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Jesper Hornskov, Building no. 7, apartment 1-502, Yin Jia Zhuang Xiao Qu, Xining 810001, Qinghai Province, People's Republic of China.

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The status of the Green Peafowl *Pavo muticus* in Laos

TOM D. EVANS and ROBERT J. TIMMINS

The Green Peafowl *Pavo muticus* was once widespread in Laos. Recent surveys involving field searches and interviews indicate that there has been a widespread and serious decline. Only remnant populations remain. The largest populations are thought to occur in southern Laos, mainly in the basin of the Xe Kong (Se Kong) and possibly also in Phou Xiang Thong National Biodiversity Conservation Area on the east bank of the Mekong. Hunting is thought to be the chief reason for the decline, compounded by habitat loss and the human colonisation of most areas of suitable peafowl habitat. Local populations continue to die out and without energetic protection the species will probably become extinct in Laos in the foreseeable future. Action to stop illegal hunting and collecting of eggs and chicks is urgently required. This action should concentrate first on known populations within and near existing and proposed protected areas in Chasmpasak, Sedone, Attopu (Attopeu), Salavan (Saravane) and Vientiane Provinces. The governmental body responsible for management of the protected areas network may require additional external funding and technical support to achieve this. Additional populations could probably be located by further surveys. The trade in peafowl feathers should be investigated further.

INTRODUCTION

Visually, the Green Peafowl *Pavo muticus* must number amongst the most impressive birds in South-East Asia. It was formerly found from south-eastern Assam, through Myanmar (Burma), southern China and Indochina, to Java, though it was absent from Sumatra (Delacour 1951). Collar *et al.* (1994) reviewed the available data on numbers and threats and listed Green Peafowl as having a high risk of global extinction in the medium-term future, mainly as a result of habitat loss and excessive hunting.

Green Peafowl are probably extinct in Malaysia, Bangladesh and north-east India (Collar *et al.* 1994). In Thailand there is a population of about 300 in Hwai Kha Khaeng Wildlife Sanctuary and unconfirmed reports from three other sites (Collar *et al.* 1994). In Java, van Balen *et al.* (1995) reported at least 915-1,149 birds, including two populations of 200 or more, and stated that significant unsurveyed populations may also exist on the island. Information from the remaining five range states, Viet Nam, Laos, Cambodia, Myanmar and China (in the southern state of Yunnan) is much less detailed. In Viet Nam there were records of small remnant populations at three sites in central Viet Nam and at least 17 calling birds at Nam Cat Tien National Park in the south (Robson *et al.* 1993a, b). From Cambodia and Myanmar there is no recent information other than a report from a single site in Cambodia in 1994 and reports that it was locally common in the early 1980s in Myanmar (Collar *et al.* 1994). In Yunnan the range has contracted and the population declined so that it is now restricted to about ten sites (Collar *et al.* 1994).

There is no widely available review on the status of the Lao population, but some data were reviewed in Salter (1993) and it was reported from at least five protected areas since 1989 in Collar *et al.* (1994). All the data available to Salter and Collar *et al.* are included in the current paper.

This paper details information on Green Peafowl collected in Laos up to August 1995. The historical status is briefly reviewed, then data on more recent surveys, involving interviews and field observation, are reviewed on a site-by-site basis. Needs and possibilities for conservation action are discussed.

Abbreviations

The following non-standard abbreviations are used throughout the text: CPAWM (Centre for Protected Areas and Watershed Management, Department of Forestry, Vientiane); IUCN (The World Conservation Union); NBCA (National Biodiversity Conservation Area, a large, legally gazetted reserve) and PPA (Proposed Protected Area, under official consideration by CPAWM) and WCS (The Wildlife Conservation Society, New York)

Note on place names

In this paper place names follow the maps of the most recent series of the Lao Service Geographique d'Etat, which use French transliterations of the original Lao pronunciations. Although this system is not perfectly suited to English-speakers, the maps are perhaps the most commonly used and certainly the most comprehensive source of names for those conducting fieldwork in Laos and so form an appropriate standard. Protected area names follow Berkmüller *et al.* (1993) and Berkmüller *et al.* (1995), even where they include place names spelt differently from those on the standard maps. Where place-names given in the *Times Atlas of the World* (1990 edition) differ, these are given in parentheses at the first mention. Commonly used elements of Lao place names are *Ban* (village), *Xe* or *Nam* (both meaning river), *Phou* (Mount or Mountain) and *Dong* (an area of dense forest).

HISTORICAL STATUS AND HABITAT

The Green Peafowl was once widespread and very common in Laos. For example, Engelbach (1932), speaking of southernmost Laos, said simply 'common everywhere, especially abundant in some of the valleys of Tahoi'. Delacour (1929), describing an expedition covering Cambodia, central Laos and the full length of Viet Nam, stated simply 'Common everywhere'. David-Beaulieu (1949), having spent several years in Savannakhet Province, central

Laos, reported it 'Extremely common throughout the province, but particularly along the Se [River] Bang Hieng, where, morning or evening, and even during the day, one might encounter them at any moment, on sandbanks or riverbanks'. In northern Laos, Delacour and Jabouille (1931) stated that it 'abounds everywhere', although David-Beaulieu (1944) was more cautious, stating that in the province of Tranninh, now known as Xieng Kouang, '[it] is found only in lower areas, and even there is not very common'. He listed six areas where one could regularly see them, the highest (Muong Suoi) being at 1,200 m the others below 600 m. There was no report on the avifauna of Laos between 1949, when David-Beaulieu left, and the late 1980s.

