A Preliminary Wildlife and Habitat Survey of the Dong Khanthung Area, Champasak Province, Lao PDR

Conducted during April to May 1996

Final report to the
Centre for Protected Areas and Watershed Management of the Department of Forestry, Ministry of Agriculture and Forestry, Lao Peoples' Democratic Republic

R.J. Timmins and Chantavi Vongkhamheng

Vientiane 1996

WILDLIFE CONSERVATION SOCIETY, New York

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WILDLIFE CONSERVATION SOCIETY
P. O. Box 6712
Vientiane
Lao PDR

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ABBREVIATIONS

APR, Action Plan Rating [of turtles listed in IUCN/TFTSG (1991)]
BIMS 1996, Biodiversity Information Management System database, developed by J. MacKinnon/WWF Indochina. Data as of March 1996.
c., approximate[ly]
CPAWM, Centre for Protected Area and Watershed Management (formerly NONC)
dbh, diameter at breast height
DDF, Dry Dipterocarp Forest
EF, Evergreen Forest
GNT, Globally Near-Threatened
GT, Globally Threatened
LSFCP, Lao-Swedish Forestry Cooperation Programme
MDF, Mixed Deciduous Forest
NBCA, National Biodiversity Conservation Area
NHD, National Historical Decline *sensu* Thewlis *et al*. (in prep.)
NOFIP, National Office of Forest Inventory and Planning
NONC, National Office for Nature Conservation and Watershed Management
PPA, Proposed Protected Area (*sensu* Berkmuller *et al*. 1995)
RAR, species Regionally at Risk (for birds, *sensu* Treesecon and Round (1990), for mammals *sensu* Salter (1993))
SEF, Semi-evergreen Forest

Meanings of commonly used Lao words in place names:

Ban, village
Phou, mountain
Xe, large river
Nam, river/stream
Nong, pool
Houay, seasonal stream

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Cover illustration: Pileated Gibbon, *Hylobates pileatus*, drawn by Mr. Sakon Jisomkom

Executive Summary

This report provides a summary of findings from an initial survey of the Dong Khanthung area between April and May 1996. The Dong Khanthung area lies within the Mounlapamok district of Champasak Province in the far south-west of Lao (14°7'-14°32' N, 105°12'-105°45' E). The area under consideration during the current survey, and the resulting area suggested for protection (see recommendations) covers approximately 2230 km^2 of the south-western portion of the district, adjacent to the Thai and Cambodian borders. The primary aim of the survey was a rapid assessment of the area's conservation importance on a national scale, based on habitat condition and wildlife populations present. Four sites were visited, each for a period of one-half to three days.

The area investigated comprises flat lowlands (80-140m) stretching from the Mekong west to a steep escarpment along the border with Thailand, and is continuous to the south with similar lowlands in Cambodia. The name Dong Khanthung derives from the local name of an area of dense lowland Evergreen/Semi-Evergreen Forest (SEF/EF) at its centre (the Dense Central Forest). This central forest area, although low in stature, appears to be relatively intact. Further west along the Thai border is another area of dense lowland SEF/EF contiguous with hill forests in Thailand, included within the 687 sq. km Phu Chong Nayoi National Park. Between these two areas the habitat has been heavily degraded, some reverting to Dry Dipterocarp-like Forest. In the south-eastern area adjacent to Cambodia the habitat is a mosaic of forest types ranging from grassland with few trees, virtually closed canopy Dry Dipterocarp Forest (DDF) and patches of SEF/EF, particularly along watercourses. This area also has a relatively high density of pools. The area is contiguous with a similar mosaic of habitat in Cambodia. The habitat is predominantly DDF, to the north and east of the Dense Central Forest.

Most settlement within the district is along the Mekong. The area further west has a low population density, in partly due to armed conflicts which have taken place within the area in the recent past.

The Dense Central Forest is the best and most extensive level lowland Semi-evergreen or Evergreen Forest (SEF/EF) remaining in Lao. The only other examples of this habitat type within an NBCA or Proposed Protected Area (PPA) are the smaller patches in the Dong Kalo and Xe Kong plains areas of Xe Pian NBCA. Although other NBCAs have lowland forest, it invariably lies on hills. Logging, although not presently sanctioned within the area, presents probably the greatest long-term threat to this forest, particularly when other regionally available sources become depleted.

The open forest mosaic adjacent to the Cambodian border west of the Dense Central Forest is some of the best of this vegetation type recently found in Lao in terms of vegetation diversity and lack of disturbance. It is probably only rivalled in quality by the Dong Kalo and Xe Kong Plains areas of Xe Pian NBCA. In addition, few areas in Lao have such a high density of pools.

Relative to the length of the survey a large number of high priority Key Species were recorded in the area. Most significant is the sighting of Giant Ibis *Pseudibis gigantea*, a globally Critically Threatened species, seen only six times in the last thirty years. Of next greatest significance in the area is probably the Lesser Adjutant *Leptoptilos javanicus* and Green Peafowl *Pavo muticus* populations and the as yet unconfirmed presence of White-winged Duck *Cairina scutulata* and Greater Adjutant *Leptoptilos dubias*, all Globally Threatened species. Lesser Adjutants are reported to breed within the area, while the White-winged Duck population is likely to be a component of the world's largest known population of this species. The Pileated Gibbon *Hylobates pileatus* population is also likely to be of global significance. In a regional context the populations of Woolly-necked Storks *Ciconia episcopus* and vultures are important. If confirmed, the populations of Banteng *Bos javanicus* and Eld's Deer *Cervus eldii* would be at least nationally significant and possible globally significant.

The most serious immediate threat to wildlife is from hunting, particularly for the large birds and large mammals. Given the precarious global status of Giant Ibis, Lesser Adjutant, and Green Peafowl (and the unconfirmed Greater Adjutant, White-winged Duck, Banteng, Eld's Deer and possibly also Masked Finfoot) any hunting of these species is of very high concern. Hunting of several other confirmed and unconfirmed species is also of high concern. Nesting sites of large water-birds are

likely to be particularly vulnerable. In addition to hunting pressure from local villages, hunting by military personnel within the area is also of concern.

Mounlapamok district authorities have recently drawn up a social and economic development plan for the district. The plan at present conflicts with the conservation importance of the area. Creation of a new village, Ban Kadan, is potentially damaging as it is close to the Dense Central Forest which has recently been opened up by a new east-west district road. Increased exploitation of the area is almost inevitable with the foundation of a new settlement, unless measures are taken concurrently with village development to protect Key Species and habitat. New agriculture areas in the west are damaging since they imply destruction of Semi-evergreen/Evergreen Forests. It is unclear what the development of livestock rearing areas will entail, however at least in some areas such development will bring people into little used areas and as with new settlements, is likely to increase pressure on wildlife species, unless strict conservation measures are implemented concurrently.

In a national context the conservation value of the Dong Khanthung area is probably as high as such important NBCAs as Xe Pian and Nakai-Nam Theun, and certainly higher than areas such as Xe Bang Nouan NBCA, Phou Xiang Thong NBCA, Dong Hua Sao NBCA and Phou Khao Khoay NBCA. Many of the most important Key Species within the area are under considerable threat from hunting, making measures for their protection urgent and protection of the area as a whole a high priority, higher in fact than several existing NBCAs. Due to human population increase and development in the near future, much of the areas conservation value could be lost very soon, unless the area is properly protected and managed accordingly.

This importance is further enhanced by contiguous habitat across the borders in both Thailand and Cambodia, which is probably of similar conservation value to that in the Dong Khanthung area.

Dense Central Forest and the lowland forest mosaic adjacent to the Cambodian border in the south-west clearly have the greatest conservation value and should be the focus of any conservation measures. It must be remembered, however, that other very important sites probably lie outside of this area, for example nesting sites of large waterbirds.

Recommendations

Recommendations are given with consideration of the exceptional value of the Dong Khanthung area in comparison with the most important NBCAs within Lao, and where the aim is to maintain this value in to the long-term.

- Declare the area in Figure 1 as the Dong Khanthung NBCA with the aim of protecting Key Species and habitat of conservation significance, and take the necessary steps for active site management.

- Prhibitions on the killing of nationally protected species should be well enforced.

