation forest' has been suggested by the Director General for Forestry and Wildlife to stress the importance of biodiversity conservation.

gazetted as soon as possible to prevent further degradation. Provisional boundaries would provide immediate legal protection from logging & mining, freeze land ownership, and require an environmental impact analysis for infrastructure development such as roads and dams until final demarcation. This gazettement process is practised in other countries such as Indonesia and has been already proposed by the Cambodian Ministry of Forestry. (Chhim Somean & Le Billion 1993)

Together, the proposed Central Cardamom Mountains Conservation Forest, Phnom Samkos and Phnom Aural Wildlife Sanctuaries form the largest block of intact and protected tropical evergreen forest in Cambodia and Indochina (more than 900,000 ha). The outstanding biodiversity of the Cardamom Mountain Range may qualify the protected area / conservation forest cluster to be designated as Natural World Heritage Site.

BIOREGIONAL/ECOREGIONAL PLANNING FOR THE TROPICAL EVERGREEN FOREST ECOREGIONS OF SOUTHWEST CAMBODIA

Bioregional Planning provides a means of linking protected area management to land use planning and sustainable economic and social development at a broader scale (Miller 1996, Momberg 1999). This approach looks beyond the boundaries of strictly protected areas, to include the establishment of buffer and support zones around them and the creation of ecological friendly land use between them. (Davey 1998)

The Cardamom Mountains are part of the larger Tropical Evergreen Forest Ecoregion of Southwest Cambodia. It is necessary to integrate regional development planning with biodiversity conservation. The construction of dams, roads, and new settlements need to be carefully planned in order not to threaten the biointegrity of the Cardamom Mountains. The ideal land use in the surrounding of the protected area cluster should be sustainable forest management. It is important to maintain forest cover along rivers all the way to the coast as well as forested wildlife corridors linking the Cardamom Mountains to Mount Aural and the Elephant Mountains. New infrastructure development especially in Veal Veng district needs to be accompanied by the development of park infrastructure for Mt. Samkos Wildlife Sanctuary including ranger posts and a patrolling and law enforcement system to prevent poaching and agricultural encroachment.

The current forest concession review may establish a sustainable forestry industry in the future. Sustainable managed and certified forest management in production forest would certainly the best land use adjacent to the protected area cluster. The Ministry of Forestry is also currently developing a watershed classification that will lead to a forest use classification based on geo-morphological criteria such as slope inclination, rainfall and soils. Some of the Central Cardamom Mountains will have to be classified as Protection or Limited Production Forest rather than Production Forest.

INTREGRATION OF BIODIVERSITY CONSERVATION AND POST WAR RECOVERY

Building in good environmental practices at an early stage and closely integrating with other vital forms of emergency aid and development assistance has the potential to prevent many future problems and to contribute positively to post conflict recovery. Deprived communities in affected areas can become positive agents for the sustainable management and use of natural resources on which they have depended. The transition from aid dependency to self-sufficiency can, if well planned, include measures that provide positive support for

sustainable relationships between communities and wildlife. Environmental programs may present opportunities for local people to gain meaningful employment in remote rural areas as forest wardens, rangers or in the provision of goods and services for tourism.

It is FFI's aim to work with refugee and other communities to enable them to have a 'from the start involvement' in natural resource protection and management, while working alongside aid and development agencies to enable food security and to raise awareness of environmental values and their relevance.