Delacour (1951) described the habitat needs thus: '[the Green Peafowl] requires open spaces, such as river banks, clearings and park-like country with long grass, patches of jungles and trees in which they can rest and hide. They shun deep, unbroken forest and large open plains, being absent from the great cultivated deltas of the Irrawaddy, the Menan, the Mekong and the Red River. They also do not ascend mountain slopes above 4,000 feet [c. 1,200 m], although numerous just below that altitude'.

METHODS OF RECENT SURVEYS

Surveys fell into three broad categories - general interviews during reserve feasibility studies, detailed interviews by ornithological fieldworkers and direct searches for peafowl in suitable habitat.. The authors of this paper participated in the latter two categories of survey.

General information was gathered over wide areas during interviews conducted by the Lao government's Centre for Protected Areas and Watershed Management (CPAWM) from 1988-1994, during the planning of the country's protected areas system in association with staff of the World Conservation Union (IUCN). Interviews were conducted mostly in and around areas under consideration for protected area status. Villages were not randomly selected, but a mixture of readily accessible and remote villages, both large and small, was covered. It is likely that the remotest sites were somewhat under-represented. Semi-structured interviews (pro-formas are given in Berkmüller *et al.* 1993) were conducted with the chiefs of each selected village and as many other local residents as the chief wished to invite. Interviewees were asked for simple socio-economic data and reports of current or former presence of threatened wildlife (from a list the interviewers read out) within half a day's walk of the village. This list included Green Peafowl. The completed interview forms, about 300 in total, are held on file at CPAWM Head Office in Vientiane. Most of the interview data are summarized in Salter (1993).

The first field-surveys of birds in Laos since 1949 began in 1992, since which time work has been conducted in eight very large protected areas (National Biodiversity Conservation Areas, NBCAs), one Proposed Protected Area (PPA), two other extensive areas with no proposed protection and one small nature reserve. Early priorities for surveys were identified by CPAWM as those reserves or proposed reserves where management implementation was planned to start soon. These priority sites were surveyed in 1992-94. In 1995 some areas not considered high priorities by CPAWM were also surveyed to investigate their conservation value. Ornithological fieldwork was conducted by an independent survey team in 1992-93 and by staff of the Wildlife Conservation Society, New York, thereafter, accompanied at all times by Lao-speaking counterparts from CPAWM. Broad faunal inventories were requested by CPAWM, concentrating on globally threatened species and the threats to them. Thus the Green Peafowl, though not the sole object of survey, was a high-priority species which received particular attention.

The first stage was to review interview data collected by CPAWM. Field-survey areas within the NBCAs were planned to cover most major habitats and altitudes, partly on the basis of likely presence of threatened species (due to remoteness, reports in earlier interviews or presence of localized habitats such as wetlands) and partly on the basis of access practicalities. Interviews were conducted in these survey areas whether or not they had been carried out in the past. The objective was to find local people, invariably adult males, with particular knowledge of wildlife, who could help fieldworkers to find localized or secretive species and provide information on low-density species which were unlikely to be observed directly during field surveys. Therefore a standardized questionnaire was not used. Interviewees were specifically asked about the current or former presence of Green Peafowl ('*nok nyoung*' in the Lao language). Further information was then sought on locations, numbers, seasonality and the possibility of observing the birds, or alternatively how long it was since peafowl were last seen in the area.

Where local reports indicated peafowl were still present, guides were hired to lead observers to areas where they might be seen. Periods of from one night to two weeks were spent birdwatching in these sites, on foot or in small canoes. The duration depended on initial success, further discussions with the guides and the likelihood of recording other threatened species there. Effort was concentrated in the mornings and evenings when peafowl activity and calling were likely to be highest. Direct sightings, calls and shed feathers were sought as evidence. No dust-baths were found and no footprints were found except at sites where calls or sightings were also recorded. Fieldwork methods in the many areas visited where no peafowl had been reported were essentially similar, involving long periods of searching for wildlife along forest trails and stream sides or by boat on forest rivers, and offered good chances for detecting peafowl, had they been present.

Co-ordinated counts of calling birds were attempted at Phou Khao Khouay NBCA. Three groups of one or two observers were stationed at 50-100 m spacing in an area where a few peafowl were known to roost. They were in position from approximately 05h00-08h00 and 17h30-19h15, covering the periods of dawn and dusk. Observers recorded the exact time each brief burst of calls was uttered and its approximate direction (using the eight points of a compass). A minimum estimate of the number of calling birds was then reached by plotting the data on a sketch map and treating birds heard simultaneously by different observers as identical unless the recorded directions made this impossible. Repeated calls heard by an observer from the same direction were treated as the same bird, unless it was clear that two birds were involved. Records after 07h00 were disregarded to reduce the effect of birds calling from more than one area in the course of the morning count. A more elaborate method was not attempted since numbers were so low.