- The first priority should be the protection of all storks, all ibises, Sarus Crane, White-winged Duck, Green Peafowl, Banteng (and, if they occur, Oriental Darter, Masked Finfoot, Kouprey, Wild Water Buffalo and Eld's Deer). A conservation education/information campaign, aimed at all villages and military camps, is essential. Populations of these species should be monitored annually. Location and possible guarding of nesting sites may be important for some species, particularly storks and Sarus Crane.

- Species of second though still high priority for protection are; Elephants, Gaur and Pileated Gibbon (and if they occur Dhole, Tiger and fish-eagles).

- The primary focus of a conservation strategy should be around the Dense Central Forest and the lowland forest mosaic to the south, west and north of Ban Khiam (Figure 2). Initially it should be thought of as a rudimentary Core Area. It must be remembered, however, that other very important sites probably lie outside of this area, for example nesting sites of large waterbirds.

- Carry out further surveys of wildlife, habitat and human use to refine recommendations and to locate the most important areas for wildlife and of habitat.

- In particular, a survey of all wetlands for the intensity of human use, vegetation characteristics and wildlife use is needed.

- The district social and economic development plans should be made with consideration of the exceptional conservation importance of the Dong Khanthung area and the realities of human natural resource use in Lao. At best, no new settlements should be proposed within the area (and Ban Kadan should be relocated or at least not expanded) and no natural habitat should be converted to agricultural land. A conservation education program should run concurrently with any development within the area.

- Hunting by military personnel should be assessed and reduced, if necessary, to protect Key Species.

- Wildlife trade from the area should be monitored.

- There should be liaison with Thai and Cambodian officials to establish effective protected areas and wildlife protection in areas of Cambodia and Thailand adjacent to Dong Khanthung.

Survey Area

Background

The Dong Khanthung area has never been formally recommended as a conservation area at the national level, although (Berkmüller, 1995) held it as one of three areas still under consideration. The Centre for Protected Areas and Watershed Management (CPAWM) had deferred a decision pending up-to-date information on landuse and wildlife status. Comparison of the area's location, topography and land use with Xe Pian NBCA, an area of very high conservation importance Timmins *et al*. (1993), suggested that the Dong Khanthung area might be of similar importance. This has been recognised by other authors (Salter *et al*., 1990), and is supported by newly available satellite imagery held by the National Office of Forest Inventory and Planning (NOFIP).

A reconnaissance visit was made to the Dong Khanthung area by staff of the IUCN Biodiversity Conservation Project from the Agriculture and Forestry Office, Champasak Province, just previous to this survey. Their findings are summarised in Berkmüller and Vilawong, (1996).

The Dong Khanthung area lies within Mounlapamok District of Champasak Province in the far south-west of Lao (14°7'-14°32' N, 105°12'-105°45' E). The area under consideration during the current survey, and the resulting area suggested for protection (see Recommendations) covers approximately 2230 km^2 of the south-western portion of the district, adjacent to the Thai and Cambodian borders.

The 687 sq. km Phu Chong Nayoi National Park in Thailand is contiguous with Dong Khanthung (Gray *et al*. 1994).

Geography

The area investigated comprises level lowlands (80-140m) stretching from the Mekong west to a steep escarpment along the border with Thailand, and is continuous to the south with similar lowlands in Cambodia. "Dong Khanthung" derives from the local name of an area of dense lowland Evergreen/Semi-Evergreen Forest at its centre (the Dense Central Forest), but for the purposes of this report it is taken to mean other adjacent areas of important wildlife habitat. Surrounding areas support mainly Dry Dipterocarp Forest.

Settlement

The eastern-most portion of the district adjacent to the Mekong is heavily settled. Yet much of the remaining area has had few permanent settlements within the last twenty five years due to armed conflicts, from the time of the Indochinese-American war until more recent Khmer Rouge and Thai incursions. With recent stabilization people are moving back into the area. For example, the south-western most village of Ban Khiam was only reoccupied in 1992. A large number of Lao military personnel are currently based at four locations within the area. The district authorities have put together a social and economic development plan which includes road improvements, new settlements, livestock rearing areas, silviculture and agricultural land extensions and improvements (Anon. 1995). Also included within the new plan is the designation of c. 200 sq. km as provincial conservation forest (Berkmüller and Vilawong 1996).

Access

Two dirt roads run north-south on either side of the Dense Central Forest, the western most of which continues into Cambodia. Two tracks connect these roads to the north and south of the Dense Central Forest. In addition, the north-south roads have been recently connected by a third dirt road running east-west from the district town of Mounlapamok, directly through the Dense Central Forest. The Xe Lamphao River along the Cambodian border is navigable past Ban Tahin.

Survey Description

The primary aim of the survey was a rapid assessment of the areas conservation importance, based on habitat condition and wildlife populations present, between 28 April and 5 May. The reconnaissance visit made by the IUCN Biodiversity Conservation Project concentrated on village interviews and automobile-based assessments of general habitat condition (Berkmuller and Vilawong 1996). To

prevent repetition and build on the knowledge already gained, this survey focuses on rapid field visits to potentially important areas for wildlife. These were identified firstly by interpretation of topographic maps in conjunction with preliminary information gathered by the IUCN Biodiversity Conservation Project and by discussion with local people. Due to the limited time available for the survey, the surveyors concentrated on locating the highest priority Key Species (i.e. large waterbirds, Green Peafowl, gibbons and large mammals) by direct observation or signs. Methodology followed that of other recent surveys (Timmins and Evans 1996). Field visits were made to three areas for periods between 1/2 and 3 person days. The Xe Lamphao was travelled by boat up to Ban Tahin.

Satellite spot images compiled from data collected between March 1988 and December 1991, at 1:100,000 scale (kept at the NOFIP) were analysed on return to Vientiane. These provided a basis for the broader assessment of habitat condition and wildlife distribution.

The principal surveyors were R. J. Timmins of the Wildlife Conservation Society and Chantavi Vongkhamheng of the Center for Protected Areas and Watershed Management.

The survey was very brief and only a small proportion of the area was surveyed. While results from such limited sites probably reflect the general condition throughout the area, it must be remembered that many important aspects of human use, habitat condition and wildlife populations are likely to have been missed.

Table 1: extent of field survey effort and coverage.

Site	Date	Effort	Habitat	Number of pools visited
Xe Lamphao	28 - 29April	1 person day	Degraded riverine forest and secondary growth	0
Nong Laha	1 - 3 May	3 person days	Mosaic of grassland, Dry Dipterocarp Forest and Semi-evergreen/Evergreen Forest	9
Ban Po-Nong Pur	4 May	1 person day	Dry Dipterocarp Forest and degraded Semi-evergreen/Evergreen Forest	1
Ban Kadian	5 May	1/2 person day	Dry Dipterocarp Forest	4

Note: notes on habitat condition, human use and opportunistic wildlife observations were taken during travel periods between the two sites.

Findings with respect to habitat

Significance of and Threats to Habitats

The Dense Central Forest is the best and most extensive level lowland Semi-evergreen or Evergreen Forest (SEF/EF) remaining in Lao. The only example of this habitat type within an NBCA or Proposed Protected Area (PPA) at present are the smaller patches in the Dong Kalo and Xe Kong plains areas of Xe Pian NBCA. Although other NBCAs have lowland forest, it invaribly lies on hills. Even the majority of forest in Xe Pian NBCA lies on gently undulating hills rather than level plains, and as a result is likely to be botanically different. Logging, although not presently sanctioned within the area, presents probably the greatest long-term threat to this forest, particularly when other regional sources become depleted.

The open forest mosaic adjacent to the Cambodian border west of the Dense Central Forest is some of the best of this vegetation type recently found in Lao in terms of diversity and lack of disturbance. It is probably only rivaled in quality by the Dong Kalo and Xe Kong Plains areas of Xe Pian NBCA. The DDF component of this mosaic had elements which have not been seen in other Dry Dipterocarp Forest (DDF) recently surveyed, particularly the presence of a giant heather (*Ericacae*).

Few areas in Lao have such a high density of pools, and the only NBCAs or PPAs known to hold comparable areas are Xe Pian NBCA, Dong Hua Sao NBCA, Xe Khampho PPA and Boloven Southwest PPA.

General Habitat Description

Important known wildlife habitats are mapped in Figure 4.

With the exception of the escarpment along the Thai border, Dong Khanthung is characterised by essentially level habitats at some of the lowest altitudes (80-140m) to be found in Lao. Most waterways within the area are seasonal, although. The Xe Lamphao's water-level stays high but does not flow all year because of the very flat topography.