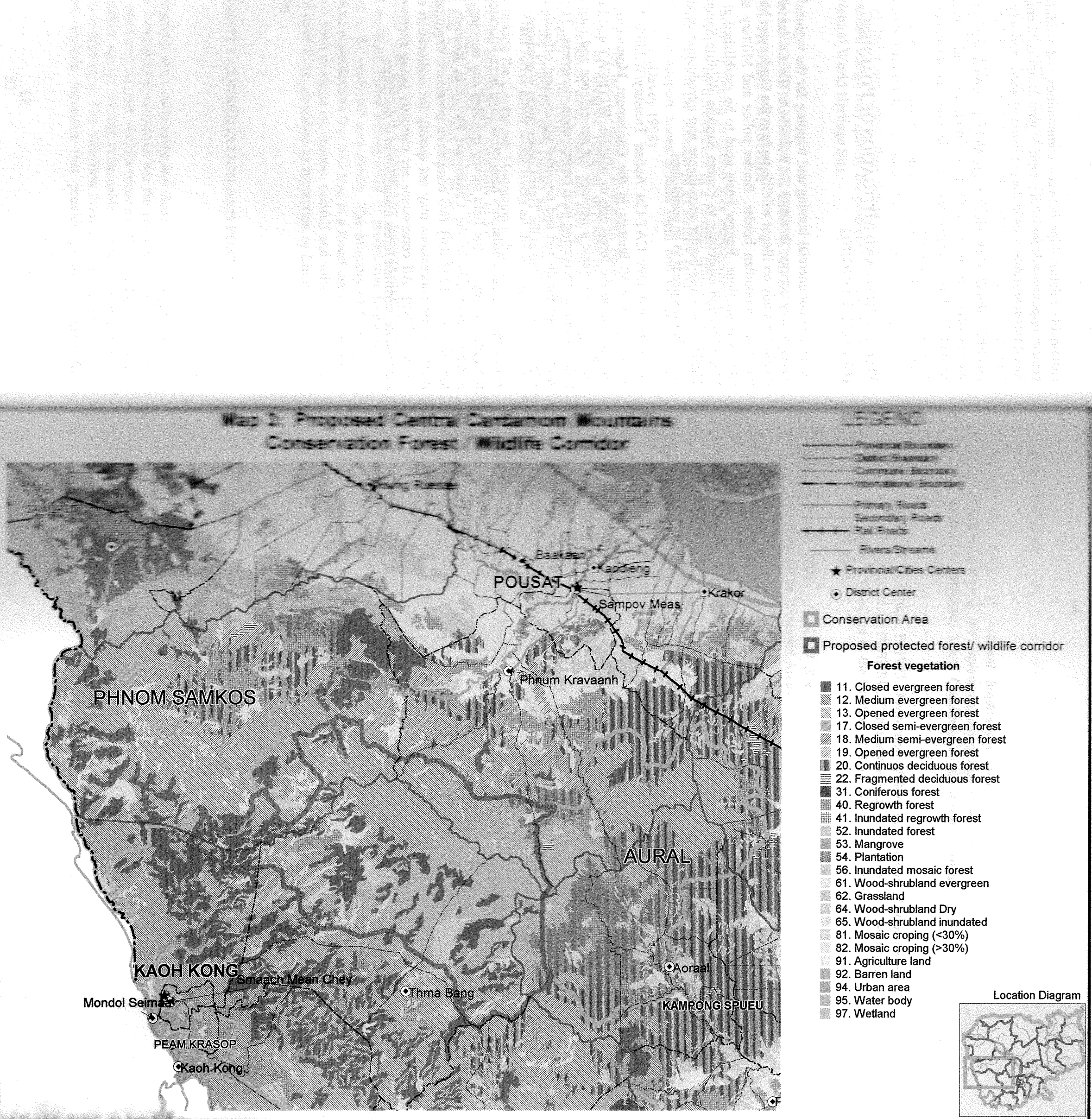
MONITORING AND MITIGATION OF POACHING, WILDLIFE TRADE AND ILLEGAL LOGGING

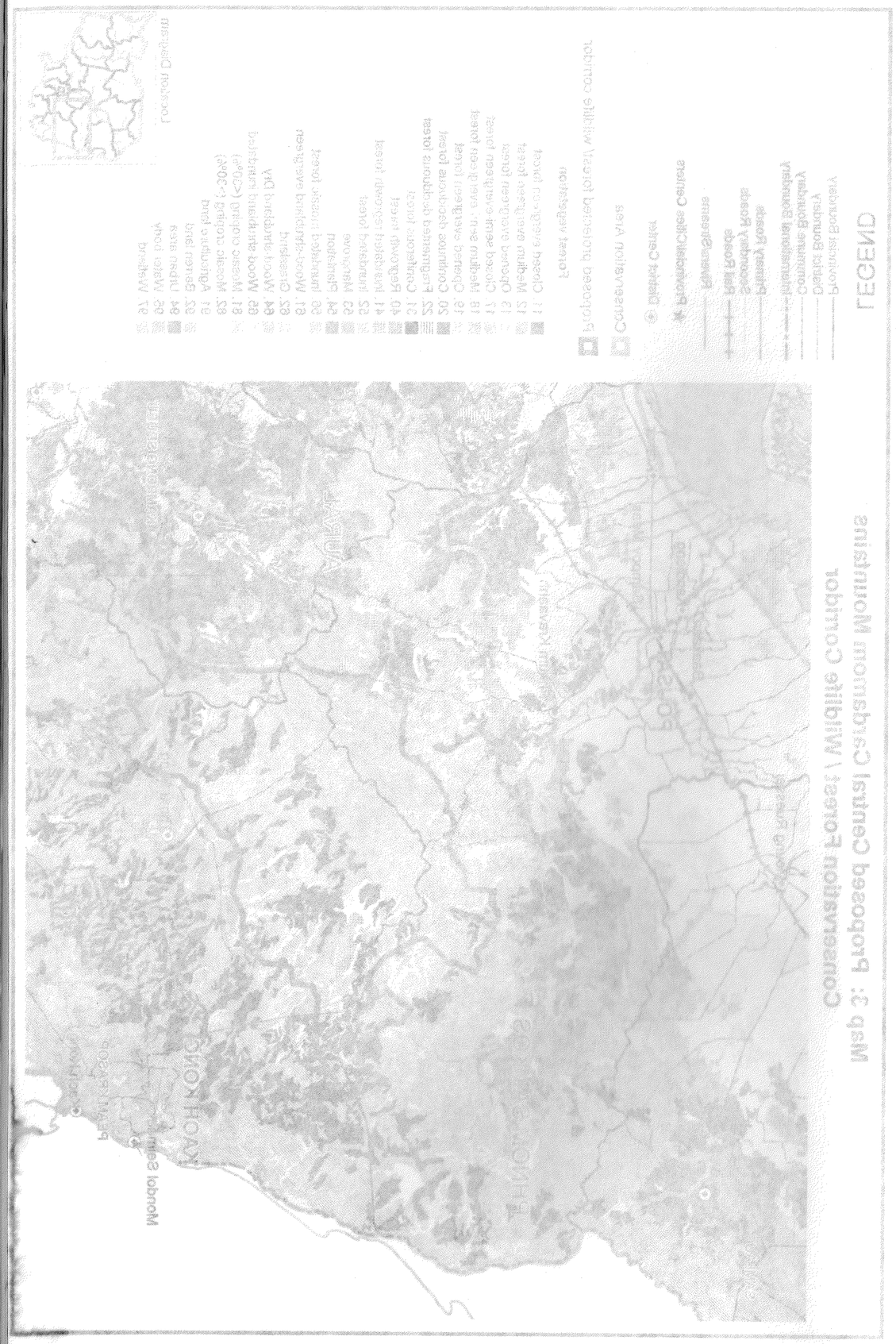
Organised commercial hunting and trapping for the regional and international wildlife trade poses a very serious threat to the wildlife in the Cardamom Mountains. It is necessary to conduct a study on illegal wildlife trade in the Cardamom Mountain Region, especially along the Thai-Cambodian border. Border police and Military should be trained to understand CITES regulations. Ranger posts need to be established at access roads to the Cardamom Mountains and especially to Phnom Samkos Wildlife Sanctuary. Bilateral cooperation with Thailand on cross-border surveillance and introduction of strict border crossing and port of entry controls needs to be established.

The 1998 and 1999 CAT-Cat Action Treasury/Wildlife Protection Office hunter surveys identified over 50 hunters in the Cardamom Mountains with a wealth of irreplaceable information on the forest and its wildlife. WPO/CAT and FFI should continue to work with local hunters to create a network for surveillance and monitoring of poaching and wildlife trade as well as increasing local conservation awareness. These activities would be integrated with support for district and province government officials to further the excellent working relationships initiated at the Tiger Conservation Workshops.

All of the Central Cardamom Mountains have been allocated to forest concessions. Neither the flight survey nor the field survey revealed any ongoing illegal logging. However most logging companies in the Cardamom Mountain Regions have been involved in illegal logging, as in 1997 only two companies possessed exploitation permits (GAT and Double Ace). Some concessions may not qualify for reallocation of concessions (Global Witness 1999a, 1999b). All concessions are currently being reviewed with the aim of developing sustainable, certified forest management in the future.