RESULTS: HABITAT USE

The habitat of areas with recent sightings and reports matches that described by Delacour (1951) and quoted above. There was no suggestion that hill evergreen or semi-evergreen forest was used (forest types follow Round 1988), except for one unsubstantiated report from the headwaters of the Xe Pian in Bolovens Southwest PPA. This may have referred to a large block of semi-evergreen or hill evergreen forest, though the precise site was not clearly described and was not visited. At c. 800 m, this area was also the highest that reports came from. Other sites where recent or current presence was reported were at 70-550 m altitude.

The Phou Khao Khouay NBCA population occupied a gently-curving convex sandstone outcrop at 400-500 m. There were large areas of bare rock, with stunted dry dipterocarp forest on pockets of shallow sandy soil and somewhat taller dry dipterocarp forest along drainage lines. There was no flowing water in the dry season, and very little standing water other than puddles from recent rain showers. Much of Phou Xiang Thong NBCA is also deciduous forest types with scattered pools on gently sloping rocky outcrops (K. Berkmüller *in litt.* 1994). Peafowl there may occupy similar habitat to those in Phou Khao Khouay NBCA.

Quan Moor in Dong Hua Sao NBCA was a large grassy glade in flat mixed deciduous forest at c. 200 m. Reports and records from Xe Pian NBCA and Dong Lao Louang, Phou Louang, Phou Katoung and Phou Theung PPAs also appear to be associated with mixed deciduous forest below 300 m, either as extensive stands or as gallery forest along rivers in areas of dry dipterocarp forest.

The two areas reliably reported in Nakai-Nam Theun NBCA, the one in Khammouane Limestone NBCA, some in Xe Bang Nouan NBCA and the one in the northern sector of Xe Pian NBCA were flat or gently-rolling alluvial areas quite near villages. The habitat in each was a mosaic of wet rice paddies, short-cycle shifting cultivation of rice on dry ground, bamboo-dominated scrub and degraded forest, small pools and streams or rivers. These populations are all thought to be extinct (see Discussion).

RESULTS: SEASONALITY

February-April was widely reported by interviewees to be the time when peafowl call and display in Laos, with a peak in March. This represents the latter part of the long dry season. The monsoonal rains start in mid-May and are heavy from June-September before gradually ceasing in October. There were reports of eggs taken from the wild in April 1994 at Phou Khao Khouay NBCA and a chick held captive in April 1995 in Bolovens Southwest PPA, indicating that breeding was occurring in this month.

RESULTS: DISTRIBUTION AND STATUS

Results are presented separately for those sites where evidence of significant peafowl populations was found and those where, at best, only a handful of individuals is thought to remain. Data are reviewed separately for the three biogeographical regions of Laos, North, Central and South recommended by Delacour and Jabouille (1931) and followed by King *et al.* (1975). The boundaries of these regions and the approximate boundaries of the survey areas are marked on Figures 1 and 2.

'Sites' are mostly quite restricted areas at least 10 km from another place where peafowl were reported, separated by areas of dense forest or dense human population. Some of those in southern Laos are apparently more extensive areas and may represent either extensive populations or a number of separate 'sites' which could not be distinguished due to inadequate information.

Information on the location and size of populations is followed by notes on human activities that may affect the birds. In the absence of other comments, all sites discussed may be assumed to experience frequent visits by men hunting opportunistically with guns and snares.

Areas of NBCAs and PPAs are not presented here since they bear limited relationship to the extent of habitat suitable for Green Peafowl (for example, Xe Bang Nouan NBCA is less than one third the size of Nakai-Nam Theun NBCA, but supports comparable areas of scrub and deciduous forest types) or the number of peafowl thought to be present. Areas of the NBCAs can be found in Berkmüller *et al.* (1993).

Table 1 Sites where peafowl populations of more than a few birds are thought to exist
Numbers of interviews are given in the order peafowl reportedly absent/extinct/present. The absent category may include some sites where the species is extinct, since the distinction was not always made in interviews.
A dash indicates no information available - if negative information was gathered it is presented.
^ Numerical data not available in the same form as at other sites.
* Pooled here because CPAWM results for the two cannot be separated.

Area	Co-ordinates	CPAWM interviews	Other interviews	Records	Status
North Laos					
2. Nam Ma NBCA	20°32'-20°53'N 101°10'-101°28'E	9/0/2	–	–	Probably present
9. Phou Khao Khouay NBCA	18°14'-18°34'N 102°44'-103°29'E	6/0/5	2/0/0	Observed at one site	Present
11. Nam Kading NBCA	18°10'-18°30'N 104°08'-103°30'E	1/0/1	10/0/1	None	Probably present
Central Laos					
None					
South Laos					
18. Phou Xiang Thong NBCA	15°19'-15°52'N 105°25'-105°47'E	0/2/6	–	–	Probably present
20. Phou Theung PPA	15°25'-15°58'N 106°29'-106°55'E	4/0/3	–	–	Probably present
21. Phou Katoung PPA	14°52'-15°19'N 106°45'-107°15'E	8/0/8	–	–	Probably present at more than one site
22. Dong Amphan NBCA	14°38'-15°12'N 107°12'-107°48'E	1/1/1	reported to Baird (1995)^	–	Probably present
23. Nam Kong PPA	14°18'-14°52'N 106°33'-107°32'E	5/0/5	–	–	Probably present
24. Dong Hua Sao NBCA	14°50'-15°11'N 105°55'-106°18'E	5/4/2	5/0/1	Seen at one site	Present
26. Dong Lao Louang PPA/ 27. Phou Louang PPA *	14°42'-15°06'N 106°11'-106°31'E	2/2/15	3/0/3	Captive chicks seen from one site in Phou Louang PPA	Probably present at 2-3 sites, including both PPAs
28. Xe Pian NBCA	14°02'-14°47'N 105°54'-106°29'E	5/2/6	0/3/4	None in three sectors, confirmed in one	Present in one sector, probably two, extinct in one, probably absent in one