The Dense Central Forest

The center of the area is characterised by short, dense Semi-evergreen or Evergreen Forest (SEF/EF). A long section has been made accessible with the new east-west district road; this forest was viewed from the road. The structure generally comprised 10-20 m tall densely growing trees of small diameter, relatively few of which were over 30 cm dbh. At the western edge patches with pine (*Pinus* sp.) were seen in association with more open, presumably disturbed forest.

The road to the south-east of Ban Po village runs through strips of SEF/EF associated with stream gullies and small areas of open Dry Dipterocarp Forest (DDF) with a mixed grass/sparse, shrubby understorey. The structure of the SEF/EF was generally similar to that along the east-west road although there is a higher density of larger trees, making the canopy taller. Forest associated with a stream gully to the north of the road was traversed. It was particularly low in stature and of apparently secondary nature. There was considerable vine growth in the canopy and sporadic but very large emergent dipterocarps. In this area and in other SEF/EF strips, patches of the forest floor were broken up into a network of small mounds (1-2m diameter) from which vegetation grew, with a lattice work of shallow gullies between. This is possibly the result of termite activity. Such characteristics were also found in dense level lowland forest in Xe Pian NBCA.

Satellite images show the Dense Central Forest to be contiguous over the central portion of the area, with recent cultivation only encroaching appreciably on the its northwestern edge. They suggest that taller forest is restricted to streams within the area, particularly on the western edge.

Ban Khiam south and west to the Cambodian border

The area to the south of Ban Khiam was a mosaic of habitats ranging from open areas of short grass, DDF of variable stature and dense SEF/EF. The SEF/EF was generally short, 15-20 m tall, with few trees over 30 cm dbh. Satellite images show that most of the dense forest is associated with seasonal stream courses. There was a reasonably rich understorey of rattan, saplings and some low herbage. Also present in many areas was a *Rhaphis* like fan palm with a thorny leaf stem. Stream gullies were often dominated by a pandan with relatively small leaf rosettes.

The DDF was variable. In some places the canopy was almost closed, in others it was mainly grassland with few trees. Particularly noticeable were patches of a giant heather (*Ericacae*).

The area is dotted with pools, most of which had only a small area of open water (at most 200 sq. m) and a broad fringe of reeds and sedge-like vegetation. Topographic maps showed more pools than were known by local people or visible on satellite images. In other recent areas surveyed the agreement between the three sources has generally been much better.

Satellite images show the area to the south of Dong Khanthung in Cambodia to be generally more open with extensive grassy plains, and SEF/EF restricted to thin strips along the rivers. Further east the DDF appears to get denser with more frequent patches of SEF/EF.

Western villages and the Thai border area

To the east of Ban Khiam on the road to Ban Po the forest there is again a mosaic of various types, but with evident characteristics of degraded/secondary vegetation, particularly in the case of SEF/EF strips. In some places DDF gave the appearance that it was a secondary regeneration from heavily degraded SEF/EF, the understorey had a larger proportion of low shrub and herb growth in proportion to more extensive DDF elsewhere, as well as a somewhat different tree species assemblage. By comparing vegetation throughout the area it was possible to see a transition between the two, related by

human degradation. The road between Ban Po and Ban Nongnga had a lower percentage of DDF and a predominance of degraded SEF/EF and short secondary growth.

Satellite images show a broad strip of dense forest along the border with Thailand in the west. This forest appears generally taller than the Dense Central Forest area. Tall streamside forest in several areas spreads into broad swaths of tall forest at the base of the escarpment. It is perhaps mixed deciduous in character with a predominance of large dipterocarps. The forest on the escarpment which forms the border is probably fairly open, relatively short, dry MDF like forest, with patches of denser tall SEF/EF in places. The hills on the Thai side of the border are a mixture of SEF/EF and MDF and open (presumably sandstone) expanses (probably very similar to areas of Phou Xiang Thong NBCA, Phou Xang He NBCA and Xe Bang Nouan NBCA).

It is clear that this lowland strip of forest along the border with Thailand must once have been continuous with the Dense Central Forest, and that the area between has been degraded as a result of forest clearance for cultivation, some of which has reverted to DDF. Other areas are short secondary growth.

North and East

To the north and east of the Dense Central Forest the area is predominantly DDF of a much more uniform stature than that in the Ban Khiam southern border area. Tree cover is relatively dense at a height of 4-8 m, with a grass and shrubby understorey. SEF/EF is more patchy and mainly associated with seasonal stream courses.

Topographic maps show many pools around Ban Kadan and Ban Kadian. Again, however, information from villagers and satellite images suggest fewer. Four pools were visited. They were generally larger than those seen in the south with a greater expanse of open water, but with a smaller area of tall herbage, probably a result of greater use by local people and domestic livestock.

Findings with respect to wildlife

Significance of and threats to wildlife

Relative to the length of the survey a large number of high priority Key Species were recorded in the area. Most significant is the sighting of Giant Ibis *Pseudibis gigantea*, a globally Critically Threatened species, seen only six times in the last thirty years. Of next greatest significance in the area is probably the Lesser Adjutant *Leptoptilos javanicus* and Green Peafowl *Pavo muticus* populations and the as yet unconfirmed presence of White-winged Duck *Cairina scutulata* and Greater Adjutant *Leptoptilos dubias*. The Pileated Gibbon *Hylobates pileatus* population is also likely to be of global significance. In a regional context the populations of Woolly-necked Storks *Ciconia episcopus* and vultures are important. If confirmed the populations of Banteng *Bos javanicus* and Eld's Deer *Cervus eldii* would be at least nationally significant and possible globally significant.

Taken together, this complement of Key Species places the Dong Khanthung area in equivalent importance for rare wildlife to the top NBCAs in Lao, much higher in fact than several NBCAs such as Xe Bang Nouan NBCA, Phou Xiang Thong NBCA, Dong Hua Sao NBCA and Phou Khao Khoay NBCA.

The most serious immediate threat to wildlife is from hunting, particularly for the large bird and large mammal species. Given the global status of Giant Ibis and Lesser Adjutant, Green Peafowl and White-winged Duck, any hunting of these species is of high concern. Hunting of several other confirmed and unconfirmed species is also of high concern (Table 2). It was not however possible to identify areas where hunting may possibly be critically high, or whether any species are facing higher than expected hunting pressures. Nesting sites of large water-birds however are likely to be disproportionately threatened, while the open forest mosaic alows easy human access and thus presumably has a higher human pressure, than denser habitats. It is also suspected that hunting by military personel based within the area may be particularly high.

It has not been possible to assess the current threat of habitat clearance and degradation. If habitat degredation were to occur the species and habitat most likely to be at risk are those of the dense SEF/EF comunities, particularly the Pileated Gibbon population.

Table 2: Key Species status, importance and potential threats to populations.

	Key species status	Xe Lamphao	DDF	Dense	Global Importance	Threat hunting	Habitat Degredation	Action	National Importance
Little Cormorant	NHD	P			?	high	?	stop any hunting	mid/high
Purple Heron	RAR		P		low	mid	low	probably none required	?
Woolly-necked stork	RAR		P		?	high	low	stop hunting protect breeding sites	high
Greater Adjutant 1	GT		[P]		?	high	mid	stop hunting protect breeding sites	?
Lesser Adjutant	GT		P		mid+	high	mid	stop hunting protect breeding sites	high
Giant Ibis	GT		P		high	high	?	stop hunting	high
White-winged Duck 1	GT	[P]		[P]	mid+	high	mid	stop hunting prevent riverine forest clearance	high
Brahming Kite		P			low	mid/high	low	control hunting	mid
Vulture sp.	GNT	P			?	mid/high	low	prevent any hunting	?
Rufous winged Buzzard	GNT		P		?	mid/high	low/mid	control hunting	?
Siamese Fireback	GT			[P]	?	mid/high	mid	control hunting	?
Green Peafowl	GT		P		mid?	high	low	stop hunting	high
Sarus crane 1	GNT		[P]		?	high	mid	stop hunting protect nest sites	?
Green Imperial Pigeon	RAR	[P]	P[C]	P[C]	?	mid	mid	control hunting	high
Red-breasted Parakeet			C	[P]	?	mid	low/mid	control hunting	mid
Coral-billed Ground-cuckoo	GNT			P	?	mid	low?	probably not urgent	?
Black-headed Woodpecker	RAR		C		?	low	low	probably not urgent	?
White-bellied Woodpecker	RAR		P		?	low	low/mid	probably not urgent	?
Black and Red Broadbill	RAR		P		?	low	low/mid	probably not urgent	?
Hill Myna	RAR			P	?	mid/high	low	control hunting	?
Asian Golden weaver	GNT		P		?	low	mid/high	protect marsh habitat	mid/high
Pileated Gibbon	GT			P	mid+	high	mid/high	stop hunting prevent logging/forest clearance	high
pangolin sp.	RAR			P	?	high	low?	control hunting	?
Variable squirrel	RAR			P[C]	?	low	low?	probably not urgent	mid
Bear sp.				P	?	high	low?	stop any hunting	?
Medium cat sp.	RAR/GT		P	P	?	high	low/mid?	control any hunting	?
Elephant	GT		P	P	?	?	low	prevent hunting	?
Brow-antlered Deer 1	GT				?	high	?	prevent hunting	
Wild cattle	GT		P		?	high	?	prevent hunting	mid

1. Reported Only

Key Species Accounts

Little Cormorant *Phalacrocorax niger* (NHD)
A single was seen along the Xe Lamphao on the 28 and 29 April, 4 km downstream from Ban Tahin.