Map 1: Proposed Central Cardamon Mountains
Conservation Forest / Wildlife Corridor





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APPENDIX I: LIST OF CURRENT LOGGING CONCESSIONS IN CAMBODIA

(Source: WPO 1999)

Company	Location (Province)	Area (Ha)
Pheapimex	Kraches, Stoeng Treng, Kompong Thom	358,725
Pheapimex	Stoeng Treng, Ratanakiri	350,000
Samling	Kraches, Kompong Cham	467,484
Samling	Kompong Speu, Koh Kong	299,598
GAT Internationational	Koh Kong, Pursat	215,720
GAT Internationational	Kompong Thom, Kraches	149,780
Silverroad Wood	Koh Kong, Pursat	315,460
TPP Cambodia Timber	Siem Reap, Preah Vihear, Pursat	395,900
Yourysaco	Pursat, Battambang	214,000
Colexim	Kompong Thom, Kraches	149,890
King Wood	Kraches, Stoeng Treng, Mondolkiri	310,900
Kasotim	Kraches	131,380
Samrong Wood	Siem Reap	200,050
Chenda Flywood	Preah Vihear,	103,300
Everbright	Kraches, Stoeng treng	136,376
Timas Resources	Kraches, Kompong Cham, Preah Vihear	161,450
Hero Taiwan	Ratanakiri	60,150
Lang Song	Preah Vihear	132,000
Meangliheng	Kompong Thom, Kompong Cham, Preah Vihear	198,500
Longday	Kompot, Kompong Speu	98,000
Cambodia Timber	Kompot	34,924
Super Wood	Kompong Speu, Pursat	94,419
Talam Resources	Kompong Speu, Koh Kong	111,500
Woodtee Peanich	Koh Kong	63,050
TOTAL		4,752,556

APPENDIX II: LIST OF PARTICIPANTS IN FIELD SURVEY

Ramesh Boonratana	FFI[29] Consultant
Frederic Hunter Weiler	CAT[30] Cambodia Representative
Marcus Hardtke	ARA[31] Cambodia Representative
Chheang Dany	WPO Staff, Phnom Penh
Prum Sovanna	WPO Staff, Phnom Penh
Som Sitha	WPO Staff, Phnom Penh
Sawk	Yourysaco security staff
Liang Sarom	Yourysaco security staff
Con	Yourysaco security staff
Jaen Noi	Yourysaco security staff
Lai	Yourysaco security staff
Chan	Koh Kong Villager/Guide
Red	Yourysaco truck driver
Cheun	Driver's assistant

29 FFI = Fauna & Flora International (Indochina Programme)

30 CAT = Cat Action Treasury

31 ARA = Working Group on Rainforests

APPENDIX III: WILDLIFE DATA RECORDING FORMAT

Location:..... Date:.....
Time Start:..... Time End:..... Distance Covered:.....
Personnel:.....

Evidence:
1. Sighting
2. Tracks
3. Vocalisation
4. Scat/Dung
5. Nests
6. Scrapes/Claw Marks
7. Feeding Signs
8. Other:
- Wallows
- Bathing Pools
- Mud Smears
- Antler/Horn marks
9. Reliable Report

Time	Species	Location	Evidence	Remarks

APPENDIX V: SAMPLE SPECIMEN RECORDING FORMAT

No.: specimen number as entered into the record book
Date: date of collection
Specimen: specimen type (hair, skin, bones, casts, traps, etc.), and species if known.
Location: location where specimen was collected
Personnel: names of prsonnel who made the collection
Remarks: to include relevant information associated with the specimen (age, sex, habitat, amount, etc.)

No.	Date	Specimen	Location	Personnel	Remarks
001					
002					
003					
004					
005					

Species		Evidence	IUCN[35]	CITES[36]
Pileated gibbon	*Hylobates pileatus*	1,3	VU	
Silvered leaf monkey(?)	*Trachypithecus cristatus*	9	LR	
Pig-tailed macaque	*Macaca nemestrina*	1	VU	
Long-tailed macaque	*Macaca fascicularis*	1,3	LR	
Stump-tailed macaque(?)	*Macaca arctoides*	9	VU	
Slow loris	*Nycticebus coucang*	1		
Pangolin	*Manis* sp.	2,5	LR	II
Black giant squirrel	*Ratufa bicolor*	1,3		
Variable squirrel	*Callosciurus finlaysoni*	1		
Indochinese ground squirrel	*Menetes berdmorei*	1		
Malayan porcupine	*Hystrix brachyura*	7	VU	
Otter sp.		4		
Oriental small-clawed otter	*Amblonyx cinerea*	2(?)	LR	
Northern treeshrew	*Tupaia belangeri*	1		
Flying lemur(?)	*Cynocephalus variegatus*	9		