Sites where peafowl populations of more than a few birds are believed to occur

Data are summarized in Table 1. All sites are discussed in more detail below. Where the only evidence comes from CPAWM interviews there is less confidence that peafowl still occur (see Discussion, below, for a justification of this) and presence should be considered unconfirmed. The sites below include three in North Laos, but none shows evidence of large numbers. Except for Phou Xiang Thong NBCA, which lies on the east bank of the Mekong in Sedone Province, South Laos, the remainder of the sites all lie

relatively close together in and around the catchment of the Xe Kong (Se Kong) river, the largest single tributary of the Mekong, in the provinces on Champasak, Attopu (Attopeu) and Salavan (Saravane) in South Laos. The Xe Pian NBCA population probably extends into Cambodia.

2. Nam Ma NBCA, North Laos

Two villages reported peafowl during CPAWM interviews in 1991. There is no other information.

9. Phou Khao Khouay NBCA, North Laos

All CPAWM reports appear to stem from a single site. In early 1994, a number of brief visits was made by CPAWM staff and one of the authors to this area, on the southern edge of the reserve near the village of Ban Nakhay. The birds are reported to occur at 2-6 separate roosting areas across a gently sloping outcrop of sandstone rock a few kilometres long and about 2 km across. Peafowl at one of the roosting areas (locally called Dan Houay Sai Khao) have been counted, on 22 March 1994 and 1 May 1995. Coordinated recording of calls suggested at least six calling birds (presumably all males) were present on the first visit and two on the second. The latter visit fell after the peak February-April calling period. Faunal surveys in 1994/1995 revealed no peafowl in the Nam Leuk area in the centre of the reserve, despite the presence of suitable habitat (J. W. Duckworth, *in litt.* 1995).

The Ban Nakhay population is under severe pressure. There are several villages within 4 km of the outcrop. Six birds were reportedly shot in 1993 and one of the six roosting areas may no longer be occupied (Dobias 1994). The villagers also collect peafowl eggs (ten in 1993) to incubate under domestic chickens, then sell the chicks to traders in Vientiane (Dobias 1994).

11. Nam Kading NBCA, North Laos

No peafowl were located during 24 man weeks of surveys along the main river valleys in December 1994-January 1995 and March-May 1995. Further, none was reported by most local residents. However, peafowl were reported from one remote ridge-top area by a guide of the Hmong ethnic minority, a man who had demonstrated a great knowledge of the area's other wildlife. The reported site (which some local informant said had no peafowl) was near the upper Houei Ba Song, a left bank tributary of the Nam Kading (Nam Ca Dhin), 15 km upstream of the Nam Mouan confluence (W. Robichaud, verbally 1995).

18. Phou Xiang Thong NBCA, South Laos

There were reports during CPAWM interviews from villages all along the eastern border of this reserve, suggesting that significant populations may remain.

20. Phou Theung PPA, South Laos

Several villages reported peafowl in one limited, south-central part of this area during CPAWM surveys.

Table 2 Sites where there is evidence that peafowl are extinct, absent or extremely rare
Numbers of interviews are given in the order peafowl reportedly absent/extinct/present. The absent category may include some sites where the species is extinct, since the distinction was not always made in interviews.
A dash indicates no information available - if negative information was gathered it is presented.
* These positive reports identified locations where presence was discounted by fieldwork and further questioning
^. Numerical data not available in the same form as at other sites.

Area	Co-ordinates	CPAWM interviews	Other interviews	Records	Status
North Laos					
1. Phou Dene Dinh NBCA	21°40'-22°18'N 102°00'-10°40'E	6/0/0	2/0/0	None	Probably absent
3. Phou Louey NBCA	19°50'-20°29'N 103°00'-103°23'E	23/0/0	–	–	Probably absent
4. Nam Et NBCA	20°09'-20°50'N 103°21'-103°53'E	6/0/0	–	–	Probably absent
5. Nam Xam NBCA	20°02'-20°14'N 104°18'-104°53'E	13/0/0	–	–	Probably absent
6. Nam Poui NBCA	18°12'-18°46'N 101°05'-101°30'E	0/2/1	–	–	Probably very rare
7. Pak Sa	18°27'-18°50'N 101°30'-101°50'E	2/7/0	–	–	Probably very rare or extinct
8. Houei Nhang Nature Reserve	18°05'N 102°41'E	2/0/0	1/0/0	None	Extinct or absent
10. Paxane (Pak Sane) marshes	18°25' N 103°46' E	2/0/0	–	-	Probably extinct or absent
12. Nam Mouan Valley	18°32'-18°52'N 104°14'-104°20'E	–	7/0/0	None	Probably very rare or extinct
Central Laos					
13. Khammouane Limestone NBCA	17°26'-18°05'N 104°25'-105°10'E	1/12/1*	0/1/0	–	Probably very rare or extinct
14. Nakai-Nam Theun NBCA rare or extinct	17°34'-18°23'N 105°02'-105°46'E	15/8/12*	10/11/2*	None	Probably very
15. Phou Xang He NBCA	16°42'-17°04'N 105°19'-106°06'E	0/8/3	1/3/0	None	Probably very rare or extinct
16. Nong Louang wetlands	16°13'N 105°21'E	1/2/0	None reported to Claridge (1993)^		Probably very rare or extinct
South Laos					
17. Xe Bang Nouan NBCA	15°44'-16°01'N 105°33'-106°18'E	5/2/10*	11/0/2*	None	Probably very rare or extinct
19. Ban Thateng area	15°23'N 106°25'E	1/2/0	–	–	Probably very rare or extinct
25. Xe Namnoy headwaters	14°50'-15°10'N 106°30'-106°45'E	9/0/2	5/5/0	None	Probably very rare or extinct

