Second Annual Meeting of the Eld's Deer Interest Group on Eld's Deer Conservation and Restoration

C. eldi siamensis

Dusit Zoo, Bangkok, Thailand
November 17 – 18, 2004

Editor
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Introduction and Purpose of the Workshop

At the last meeting in November 2003, several action steps were proposed and individuals were identified to complete those actions. A decision also was made to meet a year later to review progress made with respect to various action steps, as well as identify new actions for the coming year. In the spirit of regional co-operation, participants from various regional governments, zoos, NGOs, and international aid organizations participated in this workshop. It was very encouraging to see the progress made in various aspects of Eld's deer conservation. The Zoological Park Organization (ZPO) generously supported two participants from Cambodia. All local arrangements (transportation, food and meeting venue) were sponsored by ZPO. The National Zoo supported travel for participants from Lao PDR and Myanmar. It is now clear that there is sufficient interest among various organizations in the range countries to pursue Eld's deer conservation and restoration initiatives. At the end of the two day meeting, it also became clear that progress can only be achieved if there is an advocate for each action step. For example, we were unable to determine the progress made in various action steps for training and capacity building due to inability of lead people to attend this meeting. However, it is hoped that those action plans will be completed in 2005.

The Meeting Process

General agreement was that the desired outcome is to prevent the extinction of the species and to maintain a viable population(s) in nature. After brief presentations from various participants, action plans from last years meeting were reviewed. Individuals identified as lead person(s) were asked to provide a progress report. Action steps that were not completed were identified for further discussion (whether to retain it or drop it for want of a 'champion' for the cause.

Decision was made to form four working groups focusing on 1) field projects; 2) reintroduction; 3) education and training; and 4) captive animal management and research strategies. Participants worked together to identify the key issues that needed immediate attention with each focus area, propose potential solutions, action steps, time lines, and individuals willing to champion each action step. The working groups also produced brief reports on their topic that were presented in plenary sessions. These reports have been included in this workshop report. The idea was to reach consensus on major recommendations and action steps. Towards the end of the meeting, participants also discussed fund raising strategies and priorities. Suggestions included seeking donations from various zoological institutions holding or displaying Eld's deer, approaching other foundations, as well as private donors. Although no decisions were made on who was going to take the lead, these discussions clearly demonstrated that the Eld's deer Interest Group is at a critical juncture wherein, several actions steps could not move forward without immediate infusion of funds. Participants also agreed to continue seeking funds from various sources to support their conservation activities.

Key Funding Need(s) (not prioritized):

- Enclosure construction at Phnom Tamao Wildlife Rescue Center, Cambodia, for housing *C. eldi. Siamensis* (US $15,000)

- Funding to support patrolling activities at Chatthin Wildlife Sanctuary in Myanmar (US $10,000/year)
- Conduct surveys in Laos part of the tri-border area (US $3,000)
- Genome Resource Banking of *C. eldi. Siamensis* maintained in captivity in Cambodia (US $6,000)
- Ecological study of Eld's deer in Ang Trapang Thmar Reserve in Cambodia (US $25,000)
- Improvement of captive breeding center at Huai Kha Khaeng Wildlife Reserve for establishment of reintroduction population (US $15,000)

The Status and Distribution of Eld's Deer *Cervus eldi siamensis* in Preah Vihear Province, Cambodia

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Wildlife Conservation Society, Cambodia Program

Executive Summary
Northern Cambodia historically supported large populations of Eld's Deer (*Cervus eldi siamensis*), with groups of up to 14 individuals observed in the 1950-1960s by surveys supported by WCS. Civil conflict prevented access to the area until the late 1990s. Since 2000 WCS has worked in collaboration with DFW and MoE to complete an intensive re-survey of the northern plains. Surveys were conducted on foot, with camera-traps used in key locations to confirm the presence of Eld's Deer.

Three areas - the Chhep Protected Forest, Koulen Promtep Wildlife Sanctuary and Sangkom Themei district were confirmed to support groups of Eld's Deer. Numbers and densities are highest in Chhep where up to 13 groups were found, and photographs or sightings of 34 individuals obtained. Smaller pockets exist in Koulen Promtep and Sangkom Themei. All groups are smaller than those reported in historical accounts.

Eld's Deer was found only in open and deciduous forest, with results and interviews suggesting clear habitat preference for different areas depending upon the season. Lowland areas are preferred feeding habitats in the dry season, when extensive wetlands can be found. However, these lowland forests and grasslands burn in the late dry season and flood during the wet season. At these times the Eld's Deer retreat to the upland forest areas. Some upland forest types contain seasonal waterbodies, are also favoured feeding grounds, but burn in the dry season. Other areas upland areas are less experience less prevalent burning and are important for hiding when other locations are either burnt or flooded.

The Chhep Protected Forest provides the greatest potential for long-term conservation. The area is surrounded by only six villages, and Eld's Deer can be seen within a few kilometers of at least 3 of these. Low population densities means that the pressure on forest resources is considerably reduced. Poor access to key areas also limits threats to the population. Some locations in Koulen Promtep share similar characteristics with Chhep, however the Eld's Deer populations are generally smaller. The population density in Sangkom Themei is much higher, and the threats correspondingly greater, so this area has the least potential for conservation.

Hunting with guns is the principal threat to Eld's Deer, principally for wildlife trade of meat and bone products. Late dry season (after the forest burns) and the early wet season (when the deer are attracted by new grass growth) are particularly important hunting periods. Indirect threats include human disturbance, caused by fishing activities and camps made at crucial watersources during the dry season, when water is extremely limiting. The increasing use of extremely toxic chemicals (including DDT) for poison fishing is of considerable concern and is likely to have a large impact on the Deer and water bird populations that are so reliant on a few wetland areas. However,

extensive areas of suitable habitat remain so long-term conservation is achievable if more direct threats can be reduced.

Introduction

Preah Vihear Province

Preah Vihear province is located in the Northern Plains of Cambodia. It covers approximately 1,401,174 ha of land, of which 1,242,088 ha (or 88.6%) of the province is covered by forest, most of which is deciduous. 190,027 ha of this forest is protected (Department of Forestry and Wildlife, 2003). The entire area is very low- lying, mostly 80-100 meters in elevation, except part of Phnom Tbeng plateau in the center of the province (552 m), Phnom Charey (483 m) close to the Lao border and the Dang Rek range which rises to 269-766m and shares a natural border with Thailand.

There are seven districts within the province. The province has a total population of 105,226 people (Preah Vihear Provincial Governor, pers comm). The provincial town is named Tbeng Meanchey. It is accessible by the roads A6 and 64. The provincial boundaries border the Kingdom of Thailand and Lao PDR to the north, Siem Reap and Oddar Meanchey provinces to the west, Kam Pong Tom provinces to the South, and Steng Treng and Kra Tie provinces to the East.

In the 1930s, Preah Vihear province was brought to international attention with the discovery of the Kouprey *Bos sauveli* and other wild cattle (Urbain, 1937). This prompted several subsequent wild cattle surveys in the area, including a survey conducted by the Cambodian Government-Pacific Science Board in 1951-1952 and by Wharton in 1966,

Previous Surveys

Prior to 2000, most surveys carried out in Preah Vihear were carried out to look for the Kouprey and other wild cattle. However, during these surveys evidence of Eld's Deer was found. Such evidence included:

Date of Survey	Location	Researcher	Aim of survey	Evidence of Eld's Deer
1998	PVH	Weiler, H	The distribution of tiger in Cambodia	Presence/absence of Eld's Deer in tiger range
1964	PVH	Oliver Milton	Kouprey Expedition	Most frequently seen and one herd of 14 were recorded.
1957	PVH	Wharton C,H	An Ecological study of the Kouprey	Presence of Eld's Deer

Surveys Conducted from 2000-2003

From 2000, the number of surveys carried out to investigate the wildlife of the northern plains increased with the greater accessibility to the area. A summary of these surveys is given below. The first survey to specifically investigate the status of Eld's Deer was

carried out in 2001 by WCS in collaboration with MAFF. The best time to conduct surveys on Eld's Deer is during the dry season between January and May, when wildlife concentrates at the water sources and it is easier to travel and to access the key areas.

Date	Researchers	Purpose	Source
2000			
29 Nov-21 Dec	WCS	Large mammals in Koulen Prumtep	Transect survey
2001			
10 Jan-18 Jan	WCS	Large mammal in Koulen Prumtep	Transect survey
07 -16 Feb	WCS	Eld's Deer survey in Chhep	Survey and put camera-trap
16 Mar- 02 Apr	WCS	Eld's Deer survey in Chhep	Survey and re-put camera-trap
02-31May	WCS	Eld's Deer survey in Chhep	Collected and re-put camera-trap
2002			
12 –29 Jan	WCS	Eld's Deer survey in Chhep	Survey and put camera-trap
15 Feb-06Mar	WCS	Eld's Deer survey in Chhep	Survey and put camera-trap
14-30 Dec	WCS	Eld's Deer survey in Chhep	Survey and put camera-trap
2003			
21Jan-03 Feb	WCS	Eld's Deer survey in Sangkomthmey	Survey and put camera-trap

Survey Objectives
Since the first survey in 2001, six more surveys have been carried out by WCS to investigate the status of Eld's Deer in Preah Vihear Province. The principle objectives of these surveys were:

- To estimate the status and distribution of Eld's Deer and other key species in Preah Vihear province.
- To assess where to create viable conservation areas
- To assess threats to Eld's Deer and other key species
- To make recommendations on possible boundaries of protected areas
- To develop the capacity of provincial staff that participate in WCS activities.

Survey Areas
Selection of the survey sites was based on habitat reports from local people and historical evidence of the presence of wildlife and based on researchers who give recommendations.

Survey Area 1: Chhep. Chhep is a Protected Forest located in the northeast of Preah Vihear. It is bordered by Tonle Rorpou to the north, the Mekong River to the East, and Chhendar Plywood to the west. The area covers approximately 157,680 ha. Most of the area is flat, low-lying and sandy with an average altitude of 90-meter above sea level. Six villages are located in or adjacent to the area. Forest covers 97% of the protected area of which dry Dipterocarp forest makes up 65%. This area is easily flooded in the wet season. Waterways, ponds and wetlands exist throughout the area, some of which are permanent and some seasonal. These make up key sources of water for wildlife, including Eld's Deer (See Maps).

Survey Area 2: Koulen Prumtep. This area is located in the southwest corner of the province. It is a Wildlife Sanctuary of 402,500 ha. The area is flat, sandy and low-lying with an average altitude of 80 meters above sea level in the east part and 100 meters in the west part, except Phnom Sandok (478m) and Dang Rek range (650m). There is one main waterway that drains in a southerly direction into the Tonle Sap River. It makes up the main water source for animals in the dry season. The dominant habitat type is deciduous forest.

Survey Area 3: Sangkom Thmei Area. The area is located to the south of Tbeng Meanchey town and partly includes a district of the same name. In general this area is low-lying, flat with a maximum altitude of 104 and a minimum altitude of 54 meter, with the exception of small mountains such as Phnum Anlung (373 meters), Phnum Tnaot (252 meters), and Phnum Pel (139 meters). The dominant habitat type is deciduous forest, and the main waterway is Stoeng Sen, most of which is permanent water.

Survey Methods

A. Interview survey. Group interviews with 2-3 people were conducted with hunters, fishermen, resin-collectors, farmers and NTFP collectors. The information collected from these people was used to find out the best place to conduct ground surveys for Eld's Deer by comparing the information given by local people (such as their sightings of Eld's Deer) with habitat zones on the map and information from previous surveys.

B. Sign survey. Surveys were completed in all three areas. Tracks and signs were considered recent if less than 10 days old and not recent if considered more that 10 days old. All the tracks and signs were recorded in a special data book with habitat and location in UTM using GPS (Garmin 12 XL, GPS 12). Mostly, this data collection occurred in Dry Dipterocarp forest where there were ponds and wetlands where Eld's Deer concentrated. Where seen, tracks were recorded to confirm identification of the species by measurements and comparisons. For instance, measurements allowed the survey team to positively identify Eld's Deer tracks from Sambar or Muntjac tracks.

C. Camera-trap survey. Camera-traps were placed in locations where we thought there was a relatively high chance of being able to photograph a key species. Data collected from the photographs helped to assess the abundance of the key species in the area. The camera-traps used in this survey were made by Camtrakker and were equipped with a passive infrared heat-in-motion detector. Each camera-trap was set up on a tree about 50 centimeters from the ground near a water source (Trapeang). The traps were checked for correct functioning of flash, date, censor and time.

D. Habitat Observations. The vegetation types were detailed and recorded using observation and a map of scale 1:50 000 prepared by US Army in 1967. Some plant types were confirmed using the Dictionary of Plants prepared by the Ministry of Agriculture in Cambodia (Dy Phon 2000).