Together with several flocks seen in the Ban Hangkhon area of Seephandon during the same months (Evans 1996) these are the first recent records for Lao. Historically the species had been widely recorded from Lao (Thewlis *et al.* in prep.).

Purple Heron *Ardea purpurea* (RAR)
A single bird was seen at Nong Ther, north of Ban Kadian, on 5 May.

Woolly-necked Stork *Ciconia episcopus* (RAR)
There were three records all from the area to the south-east of Ban Khiam; one at Nong Songhong pool on 1 May, two at Nong Quangtaven and one at Nong Na on 2 May. Two birds were also seen by the IUCN Biodiversity Conservation Project team at a pool beside the east-west road to the north of the Dense Central Forest (Berkmüller and Vilawong 1996)

This species has declined considerably in Lao and is now only known from southern Champasak and Attapu Provinces (Thewlis *et al.* in prep.).

Greater Adjutant *Leptoptilos dubius* (GT)
Reports from villagers at Ban Khiam and Ban Kadian of a stork similar to Lesser Adjutant, but with a reddish head and bill may be this species. Actual dated sightings were not forthcoming The species is historically known from the far south of Lao (Engelbach 1932), and informants might have been describing birds they saw many years ago.

Lesser Adjutant *Leptoptilos javanicus* (GT)
There were two records from the area to the south-east of Ban Khiam; one was seen at Nong Gnoolooam pool on 1 May and one was seen flying over Nong Na on 2 May. Villagers from Ban Khiam reported seeing seven occupied nests of this species in February and March 1996, at the base of the escarpment along the Thai border, close to the Houay Mankheo. Berkmüller and Vilawong (1996) in addition to this site also gave accounts of two other reported nesting sites.

This species has declined considerably in Lao and is now only known from southern Champasak and Attapu Provinces (Thewlis *et al.* in prep.).

Giant Ibis *Pseudibis gigantea* (GT)
Two were flushed from Nong Songhong pool on the 1 May close to the Nong Laha site. Probably the same two birds were flushed a little later on the same day from shallow rainwater pools in Dry Dipterocarp Forest a little further east.

These represent only the sixth recent record of Giant Ibis (four of which have come from Xe Pian NBCA) and the first recent record of two or more birds together. The species is Critically Globally Threatened, and requires immediate protection.

White-winged Duck *Cairina scutulata* (GT)
Villagers reported that the species occurs widely on streams and some nongs throughout the area. None was recorded during the survey, although this is not surprising given the secretive nature of the species. The population of White-winged Ducks is not likely to be very large, perhaps only around 20 birds or less, because there are relatively few permanent pools and most of the streams are highly seasonal and small, leaving in the dry season relatively few suitable standing-water pools on which the ducks depend. The most suitable areas are the Xe Lamphao above Ban Tahin, and the lower stretches of the Houay Vian, Houay Phak and Houay Kadan.

The largest known world population of White-winged Ducks occurs in the Khao Phanom Donngrak mountains of Thailand. A large component of this population is found in Phu Chong Nayoi National Park (Parr *et al.* 1994) which is contiguous with Dong Khanthung along the Lao-Thai border. It is likely that the Dong Khanthung and Phu Chong Nayoi National Park populations are freely

interchangeable, making the Dong Khanthung birds part of the world's most important White-winged Duck population.

Rufous-winged Buzzard *Butastur liventer* (GNT)
A single bird was seen in Dry Dipterocarp to south Ban Khiam on 3 May.

Vultures spp. *Sarcogyps/Gyps* (GNT)
A single was seen flying high over the Xe Lamphao on the 28 April. A mixed party of ten vultures including Red-headed *Sarcogyps calvus*, White-rumped *Gyps bengalensis* and Long-billed *G. indicus* were seen at an unidentified carcass on the banks of the Mekong near Ban Hangkhon in the Seephandon area, less than 50 km from the Dong Khanthung area in May 1996 (Evans 1996).

The southern area of Champasak and Attapu is the only area where vultures have recently been found in Lao, and even these records have been patchy. Populations of all three species have collapsed regionally. Vultures require large areas over which to forage, making them vulnerable to hunting. As scavengers they also require populations of free ranging large mammals. In Xe Pian NBCA, lowland open forest mosaics support an important vulture population, the same is likely to be true of such habitats in Dong Khanthung.

Green Peafowl *Pavo muticus* (GT)
A single was watched over a period of two hours at Nong Na pool. Feathers from a male bird's train were found over 1 km away to the north east.

The species has undergone a severe decline in Lao and is now known only from scattered localities throughout the country (Evans and Timmins 1996).

Sarus Crane *Grus antigone* (GNT)
There were no records of this species. The species is reported to still occur in the area, although there may no longer be any breeding on wetlands within the area. Berkmüller and Vilawong (1996) include an account of one reported breeding site on the east side of the Dense Central Forest, the validity of this is unknown.

Green Imperial-Pigeon *Ducula aenea* (RAR)
Green Imperial-Pigeons were identified three times in the forest mosaic to the southwest of Ban Po on 4 May, where on the same day over 23 unidentified imperial-pigeons were recorded. Imperial-pigeons were recorded less commonly as follows; seen over the Xe Lamphao on 28th (1,2) and 29th (1), in the Dry Dipterocarp mosaic to south of Ban Khiam on 1 May (1), 2 May (1) and 3 May (1). These records probably all refer to Green Imperial-Pigeon rather than to Mountain Imperial-Pigeon *D. badia*, which would be very unlikely in such habitat at such low altitude.

Green Imperial Pigeon has declined in Lao as it has done in Thailand. The species appears to be dependent on flat lowland dense forest mosaic, which has been lost or severely degraded in many areas (Thewlis *et al.* in prep.).

Parakeet Spp. *Psittacula* (some RAR)
Parakeets were common through out the area usually in small groups (less than 5). All those identified were Red-breasted Parakeet *P. alexandri*. They were commonest in Dry Dipterocarp in the Ban Kadian area, where one group of over 30 was seen from Nong Ther.

Parakeets are popular as pets and are probably declining throughout the Lao lowlands (Thewlis *et al.* in prep). The healthiest populations recently found have been in the southern provinces of Champasak and Attapu.

Coral-billed Ground-Cuckoo *Carpococcyx renauldi* (GNT)
A single was heard south east of Ban Po on 4 May.

Hornbill Spp. (some RAR)

Large hornbills are reported to occur, and would be expected given the large area of Semi-Evergreen/Evergreen Forest. Wreathed Hornbill *Rhyticeros undulatus* (RAR) is most likely although Great Hornbill *Buceros bicornis* (RAR) may also be present. The small Oriental Pied Hornbill *Anthracoceros albirostris* was seen commonly from the Nong Laha site, and to the south east of Ban Po.

Black-headed Woodpecker *Picus erythropygius* (RAR)
Common in Dry Dipterocarp Forest through out the area, with up to three groups recorded in a day.

White-bellied Woodpecker *Dryocopus javensis* (RAR)
A single was seen on 1 May in the Dry Dipterocarp Forest mosaic from the Nong Laha site.

In Lao this species appears to be restricted to the level lowlands of the south, and thus it is disproportionately threatened by habitat loss (Thewlis *et al*. in prep).