21. Phou Katoung PPA, South Laos

Several villages from all around this area reported peafowl within it during CPAWM interviews, possibly in several different river catchments.

22. Dong Amphan NBCA, South Laos

One village of the three interviewed by CPAWM reported the presence of peafowl. They were also reported to Baird (1995) who visited ten villages along the Xe Kaman (Se Kamane) river in December 1994 - January 1995.

It is not known whether the reported birds are within the current NBCA boundaries.

23. Nam Kong PPA, South Laos

Five villages reported peafowl during CPAWM interviews, but the informants did not give information on how many sites might be involved.

24. Dong Hua Sao NBCA, South Laos

The reserve was surveyed for four person-months in May-July 1993 (Timmins *et al.* 1993a). Reports had been received by CPAWM in early 1993 of peafowl near the southern boundary. Similar reports were given to the survey team, who eventually sighted Green Peafowl twice (possibly the same bird) at a wide grassy clearing called Quan Moor. Local people said that they did not hunt the birds, because they were beautiful, and that as a result Quan Moor hosted a communal display of up to 70 birds in March. This remains to be confirmed.

26. Xe Khampho PPA, South Laos

There were reports from many villages around this area in CPAWM interviews in 1993-1994. During field-surveys in 1995 in Ban Houayko (known in the area as Ban Don Kong) and Ban Hinlat along the Xe Pian river (Evans *et al.* 1995), there were interview reports of peafowl occurring near Ban Makka at the southern foot of the Phoupiang Bolaven (Plateau des Bolovens). It is one of an isolated enclave of villages in an extensive area of mixed deciduous and semi-evergreen forest at 100-300 m.

27. Phou Luang PPA, South Laos

There were reports from many villages around this area in CPAWM interviews in 1993-1994. During field-surveys in 1995, large numbers of peafowl (possibly in excess of 100) were reported from the extensive belt of mixed deciduous forest in this area by the chief of the village of Ban Hinlat (Evans *et al.* 1995). There were also possible reports stemming from people in Ban Houaychot, of peafowl in another area, the headwaters of the Xe Pian, in a remote area at about 800 m, (I. Baird, cited in Evans *et al.* 1995). People in Houaychot did not report peafowl during previous CPAWM interviews. The informant in Ban Hinlat said that the birds were often hunted. Captive chicks were seen (I. Baird and T. Roberts *in litt.* 1995). Parts of the area are, however, relatively distant from villages, and difficult to reach because there are no roads or navigable rivers. They may thus experience low hunting pressure.

28. Xe Pian NBCA, South Laos

A large proportion of the reserve in the main sector is dense semi-evergreen forest unsuitable for peafowl. The extensive mixed deciduous and dry dipterocarp forest and scrub in the northern, southern and eastern sectors are apparently more suitable (Timmins *et al.* 1993b). The reserve was surveyed for a total of about sixteen person-months, covering all four sectors, from November 1992-May 1993 (Timmins *et al.* 1993b). The eastern sector was visited again for a week in May 1995 (Evans *et al.* 1995).

Although there was a previous report to CPAWM staff, all informants interviewed by ornithological fieldworkers in 1992-1993 agreed that peafowl have been hunted out in the heavily populated northern sector, around the large village of Ban Phapho.

In the southern sector, known locally as Dong Kalo, none was heard during 15 person-days of survey work. Local people from Dong Kalo reported peafowl to CPAWM and in 1993 offered to show observers peafowl in the nearby Phou Mailai hills, but this was not possible for security reasons.

In the eastern sector of the reserve, the plains of the Xe Kong river and its tributaries, peafowl were reported to be quite common during interviews by CPAWM and the ornithological teams. In 1995 soldiers manning border posts along the Xe Kong river reported that peafowl were still common both in the reserve and in the extensive uninhabited deciduous forests on the Cambodian side of the river (Evans *et al.* 1995). At least two different individual peafowl were heard calling by the team on a total of four occasions around the Xe Pian-Xe Khampho confluence in March 1993. A shed feather was found in 1995 at another place, Keng Louang, over 30 km upstream along the Xe Pian. Since only two birds were heard during two weeks of survey work (c. 10 person-weeks) at the expected peak calling period in 1993 the population is suspected to be either localized or at low density.