Results

Habitat

Chhep Protected Forest

This area is mostly dominated by Dry Dipterocarp forest, Open forest and Savannah with some patches of semi-evergreen and evergreen forest along the waterways and around Phnom Baray and Phnom Sithor. The vegetation in the area is divided by category of structure as described below:

1. Dry Dipterocarp forest in upland areas that frequently burns during the dry season. The most common plant species on the upper stratum averaged 12 meters in height. The vegetation is composed mainly of *Dipterocarpus tuberculatus* (Klong), *Dipterocarpus obtusifolius* (Tbeng), *Dipterocarpus intricatus* (Trach) and *Dipterocarpus alatus* (Chher Teal). On the lower stratum, vegetation is composed of scrub, bamboo grass (prich), grass (smav Skous) and Imperata (Sbouv) of head height.

2. Dry Dipterocarp forest in the uplands that rarely burns in the dry season. This is a special habitat dominated by sandy soils and supports a few tree species with an average height of 8-10 meters in the upper storey such as *Dipterocarpus obtusifolius* (Tbeng), *Dipterocarpus intricatus* (Trach), *Parinari annamensis* (Tlork). Its under-storey is dominated by special grass (Tbal Dek) mixed with *Baeckea frutescens* (Mrek Tannsay). This sector is disliked by Eld's Deer for grazing, but it provides the best places for hiding during periods of fire.

3. Open forest, the preferred habitat of Eld's Deer during the dry season. Every year it floods during the wet season, and burns in the late dry season. The upper storey mostly consists of *Syzygium baviense* species (Pring changkong rormang) and its understorey is dominated by grassland of head height.

Unlike Koulen Prumtep and Sangkom thomey, Chhep is characterized by patches of mineral licks and Trapeang (pools). Compared to the other two areas, low human population and very few settlements (six villages) ensures that, so far, land used and encroachment are not a significant threat wildlife.

Besides the Dry Dipterocarp forest, semi-evergreen or evergreen forest represents the important habitat in Chhep. This habitat is found in the Chhandar Plywood concession, along the foot hills of the Phnom Dangrek range, on Phnom Bary and along the waterways. This vegetation has long been affected by both legal and illegal logging but still remains an important habitat for wildlife in Chhep.

Koulen Prumtep

Dry Dipterocarp forest is the largest habitat in this area. Every year this habitat increases in size as fires and cutting destroy semi-evergreen and evergreen forest which is replaced by open forest. Compared to Chhep, this open forest has a greater variety of plants, which tend to grow to greater heights (7-9 meters high). In the wet season the waterways in the area will flood, creating important wetlands.

SangkomThmei
This area is dominated by Dry Dipterocarp forest. Of the three areas, Sangkom Thmei has the largest human population. Every years parts of the forest and burnt to make way for expanding paddy fields. Hunting and logging activities are also frequent. Semi-evergreen and evergreen forest is patchy in this area and found mostly along the river. It is now hard to find good habitats in this area. Permanent settlements have appeared along both sides of the river.

Wildlife
Eld's Deer were recorded in several places in small numbers. Key places for include around Ror Bonh village, Okoki, Okapok, viel Ksach La at, Narong village (Chhep district). In Koulen Prumtep the best places were Viel Veng, Viel Rovey, Viel Pou Rieng and Viel Srey Sronos. In SangkomThmei the best places were Viel Chhker Prouse and Prorlay Beyboth. According to data collected from tracks, sightings and camera-traps we could make conclusions regarding distribution and population. The area of highest conservation priority for this species is Chhep because it has lower levels of risk to Eld's Deer compared to the other two places and its habitat and water sources are the best as well.

Locations	*Number estimated by Tracks and Sign*	*Number recorded by Camera-trapping and Sighting*
Chhep	47	34
Koulen Prumtep	35	4
Sangkom Thmei	12	1
Total	94	39

Chhep and Koulen Prumtep also support numbers of other key species, including Elephants, Banteng, Gaur, Dhole, Leopard, Lesser and Greater Adjutants, Giant and White-shouldered Ibis, White-winged Duck, Green Peafowl, Black-necked Stork, Sarus Crane, Slender-billed and White-rumped Vultures.

Threats to the species

Hunting
Hunting is the biggest threat to the wildlife, especially Eld's Deer, throughout PVH. Many of the hunters coming to the area are often wealthy urban-dwellers or foreigners, often from Thailand and Laos, who hire local people as guides. Hunting tends to peak in the month of June. Guns are easily available from the local police or soldiers. It is also easy to get a gun permit from the head of the district. The armed hunters then bring back wild meat, or sell it for money to pay for the hire of the guns.

In the dry season hunting is mostly concentrated around water sources (ponds) where Eld's Deer would drink or graze. Entire groups of deer can be killed at one time because if one is shot, the others will stay nearby. Hunters will even maintain some ponds at the end of the dry season when other water has dried up, thus attracting Eld's Deer in large groups, which are then shot.

During the wet season, traveling is difficult for hunting, but this is also the time when hunting can get the best results because this is the season when most areas are flooded. At this time wildlife, including Eld's Deer will migrate to the confined areas of upland Dry Dipterocarp forest. Some Eld's Deer will remain in the lowlands, attracted to the rice paddy. This also makes them very easy to hunt. There have been recent reports from local people of Eld's Deer in inhabited areas such as; three female Eld's Deer were shot by Prey Veng villagers, one male was killed at Sre Tbengs in September 2001, one male killed at Rorhal Kang by Ror Bonh villagers, and one male was shot east of Dong Pleat village in July 2001.

Predation by Dholes

As the large carnivores are rare in these areas good populations of Dholes are still likely to live in open forest. Eld's Deer is one of their target prey species and as Eld's Deer find it difficult to escape into the forest, they have very little chance against this predator. A dead Eld's Deer was found during the latest survey and our guides insisted that it was left by Dhole.

Poison Fishing

Poisoning of fish is an activity that frequently occurs in the dry season (January-April), because this is the time of year when the water is concentrated in small areas and the poison can have the greatest effect. Either natural toxins (from fruit and bark of trees) or chemical toxins (e.g. DDT) are used. Compared to DDT, poisoning with natural toxins does not have such long-term negative effect on the water sources and the species that use them. This method of poisoning is only used in areas of confined water. Water sources poisoned by DDT will remain contaminated until the next wet season when the water is replaced and it still has an effect 2-3 years later. DDT can be used to poison large areas of still or flowing water. During the survey, many poisoned water sources were found. Poisoning affects the fish, all wildlife and also local people who depend on these water sources. It causes Eld's Deer and large water birds to go to other areas for better water closer to the village, which is dangerous for them.

Burning and hunting with dog

Every year, man-made forest fires occur in the dry season between January-March. These fires cause losses to wildlife and habitat and threaten the extent of evergreen forest. Forest is set alight to clear trails, facilitate the collection of turtles and snakes and to improve visibility for hunting.

Wildlife trade

Trade is the principle factor that encourages hunting activities. It is difficult to control, because it is connected to powerful people and the wildlife law is ineffective in punishing people who violate it. Every year Eld's Deer are hunted though it is illegal. Eld's Deer meat and other wild cattle meat can sell for 5000-6000 Riels per Kg. Dried meat and

antlers are sold to Thailand, Laos and adjacent provinces where prices are better. Good, sharp Eld's Deer antlers are sold for US$ 40-70 and used for home decoration or for traditional Chinese medicine.

Logging

Logging is increasingly accessing remoter areas. Logging activity is likely to increase the hunting pressure by opening up relatively inaccessible areas. Illegal activity peaks around election time and is widespread throughout the area. The direct impact of logging is hard to assess but the human activity it creates disturbs wildlife and causes it to disperse. Illegal loggers use guns to hunt wildlife for food especially Eld's Deer, whenever they see them.

Shifting cultivation and grazing

The area dominated mainly by DDF has been cleared around villages to make way for paddies, cassava and vegetable gardens with temporary habitation built in some. The area of cleared forest grows bigger every year. Domestic cattle are also present throughout in the area, as far as 30 km from the nearest village. Data from camera traps shows that in areas where domestic cattle are present, there is very little evidence of Eld's Deer.

Recommendations

The results collected from the field survey using the methods of interviews, signs and camera-traps show that hunting in the area is a serious catastrophe to Eld's Deer and another key species. The following recommendations should be implemented to help address this problem:

- Weapon management must become a priority, with commitment to support this control from central and provincial level.

- The boundaries of protected areas must be clearly marked and recognized locally, nationally and globally. Education measures should be implemented to explain the importance of these areas for Eld's Deer and to explain the wildlife law.

- Introduce land management policy to control shifting agriculture and forest clearance by local people and the increasing number of migrants to the area, particularly into the Koulen Prumtep.

- Introduce micro-credit schemes so that people have the means to increase their rice yields through technical investment without having to extend their area of paddy.

- Maintain small ponds for Eld's Deer in the dry season in key areas, and stop or reduce the number of people and domestic cattle who enter these areas.

- Establish patrol teams who cooperate with the provincial armed forces to control and reinforce the wildlife law. Create checkpoints to control wildlife trade and

illegal transportation of timber from the area. Populations and the locations of Eld's Deer and other key species should be monitored annually. Guarding of Eld's Deer should be considered during breeding time and when they come to water sources. It would be equally important to patrol around the nesting sites of important bird species, especially the Sarus Crane, Giant ibis, Stock and Oriental Darter.

- Monitoring should be conducted to the populations, distribution and habitat of Eld's Deer, and there should also be active promotion of local understanding about conservation in addition to capacity building to promote joint conservation ventures with local people in the future.

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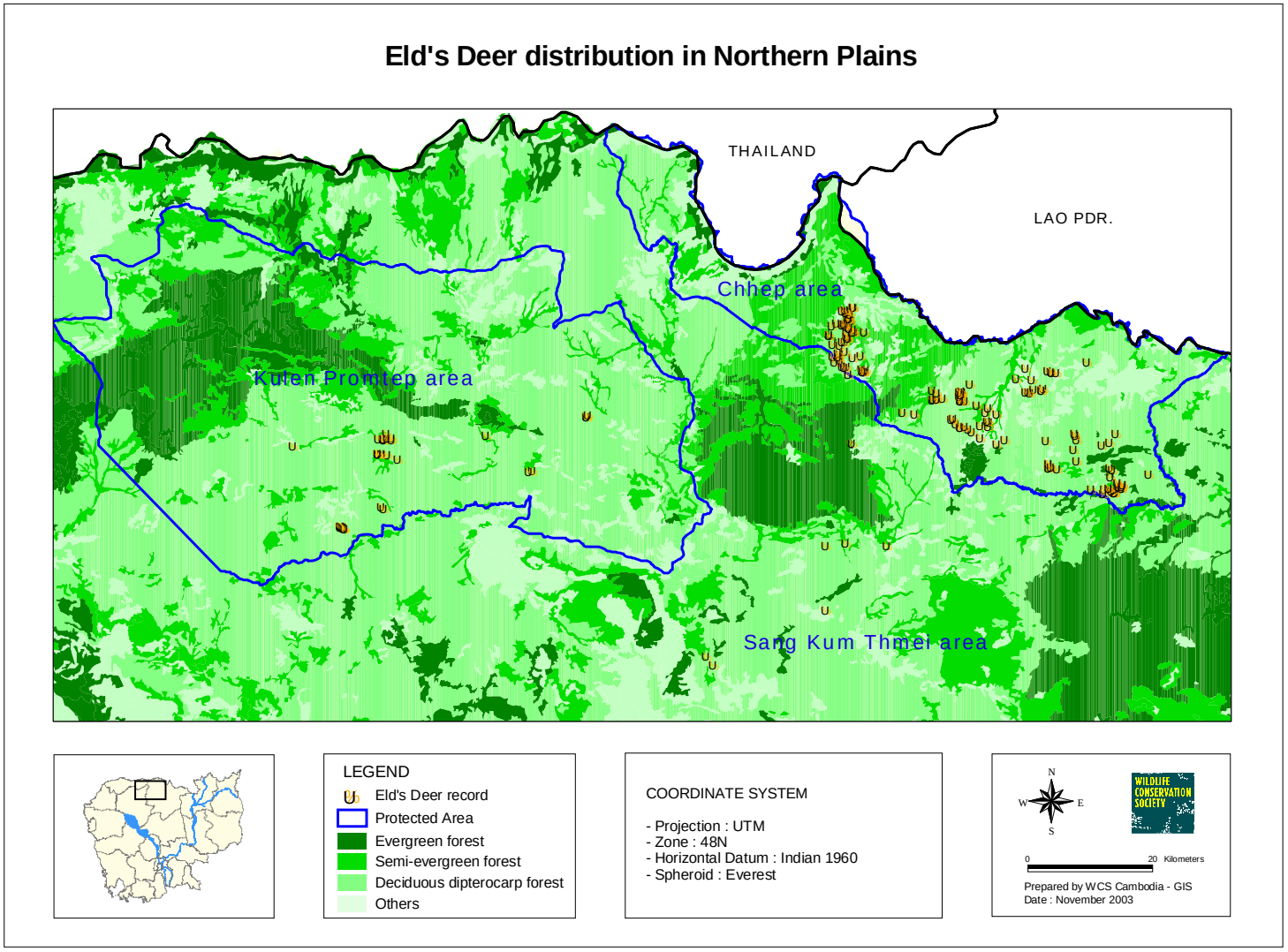
Map