Birds[37]

Species		Evidence	IUCN	CITES
Chinese pond heron	*Ardeola bacchus*	1		
Black-shouldered kite(?)	*Elanus caeruleus*	1		
Brahminy kite	*Haliastur indus*	1		
Crested serpent eagle	*Spilornis cheela*	1		
Red jungle fowl	*Gallus gallus*	1,3		
Chestnut-headed partridge(?)	*Arborophilia cambodiana*	1		
Scaly-breasted partridge	*Arborophila chloropus*	3	VU	
Thick-billed pigeon	*Treron curvirostra*	1		
Mountain imperial pigeon	*Ducula badia*	1,3		
Spotted dove	*Streptopelia chinensis*	1		
Plaintive cuckoo(?)	*Cacomantis merulinus*	3		
Green-billed malkoha	*Phaenicophaeus chlorophaeus*	1		
Mountain scops-owl	*Otus spilocephalus*	3		
Blue-eared kingfisher	*Alcedo meninting*	1		
Blue-tailed bee-eater(?)	*Merops philipinus*	1		
Green bee-eater(?)	*Merops orientalis*	1		
Indian roller	*Coracias benghalensis*	1		
Wreathed hornbill	*Rhyticeros undulatus*	1		
Oriental pied hornbill	*Anthracoceros albirostris*	1		
Lineated barbet(?)	*Megalaima lineata*	1,3		
Coppersmith barbet	*Megalaima haemacephala*	1,3		
Woodpecker sp.		3		
Lesser yellownape	*Picus chlorolophus*	1		
Asian palm swift(?)	*Cypsiurus balasiensis*	1		
Blue-winged leafbird(?)	*Chloropsis hardwickii*	1		

35 IUCN (World Conservation Union) Categories: CR=Critically Endangered; EN=Endangered; VU=Vulnerable; LR=Lower Risk; DD=Data Deficient.

36 CITES = Convention for International Trade of Endangered Species

37 Species names follow Lekagul and Round (1991).

Species		Evidence	IUCN	CITES
Black-headed bulbul(?)	*Pycnonotus atriceps*	1		
Black-crested bulbul	*Pycnonotus melanicterus*	1		
Stripe-throated bulbul	*Pycnonotus finlaysoni*	1		
Greater racket-tailed drongo	*Dicrurus paradiseus*	1		
Ashy drongo	*Dicrurus leucophaeus*	1		
Blue magpie(?)	*Urocissa erythrorhyncha*	1		
Large-billed crow	*Cervus macrorhynchus*	1		
White-crested laughingthrush	*Garrulax leucolophus*	1,3		
Oriental magpie robin	*Copsychus saularis*	1		
White-rumped shama	*Copsychus malabaricus*	1		