Sites where Green Peafowl are thought to be absent, extremely rare or extinct

Data are summarized in Table 2. Further details are given below for those sites where they are available.

1. Phou Dene Dinh NBCA, North Laos

CPAWM intwerviews have been conducted. Two person-weeks of field surveys were conducted at this site in May-June 1995. There is no suggestion that Green Peafowl occur (W. Robichaud *per* J. W. Duckworth *in litt.* 1995).

6. Nam Poui NBCA, North Laos

During CPAWM interviews a few peafowl have been reported to persist in valleys outside the reserve, but there is reportedly none within it (R. Dobias verbally 1993).

8. Houei Nhang Nature Reserve, North Laos

This reserve was intensively surveyed by a team of 6 observers for six weeks in October-November 1992 and on many subsequent occasions and it is certain that no peafowl are present (Cambridge Survey Team 1992). This small reserve experiences extremely heavy hunting pressure, from local residents and visitors from Vientiane (Cambridge Survey Team 1992).

12. Nam Mouan Valley, North Laos

No CPAWM interviews have been conducted in this area. Field surveys and interviews were conducted along the main river valley for one person-week

in March 1995. It became clear that the area was heavily populated and lacked any extensive natural forest. Seven villages reported that peafowl were not present in their area. It is conceivable that peafowl remain in the headwaters of the catchment.

13. Khammouane Limestone NBCA, Central Laos

There were reports from a single village at the south end of the reserve among 14 villages interviewed by CPAWM in 1991. This village, Ban Nakayak (locally known as Ban Kok Savang), was revisited in 1994 and several informants stated that no peafowl had been seen for 3-5 years. Two other nearby villages gave similar information. This population is probably extinct.

14. Nakai-Nam Theun NBCA, Central Laos

During interviews conducted by CPAWM in 1988-94, reports came from three sites, two about 35 km apart in the western Nakai plateau sector and one 30 km east in the Tasaeng Theung sector (a Tasaeng is an administrative unit of, at most, two or three dozen villages). An eight person-month ornithological survey was conducted in January-April 1994 (Timmins and Evans 1994). On this survey there were fewer positive reports and more negative ones (as more interviews were conducted in 1995), with several people saying that peafowl had become extinct near their villages in the past ten years.

Two convincing reports on the Nakai Plateau were followed up in April by camping at the stated site for 1-2 nights, guided by the informant. No peafowl were found and further information suggested that both populations were now extinct or almost so. At one of them, locally known as Nong Nyian, near the abandoned village of Ban Bo-Tai, a new village, known locally as Ban Soupen, had grown up nearby since the informant had last visited six years ago. People in Ban Soupen said the peafowl had all been shot. At the other, the mouth of Houei Luuk, upstream of Ban Khonken, bamboo scrub had come under fresh cultivation a year earlier and the farmer said the birds had not been heard since.

Tasaeng Theung (which is essentially the headwaters of the Nam Noy) is dominated by members of the Lao Theung ethnic group. Initial confusion over the names of Green Peafowl and Crested Argus in local dialects led us to seek very detailed information, and to request to look at feathers. Our conclusion after six days of interviews and seeing several feathers was that all or almost all of the reports of 'peafowl' actually referred to Crested Argus *Rheinardia ocellata*. That species is quite common on the hills around the head of the valley. One informant, at the village of Ban Buk, described 'peafowl' which lived near rivers and sometimes came into paddies, though he had last caught them 8 years ago. The habitat described was suggestive of Green Peafowl. Crested Argus, being notoriously secretive, would be most unlikely to visit open areas. However, when he showed us a feather from the

bird, it was that of male Crested Argus. It is conceivable that Green Peafowl remain in Tasaeng Theung, but the balance of evidence is that they do not, or are extremely rare.

The three sites were all in inhabited and actively cultivated areas where hunting pressure can be expected to be high. Some other parts of the Nakai Plateau are thought to experience lower levels of human pressure but peafowl were not reported from them.

15. Phou Xang He NBCA, Central Laos

There were reports to CPAWM interviewers in 1992. A significant proportion of the reserve was surveyed, for three person-months in April 1993 (Duckworth *et al.* 1993b). Though a few individual Green Peafowl might persist in more remote areas not surveyed, no peafowl were found, nor were reports received. Several interviewees said they had been extinct for many years.

17. Xe Bang Nouan NBCA, South Laos

Six person-weeks were spent surveying the reserve in May-July 1994. Though significant populations were suggested by CPAWM interview results, the field survey found that the population was in fact extremely small, if not extinct. The most recent seemingly reliable report was of a single bird from 1992, at a site that certainly no longer supported them by 1994. The whole reserve was found to be exposed to high levels of hunting, fishing and other extractive uses.

25. Xe Namnoy headwaters, South Laos

Though CPAWM interviewers received reports in 1993-1994, it is possible these refer to areas in the lowlands to the south, east or west, in the NBCAs and PPAs of the Xe Kong basin. No reports were received during 3 person-months of fieldwork in March-April 1995, nor were there any field sightings. The area, though relatively populated, has villages almost throughout and there are no particularly remote areas where peafowl might be expected to survive.