Eld's Deer distribution in Northern Plains
THAILAND
LAO PDR.
Chhep area
Kuten Promtep area
Sang Kum Thmei area
LEGEND
Eld's Deer record
Protected Area
Evergreen forest
Semi-evergreen forest
Deciduous dipterocarp forest
Others
COORDINATE SYSTEM
- Projection : UTM
- Zone : 48N
- Horizontal Datum : Indian 1960
- Spheroid : Everest
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Prepared by WCS Cambodia - GIS
Date : November 2003

Collaborative Approach to Eld's Deer Conservation and Research in Savannakhet Province, Lao PDR

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1. Short history of the project and site

In 2002, a population of Eld's deer (subspecies *C. e. siamensis*) in Chonnabuly District, Savannakhet, was reported to the Wildlife Conservation Society Lao (WCS) by the Lao Department of Forestry (DoF). Later in 2002 WCS, Smithsonian Institute and DoF staff conducted field surveys, confirming the presence of the deer as the second known population of Eld's deer in Lao PDR. From survey of tracks, scats and deer sightings along transect lines in 2002 it was estimated that the deer number between 6 and 20 individuals (Vongkhamheng and Phirasak 2002). The area in which the deer occur is mainly Open Dipterocarp Forest and three villages are sited within or adjacent to the site. Since 2002, WCS in association with the Smithsonian Institute have been undertaking Eld's deer conservation and research activities at the Chonnabuly site. A collaborative approach has been taken in all aspects of the project, encompassing government, the National University, and local villages.

2. Threats to Eld's Deer and Habitat

Thirteen villages have been identified by WCS as having activities relevant to the Eld's deer population, such as agriculture in the Eld's deer forest (Vongkhamheng and Phirasak 2002). Two of these villages occur adjacent to the area inhabited by the deer, and one village is sited inside this area. The total population of the 13 villages is around 63,000 people. The main threats to the Eld's deer and habitat are believed to be:

- conversion of forest to rice paddies, with no land use plan in place, such that conversion is unplanned and unrestricted;
- impacts on the forest by villagers' grazing cattle and water buffalo;
- regular burning of the forest by villagers to encourage new grass growth for the benefit of livestock grazing;
- collection of non-timber forest products and selective logging in the Eld's deer habitat;
- occasional opportunistic hunting of the deer by villagers, or hunting by outsiders; and
- villagers' creation of water holes and use of seasonal watercourses, which may conflict with the deer's access to water.

3. Current Collaborative Activities

WCS began collaborating with district and provincial offices of the Department of Forestry, to implement Eld's deer conservation activities, and with the National University of Laos to undertake research on the Eld's deer. The overall aim of the collaboration was to undertake research on the deer and habitat, reduce the threats to the deer population, and build capacity in government offices to carry out Eld's deer conservation. The collaboration has achieved a number of outcomes.

Establishment of an "Eld's Deer Sanctuary"

The forested area inhabited by the Eld's deer population was formally designated as an Eld's Deer Sanctuary by the Provincial Governor in April 2004. The Sanctuary is 93 000 hectares in size and is a provincial level protected area. The Sanctuary boundary was demarcated by 30 wooden and 6 metal signs, by district staff in October 2004. Regulations for Sanctuary management and villager activities in the Sanctuary are scheduled to be drafted in November 2004, by representatives from the three villages and district and provincial forestry staff. It is expected that regulations will allow continuation of farming of the current rice paddies in the Sanctuary, but no new agricultural plots will be permitted. It is expected that the regulations will also deal with over-use of fire, selective logging, and hunting, but we are unsure whether there will be discussion over grazing livestock and use of seasonal water bodies and creation of water holes in the Sanctuary area during regulations drafting.

A process of land allocation will take place in December/January 2004/5. This will be facilitated by five provincial and five district forestry staff, working with six villagers from each village: the village Headman, a Women's Union representative, a Youth Union representative, the village forester, the village property official and a village militia representative. Land allocation will take 15 days for each village. Land allocation will identify the boundary of each village, and within that, the land owned by each village family. New agricultural plots can occur in this village land, but not within the Sanctuary, so the process should lead to a stabilization of the amount of agriculture occurring in the Sanctuary. As part of the land allocation process, the 93,000 hectares of the Sanctuary will be zoned as core, buffer and management zone, following the Ministry of Agriculture and Forestry protocol for establishment of National Biodiversity Conservation Areas. By definition, the core zone excludes human-use, and forest products collection and agriculture would be permitted in the buffer zone and management zone (MAF 039X). However, WCS research has found that rice paddy farming occurs widely across the Sanctuary, so whether a core zone can actually be established remains to be seen.

As part of the Eld's deer project, WCS has been building capacity within the District Agriculture and Forestry Office (DAFO) and the Provincial Agriculture and Forestry Office (PAFO). The PAFO have been supplied with a computer and office equipment and the wage of one PAFO staff has been supplemented by WCS so that he can act as the government Eld's Deer Conservation Coordinator.

Village Eld's Deer Conservation Team

In 2003 WCS implemented an incentives program to encourage village support of Eld's deer conservation activities. Each of the three villages was granted US$300 in 2003 and US$450 in 2004, and this funding is used for village enhancement projects, such as building a village meeting house, renovating the school or stocking dams with fish. The villages are assisting with Eld's deer conservation activities. The three villages have formed a Village Eld's Deer Conservation Team, which has 14 members. The Team undertakes deer population monitoring, patrolling for poaching and education.

To **monitor** the Eld's deer population, Team members walk nine 8km transects three times a year and records all tracks, scats and sightings of Eld's deer along the transect.

In addition, **sighting records** are completed every time a villager sees an Eld's deer. A Team member from each of the three villages fills out a data form for each of these opportunistic sightings. For each sighting the following is recorded on the form: number of deer sighted; the age and sex of the deer; habitat type in which it was sighted; and the deer's action (e.g. walking, running, feeding). WCS is collating this data to provide estimates of numbers of deer in the population and population demographics.

The Team **patrols** for poaching of deer and establishment of any new rice paddies in the forest. Patrols occur once a month every month. DAFO and PAFO staff join the villagers one time per year in this patrolling. To date, the patrolling has not directly found any deer hunting, but they have recorded numbers of people with guns in the forest, people burning the forest and people cutting down trees. The information collected during patrolling is given to DAFO staff, who then report to PAFO. Once the regulations are finalized, any poaching or new agriculture in the Sanctuary will be fined, enforced by PAFO.

Awareness raising

In March 2004 WCS trained four DAFO staff and four villagers from the Village Eld's deer Conservation Team in education extension work to build on their capacity to raise awareness on Eld's deer conservation issues. The DAFO and villagers were trained over four days by WCS staff in awareness raising techniques, such as role playing, puppet shows, interactive activities, use of visual aids, and game playing, so that the DAFO and villager educators do not simply read information to the villagers. After the four days of training the DAFO and villager education team visited 17 villages in the Sanctuary area, and it was the DAFO and villagers who implemented the education extension activities, with support from WCS staff when needed. The main message was why we need to conserve the forest, and the consequences of non-sustainable natural resource use. They used the puppet show to explain that the Eld's deer are an endangered species and that by decree of the Provincial governor, villagers are not allowed to hunt the deer.

If the deer population persists/increases and there is evidence of threats decreasing in the Sanctuary, the incentives will continue to be paid to the three villages, funded by WCS and the Smithsonian Institute.

Research by WCS and National University of Laos

In 2004, two research projects were undertaken in the Eld's Deer Sanctuary, through collaboration between WCS and the Department of Biology from the National University of Laos (NUoL). Each project involved two final year students and two or three villagers doing field work in the area for a 30-day period, supervised by NUoL teachers and WCS staff. The students were trained in field methods by WCS staff prior to the field work. Students used the research results in their final-year theses, and WCS included the results in a Technical Report on Eld's deer habitat.

The first project aimed to assess and map land use in a 100 km^2 area of the Sanctuary. The students and villagers traversed the area in 1 km^2 grids and for every rice paddy and human-made water hole, they recorded the GPS location, size and village

ownership. They recorded a total of 537 rice paddies and 43 water holes. The rice paddies were owned by 7 villages. The one village that occurs within the Sanctuary owned 50% of the rice paddies, and the two villages adjacent to the Sanctuary owned the majority of the remainder. This confirms the importance of targeting these three villages in land use allocation and conservation activities.

The second student project aimed to estimate the proportion of each habitat type occurring in the same 100 km^2 area of the Sanctuary by identifying habitat type along eight 1 km transects. In addition, they provided a floristic analysis of each habitat type, from surveys of 10 vegetation plots per habitat type. It was found that Open Dipterocarp Forest was most common vegetation type, accounting for 80% of transects, on average (Figure 11 from report). In the six habitat types, over 260 plant species were identified, including four IUCN Red Listed tree species (yet to be confirmed). Thus the Sanctuary has high floral biodiversity value. From this research and previous research by WCS-Lao and research from Myanmar, 15 plant species that provide forage for Eld's deer were identified as occurring in the Sanctuary, mainly grasses, grass-like species and trees that provide fruit. These species were most common in the Open Dipterocarp Forest. To a lesser extent, Headwater, Agriculture and Grassland habitats hosted plant species foraged by Eld's deer. While Evergreen and Semi-evergreen Forests did not provide as much forage potential to the deer, these two habitats were the most plant species diverse. Thus it is important to conserve all natural habitat types in the Sanctuary.

4. Future Plans for Activities and Research

WCS plans to continue to support PAFO, DAFO and the villages in Eld's deer conservation activities. Awareness raising activities will also continue. WCS will organise a concert with a Lao band in Chonnabuly District. Government officials from the National through to District level will talk to the crowd about the Eld's deer project and the importance of the Chonnabuly Eld's deer population for conservation of this endangered species in Lao PDR. The National Games will be held in October 2005 and the Eld's deer has been chosen as the "lucky animal" symbol for the Games. A sign about Eld's deer will be made for the Games and remain in the stadium. Brochures are being made to give to visitors to Savannakhet Province to raise awareness about the project. It is hoped that activities such as this will instil in the general public a feeling of pride and attachment towards the Eld's deer.

Collaborative research with the University will also continue in the 2004/5 academic year. Again, two projects have been planned to be undertaken by four final year students. One project will repeat the land use project for another part of the Sanctuary. This information will help in regulating agriculture in the Sanctuary. The other project will inventory the plant species collected from the Sanctuary forest by residents of the three villages. It is aimed to determine whether villagers are harvesting the same species that the Eld's deer depend on for food, and if so, if this harvest is at a rate that is likely to cause a decline in these species populations.

5. Conclusion

The population in Chonnabuly District is one of only two known populations of Eld's deer in Lao PDR. The population resides in an area of mainly Open Dipterocarp Forest.

However, the Eld's deer habitat is being cleared or degraded by agriculture from three local villages. Through collaboration among WCS, the villages and district and provincial government, the area has been designated a Sanctuary, regulations for management are being drafted and land use allocation is occurring to limit agriculture in the Sanctuary. In addition, villagers are monitoring the deer population numbers, patrolling for poaching and raising awareness in the villages about Eld's deer conservation. WCS has also assisted University students to undertake research into Eld's deer habitat, and the results of this research has been used to inform drafting of regulations and other conservation activities. In all aspects of the Eld's deer project, collaboration and particularly villager involvement has been emphasized. Information flows and joint decision-making among WCS; the University; National, Provincial and District government; and villages has been maintained for all aspects of the project. This collaborative approach has given the project strength, and provides a greater chance of security of the Eld's deer population than if WCS or government were to undertake such a project alone.