Black-and-Red Broadbill *Cymbirhynchus macrorhynchos* (RAR)
Birds were seen nest-building in a small tree in a patch of Dry Dipterocarp Forest to the south east of Ban Po on 4 May.

In Lao this species appears to be restricted to the level lowlands of the south, and thus it is disproportionately threatened by habitat loss (Thewlis *et al.* in prep).

Hill Myna *Gracula religiosa* (RAR)
There were several record of this species from the forest mosaic to the south-east of Ban Po and also of two birds flying over the east-west district road in the Dense Central Forest area.

The species is a popular cage-bird particularly in Thailand, it is one of the common species of wildlife traded at the Thai border at Hom Mek (Srikosamatara 1992).

Asian Golden Weaver *Ploceus hypoxanthus* (GNT)
Two males and possibly a female were seen in sedge-like vegetation around Nong Songhong on 3 May. These are the first ever confirmed records from Lao, although there are provisional records from Xe Pian NBCA (Timmins et al. 1993, Thewlis *et al*. 1996).

The species is threatened by loss of its marshland habitat in Thailand, and presumably also in Lao (Thewlis *et al*. in prep.).

Gibbon sp. *Hylobates* (RAR/GT)
Gibbons were heard calling during the mid morning on 2 May to the south west of Nong Laha, and latter at 11h00 in the same day from Nong Na. One or two distant groups were heard on 4 May to the south-east of Ban Po, a black individual was seen in degraded Semi-Evergreen/Evergreen Forest in the same area. The calls heard and the one individual seen are thought to be Pileated Gibbon *H. pileatus* (GT).

The low number of records is probably the result of two factors; fieldwork concentrated on areas with a predominance of open vegetation types, while gibbons favour dense forest, and gibbon calling is generally reduced during the rainy season. Pileated Gibbon is the most likely species; it has a restricted range in the south-eastern portion of Thailand and Laos and Cambodia west of the Mekong.

Pangolin sp. *Manis* (RAR)
Pangolin prints were found on the road to the south-east of Nong Laha.

Pangolins are widely collected in Lao as well as in many other parts of the region for its commercial sale, mainly because of the medicinal use of their scales.

Variable Squirrel *Callosciurus finlaysoni* (RAR)

A single individual of the sub-species *C. f. annellatus* was seen in Semi-Evergreen/Evergreen Forest to the south of Nong Laha. Callosciurus calls were heard commonly south-east of Ban Po, but much less frequently elsewhere.

Cats (some RAR/GT)
Fresh prints (7 cm long) of a single medium sized cat were seen to the south west of Nong Laha on the 2 May.

The lack of signs is not overly surprising given the brevity of the survey.

Elephant *Elephas maximus* (GT)
Old Elephant signs were found in scattered localities through the Dry Dipterocarp Forest mosaic in the Nong Laha area. Fresh Elephant signs were found along a stretch of a couple of kms of the road to the south east of Ban Po. The IUCN Biodiversity Conservation Project team found old signs in open forest along the road north of Ban Tahin (Berkmüller and Vilawong 1996).

The number of records of Elephant signs from such a short survey is encouraging. However further surveys need to be made before the importance of the Elephant population can be assessed.

Brow-antlered Deer *Cervus eldi* (GT)
A villager from Ban Kadian reported seeing a male of this species on 4 May in forest between Ban Kadan and Ban Tahin. Berkmüller and Vilawong (1996) given an account of two reports of this species from the northern end of the Dense Central Forest area.

This species has declined considerably throughout the region, there have been no recent records from Lao.

Wild cattle *Bos* (GT)
Old prints resembling those of Banteng *Bos javanicus* were found in many areas of the Dry Dipterocarp Forest mosaic in the Nong Laha area.

Despite the lack of fresh tracks, the limited records during such a short survey suggest that wild cattle populations may be of importance. In many suitable areas recently surveyed signs of wild cattle have been considerably less common.

Findings with respect to human use

Demography
The greatest concentration of people within the area is along the Mekong with at least 30 villages, and to a lesser extent along the eastern portion of the new east-west district road and the lower stretch of the Xe Lamphao. Due to armed conflicts almost all of the western villages were abandoned for a number of years, and only recently have some of these been resettled. At present there are five main settlements west of the Dense Central Forest and only three main settlements along its eastern edge. Thus at present human pressure is still relatively low. To the north, Soukhouma district is much more heavily populated. In addition there are four military camps within the area, one close to Ban Khiam, one close to Ban Tahin, one in Ban Pheo and one in Ban Nongnga. Patrols from these camps regularly traverse the area.

Natural resource use
From such a brief survey it is hard to judge the level of natural resource use. However, certain uses, in particular hunting, are clearly having an impact on the wildlife and habitat of the area.

There is apparently no current large-scale commercial logging within the area, although there is some dead wood collection. However some commercially hauled timber seen was from recently felled trees, perhaps from recent forest clearance in the area of the western villages or possibly of timber originating in Cambodia. Villagers in Ban Po are locally known for small-scale timber dealing. At least some of this timber comes from newly cut trees within the area. Judging by forest structure,

logging has probably occurred in some if not all of the SEF/EF in the past, perhaps as long ago as the French colonial period.

Although extensive recent forest clearance was not seen, it is very obvious from satellite images that a large area of the tall SEF/EF forests in the west has been cleared in recent times. Further investigation is required to determine how prevalent the practice is.

As elsewhere in Lao hunting is prevalent in most areas. Although the number of guns in the possession of local people is noticeably fewer than in comparable villages elsewhere in Lao, this is offset by the high number of military personnel within the area most of whom have automatic or semi-automatic rifles, and who visit the field on patrol more often than locals. Both villagers and the soldiers themselves reported that most of the meat eaten in the Ban Khiam military camp was wildlife shot or caught while on patrol. Of perhaps more serious concern were several indications of commercial hunting and trade in wildlife. Even villagers at the southern most village B. Khiam knew of the wildlife border trade at Hom Mek and readily quoted the market value of wildlife. Wildlife species, particularly monitors and turtles, said to be destined for sale or being carried out of the area, were seen at several locations.

Grazing by domestic livestock occurs probably throughout open habitats within the vicinity of villages. There is no reason to suspect that it is of conservation concern, except where grazing brings large carnivores into conflict with local people, because of predation on livestock, or where it occurs intensively around pools, resulting in excessive aquatic disturbance.

Little information was gained about fishing practices. Knowledge gained in other NBCAs suggests that fishing may be intensive, particularly in more accessible wetlands. Consequences for wildlife of widespread intensive fishing in wetlands, may be increased hunting and disturbance, and in some cases habitat degradation.

District development

As part of the district's social and economic development plan a large proportion of the Dense Central Forest has been designated provincial conservation forest (Berkmüller and Vilawong 1996). The plan also has provisions for new villages, livestock rearing areas and agricultural land extension and improvement. A new village, Ban Kadan, had been under construction for approximately six months, and new paddy fields are being created in the surrounding Dry Dipterocarp Forest. This new village occupies a strategic position in relation to exploitation of the Dense Central Forest where human use has probably been minimal. Of the other proposed developments, those of most significance for conservation are three large areas designated for livestock rearing: one to the east of the Dense Central Forest between Ban Tahin and Ban Kadan, one on the northern end of the Dense Central Forest, and one between Ban Houayxai and the Thai border and several areas designated for agricultural improvement and silviculture in the west, particularly those areas along stream valleys to the west of Ban Po and Ban Pheo.

Unexploded Ordinance

During the armed conflicts land-mines were lain sporadically throughout the western portion of the area. This seemed to be particularly so around some of the villages and along some of the access routes. The known presence of land-mines to some degree limits the movements of local people, however in most cases it is only relatively small areas where access is impossible. It appears that people only avoid areas where land-mines have exploded, thus areas where there may be undetected land-mines are still frequented. In the case of the large mammal species mines represent a further hazard.

Thailand and Cambodia

The hill forests adjacent to Dong Khanthung on the Thai side of the border are within the Phu Chong Nayoi National Park which forms a complex with four other reserves stretching south-west along the Thai-Cambodian border. Satellite imagery of part of the area showed the forest to be in relatively good condition. There is no legal border crossing with Thailand in this area.