DISCUSSION

Validity of the interview data

Interview results have to be treated with considerable caution due to possibilities of misinterpretation by either party and the risk that respondents may not be telling the truth for various reasons or simply not know the correct answer. These problems are believed to be relatively small for the Green Peafowl because it is a familiar species whose Lao name is the same over virtually all of the surveyed areas, it is readily observed at certain times of the year by people farming and hunting in an area and there was no suggestion that respondents were shy or suspicious of the interview teams, or that they

were worried to report hunting of this legally protected species. Reports from different respondents around an area were generally consistent: for instance, specific sites with peafowl were frequently known to many or most interviewees in a number of nearby villages. Thus it is felt unlikely that significant populations have been wholly missed in areas where both interviews have been conducted.

In one area, the Tasaeng Theung sector of Nakai-Nam Theun NBCA, there was doubt over the identification of reports, due mainly to local dialect differences rather than an inability of interviewees to separate the two species. The confusion species, Crested Argus, is not thought to occur at any of the other sites where peafowl are reported, so the possibility for confusion at these sites is much less.

Data from interviews and fieldwork during ornithological surveys indicate that the CPAWM interview results give a somewhat over-optimistic picture in areas that are subsequently re-surveyed, for example, Phou Khao Khouay, Nakai-Nam Theun, Phou Xang He, Khammouane Limestone and Xe Bang Nouan NBCAs and parts of Xe Pian NBCA. This may be because reports refer to groups which became extinct in the interim (e.g. in at least one part of Nakai-Nam Theun NBCA and in Xe Bang Nouan, Phou Khao Khouay and Khammouane Limestone NBCAs), because several reports from well-separated villages may refer to the same small group, because respondents misunderstood the questions posed (e.g. they reported the former presence of peafowl but this was not realized by the interviewer) or, in the Nakai-Nam Theun NBCA case discussed above, due to nomenclatural confusion with Crested Argus. Thus presence at sites where CPAWM interviews provide the only evidence should be considered probable rather than confirmed, and the overall status of the peafowl may be somewhat worse than suggested by the data available.

Completeness of coverage

Direct searches for this often secretive species have only been attempted over a small percentage of the country, and it is difficult to infer the nationwide status of the peafowl from these searches alone. However, the interview data are much more extensive. The 17 NBCAs cover over 10% of the nation's land surface (Berkmüller *et al.* 1993, 1995). The areas immediately around them (which were also effectively covered by interview surveys) and the other proposed or formerly proposed protected areas also surveyed add considerably more land area to this total. It should be noted, however, that not all sectors of some of these areas were covered. It is likely that additional peafowl populations remain to be discovered elsewhere in Laos. Nonetheless, the sites surveyed include the great majority of those with large areas of natural habitat, relatively low human population densities and relatively low hunting

pressure (Berkmüller *et al.* 1993, 1995). In view of the evidence for a great decline and the probability that hunting is the key factor (see below), the surveyed sites would thus be expected to hold the bulk of remaining peafowl numbers. Most of the areas of suitable habitat not surveyed, both lowland and highland, are heavily populated and heavily cultivated and seem unlikely to support more than small peafowl numbers.

Evidence for a decline

Three lines of evidence suggest that there has been a great decline in the population of Green Peafowl in Laos. Firstly comparison of historical accounts with recent survey results indicates that populations are very much smaller, fewer and harder to locate than in the period before 1949. For instance, there are no reliable current reports from anywhere in Central Laos, and only three of twelve sites surveyed in North Laos appear to have even modest numbers of peafowl. A number of extensive areas in South Laos (e.g. Xe Bang Nouane NBCA) that once supported peafowl no longer do so.

Secondly, there is no evidence that any peafowl occur within a few kilometres of any existing village in Laos except for the birds in Phou Khao Khouay NBCA. This was not formerly the case, judging from historical accounts (see Historical Status and Distribution, above) and the reports of interviewees. Although there are a number of reports of populations being present in the past 20-30 years in areas near villages with a mosaic of scrub and cultivation (see Habitat above), none appears to be occupied any longer and the remaining significant populations appear to be in extensive areas of deciduous forest-types away from villages. Considering the low population density, surprisingly few areas in Laos are more than a few kilometres from a village, due to the highly dispersed, overwhelmingly rural nature of the population. Thus an absence from the vicinity of villages implies absence from the great majority of the country.

Thirdly, many respondents in recent interviews have reported that Green Peafowl have become extinct in the area within half a day's walk of their villages in living memory, sometimes as long ago as 30 years, others in the past five years (Tables 1 and 2). This is clear evidence for a decline, in these areas at least. Extinctions were reported in 77 of the 362 interviews (21%). A few of these represent two villages interviewed at different times. However, the true figure is probably much higher, since in many cases the distinction between extinct and absent was not made by the interviewer or respondent, or was not recorded on the answer sheet.