Updated 2004 Overview of Eld's deer Distribution in Cambodia

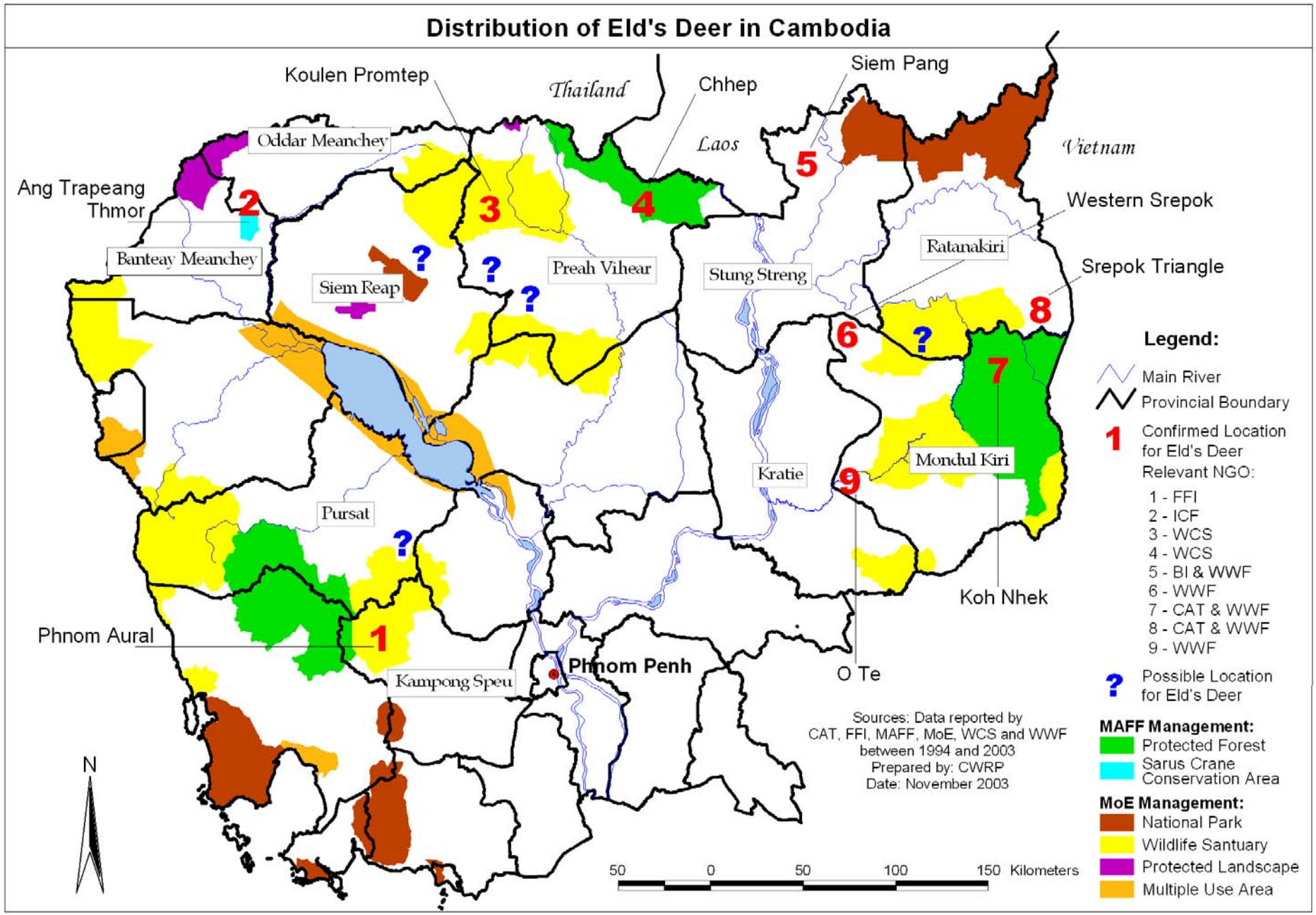
Hunter Weiler
Cambodia Program Director
Cat Action Treasury

Little change has occurred overall in understanding of countrywide distribution since the author's report published in the 2003 workshop proceedings. Attached is a full- page color map for current reference, which is much clearer than the small black and white map published last year. Furthermore, last year's accompanying table was spread over two pages. The attached table accompanying the map has been updated somewhat and published on one page.

The most significant new conservation project to be initiated is the ITTO transboundary project focused on Map Area #4: Chhep. This area has possibly the largest and certainly the best-researched Eld's deer population in Cambodia, per Prum Sovanna's proceedings report. In December 2004, the International Tropical Timber Council gave final approval to "Management of the Emerald Triangle Protected Forests Complex to Promote Cooperation for Transboundary Biodiversity Conservation between Thailand, Cambodia and Laos." Financing was authorized for immediate implementation of the project, with $688,208 for two years being provided by Japan, Switzerland, and USA. We worked with the Wildlife Conservation Society to integrate the transboundry project with the WCS multi-year GEF for the Northern Plains "Conservation Areas through Landscape Management", resulting in co-funding. The Grand Total budget from all sources is $1,551,943. A hopeful long-term outcome of these projects will be expansion of the Chhep Eld's deer population into adjoining areas of Thailand and Laos.

Table: Distribution of Eld's Deer in Cambodia (see accompanying map)

Map #	Name	Confirming Information	Estimated Population	*Relevant Ministry*	Relevant Conservation NGO
1	Phnom Aural	Direct observation: 2000 Reliable reports: 2000-2003 Tracks: 2001	5 – 10	Ministry of Environment (MoE)	Fauna & Flora International (FFI)
2	Ang Trapeang Thmor	Direct Observations, Reliable reports, Tracks: 2000-2004	40-60	Ministry of Agriculture Forestry & Fisheries (MAFF)	International Crane Foundation (ICF)
3	Koulen Promtep	Direct observations, reliable reports Tracks: 2001-2004	35 – 60	MoE	Wildlife Conservation Society (WCS)
4	Chhep	Camera-trap photos, Direct observations: Reliable reports, Tracks: 2001-2004	45 – 60	MAFF	International Tropical Timber Organization (ITTO), WCS
5	Siem Pang	Camera-trap photos, Reliable reports, Tracks: 2002-2004	25 – 50	MAFF	Birdlife International (BI)
6	Western Srepok	Camera-trap photos, Tracks 2003-2004	05 – 10	MAFF	WorldWide Fund (WWF)
7	Koh Nhek	Direct observation (aerial survey): 1994 Direct observations, Reliable reports, Tracks: 2001-2004	10 – 20	MAFF	WWF & Cat Action Treasury (CAT)
8	Srepok Triangle	Direct observation (aerial surveys): 1994 & 2001, Reliable report: 1999	10 – 20	MAFF	WWF & CAT
9	O Te	Camera-trap photos, Direct observations: 2003, Reliable reports, tracks: 2001-2004	20 – 30	MAFF & MoE	WWF


Distribution of Eld's Deer in Cambodia
Koulen Promtep
Thailand
Chhep
Siem Pang
Laos
Vietnam
Oddar Meanchey
Ang Trapeang Thmor
Banteay Meanchey
Siem Reap
Preah Vihear
Stung Streng
Ratanakiri
Western Srepok
Srepok Triangle
Mondul Kiri
Kratie
Koh Nhek
Pursat
Phnom Aural
Kampong Speu
Phnom Penh
O Te
1
2
3
4
5
6
7
8
9
?
Sources: Data reported by CAT, FFI, MAFF, MoE, WCS and WWF between 1994 and 2003
Prepared by: CWRP
Date: November 2003
N
50 0 50 100 150 Kilometers
Legend:
Main River
Provincial Boundary
1 Confirmed Location for Eld's Deer
Relevant NGO:
1 - FFI
2 - ICF
3 - WCS
4 - WCS
5 - BI & WWF
6 - WWF
7 - CAT & WWF
8 - CAT & WWF
9 - WWF
? Possible Location for Eld's Deer
MAFF Management:
Protected Forest
Sarus Crane Conservation Area
MoE Management:
National Park
Wildlife Santuary
Protected Landscape
Multiple Use Area

Update on *Cervus eldi siamensis* Conservation Activities in Cambodia

Matt Hunt
WildAid Cambodia

In situ conservation

As reported last year, Eld's deer are known to exist in at least nine separate locations within Cambodia, primarily throughout the Northern Plains and the North-East. All confirmed Eld's deer areas have similar habitats consisting of dry open forest interspersed with either wet grassy areas or rice paddies. Salt licks and permanent dry season ponds are also essential (Weiler, Conservation Status of Eld's deer in Cambodia, 2004). All of these areas are subject to ongoing conservation activities by either the Forestry Administration (FA) of the Ministry of Agriculture, Forests and Fisheries (MAFF) or the Ministry of Environment (MoE). These efforts are assisted by numerous international conservation organizations including Birdlife International (BI), Cat Action Treasury (CAT), Fauna and Flora International (FFI), International Crane Foundation (ICF), WildAid (WA), Wildlife Conservation Society (WCS) and Worldwide Fund for Nature (WWF). All of these organizations recognize the critical status of the Eld's deer as a flagship species for Cambodia and it is proposed that the species will be offered the highest level of protection under the new Forestry and Wildlife law.

Two consultation meetings were held over the past year to discuss factors affecting Eld's deer conservation and improve communication between the various groups. The idea of forming a specific Eld's deer group was discussed but the overall feeling was that each organization should continue to manage respective areas on a landscape level, whilst continuing to co-operate towards the conservation of this species within Cambodia.

One new initiative, due to begin in December 2004 is the WildAid/FA/MoE Kouprey Express project to increase conservation awareness amongst communities surrounding National Parks and Protected Areas. Based upon the conservation buses used by RARE in the Caribbean and South America during the 1990's, this project will be touring rural communities in key wildlife areas, offering lessons on wildlife conservation to schoolchildren and carrying out community outreach meetings to increase awareness of Cambodia's new Forestry and Wildlife laws. The theme for the first year will be "Ecosystems and Extinction", pushing home the message that the extinction of any single species will have a knock-on effect to other species of wildlife. The project will use the Kouprey, Cambodia's national animal, to demonstrate how quickly a species can become extinct through over-hunting and will have five focal species of wildlife that could potentially become extinct within Cambodia during the next 10 years if current levels of hunting and habitat loss continue. The Eld's deer will be one of the focal species for this project and as such will feature on 10,000 t-shirts, 20,000 student booklets and a specially created poster to be distributed in key communities over the next year.

Captive Eld's deer within Cambodia

Introduction

The global captive population of *Cervus eldi siamensis* is believed to stand at fewer than 30 animals, spread between Cambodia, Thailand and France. However, the captive populations in both Thailand and France are highly inbred, leading to unnaturally high levels of neonatal

mortality (up to 90%; Thevenon and Couvet, 2002) and decreased fertility. Long-term survival of these captive populations must now be considered unlikely without genetic intervention. The captive *Cervus eldi siamensis* within Cambodia represent perhaps the best hope for the establishment of a genetically viable population of this sub-species for any future re-stocking or re-introduction programmes for this animal throughout its former range, either within Cambodia or other range states where they may have already been extirpated (i.e. Thailand or Vietnam). Three of the four animals currently held in Cambodia are wild caught animals of known origin (see Table 1.) and three are proven breeders (the single male at Kampot is believed to have fathered a hybrid fawn with a female Sambar).

No.	HOUSENAME	SEX	LOCATION	DAM	SIRE	ORIGIN	Age on Arrival	DOA/DOB	Observations
1	Nee-moy	F	PTWRC-S1	WILD	WILD	UNK	Approx. 18mnth	A:1999	Donation
3	Aural	M	PTWRC-S1	WILD	WILD	Aural district	<1 yr	A;11/09/02	Confiscation
4	Ley-moy	F	PTWRC-S1	1	2	Captive-bred		B;4/1/04	
5	Kampot	M	KAMPOT	WILD	WILD	Pursat		A:09/01	

DEATHS/CONFISCATIONS

No.	HOUSENAME	SEX	LOCATION	DAM	SIRE	ORIGIN	Age on Arrival	Confiscated	Observations
2		M		WILD	WILD		Adult	11-Dec-01	Snared animal

Table 1. Eld's deer in captivity within Cambodia

Despite the best efforts of all concerned in wildlife conservation within Cambodia it also remains possible, if not likely, that further animals will enter the captive population through confiscation from the illegal trade in wildlife. In July 2001 the WildAid/Forestry Administration Wilderness Protection Mobile Unit was launched to combat illegal wildlife trade throughout Cambodia. In just over three years of operations two live Eld's deer and six sets of antlers have been confiscated, demonstrating that hunting still poses the greatest single threat to the continued existence of this species in Cambodia.