The area of Cambodia adjoining Dong Khanthung in the south is apparently unprotected (BIMS 1996). Satellite imagery of part of the area suggested that the area is mainly uninhabited except for the lower

reaches of the Xe Lamphao and the Mekong. A few roads traverse the western area. There is apparently one village above Ban Tahin on the Xe Lam Phao. Villagers report that much logging has occurred across the border in Cambodia, and that there are several Cambodian military camps in the north along the border. There is apparently very little cross border traffic other than military personnel.

Discussion: significance of and threats to the Dong Khanthung area

The Dong Khanthung area retains important wildlife populations and habitat types which have disappeared from most areas of Lao and rival those remaining in some of the most important NBCAs within Lao. The primary reason the area retains such conservation importance seems to be its low human population density. It is in part also probably due to the area's continuity with similar areas of conservation importance in Cambodia and Thailand.

If the aim of the Lao conservation strategy is to locate and protect the most important representations of natural habitats and wildlife populations in Lao, then the Dong Khanthung area is of high priorty for protection, higher in fact than several existing NBCAs. The area is probably of equal importance to such important NBCAs as Xe Pian and Nakai-Nam Theun.

It is likely that in the near future the area's population density will increase perhaps markedly, and unless the area is properly protected and managed accordingly much of its conservation value could be lost very soon, particularly the large Key Species. The high value of the area will in part be dependent on protection of habitat and Key Species across the borders in Thailand and Cambodia.

Hunting of wildlife is a very serious threat to populations of larger Key Species, and it needs to be addressed immediately. Military personnel perhaps pose a greater threat in this respect than the local communities of the area. Wildlife trade may have major negative effects, but this requires further investigation. Logging of the Semi-evergreen/Evergreen Forests in the future is a possibility which could reduce the areas conservation value considerably.

At present the social and economic development plans of the district seriously conflict with the conservation importance of the area. Although new settlements and low-scale agricultural development do not necessarily threaten natural resources (especially in Dry Dipterocarp Forest areas), it appears in Lao, at least, that human settlement in and access to little disturbed natural habitat results in degradation of habitat and loss of Key Species. The Ban Kadan site is potentially damaging as it is close to the Dense Central Forest which has recently been opened up by the new east-west district road, in an area with many pools. The creation of paddies in the surrounding Dry Dipterocarp Forest probably has a minimal deleterious effect on the area's conservation importance, except that increased exploitation of the area is almost inevitable with the foundation of a new settlement, unless measures are taken concurrently with village development to protect Key Species and habitat. Agriculture areas in the west are damaging since they imply destruction of Semi-evergreen/Evergreen Forests. It is unclear what the development of livestock rearing areas will entail, however at least in some areas such development will bring people into little-used areas and as with new settlements, is likely to increase pressure on wildlife species, unless conservation measures are implemented concurrently.

From satellite imagery it is clear that habitat of comparable importance can still be found in both Thailand and Cambodia. This continuity of important wildlife habitat between the three countries makes the sum total of the area of much greater importance than of Dong Khanthung alone. The long term importance, in particularly of the open forest mosaic in the south west along the Cambodian border and of the Semi-evergreen/Evergreen Forests SEF/EF along the border with Thailand in the west, is dependent on effective protection of similar habitat across the borders in each of the respective countries. Large waterbirds are nomadic and probably use both Lao and Cambodian wetlands; the same is likely to be true of species such as Banteng and Elephant. The Thai hill forest is likely to be of importance to gibbons and bird species such as hornbills which forage over wide ranges. This area has part of Thailand's and the world's largest population of White-winged Ducks (Parr *et al*. 1994), the viability of which is almost certainly dependent on the population within Lao.

References

Anon. (1995). [*Social and Economic development plan for Mounlapamok district, Champasak*.] Unpublished report. Champasak Provincial Planning Office, Pakse. [In Lao]

Berkmuller, K. and Vilawong, W. (1996). *A rapid wildlife and habitat survey of Dong Khanthung Conservation Forest and its environs*. Unpublished report. IUCN, Biodiversity Conservation Project, Agriculture and Forestry Office Champasak.

Berkmüller, K., Southammakhot, S. and Vene Vongphet. (1995). *Protected area system planning and management in Lao PDR: status report to mid-1995*. Unpublished report. Forest Resources Conservation Subprogramme, Lao/Swedish Forestry Cooperation Programme, Vientiane.

Collar, N. J., Crosby, M. J. and Stattersfield, A. J. (1994). *Birds to watch 2: The world list of Threatened birds*. BirdLife International (Conservation Series 4), Cambridge, UK.

Ernst, C. H. and Barbour, R. W. (1989). *The turtles of the world*. Smithsonian Institution Press, Washington D. C. and London.

Engelbach, P. (1932). Les oiseaux de Laos méridional. *L'Oiseau R. f. O*. 2: 439-498.

Evans, T. D. and Timmins, R. J. (1996). The status of the Green Peafowl *Pavo muticus* in Laos. *Forktail* 11: 11-32.

Evans, T.E. (1996). *Birdwatching Trip Report, Ban hangkhon, Seephandon area, Southern Champassak, Laos*.

Gray, D., Piprell, C. and Graham, M. (1994). *National Parks of Thailand*. Industrial Finance Corporation of Thailand, Bangkok.

Groombridge, B. (1993). *The 1994 Red List of Threatened Animals*. WCMC, Cambridge and IUCN, Gland, Switzerland.

IUCN/TFTSG (1991). *Tortoises and Freshwater Turtles. An Action Plan for their Conservation*. IUCN, Gland, Switzerland.

King, B. F., Woodcock, M. and Dickinson, E. C. (1975). *A Field Guide to the Birds of South-East Asia*. Collins, London.

Lekagul, B. and Round, P. D. (1991). *A Guide to the Birds of Thailand*. Saha Karn Bhaet, Bangkok.

Mlivkovsky, J. and Inskipp, T. P. (in prep). *Ornithological bibliography of Indochina 1758-1994*. Oriental Bird Club.

Nowak R. M. (1991). *Walker's Mammals of the World, Fifth Edition*. Baltimore and London: The Johns Hopkins University Press.

Parr, J. W. K., Pongpan Laothong and Gorrerk Ruangsree (1994). The status of white-winged wood duck *Cairina scutulata* in Thailand. *Tigerpaper*, 21: 1-7.

Salter, R. E., Phanthavong, B., Sawathvong S., Souriyakan, S and Louanglath, K. (1990). *An assessment of the current status of kouprey and other wild cattle in southern Laos*. Unpublished report. Forest Resources Conservation Programme, Lao/Swedish Forestry Cooperation Programme, Vientiane, Lao PDR.

Salter, R. E. (compiler) (1993b). *Wildlife in the Lao PDR. A Status Report*. IUCN, Vientiane, Lao PDR.

Srikosamatara, S., Siripholdedej, B. and Suteethorn, V. (1992). Wildlife trade in Lao P.D.R. and between Lao P.D.R. and Thailand. *Nat. Hist. Bull. Siam Soc.* 40: 1-47.

Thewlis, R. M., Duckworth, J. W., Anderson, G. Q. A., Dvorak, M., Evans, T. D., Nemeth, E., Timmins, R. J. and Wilkinson, R. J. (1996). Ornithological records from Laos, 1992-1993. *Forktail* 11: 47-100.

Thewlis, R.C.M., Timmins, R. J., Evans T. D. and Duckworth, J. W. (in Prep.). *A preliminary assessment of the status and conservation of Threatened birds in Laos.*

Timmins, R. J., Evans, T. D. and Duckworth, J. W. (1993). *A wildlife and habitat survey of Xe Pian National Biodiversity Conservation Area.* Draft report to the Forest Resources Conservation Programme, Lao/Swedish Forestry Cooperation Programme, Vientiane, Lao PDR.

Timmins, R. J. and Evans, T. D. (1996). *A wildlife and habitat survey of Nam Theun National Biodiversity Conservation Area, Draft*. Unpublished report to the Department of Forestry.

Treesucon, U. and Round, P. D. (1990). Report on threatened birds in Thailand. *Tigerpaper* 17: 1-9.

van Strien, N. J. (1983). *A Guide to the Tracks of Mammals of West Indonesia*. School of Environmental Conservation Management, CIAWI, Bogor.