APPENDIX VII: LARGE MAMMAL SPECIES INDICATED AS PRESENT IN THE CARDAMOM MOUNTAINS FROM ALL SOURCES

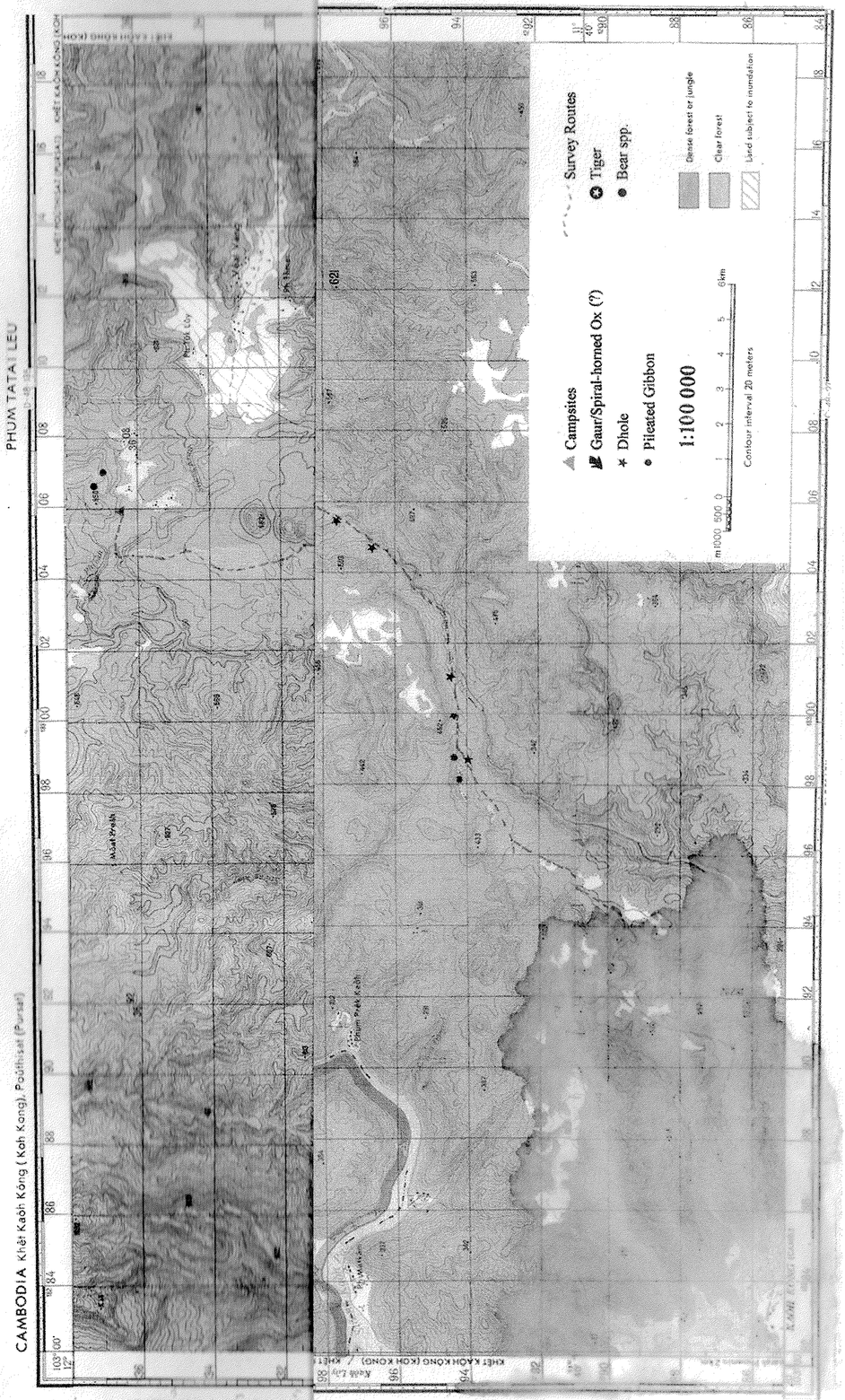
Common name	Scientific name	Source and evidence			IUCN threat category	CITES category
		Field survey	Hunter interviews	Needs assessment interviews		
Asian elephant	*Elephas maximus*	9	9	9	EN	I
Rhino[38]	*Rhinoceros* sp.		9	9	CR	I
Gaur	*Bos gaurus*	2	9	1,9	VU	I
Banteng	*Bos javanicus*	9	9	1,9	VU	
Khting vor	*Pseudonovibos spiralis*	2(?),9	9	9	EN	
Indian muntjac	*Muntiacus muntjak*	1,2,3	9	9		
Sambar deer	*Cervus unicolor*	1,2	9	9		
Serow	*Naemorhedus (Capricornus) sumatrensis*	9			VU	I
Wild pig	*Sus scrofa*	2,7,8				
Tiger	*Panthera tigris*	2	9	9	EN	I
Leopard	*Panthera pardus*	9				I
Clouded Leopard	*Neofelis nebulosa*	9	9	9	VU	I
Dhole	*Cuon alpinus*	2,4	9		VU	I
Asiatic Jackal	*Canis aureaus*	9				
Malayan sun bear	*Helarctos malayanus*	2 (4,6,7(?)	9	9	DD	
Asiatic sun bear	*Ursus thibetanus*	2 (4,6,7(?)	9	9	VU	
Pileated gibbon	*Hylobates pileatus*	1,3		9	VU	

IUCN threat categories: CR = Critically endangered; EN = Endangered; VU = Vulnerable; DD = Data Deficient