Eld's deer at Phnom Tamao Wildlife Rescue Center

Phnom Tamao Wildlife Rescue Center (PTWRC) is the only, official government-owned center for the placement of confiscated wildlife within Cambodia. It is situated within 2,500 hectares of regenerating forest some 40km south of Phnom Penh and currently houses around 800 animals of 76 different species, around half of which are considered to be globally threatened. PTWRC currently houses three out of the four known captive *Cervus eldi siamensis* within Cambodia; an adult pair with their female offspring. The female deer is about 6-7 years old, having arrived at the center sometime during 1999 at an age of 1-1 ½ years old. It is unclear exactly what region this animal originally came from as prior to her arrival at PTWRC she had changed owners two or three times. The owner who donated this animal to PTWRC was an army medic who had been working in the Northern Tonle Sap region. A previous owner had apparently been in Kratie province and so it is assumed that this animal was originally captured in either the Northern Tonle Sap area (Siem Reap or Oddar Meanchey province) or Kratie Province. The male deer was confiscated from a member of the armed forces stationed in Aural district, Kampong Speu province, by the WildAid/FA Wilderness Protection Mobile Unit on 11th September 2002. At the time of confiscation he was estimated to be between the age of 9-12 months old. He was bought

immediately to PTWRC and, after an initial quarantine period, housed with the female. A female fawn was born to this pair of animals on January 4th, 2004. She has been mother raised without incident and is now approaching a year old.

The current Elds deer enclosure is an 80m x 20m lightly wooded area which, although adequate for a small group of animals, does not have facilities for veterinary management or the introduction of new animals, thus limiting potential for growth of the herd. The surrounding fence is only 1.6 metres high, a height that could easily be cleared by these animals if placed in a stressfull situation. Water supply is also a problem as PTWRC does not have any running water but it is envisaged that a new water supply will be installed sometime in early 2005. Within the next year it will be neccessary to seperate the female fawn from her father to prevent unwanted matings and so funding is currently being sought to create a specialist facility for Eld's deer at PTWRC to improve potential for veterinary and genetic management of the herd. Discussions have now taken place between the Forestry Administration, Smithsonian Institute and the Zoological Parks Organisation of Thailand to investigate possibilities for improving co-operation between all parties for the greater benefit of this sub-species.

Eld's deer in Kampot Province

One additional male Eld's deer is currently held at the Touk Chou Zoo, on the edge of Bokor National Park in Kampot province, Southwestern Cambodia. The owner is senator Nhim Vanda, who claims the site to be either a private zoo or wildlife rescue center but has not yet been granted a license to operate as such by the Wildlife Protection Office of the Forestry Administration. The site has been visited by Forestry Administration officials twice during the past year to inspect conditions for the animals with regards to issuing a license.

The male Eld's deer came originally from Pursat province and arrived in Kampot during September 2001. Its age is estimated to be around 10-12 years old, although ages given by staff at this zoo for some animals are not believed to always be 100% accurate. During a visit by the author to this zoo in 2002 this animal was housed with a female Eld's deer. The female has since disappeared and enquiries have failed to discover what the fate of this animal was. Veterinary and husbandry expertise at this facility is low with a number of animals known to have died over the past two years. The male Eld's deer was subsequently housed with Sambar deer and is believed by staff at this zoo to have fathered a hybrid fawn with a female Sambar. This animal was seen in August 2004 and does indeed look like it may be a hybrid. The male Eld's deer is currently housed alone and appears to be in good health.

Senator Nhim Vanda has been willing to co-operate with international institutions in the past and so efforts are underway to discuss the future of this Eld's deer and possibilities to bring it into the captive management program. However, until PTWRC has facilities to hold another adult male it will be impossible to seek to take this animal on either breeding loan or in exchange for different species held at PTWRC.

Progress on Eld's Deer Conservation in China (2003 – 2004)

Yan-Ling SONG
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The first International workshop on Eld's deer conservation and restoration has greatly encouraged the conservation of Hainan Eld's deer in China. It has enabled the government officials to realize their contributions to conservation of the Eld's deer in Hainan. Furthermore, it has highlighted the global importance of this species. A net result is their willingness to continue supporting Eld's deer conservation activities.

During the past year, several action steps assigned to China have been successfully executed. They include:

- Translation of the executive summary of last years workshop in Chinese and presentation to the Governor of Hainan and National Forestry Agency (NFA) in December 2003.
- Submitted a research proposal to NFA in December to clarify subspecies issue for the Hainan Eld's deer and to create a second population. This has been approved.
- Obtained blood samples from 213 deer from 6 deer groups and selected suitable polymorphic microsatellite DNA markers for further analysis.
- The second population of Eld's deer in Houmiling was successfully monitored by radiotracking. Since July 2003, one hundred deer have been trans-located to Houmiling. At the end of last breeding season, 8 fawns were recorded. In addition, three animals also were radio collared and monitored until the end of battery life.
- A proposal for creation of the third population to reduce grazing pressures on Datian Nature Reserve (DNR) was prepared and submitted to NPA. Initial efforts to accomplish this also have been completed. A field survey to identify potential habitat for the 3rd deer population began in November 2003 and is on-going.

In addition to the above, several actions have been identified. They include:

- To examine genetic diversity within and between deer groups
- Clarify subspecies issue if blood samples of Siamensis and Thamin become available
- Create and monitor the 3rd population in Hainan Island
- Develop a genetic management program for deer population

Evaluation of Potential Reintroduction Habitat in Thailand

William J. McShea[1], Boripat Siriaroonrat[2], Ronglarp Sukmasrong[3]
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An action step of the 2003 workshop was to explore potential *Cervus eldi thamin* reintroduction sites within Thailand. To this end 2 exploratory trips were conducted in 2004; the first to Huai Kha Khaeng Wildlife Reserve (HKK) in April and the second to HKK, Mao Wong National Park and Tung Yai Wildlife Reserve in November. In summary, there is potential habitat within the western forest complex but 2 issues are primary concern, protection from local villagers and fire management policies. Reintroductions will not be successful without some form of active fire management.

In the 2003 workshop an examination of forest maps based on remote sensing technology and consultation with in-country researchers (Drs. Naris Bhumpakphan and Ronglarp Sukmasrong, Kasetsart University) indicated the Western Forest Complex has the most potential for reintroduction of thamin. This 18,700-km^2 area contained this subspecies as recently as the 1970's, contains large contiguous forest patches, has relatively low densities of people, and does possess suitable habitat based on satellite images. There are 17 conservation areas within the complex, but the best reserve, in terms of infrastructure and staff expertise in Huai Kha Khaeng Wildlife Reserve. This reserve is 2780 km^2 with a single area of about 60 km^2 that is dry dipterocarp forest and within a natural bowl that would limit deer movement beyond the area. It also possesses several research stations, a captive breeding facility, and is located about 3.5 hours drive west of Bangkok.

The April trip entailed meeting reserve staff and exploring the area around Khoa Nang Ram Research Station. We also met with the research station's director, Saksit. Ronglarp is a former director of this research station, so it has a long history of wildlife research. The forest around the research station is in excellent condition, but is not appropriate for eld's deer. This may be due to the lack of fire in the region for > 40 years. The Reserve has a strong fire-prevention program. Some of the habitat is dominated by bamboo and the rest has an abundance of small shrubs and trees, making a thick understory. It seems the reestablishment of dry-season fires would clear out the understory and restore grasses and forbs, but that is not certain. There was mention of better habitat further into the reserve but we did not have time to inspect that area. Saksit was encouraging that the deer could be reintroduced and that fire was possible as a management tool, as long as he receives assurances it would be controlled burns. The research station has good facilities and seems amenable to active research projects. Further discussions with officials in Bangkok did not meet with assurances that obtaining permissions for fire within the reserve would be an easy path to follow.

During the November trip we returned to HKK, but focused our attention on the buffer zone along the eastern border. We were informed that fire management is much more feasible within a buffer zone as many management activities are already authorized. The

disadvantage is the area is also closer to human activities and relations between the villages and the reserve are not always smooth. The habitat along the eastern edge is suitable for eld's deer, as it is primarily dry dipterocarp forest. There is mixed deciduous forest along streams and the forest closer to villages is severely degraded. It was difficult to estimate the amount of suitable habitat near the breeding station but its possibly > 20 km^2. Fires started by villagers have occurred within the region and there was abundant grass cover farther from villages.

While in HKK in November we inspected the breeding station as a potential site for reintroduction activities. Mr. Somchai Polyium, Deputy Chief of the Breeding Station, was very supportive of our goals and seems willing to be an active participant. Ronglarp also served as chief of this station. The station already has a pen and enclosure area that was built for breeding of cervidae. There are 4 forested enclosures (6-8 acres each) with attached pens and could potentially house approximately 50 Thamin (10.40), and can be expanded. The station has plans to burn and manage the vegetation within the big 4 pens. A limitation is there is no electricity at the center beyond small generators. This may limit any veterinary procedures. There is also no piped water in the enclosure area. Any large reintroduction herd would need a dependable water source. There is also need for some improvement of the fences.

Another advantage of this breeding station is its location, since it is located in the buffer zone area and adjacent to the HKK wildlife reserve. Any animals produced at the breeding center could be released directly into the forest. Within the buffer zone, Somchai can work with the local forest fire management staff to conduct managed burns of the forest near his station.

Since Ronglarp has been previously part of the staff at HKK and now serves on the faculty at KU, there is a good potential to have students conduct much of the needed research prior to reintroduction. We would need to identify the extent of suitable habitat, demonstrate that fire management does improve habitat for deer, and moniort the adjustments of the deer to their new habitat.

Mae Wong: Also on the November trip we visited Mae Wong National Park, located directly to the north of HKK. This park has a large central valley (60 – 100 km^2) where there's dry dipterocarp forest. The forest presently contains bantang, which is a good indication it would be suitable for eld's deer. There are no villages located near the suitable habitat and we gained entrance to the area along a good road that starts at a ranger station. The staff were receptive to a reintroduction project and the potential habitat was the best we observed in Thailand.

Tung Yai: Directly west of HKK, (although it is an 8-hour drive due to terrain) is Tung Yai (Great Field-in Thai) Naresuan Wildlife Sanctuary (TY). TY is approximately 2000 km^2 and is completely forested with the exception of scattered villages populated with indigenous people. There is also a central grassland (50 km^2) that is populated with gaur. HKK and TY were designated a UNESCO Natural World Heritage Site since around 10-12 years ago. We traveled through several sections of TY during the November trip and unfortunately no suitable habitat was observed. We were unable to reach the central grassland and that does remain a potential reintroduction site, but the surrounding forest is primarily mixed deciduous with too heavy a component of bamboo for eld's deer. It would also not be recommended as the first reintroduction site because of the difficult logistics of getting deer into the central area

and monitoring their movements once released. There is also a minimal of infrastructure support.

Summary

HKK has the best potential for a reintroduction site, with Mae Wong as a secondary site. We need to enhance the infrastructure at the breeding station and immediately start fire management of the adjoining forest. Faculty and students from KUU could develop several ecology projects needed prior to, and during, the reintroduction. There also should be some consideration given to community education and relations. We do need to encourage the participation of leaders within the WCS Thailand Program, Petch Manopavitr and Anak Pattanavibool. Their expertise in community relations and training would benefit the success of the reintroduction site and their inclusion at the beginning of the process would be wise.

Progress Report on the Eld's deer (*Cervus eldi*) Conservation Activities in Thailand 2004

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Abstract

The year 2004 marked the important milestone for the Eld's deer (*Cervus eldi*) conservation in Thailand. Significant progress has been made in both captive breeding efforts and the preparation of future reintroduction for Thamin. Retrospective study of the Eld's deer's historical distribution and has been investigated from published data as well as fossil remains. Captive population census of both Thamin (*C. e. thamin*) and Siamese Eld's deer (*C. e. siamensis*) in government zoos, captive breeding centers, and private collection was undertaken. Major activities and steps, taken from recommendations listed in the previous 2003 workshop final report, are summarized.

Progress on *ex situ* conservation

Establishment of genome resource bank (GRB) for Siamese Eld's deer and training for Thai ZPO staff

This is one of the steps previously discussed among the Thai colleagues from Zoological Park Organization (ZPO), Department of National Parks, Wildlife and Plant Conservation (DNP) and Eld's deer Action Group members that needed to be taken immediately due to the very limited number of animal in captivity. Scientists from the Conservation & Research Center, Smithsonian's National Zoological Park (Mitch Bush, Budhan Pukazhenthi and Boripat Siriaroonrat) were invited by ZPO to collect, freeze and establish GRB for Siamese Eld' s deer in Thailand during April 5-9, 2004. Total of 4 males (3 at Dusit Zoo, Bangkok (DZ); Male # 7, 59 and 60, and 1 at Banglamung Wildlife Breeding Station (BLM), Chonburi, Male CES004) were collected; and total of 257 straws were frozen, banked, and managed at Khao Kheow Open Zoo (KKOZ), Chonburi. Data on age, number of straws collected and post-thaw motility is shown in Table 1.