ANNEXES

ANNEX 1: MAPS AND PLACE NAMES

The following map sheets were used throughout the fieldwork:
RDP Lao Service Geographique d'Etat, 1:100,000 (1986); D-48- 68, 67, 56 and 55

Topographic features shown were broadly accurate, including the boundaries of major land-cover types. Several village names in local use differed from those mapped. Many of the natural features on the maps are unnamed or have names differing from those in local usage. Names used in the text are those in local use, related to the 1:100,000 topographic maps by Table 3 and Figure 2.

Table 3: village and other locality names of the Dong Khanthung area mentioned in the text or which differ from those on the RDP Lao Service Geographique d'Etat, 1: 100,000 maps.

Local usage	Topographic Maps	Grid reference
Villages		
Ban Mounlapamok	Ban Veunkhen	930896
?	Ban Mounlapamok	937855
Ban Kadian	same (B.Hang)	775965
Ban Kadan	none	720895
Nong Bathong	none	845878
Ban Houayxai	same	569989
Ban Nongnga	Ban Paksong	552859
Ban Pheo	Ban Don?	530848?
Ban Po	Ban Vin-tai	477746
Ban Kheam	same	350737
Ban Tahin	Ban Kanluang	630649
Ban Hinlat	same	671631
Ban Khanluang	Ban Kadan	703608
Ban Phabang	Ban Takang	715615
Ban Khamkheut	none (Cambodia)	723607
Ban Souang	none (Cambodia)	767585
Abandoned	Ban Vin-Nua	395802
Abandoned	Ban Soyut	475857
Abandoned	Ban Taseun	368659
Abandoned	Ban Paling	445615
Abandoned	Ban Kaki	333860
Abandoned	H. Kok	552920
Rivers and Mountains		
Khao Phanom Donngrak mountains	Sayphou Damlek	Along the border with Thailand
Seephandon (area of islands)	none	930800-070400
Xe Lamphao	Nam Lepou	295680-800590
Pools		
Nong Khe	none	750977?
Nong Khung	none	770985
Nong Khibow	none	777001
Nong Ther	none	778008
Nong Na	none	376625?
Nong Quangtaven	none	387633?
Nong Sonhhong	none	441635
Nong Laha	none	400646
Nong Gnoolooam	none	375678

ANNEX 2: TERMINOLOGY AND CONVENTIONS

2.1 KEY SPECIES

Key Species are species considered to be of conservation interest and are thought to be threatened in some way, either globally or regionally.

Key bird Species are those listed in any of the following three sources:

1. The highest priority species are those listed as Globally Threatened (GT) in Collar *et al*. (1994).
2. Globally Near-Threatened (GNT) species are listed in the same book and are thought likely to move into the Globally Threatened class soon, unless action is taken.
3. Treesucon and Round (1990) list species which are at risk in Thailand (RAR), which may therefore be threatened or vulnerable in Laos (there is no comparable list for Laos or Indochina).
4. Thewlis *et al*. (in prep.) lists species which have shown a documented decline in Lao, greater than the sum loss of their favoured habitat; these species are considered to be Threatened in Lao and are listed as NHD 'National Historical Decline'.

Key mammal Species are those listed in the following sources:

1. The highest priority species are those listed as Globally Threatened (GT) by Groombridge (1993).
2. Species considered to be possibly regionally threatened (RAR) are listed in Salter (1993).

Key reptile Species are those listed in the following sources:

1. The highest priority species are those listed as Globally Threatened (GT) by Groombridge (1993).
2. Further turtle and tortoise species are those listed in IUCN/TFTSG (1991) with the following action plan ratings (APR):
   (APR 1) Known threatened species.
   (APR 2) Restricted range species requiring status assessment but thought to be threatened.
   (APR 3) Widespread species which are probably in need of conservation action.

2.2 NOMENCLATURE AND SYSTEMATICS

Bird nomenclature and systematics

Nomenclature for birds follow Lekagul and Round (1991), with King *et al.* (1975) used for systematic order and species not found in Thailand.

Mammal nomenclature and systematics

Nowak (1991) is generally followed, with exceptions where noted.

Testudine nomenclature and systematics

Ernst and Barbour (1989) is followed throughout.

ANNEX 4: STATUS OF BIRD SPECIES RECORDED DURING THE SURVEY

Bird status was assessed subjectively using the following criteria:

overall encounter frequency (the number of records): this baseline is considered in the light of the following factors, to assess how the encounter rate reflects the species's abundance.

shyness: skulking or shy species are recorded much less frequently than extrovert ones.

activity level: active birds are recorded more frequently than sluggish or inactive species.

area of detection: species of dense vegetation are visible only within close proximity while many open-country species can be noticed from hundreds of meters.

main vegetation storey inhabited: forest-canopy species can be more difficult to observe than those of the mid-storey or under-storey.

aerial species: these can seem disproportionately common in open areas but conversely they are seen only rarely from within forest.

calling frequency: birds calling nearly continuously are found more often than those giving only occasional calls or songs. Calls may be strongly clustered around certain times of the day or year, and the overlap of observations with the bird's chief calling periods should be considered.

distinctiveness of calls: a diagnostic call is more readily noticed than an anonymous-sounding call.

volume of call: loud, strident calls carry further than quiet ones.

whether common calls of the species are known: when no call is known, the assessment is necessarily less accurate than when calls are known; the abundance is probably usually underestimated. Table 6 indicates those species where calls had an important influence on assessment.

flocking behaviour: a handful of records of large flocks do not equate to many records of singletons. Unusual birds can be seen in large numbers through chance encounters of occasional large flocks. The number of records and dispersion of individual birds is therefore accorded more weight than simply the number of individuals.

carrying capacity for the bird of its chosen habitat: big birds generally have much larger home ranges than small birds; thus, what is a high absolute density for the former (in terms of birds per unit area, or birds found per day) would be low for the latter.

seasonality of occurrence: many species are migrants, whose abundance changes throughout the year.

Where possible the abundance of each bird species in each habitat was assessed subjectively on a three-point scale whereby the number of records was assessed in the light of various features of detectability in order to arrive at the bird's true abundance.

The three bands of abundance can be loosely defined as follows, for a medium-sized bird of average detectability:

Common: seen daily, often in large numbers, in favoured habitat
Frequent: seen on most days favoured habitat is visited, but not usually in large numbers
Occasional: seen only occasionally, on fewer than half the days

All breeding indications and other interesting ecological observations were recorded.

Table 6: Bird species recorded during the survey.

Species	V	Other	Xe Lamphao	DDF	Dense	
Little Cormorant		W	P			*Phalacrocorax niger*
Purple Heron		W		P		*Ardea purpurea*
Little Heron		W	C			*Butorides striatus*
Chinese Pond-heron		W	C	P		*Ardeola bacchus*
egret sp.		W		P		*Egretta garzetta*
Cinnamon Bittern		W		P		*Ixobrychus cinnamomeus*
Woolly-necked Stork		W		P		*Ciconia episcopus*
Greater Adjutant		WI		[P]		*Leptoptilos dubius*
Lesser Adjutant		W		P		*Leptoptilos javanicus*
Giant Ibis		W		P		*Pseudibis gigantea*
Lesser Whistling-duck		W		P		*Dendrocygna javanica*
White-winged Duck		WI	[P]		[P]	*Cairina scutulata*
Black Baza				P		*Aviceda leuphotes*
Brahminy Kite		W	P			*Haliastur indus*
vulture sp.			P			*Sarcogyps/Gyps*
Crested Serpent-eagle	V			P	P	*Spilornis cheela*
Shikra				P		*Accipiter badius*
Rufous-winged Buzzard				P		*Buta stur liventer*
Peregrine Falcon						*Falco peregrinus*
Chinese Francolin	V			C	P	*Francolinus pintadeanus*
Scaly-breasted Partridge	V				P	*Arborophila chloropus*
Siamese Fireback					[P]	*Lophura diardi*
Red Junglefowl	V			P	P	*Gallus gallus*
Green Peafowl				P		*Pavo muticus*
Sarus Crane		WI		[P]		*Grus antigone*
White-breasted Waterhen		W	P	P		*Amaurornis phoenicurus*
Red-wattled Lapwing				C		*Vanellus indicus*
Common Sandpiper		W	P			*Actitis hypoleucos*
Thick-billed Pigeon				P		*Treron curvirostra*
Orange-breasted Pigeon		I		[P]		*Treron bicincta*
green-pigeon sp. 1	V			C		*Treron*
Green Imperial-Pigeon	V			P	P	*Ducula aenea*
Imperial Pigeon sp. 1			P	C	C	*Ducula*
Red Turtle-Dove				C		*Streptopelia tranquebarica*
Spotted Dove				P		*Streptopelia chinensis*
Red-breasted Parakeet				C		*Psittacula alexandri*
parakeet sp.1				C	P	*Psittacula*
Banded Bay Cuckoo	V			P		*Cacomantis sonneratii*
Plaintive Cuckoo	V			P		*Cacomantis merulinus*
Common Koel	V			P		*Eudynamys scolopacea*
Green-billed Malkoha	V				P	*Phaenicophaeus tristis*
Coral-billed Ground-Cuckoo	V				P	*Carpococcyx renauldi*
Greater Coucal	V		P	LC	LC	*Centropus sinensis*
Asian Barred Owlet	V			C	P	*Glaucidium cuculoides*
Brown Hawk-Owl	V			P	P	*Ninox scutulata*
Great Eared Nightjar	V			P		*Eurostopodus macrotis*
Asian Palm-Swift			P	C	C	*Cypsiurus balasiensis*