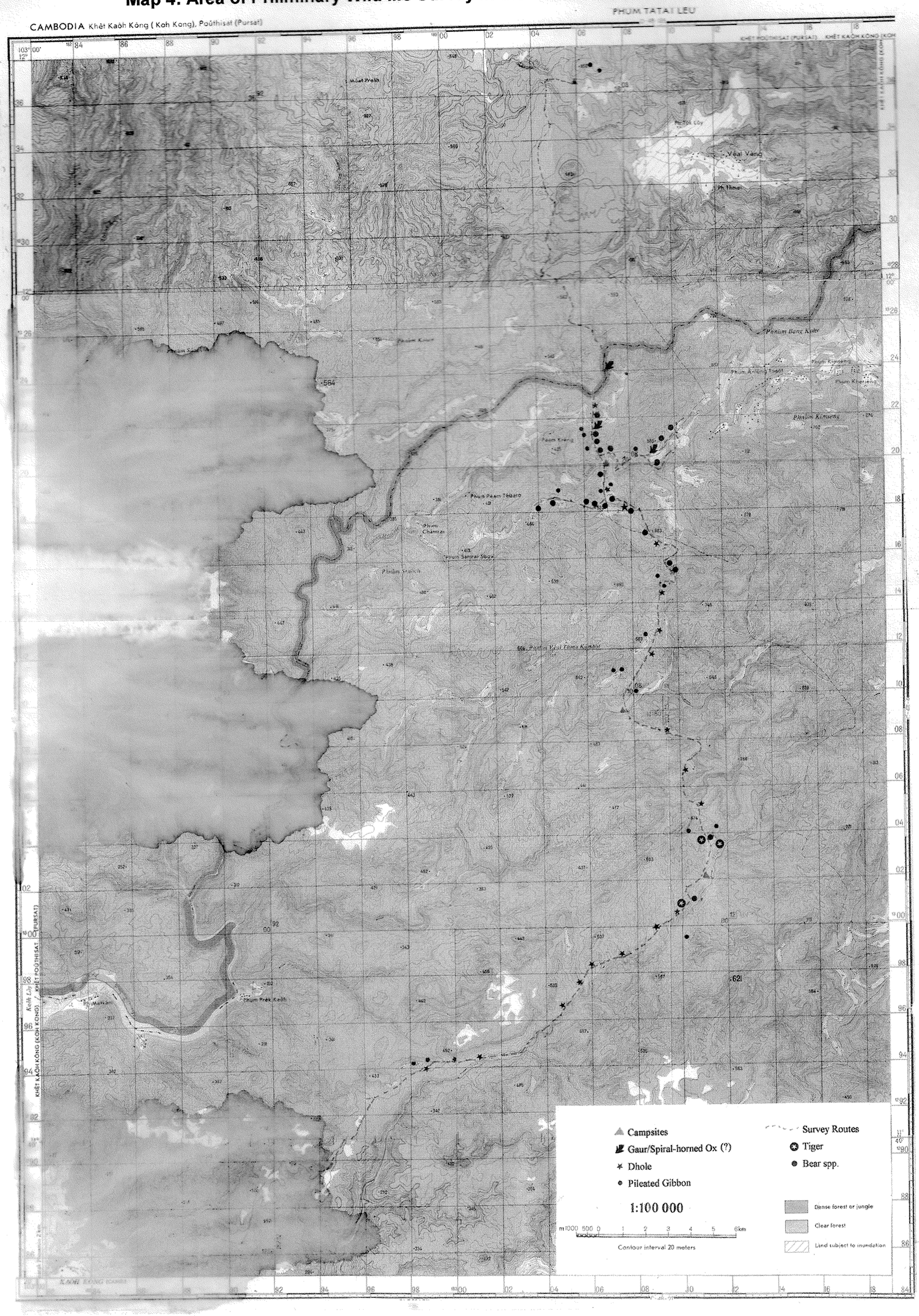
Evidence:
1. Sighting (inc trophies and carcasses)
2. Tracks
3. Vocalisation
4. Scat/dung
5. Nests
6. Scrapes/claw marks
7. Feeding signs
8. Other: wallows, bathing pools, mud smears, antler/horn marks
9. Reports
(?) Provision

[38] This could potentially indicate either Javan rhinoceros *Rhinocerous sondiacus*, or Sumatran rhinocerous *Dicerorhinus sumatrensis*.

Map 4: Area of Priliminary Wild life Survey in the Cardamom Mountains



Map 4: Area of Priliminary Wild life Survey in the Cardamom Mountains



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