Table 1. Thailand's Siamese Eld's deer GRB profile (established April 2004).

Male	Age	No. of Straws	Post thaw motility
#7	10	65	60
#59	3	101	30
#60	2	23	50
CES004	16	68	60

Continued natural breeding of Siamese Eld's deer

In 2003, the first two Siamese Eld's deer fawns (1.1) were born in captivity in Thailand from breeding loan between DNP and ZPO. Two females were sent from DZ, Bangkok to BLM. In 2004, CES004 was recommended to breed with the same females to produce one more set of offspring before being sent back to DZ and new females will be recruited for 2005-2006 breeding plan.
Two more fawns (0.0.2) were just born recently (December 2004). Animals are doing well at BLM and there are no space limitations. The 16-year-old CES004 male occasionally gets sick from wounds and sometimes shows the sign of geriatric animals and may be taken off the breeding program. Unfortunately, this animal is a genetically valuable representative because it is the only animal unrelated to DZ population. More actions need to be taken to recruit new male(s) into this captive breeding program, e.g. working with Cambodian authority to start negotiating breeding loan between the two countries and contacting France to obtain genetic material and/or animals from Paris Zoo.

Captive population census

Naris Bhumpakphan, Ronglarp Sukmasuang and others visited several DNP, ZPO and private-owned facilities, interviewed keepers, staff, officers, and owners of private institutions that keep Eld's deer, Thamin and Siamensis. Data showed that there are total of 824 Thamin and 18 Siamensis at the time of the survey (summarized in Tables 2 - 6). We found that almost all the Thamin population surveyed, management practices is not at its best to serve as a good '*genetic management*' program that we would like to see happened for the preparation and establishment of '*release Thamin herd*' for the future reintroduction. However, these populations serve as genetic reservoir for a physically and genetically healthy representative of founding stocks if recruit systematically and carefully. For Siamensis, there is a need to expand the breeding program to create the genetically sustainable founding stock for the long-term breeding management given the limited number of animal available for this attempt.

Table 2. Number of Thamin held at DNP facilities

Site	No. of stags	No. of hinds	Unknown	Total
1. Omkoi	2	8	-	10
2. Pang Thong	10	13	6	29
3. Khao Kor	16	15	-	31
4. Phu Khieo	8	7	-	15
5. Chula Bhorn	5	2	-	7
6. Chong Klam Bon	16	18	-	38
7. Bang Lamung	11	11	-	22
8. Huai Sai	13	19	-	32
9. Khao Pratapchang	13	8	4	26
10. Khao Son	2	2	-	4
11. Phattalung	6	3	-	9
Total	102	106	10	**222**

Table 3. Number of Thamin in ZPO zoos

Site	No. of stags	No. of hinds	Unknown	Total
1. Dusit	-	-	-	-
2. Khao Kheow	78	109	13	203
3. Chiang Mai	14	14	7	35
4. Korat	12	25	33	70
5. Songkhla	8	15	-	23
Total	112	163	53	**331**

Table 4. Number of Thamin in Private zoos

Site	No. of stags	No. of hinds	Unknown	Total
1. Safari World	-	-	200	200
2. Sriracha Tiger Zoo	-	-	60	60
3. Samutprakarn Crocodile Farm & Zoo	1	-	-	1
4. Chokchai Ranch	-	-	10	10
Total				**271**

Table 5. Total captive Thamin surveyed (2004)

Institution	**Total**
DNP	331
ZPO	222
Private zoos	271
TOTAL	**824**

Table 6. Number of Siamensis held in two captivities (surveyed December 2004)

Site	**No. of stags**	**No. of hinds**	**Unknown**	**Total**
Dusit Zoo	4	6	1	11
Bang Lamung	2	3	2	7
Total	6	9	3	**18**

Strategic Planning Workshop for the Eld's Deer Conservation & Restoration Program in Thailand

As recommended in 2003 report that each country develops a '*strategic plan*' for the future activity, ZPO invited Smithsonian scientists (David Wildt, Jonathan Ballou, William McShea and Boripat Siriaroonrat) to facilitate this workshop for Thailand on May 6-8, 2004 at KKOZ. This step is critical for the future activities as a master plan and detailed roadmap for Eld's deer conservation and restoration. Participants were 24 Thai from ZPO, KUFF, DNP, Ministry of Natural Resources and Environment, universities and conservation NGOs, including 4 from USA. The 2.5-day facilitated workshop utilizes participants' expertise and group processes to brainstorm, discuss and lay out the essential framework for the 10-year vision planning and implementation.
Executive Summary is presented to the group and passed on to ZPO and DNP executives. Detailed proposal, composed of *in situ* and *ex situ* conservation, activities is being developed based on the discussions and recommendations made from working groups. Funding will be sought from the Thai government by endorsing the strategic plan to the Ministerial level jointly hosted by DNP and ZPO. Below is the summary of highlights from Thailand Strategic Panning Workshop for Eld's deer Conservation and Restoration.

Recommendation and endorsement of a countrywide breeding and reintroduction program for the Eld's deer of Thailand, including both the Thamin and Siamensis subspecies

Collective management and guidance by a coordinated Thailand Eld's Deer Conservation Committee (TEDCC) comprised of the highest authorities within the Zoological Park Organization (ZPO) and the Department of National Parks, Wildlife and Plant Conservation

(DNP). This will be a committee of perhaps 20 decision-makers who are dedicated to the effort and are willing to meet at least twice annually to ensure that continued progress is made to achieve the goal of re-establishing viable populations of both Eld's deer subspecies in nature. TEDCC is scheduled to meet next in June 2004 to discuss the recommendations from this meeting with other potential partners. The anticipated budget for this 10-year program is estimated to be 200 million Baht (~$ 5 million).

Creating and managing a captive Thamin population as a resource for reintroduction

Form a genetically valuable herd based on selecting the most genetically valuable individuals from multiple sources. This source population would be comprised of two separate, but linked herds (one under ZPO management and the other under DNP management), each should be comprised of 40 founders (1:1 sex ratio). The goal will be to retain 90% genetic diversity for the next 100 years.
The tentative plan is for two new facilities to be devoted to Thamin to be built by 2005 that will result in a 25% annual growth rate and the eventual production of 350 individuals that would allow reintroduction to be initiated by 2010.
There is a substantial number of 'surplus' Eld's deer in the current population of unknown genetic provenance. These animals, however, are valuable and will be used for both research and experimental reintroductions, the latter to begin in 2005 or 2006.
The management of this collective captive program will be under the supervision of a Captive Management Subcommittee (CMS) comprised of up to 13 individuals representing zoos, the DNP and universities (a subset of the TEDCC above). The CMS also will benefit from outside advisors skilled in captive management and reintroduction (to be identified).
The captive management program will not be conducted in isolation from the preparation for reintroduction – these efforts (including planning and fundraising) must proceed in parallel.

Identifying, surveying and selecting reintroduction site(s) for Thamin followed by implementation of deer restoration

A major challenge is identifying suitable habitat for the experimental as well as authentic Eld's deer reintroduction activities. Thus, the highest priority is to survey for suitable habitat and/or altering extant habitat by controlled burning. The initial surveys will begin in 2004.
Experimental releases of 'research' Eld's deer will commence in 2006 or 2007 at Huay Kha Khaeng Wildlife Sanctuary, Uthai Thani Province.
Projected releases of genetically valuable Eld's deer will tentatively commence in 2010.
The management of this reintroduction and monitoring program will be under the supervision of a Reintroduction Management Subcommittee (RMS) comprised of representatives (to be identified) from appropriate agencies (a subset of the TEDCC above). The RMS also will benefit from outside advisors skilled in reintroduction (to be identified).
The reintroduction program will not be conducted in isolation from the captive management program – these efforts (including planning and fundraising) must proceed in parallel.

Creating and managing a captive Siamensis population as a resource for reintroduction

The main obstacle is a lack of founders in Thailand necessitating the development of cross-country partnership to establish a viable captive population. This will require high diplomatic

negotiations with Cambodia, which is likely to be the best resource for genetically valuable individuals. Additional target partners may include Laos and France (Paris Zoo).
A priority for the TEDCC is to organize as soon as possible negotiations with appropriate officials concerning availability of breeding stock or the possibility of developing a breeding center within Cambodia that would result in cooperative breeding and the sharing of offspring, including allowing the importation of new founders into Thailand.
Education and public outreach (for general public and local villagers in and around protected areas) is the key factor for the success of the activities and planned listed in the above statements.

Report on the visit to Cambodia and discussions on future collaborations on *Siamensis* Conservation

For Siamese Eld's deer conservation, the limiting factor for starting a sound captive breeding program is the low number of founders available in Thailand. In 2003 workshop, Hunter Weiler and Prum Sovanna from Cambodia presented exciting data on wild population of Eld's deer from northern Cambodia (detailed in this report). We also learned about the captive Siamensis kept at Phnom Tamao Zoo and Wildlife Rescue Center (PWTRC) near Phnom Penh. We realized the importance of the captive population in Cambodia and initiated a diplomatic mission to verify the existence and status of these animals, and to discuss future collaborations with Cambodia. A group of ZPO officials and Smithsonian scientists visited Cambodia and met with government officials of Wildlife Protection Office (WPO; Chheang Dany, Leng Chiven and others) under the Forest Administration (FA) and PWTRC (Nhek Rattanapich) on November 12-13. The team also met with WildAid Cambodia staff (Matt Hunt and Nick Marx) to discuss options for future collaboration for both wild and captive populations.

At PWTRC, there is a family of 3 Siamensis (1.2) and the female is pregnant from the same male. The animals are in good health condition and have been dewormed. They seem to be quite docile and accustomed to visitors but have never been exposed to stressful conditions or have been handled by keepers. One more fawn is reported to have been born at PWTRC in January 2005 (Matt Hunt, WildAid Cambodia, pers comm.). PWTRC will report to FA director (H.E. Ty So Khun) about our visit and recommendations that were made regarding future collaborations and gamete and/or animal exchange for captive breeding between Thailand and Cambodia. Overall, the mission was successful and ZPO invited two PWTRC staff and WildAid Cambodia to join the Second International Workshop for Eld's deer Conservation & Restoration in Bangkok on November 17-18, 2004. ZPO officials also agreed to draft a memorandum of understanding with PWTRC and FA in 2005.

Hosting the second international workshop for Eld's deer Conservation and Restoration, November 17-18, 2004

See this Final Report.

Progress on in situ conservation and related activities

Finding historical distribution of Eld's deer in Thailand

Naris Bhumpakphan, who has been collecting data on animal remains and fossil finds, initiated this task by gathering actual artifacts and anecdotal data from amateurs, professional scientists, and reliable local hunters throughout the country. A historical distribution map (see Figure 1.) was created from carefully comparing notes of historical sightings, animals sighted and hunted, fossil found, and old scientific publications. We still believe that Thailand had two subspecies of Eld's deer; Thamin in the western part of Thailand bordered with Myanmar (Lekagul and McNeely, 1977), and the Siamensis in the east. According to the new finding, the Chao Phraya River might have not been the geographic barrier that split the two subspecies. We found a total of 22 localities of *C.e. siamensis* that occurred in the north, northeastern, as well as southeast and central plain while Thamin (*C.e.thamin*) only found from 3 localities at the edged of the western forest complex of Thailand (Tak, Uthai Thani and Kanchanaburi). From this recent survey and data from available sources (Bhumpakphan *et al*., 2003, *in press*), it is shown that *C.e. siamensis* remains are found in many parts of Thailand. Antlers and bone artifacts are found in multiple archaeological sites, such as Kok Sam Rong in Lopburi Province (central plain), Ban Prasat and Ban Lum Khao in Nakhonratchasima Province (northeastern) Thailand. Geofacts (fossil and subfossil) are found in Lam Pang Province (north), Chaiyaphum Province (northeast), and the Chao Praya and Thachin Basin central along with geofacts of the extinct Schomburgk's deer (*C. schomburgki*).