Species	V	Other	Xe Lamphap	DDF	Dense	
Crested Treeswift				C		*Hemiprocne coronata*
Common Kingfisher		W	P			*Alcedo atthis*
Blue-eared Kingfisher		W	P			*Alcedo meninting*
Stork-billed Kingfisher		W	C	LC		*Pelargopsis capensis*
White-throated Kingfisher		W	P			*Halcyon smyrnensis*
Chestnut-headed Bee-eater		W	P			*Merops leschenaulti*
Green Bee-eater				C		*Merops orientalis*
Blue-bearded Bee-eater	V				P	*Nyctyornis athertoni*
Indian Roller			P	C	P	*Coracias benghalensis*
Dollarbird			C			*Eurystomus orientalis*
Oriental Pied Hornbill	V		P	C	C	*Anthracoceros albirostris*
Lineated Barbet	V			C	C	*Megalaima lineata*
Green-eared Barbet	V				C	*Megalaima faiostricta*
Blue-eared Barbet	V				C	*Megalaima australis*
Rufous Woodpecker				C		*Micropternus brachyurus*
Black-headed Woodpecker				C		*Picas eresthropygius*
Lesser Yellownape				P		*Picus chlorolophus*
yellownape sp. 1	V				P	*P. flavinucha / P. chlorolophus*
Great Slaty Woodpecker	V				P	*Mulleripicus pulverulentus*
Whitebellied Woodpecker				P		*Dryo copus javensis*
Grey-capped Woodpecker				P		*Picoides canicapillus*
flameback sp. 1	V				P	*D. javense / C. lucidus*
Black-and-Red Broadbill				P		*Cymbirhynchus macrorhynchos*
Blue-winged Pitta	V				P	*Pitta woluccensis*
Lark sp. 1				P		*Mirafra / Alauda*
Large Wood-shrike					P	*Tephrodornis virgatus*
Large Cuckoo-shrike	V			C	P	*Coracina macei*
Indochinese Cuckoo-shrike				P		*Coracina polioptera*
Scarlet Minivet	V				P	*Pericrocotus flammeus*
Blue-winged Leafbird		I		[P]		*Chloropsis cochinchinensis*
Leafbird sp. 1				C		*Chloropsis*
Black-crested Bulbul				P	P	*Pycnonotus melanicterus*
Sooty-headed Bulbul				C		*Pycnonotus aurigaster*
Puff-throated Bulbul	V				P	*Criniger pallidus*
Grey-eyed Bulbul	V				P	*Hypsipetes propinquus*
Ashy Drongo				P		*Dicrurus leucophaeus*
Bronzed Drongo				P	P	*Dicrurus aeneus*
Hair-crested Drongo				P	P	*Dicrurus hottentottus*
Greater Racket-tailed Drongo					C	*Dicrurus paradiseus*
Black-hooded Oriole	V				C	*Oriolus xanthornus*
Blue Magpie				P	C	*Urocissa erythrorhyncha*
Rufous Treepie				C		*Dendrocitta vagabunda*
Large-billed Crow	V	W	C		P	*Corvus macrorhynchus*
Velvet-fronted Nuthatch					P	*Sitta frontalis*
Puff-throated Babbler	V				P	*Pellorneum ruficeps*
Scaly-crowned Babbler	V				C	*Malacopteron cinereum*
Striped Tit-Babbler	V				P	*Macronous gularis*
White-crested Laughingthrush	V				P	*Garrulax leucolophus*
White-bellied Yuhina					C	*Yuhina zantholeuca*

Species	V	Other	Xe Lamphao	DDF	Dense	
Oriental Magpie Robin				P		*Copsychus saularis*
White-rumped Shama					P	*Copsychus malabaricus*
Stonechat				P		*Saxicola torquata*
Grey-breasted Prinia				P		*Prinia hodgsonii*
Asian Brown Flycatcher					P	*Muscicapa dauurica*
Hill/Tickell's Blue Flycatcher	V				P	*Cyornis banyumas/ C. tickelliae*
Black-naped Monarch	V				C	*Hypothymis azurea*
Brown Shrike				P		*Lanius cristatus*
Black-collared Starling	V		P	C	P	*Sturnus nigricollis*
Hill Myna	V				P	*Gracula religiosa*
Ruby-cheeked Sunbird					P	*Anthreptes singalensis*
Purple Sunbird				P		*Nectarinia asiatica*
Plain Flowerpecker					P	*Dicaeum concolor*
Eurasian Tree-Sparrow				P		*Passer montanus*
Asian Golden Weaver				P		*Ploceus hypoxanthus*

Species notes:
1. Excludes birds identified to species.

The Xe Lamphao column only includes species thought to be associated with the riverine habitat.

The DDF column includes species which were found associated with Dry Dipterocarp Forest.

The Dense column includes species which were found associated with dense forest habitats - primarily Semi-evergreen/Evergreen Forest.

Key:
Abundance codes: C = common; F = frequent; O = occasional; F/O = present but not common; P = present but abundance unknown; L (prefix) = local; d = remains found in village; [ ] = provisional identification.

Other: I = species' identification provisional; V = knowledge of the species's vocalisations greatly helped status assessment; W = species strongly associated with water, including when in other listed habitats.

ANNEX 5: STATUS OF MAMMAL SPECIES RECORDED OR REPORTED DURING THE SURVEY

Table 7: Mammal species recorded or reported during the survey.

	Identification	DDF	Dense	
Pileated Gibbon	Confirmed		P	*Hylobates pileatus*
Pangolin sp.	Confirmed		P	*Manis*
Burmese Hare	Confirmed		P	*Lepus peguensis*
Variable Squirrel	Confirmed		P[C]	*Callosciurus finlaysoni*
Red-Cheeked Squirrel	Confirmed		P	*Dremomys rufigenis*
Bear sp.			P	*Ursus*
Javan Mongoose	Confirmed		P	*Herpestes javanicus*
Medium cat sp.	Confirmed	P	P	*Felis/Neofelis*
Elephant	Confirmed	P	P	*Elephas maximus*
Wild Hog	Confirmed	P	P	*Sus scrofa*
Indian Muntjac 1	Confirmed		[P]	*Muntiacus muntjak*
Sambar	Provisional	[P]		*Cervus unicolor*
Brow-antlered Deer 2	Provisional			*Cervus eldi*
Wild cattle	Confirmed	P		*Bos*

Order and scientific nomenclature follow Nowak (1991). As mammals are difficult to detect, absence of a symbol should not be taken to suggest absence of a species from that habitat. Identification of tracks followed van Strien (1983) and the personal experience of observers. The best evidence for a species' presence is given for each sector. The estimate of coverage is only for diurnal observation.

Abbreviations:
Identification: conf = confirmed; prov = provisional. Use of a classification other than that of Nowak (1991) may result in a species changing from confirmed to provisional or vice-versa.
Evidence: x = identifiable field records; s = signs (including vocalisations of muntjacs); d = remains (v = those in village); r = reports. Evidence is given in order of importance in making status assessments. The best evidence for a species presence and abundance is given for each habitat. Only signs of Elephant are definitely identifiable to species.
Abundance codes: C = common or abundant (equivalent to the C category for diurnal birds, Annex 4 and only used for diurnal mammals); F = frequent; F/O = present but not common; P = present but not possible to assess abundance.

Notes:
1. Remains seen in village.
2. Species reported only.