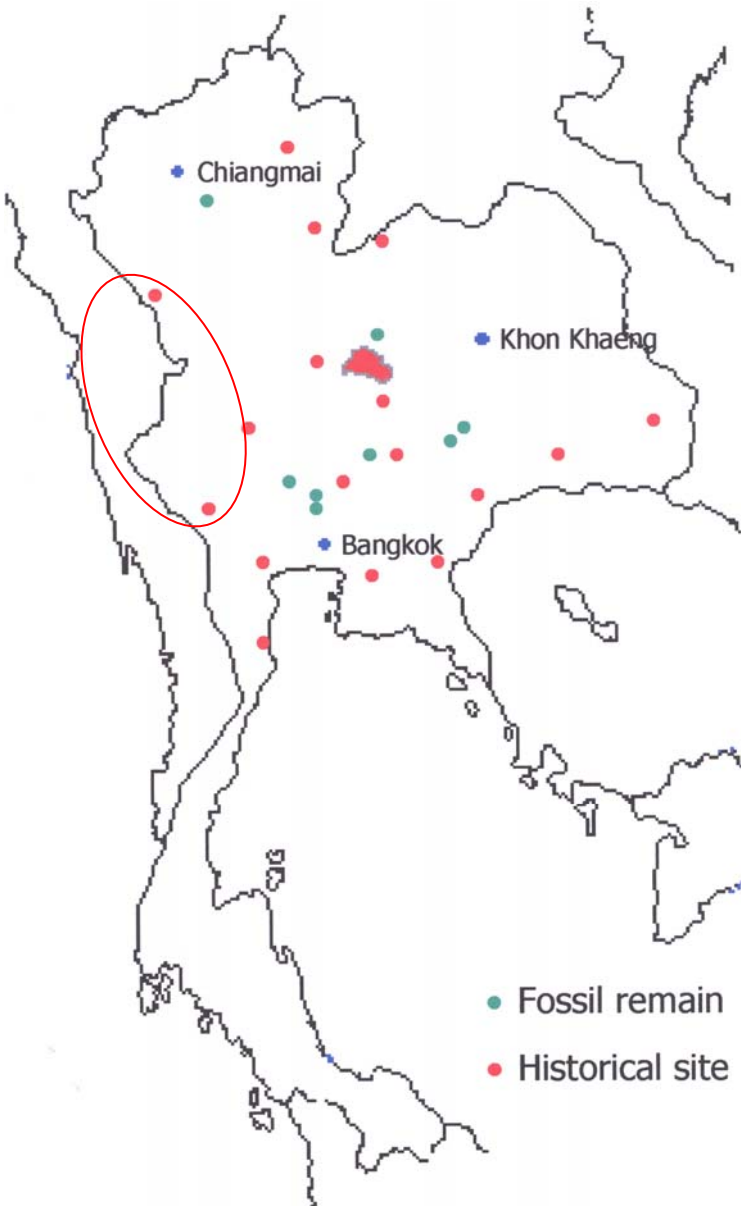

Figure 1. Distribution map of Eld's deer remains and fossil found in Thailand (By Naris Bhumpakphan). Thamin range is shown in circle.

Organizing seminars and meetings on Eld's deer conservation

Faculty of Forestry, Kasetsart University held the 24th Wildlife in Thailand Seminar on December 16-17, 2003 and the 25th Wildlife in Thailand Seminar in December 24-25, 2004 with the special session on Eld's deer conservation. ZPO, DNP and KUFF colleagues invited Hunter Weiler and Chheang Dany from Cambodia to be guest speakers at the 2004 meeting. The 1st Symposium in Ecology in February 2005 is planned to have Eld's deer conservation as one of the topic or session.

There also have been two lunch meetings hosted by the Faculty of Forestry, Kasetsart University (KUFF) on January 30 and June 18, 2004. Colleagues from KUFF, KU Veterinary School, Mahidol University Veterinary School, DNP, ZPO, and WCS-Thailand were invited

and participated in the discussion on Eld's deer conservation in Thailand. Dr. Utis Kutintara, Dean of KUFF offered to bring these organizations and personnel involved in this area to agree on this important action.

Evaluation of reintroduced Thamin at Phu Kheio Wildlife Sanctuary

In 1995, 13 Thamin (4.7.2) were kept in the 6.4 ha pre-releasing enclosure for two years before releasing in 1997 by Boonsanong (1997) at Thung-Kamang grassland in Phu Kheio Wildlife Sanctuary (PKWS), which is believed to be a historical site. It is still arguable if it is appropriate to reintroduce Thamin into 'theoretically' Siamensis habitat. Although both subspecies are extinct in the wild from Thailand's forest, we can still learn from the action taken place before members of our group have any involvement on this issue. To date, the original herd of Thamin released in 1997 still exists in PKWS along with the reintroduced hog deer (*C. porcinus*). In 2004, PKWS staff reported seeing few wild born Thamin (Mongkhon Khamsuk, pers. comm.). Comparative ecological study with released hog deer by Kuntharo (2002) will be useful for the future action whether the recommendation will be taking the deer out of PKWS, or take no action since the deer tend to cluster around marsh, open grassland surrounded by dry deciduous dipterocarp with pine forest subtype and the population seems to be stable (less than 10 animals at present). Asian wild dog or dhole (*Cuon alpinus*) is the main predator to control cervid and other wildlife population in PKWS. More research needs to be conducted to get a better understanding about this population.

Preliminary survey at Khao Chee Chan Non-hunting Area, Chonburi

Khao Chee Chan Non-hunting Area (KCNA) is a small-sized protected area in eastern Thailand adjacent to BLM Wildlife Breeding Station where sambar, hog deer, common muntjac and wild macaque are presented. There was anecdotal information that there might be some escaped Thamin from the breeding center living in the wild there. Theoretically, Chonburi is within Siamensis distribution range. Three visits to the KCNA area including preliminary survey by Ms. Juthamas Em-Saeng, M.S. student from KUFF confirmed that Thamin is still exist in KCNA. Three adult females and one juvenile Thamin were seen coming out to feed on new grassy plain during mid December 2004. Spotlight survey and transect showed tracks and signs of other cervids. Thus, KCNA might not be a good candidate for the reintroduction of captive Siamensis in the near future due to the existing population of feral Thamin. However, this population is valuable and continued research may be required for the further details on its ecology limited sized and availability of suitable habitat that Thamin. Additionally, the existing feral and wild born Thamin could later be taken out from KCNA and reintroduced into the Western Forest Complex.

Habitat survey for potential Thamin reintroduction sites

Three sites in Western Forest Complex were identified using geographic information system (GIS) criteria for dry deciduous dipterocarp forest mixed with open grassland that is large enough to maintain the sustainable population of wild Eld's deer. Huay Kha Khaeng (HKK) and Thung Yai Naresuan (TY) Wildlife Sanctuaries are the UNESCO's Natural World Heritage Site while Mae Wong (MW) National Park is also a historical site for Thamin. We believe that Thamin is sympatric species with Banteng (*Bos javanicus*) (Naris Bhumpakphan, pers. comm.). Detailed survey report by William McShea *et al*., (2004) can be found in this volume. According to the last HKK survey with Hunter Weiler and Chheang Dany from

Cambodia on December 25-26, 2004, Ronglarp Sukmasuang and Naris Bhumpakphan have selected three potential sites for Thamin reintroduction (Sap Fa Pha and Mae Dee in HKK, and Mae Rae Wa in MW).

Future research plan

There are several steps that need to be taken regarding the Strategic Plan that is being developed into a detailed proposal, both on captive breeding and reintroduction. These include:

- Form the working counterparts in the country and abroad (IUCN/SSC Deer Specialist Group, NGOs, research and academic institutions)
- Conduct a genetic analysis of captive and wild Thamin to facilitate selection of founder stocks, parentage verification and developing markers to monitor genetic variation in the population
- Establish a new breeding herd and reintroduction herd of Thamin by genetically managing populations at the Thung Fag Wildlife Breeding Station in HKK
- Conduct health check-up and screening of captive herds for infectious diseases
- Conduct the comparative ecology of two populations; the released Thamin at PKWS, and the feral Thamin at KCNA, *e.g.* behavior, foraging habit, movement and habitat utilization
- Conduct a study on fire ecology and management to create suitable habitat for Eld's deer reintroduction
- Reintroduction and monitoring
    1. Pre-release monitoring
    2. Post release monitoring
    3. Fire ecology and habitat manipulation
    5. Habitat utilization and distribution

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The Status of Eld's Deer in Myanmar both in Captivity and in the Wild

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Introduction

Eld's deer is very popular in Myanmar. It is common that girls, who have bright eyes, are called "Deer eye's lady". When the Myanmar was a kingdom, deer hunting was considered a popular sport. Scenes of deer hunting were frequently portrayed in traditional performing arts. Furthermore, Eld's deer antlers were displayed in royalty houses as part of normal decorations.

The Eld's deer, *Cervus eldi thamin* - was first discovered in 1838 in Manipur valley of India by a British Army Officer, Lieutenant Percy Eld. This subspecies was recognized as occurring in India, Myanmar and Indo-china during the 20th century. The brow-antlered deer or Eld's deer, is a sub-tropical endangered species that is primarily distributed in central Myanmar (3° to 25° N latitude). In the 1970's, the thamin population in Myanmar was estimated to be to about 4,000, but the first countrywide questionnaire distributed by the Wildlife Department in 1992 estimated that only 2,200 deer remained with in the country. However, breeding in captivity has been outstanding in Myanmar. As a result of successful captive breeding, the Yangon Zoo now has about 128 heads at Eld's deer. Here, they reproduce well but their excitable temperament combined with a reputation for displaying self-destructive behavior has hindered their transportation.

Recently, the Government also passed the Forest Act to preserve both the Eld's deer and their biodiversity. The Forest Department's Nature and Wildlife Conservation Division was opened at the Chatthin wildlife sanctuary (C.W.S) and Shwesettaw Wildlife Sanctuary (S.W.S) to protect and manage Eld's deer. Habitats in both these sanctuaries provide ample food for the Eld's deer. Furthermore, in response to increasing threats to animal species, the Union of Myanmar also has issued a notification for their protection. As a result, protection is provided to both protected and seasonally protected species. (Notification no: 583/94).

History and background of Yangon Zoo

The Yangon Zoological Gardens was formally opened in 1906 and like most other Zoos, research and conservation were high priorities. According to 2003 record, there are 128 heads (55.73) in Yangon Zoo. They are held in four separate enclosures (fence areas) with the males in one.

There are 20 males and 48 females in Fence area 1. Eight males are mature and 12 males are between 1 – 3 year old. Amongst females, 32 are mature and 16 females are under 2 years old. This enclosure has some climbing area and a cave. In Fence area 2, there are 6 males and 10 females totally. In Fence area 3, there is 1 male and 5 females together with other deer species. There also is another fenced area for separating males during breeding season to control inter-male aggression.

Feeding system
Deer are fed scientifically formulated mixtures comprising of wheat bean, rice bean, and pea bean. Each morning, this mixture is fed at 2.5 lbs/day dry matter combined the watery straw for each. Later in the evening, animals are fed about 10 lbs of fresh vegetables with vitamin powder supplement. Animal needing medical attention are provided special diets as needed.

BreedingThe Eld's deer adult stages have long thick hair which form a prominent neck mane during the rutting season in late winter to mid summer (ie. from Feb: to April). The males weigh up to 120 kg. Stages are fertile past one year of age and exhibit seasonal aggressive behavior during the March-April. Eld's deer gestation period last about 8 months and 80% to 90% of birth occurs in October and December. According to 2003 records, there have been 24 births. There have been 6 deaths due to complications of dystocia (still births). In 2004, there have been 14 births. Interestingly, male fawns appear to dominate female fawns.

Problems of breeding There is usually aggression among males during the breeding season. So it is necessary to move out the non-breeding male. Animals are housed at a ratio of 1:5. During the breeding season, male Eld's deer are very aggressive. Sometimes they charge at keepers and therefore, caution should be practiced. Mating season is normally from February – April. We also have had to cut the antlers to minimize injury to other animals. Males normally drop the antlers in May and June.

Preventative medicines Anthrax vaccination January of each year

- H.S (Hemorrhagic septicemia vaccine) in May
- Although there is no record of infectious diseases, some older animals have exhibited T.B. lesions at necropsy
- General de-worming is performed 3 times/year.
- Dystocia cases occur 3 or 4 times per year. We have had to assist the fetus as well as perform some surgical procedures during parturition

ResearchArtificial Insemination is valuable for reproduction between incompatible pairs, to eliminate the risk of animal transport and also to overcome inbreeding depression. Six each of different sex (6:6) were kept in separate enclosure and their behavior was observed daily. When necessary, animals were anesthetized to record measurements. Fecal samples also were collected once a week for the males but every other day for females.
Anesthesia was induced using either Xylazine (0.3-1.0 mg/kg) or Telazol (2 mg/kg) for measurement of antler length, neck, girth, chest and testicular circumference (cm) and body-weight. Like all other cervid species studied, antler, mineralization occurred under the influence of high testosterone and casting correlated with lower levels of testosterone. Collected fecal pellets were placed in sealed plastic bags and stored in the deep freezer. Monitoring of fecal steroid metabolites was performed at the National Zoological Park's Conservation and Research Centre, Smithsonian Institution, Front Royal - by Dr-Steven Monfort and colleagues.

Research for improved breeding health and husbandry
Local research programs such as studying the mating behavior and antler development in Eld's deer are in progress. Research on safety and effectiveness of locally produced vaccines (Haemorrhagic Septicemia) on wild deer also are conducted by the Central Veterinary Research Division in collaboration with the Zoo.

Translocation and Reintroduction

In 2003, to

- Mingalardon Garden 6
- Hlawgga Park 4
- Hainnggi Island 2

In 2004, to

- Royal hill point 3
- National Villages in Tharkaeta 6
- Hlawgga Park 7

Now, Yangon Zoological Garden will be involved in reintroduction of Eld's deer to within the Shwesettaw wildlife sanctuary and Chatthin wildlife sanctuary. Yadanabon Zoo (in Mandalay) and Hlawgga park also have captive Eld's deer.

Wild Eld's deer It is a wide area to service Eld's deer from Shwesettaw wildlife sanctuary and Chatthin wildlife sanctuary. The Shwesettaw wildlife sanctuary constitutes an area of 213.4 sq. miles (550 sq km). It is siturated in Minbu District, Magway Divsion. According to records it has 917 $\pm$ 235 animals in the sanctuary (estimated). Chatthin wildlife sanctuary is comprised of 286.2 km^2. It is situated in Kantbalu Township Sagaing Division. According to the record, there were about 3,007 animals in 2004.

The census of Eld's (thamin) deer Census is carried out annually. Since 1989, census has been conducted 12 times in Shwesettaw wildlife sanctuary. Census also has been conducted in Chatthin wildlife sanctuary. The purpose of these censuses has been to determine the abundance of Eld's deer as well as to protect their habitat.

PHVA Workshop

Thamin Population and Habitat Viability Assessment (PHVA) workshop was held in Hmawbi, Myanmar in 2000. The workshop was held at Yangon and was attended by about 40 people.

Summary

In Myanmar, there is a broad distribution of Eld's deer in the wild. Due to protection provided by Union laws the Eld's deer appear to be recovering. Most recent estimates suggest that there are 800 animals in 18 township areas. The forestry department staff is well trained and is able to minimize poaching and habitat destruction.

Working Group Report - Field Projects

Goal 1: Identify importance of microhabitats within dry dipterocarp forest in Thailand, Laos, China, and Cambodia. There is a need to know how these deer respond to water, fire, and grasslands embedded within a forest matrix.

Action step 1:

Identify projects in range countries that will address role of ecological factors in the ability of protected areas to support Eld's deer.

Action step 2:

Create proposals that bring together teams of researchers needed.

Three potential projects were identified:

1) ATT radiotracking: Attempt to capture Eld's deer at ATT and fix radio-collars to begin monitoring their habitat use and movement patterns (Use KU student and WPO staff)

2) Laos - Chonbuly Forest Project

3) Hainan Island – Monitoring of Eld's deer populations in Hainan Island using radiotracking technology

Funding source: Critical Eco-region Priority Fund – 20-30k; will require additional funds

Lead person(s):

• Need to identify a point person

Timeline:

• Proposals for Critical Eco-region Priority Fund are due by end of winter

Goal 2: **Conduct a regional survey for presence/absence of Eld's deer in Lao, Cambodia, and Thailand tri-border area.**

Action step 1:

• Monitor progress of ITTO and CALM project in Thailand and Cambodia

Action step 2:

Conduct surveys in Laos part of the tri-border area. This would be an all Laos team and project will not have international components and probably not Lao government. There will be two phases to this project – first, drive to various townships and conduct an oral survey. Second, determine if transects can be established at each possible population. Identify potential corridors.

Lead person(s):

• WCS Lao (Souvanny)

Timeline:

• 2 months for first draft; survey in 2005

Goal 3: Conduct field surveys to determine if *C. e. eldi* is present in Myanmar

Action step:

• Investigate funding (US$1,000) and permissions for the one-month field survey on Myanmar / India border. Also plan to collect tissue samples.

Lead person(s):

• U Myint Aung (Wildlife Dept)

Timeline:

• 2 months (to determine if it is feasible)

• 6-12 months (to conduct the survey, if feasible)

Goal 4: Chatthin Wildlife Sanctuary needs financial support
Action step:
• Determine sources of funding for support of Chatthin each year (US$10,000 each year)

Working Group Report - Reintroduction

Subspecies: Thamin (*C. e. thamin*)
Goal:
• To protect all existing wild populations in Myanmar – both inside and outside current reserves
Action step:
• Circulate the report resulting from this workshop to Myanmar authorities
Lead person:
• Tun Myint
Timeline:
• 3 months after receipt of workshop report

Subspecies: Siamensis (*C. e. siamensis*)
Goal:
• Protect and increase the existing wild populations in Lao PDR, and Cambodia
• Maintain Hainan population (Datian)
• Create a viable captive population (collect genetic materials from Thailand, Cambodia, France, Lao PDR and Hainan in order to create a regional breeding program for Siamensis)
Lead person:
• Need to identify a point person
Timeline:
• Need to be determined

Prioritization of Reintroduction Projects for Siamensis

Goal 1: Establish a third population of Siamensis in Hainan Island
Action step:
• Translate executive summary of workshop report into Chinese and present to the Governor of Hainan and other government officials.
Lead person:
• Song Yang-Ling
Time line:
• 2 months after receipt of workshop report

Goal 2: Consolidate captive animals in Cambodia into one herd (plus use of confiscated animals from illegal trade).
Action step:
• Start discussions about captive male in private zoo
Lead person:
• Nhek Ratanapich

Timeline:
• *3 months*

Goal 3: **Plan for reintroduction of Siamensis in Thailand tri-border area**
Note: This is a long-range project that will be preceded by the thamin reintroduction.
Action steps:
• Begin genetic management of captive population. See genetic management section for need of formal agreements between institutions.
• Need survey of field sites. Evaluate potential of animals to move from Cambodia and Laos into Thailand independent of captive efforts.
• Monitor deer populations in Cambodia jurisdiction in the tri-border area.
Lead person:
• Need to identify a person
Timeline:
• To be determined

Prioritization of Reintroduction Projects for Thamin

Goal 1: Viable populations of wild deer within the Western Forest Complex. Several populations needed.
Action step 1: Create a reintroduction herd at Thung Fag Breeding Station at HKK.
1a) Improve facilities at Thung Fag: eg., water to pens; forage improvement (i.e. fire); increase height and stabilize bottom of fence; insure availability of adequate number of trained staff at facility.
1b) Identify genetic stock and transport to Thung Fag.
1c) Use best management practices on captive animals. All individuals should be marked, record keeping practices should be established, and males and females should be separated and mated only when needed based on breeding recommendations.
1d) Construct pre-releasal area. 9 hectares. Short period – 3 months in area. For Mae Wong may construct or may use site at Thung Fag. Also there may be a second site at HKK (Mae Dee) that needs translocation before releasal.
It is recommended that the first releasal group comprise of 30 animals (2:5 sex ratio).
Lead person:
• Need to identify a person
Timeline:
• To be determined

Action step 2: Improve reintroduction habitat at HKK and Mae Wong.
2a) Develop and education program with villagers and staff
2b) Map extent of favorable habitat in both reserves
2c) Develop a fire management plan for the forest. This plan should include assessment of the impacts of fire on biodiversity and species composition.
2d) Improve water availability to HKK buffer zone. This could include installing water tanks along the road and delivering water by truck.
Lead person:
• Need to identify a person
Timeline:
• To be determined

Action step 3: Improve training and skills of reserve staff
Provide training in fire management, radiotracking, habitat evaluation and deer census techniques (to measure success of reintroduction – demographics)
Lead person:
• Need to identify a person
Timeline:
• To be determined

Working Group Report - Education and Training

Action Step 1:
• Develop a poster (prototype) for the Eld's deer for inclusion in regional Eld's deer awareness programs. The poster once finalized will also be translated into regional languages.
Target audience:
• Villagers, schools, teachers, local officials, general public
Lead person(s):
• Budhan Pukazhenthi
Timeline: 1 year

Goal: Develop an Eld's deer specific module for inclusion in field assessment/survey techniques/habitat assessment training course at the regional level (develop a set of Eld's deer specific modules for teaching people for surveying in low density situations and general conservation status, threats and biology; also include habitat assessment maps).
Action step:
Contact Tony Lynam to ensure Eld's deer module is included in the training activities
Lead person(s):
• Bill McShea
Target audience:
• Foresters, wildlife staff, researchers, conservationist, and community rangers
Timeline: 1 month

Working Group Report - Captive Animal Management and Research Strategies

Thailand

Goals:
• Develop a strategy for implementing a better genetic management for the existing captive population
• Create a viable population for both sub-species (Thamin and Siamensis) for reintroduction

Action Step 1a: Develop and submit to the Ministry of Natural Resources a proposal converting the strategic plan for captive management and conservation (habitat management, monitoring, staff training) to formalize collaboration between ZPO and DNP.
Lead person(s):
• Sumate Komalnarranath (ZPO), Ronglarp Sukmasuang (KUFF)
Timeline:

• 6 months

Action Step 1b: Conduct genetic analysis on ZPO's Eld's deer population to establish subspecies or resolve potential hybrid issues. Should consider marking individuals so that once subspecies is confirmed, individuals from this sub-population could be included in the genetic management population.
Lead person(s):
• Boripat Siriaroonrat (secure samples from US); Sumate Komalnarranath (secure at least 25 individual samples from ZPO, DNP and private collections each); Naris Bhumpakphan (genetic analysis)
Time line:
• 12 months

Action Step 1c: Establish the captive management subcommittee recommended in the strategic plan to create a plan for genetic management of both subspecies
Lead person:
• Naris Bhumpakphan
Time line:
• 3 months

Action Step 1d: Develop a co-operative pilot genetic management program using the existing DNP facilities. Should consider training staff in genetic management, create a studbook for both subspecies, and develop a plan to move founder animals to the DNP facility.
Lead person(s):
• Ronglarp Sukmasuang, Sumate Komalnarranath
Time line:
• 12 months

Thailand and Cambodia

Goal: To develop a cooperative genetic management plan for the siamensis subspecies
Action Step 1a: Implement a marking and identification system for all animals (siamensis) in captivity and establish a studbook. Suggest using the existing global studbook and updating it.
Lead person:
• Matt Hunt (WildAid – Cambodia)
Timeline:
• 6 months

Action Step 1b: Thai and Cambodian counterparts will develop a proposal for developing a joint captive management program. This proposal should consider strategies to upgrade facilities at Phnom Tamao Rescue Center and provide animals for the Cambodian genetic management program.
Lead person(s):
• Sumate Komalnarranath (Thailand) and Nhek Ratanapich (Cambodia)
Timeline:
• 6 months

Action Step 1c: Once project proposal is approved, proceed to develop a memorandum of understanding between Thai and Cambodian authorities
Lead person(s):
• Sumate Komalnarranath (Thailand) and Nhek Ratanapich (Cambodia)
Timeline:
• 12 months

China

Goal:
• Clarify whether subspecies differences exist between Siamensis and Hainanus
Action step:
• Generate samples for genetic testing in China. Collect 8-12 individual blood samples from both thamin and siamensis and ship to China (Dr. Song) for analysis.
Lead person(s):
• Boripat Siriaroonrat (thamin – USA); Sumate Komalnorranath (siamensis - Thailand) and Nhek Ratanapich (siamensis - Cambodia)
Time line:
• 6 months

Laos PDR:

Goal:
• Attempt to verify and document what subspecies are in captivity in Laos PDR
Action step:
• Trace history and records
Lead person:
• Souvanny Ounmany
Timeline:
• 6 months

Photographs of Participants

Cambodia


Hunter Weiler


Nhek Ratanpich


Nhim Phy


Matt Hunt

Lao PDR


Renea Stenhouse


Souvanny Ounmany

Myanmar


Khin Maung Zaw

China


Song Yan-Ling

Thailand


Arnuparp Yhamdee


Daraka Tongthainan


Wanlaya Thipkanta


Naris Bhumpakphan


Ronglarp Sukmasrong


Pattanawadee Kuntaro


Wisid Wichasilpa


Sumate Komalnorranath


Sophon Dumnui

U.S.A


Budhan Pukazhenthi


Steven Monfort


William McShea


Boripat Siriaroonrat

Workshop Group Photo

Standing (L to R): Sumate Komalnorranath, Matt Hunt, Daraka Tongthainan, Nhim Phy, Ronglarp Sukmasrong, Renea Stenhouse, Khin Maung Zaw, Naris Bhumpakphan, Steven Monfort, Boripat Siriaroonrat, Souvanny Ounmany

Sitting (L to R): Nhek Ratanpich, William McShea, Song Yan-Ling, Budhan Pukazhenthi, Hunter Weiler

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