Reasons for the decline

Forest loss has been extensive in Laos, and may have reduced the area available for Green Peafowl to inhabit. It may also have improved feeding opportunities where birds were able to roam into cultivated areas with quantities of spilled grain or where open habitats replaced dense, closed forest. In either case, habitat loss or fragmentation cannot alone account for the present scarcity of the peafowl or the speed of the decline, since large areas of apparently suitable habitat clearly remain. The authors have a strong suspicion that the cause is human activity within the remaining habitat, in particular hunting with snares or guns. Many interviewees stated that the peafowl were shot whenever possible, because they taste good and provide lots of meat. In support of this, David-Beaulieu (1949) praised the quality of meat from the young peafowl. Hunting of virtually any animal, mainly for food, is ubiquitous in rural Laos and most people have access to guns, or can use snares. The authors and their co-workers on recent surveys have found that populations of all large mammals and large birds are very low except in the remotest areas, at least in South and Central Laos and the southern third of North Laos. Peafowl are particularly vulnerable in places where they occupy riversides and scrub around cultivation, and are easily shot at their roosts which they draw attention to by calling loudly. J. Eames (*in litt.* 1995) points out that the Green Peafowl's preference for alluvial valleys and need for daily access to water overlaps, to the bird's detriment, with the preferences of the low-altitude rice-farming cultures which now dominate Indochina.

Eggs are reportedly taken to hatch under domestic chickens so that the peafowl chicks can be fattened for meat or sold as cage birds. This may be a contributory factor in the decline and is probably a serious threat to remaining small populations.

The trade in the males' spectacular train feathers, which are used as ornaments or as parts of more elaborate craftwork, may have had an impact, especially once populations had already been reduced by hunting. We observed one skin, with its train, prepared for sale as a trophy. It had been confiscated by CPAWM staff from a village near the Phou Khao Khouay NBCA population. Bundles of peafowl feathers can freely be bought in Vientiane and in towns on the Thai side of the Mekong, for example Nong Khai (personal observations on many occasions) and Muang Amphoe, Mukdahan Province (Srikosamatara *et al.* 1992, Srikosamatara and Suteethorn 1993). However, following examination of specimens in the British Museum (Natural History) we have concluded that the train feathers of Green and Blue Peafowl *Pavo cristatus* are almost impossible to distinguish, other than the marginal feathers, which are asymmetrical, usually lack ocelli and which appear to differ in colour between the species. Thus it has not been possible to identify the feathers on sale. Many or most conceivably stem from captive

populations of Green or Blue Peafowl or from the large wild population of Blue Peafowl in the Indian subcontinent, though this has been difficult to determine since, in Vientiane at least, traders seem unwilling or unable to answer casual enquiries about the origins of the feathers. Feathers from captive birds have the advantage that they can be gathered in better condition and in larger numbers. Both Blue and Green Peafowl are quite numerous in collections in Laos and Thailand, and breed well (Nattakit Krathintong, Project Manager, Vientiane Zoological Gardens Inc., verbally 1995).

Status and global importance of the Lao population

The results clearly indicate that the Green Peafowl is now extinct over large parts of Laos where it was probably common 50-100 years ago and that local populations have continued to die out even during the past few years. There is no indication that the decline is likely to stop. There is little information on the numerical strengths of the remaining populations, but on current evidence none is suspected to exceed 100-200 birds and the largest populations may in reality be markedly smaller than that. The largest single report was in the order of 100 birds at Bolovens Southwest PPA, but this was simply a guess by a local hunter. The bulk of the Lao population appears to be in the south, particularly in mixed deciduous forests in the catchment of the Xe Kong river. Known populations appear to be widely dispersed, though least so in the catchment of the Xe Kong river. Many may be too small to be genetically viable in the long term.

The Lao population is potentially significant to the future survival of the species. It appears to be at least as numerically important as that of Thailand, though possibly not as large as that reported from Java (see Introduction, above). Further surveys will enable more precise statements to be made. However, the number of reports received of populations disappearing within the past ten years suggests that within a few more years many of those which exist today will also have vanished or shrunk markedly, unless practical conservation action is taken.

CONSERVATION OF THE GREEN PEAFOWL IN LAOS

Development of the institutional capacity of the Lao government to manage its protected areas is being supported by bilateral aid from Sweden through the Lao-Swedish Forest Resources Conservation Project, with the assistance of IUCN. WCS have also initiated a long-term programme of field surveys and training of Lao conservation staff. If these inputs continue, extensive, long-term conservation measures are likely to become possible for the Lao government to undertake.

At certain NBCAs general management implementation is underway, though low staffing levels and uncertain funding are very restrictive. These sites include three, Xe Pian, Dong Hua Sao and Phou Khao Khouay, where peafowl occur. Protection of peafowl needs to receive a higher priority at these sites. For most threatened species the emphasis is to be on general reduction of hunting, disturbance and habitat destruction in the large NBCAs over a period of years, in parallel with the establishment of sustainable patterns of resource use by local residents (Berkmüller *et al.* 1993). Because peafowl are very localized, declining rapidly, especially targeted by hunters and easily hunted, the remaining populations need more specific protective measures implemented with greater urgency. The Green Peafowl is one of the few species in Laos for which a highly focused conservation programme is currently appropriate.

Many other NBCAs and PPAs are currently given a low priority for survey and general management implementation (Berkmüller *et al.* 1993) due to the constraints of funding and manpower under which CPAWM operates. The speed with which peafowl groups are becoming extinct in Laos urges much more rapid action at some of these sites (Phou Xiang Thong NBCA and Bolovens Southwest PPA being good examples), aimed specifically at peafowl. By the time general management implementation starts there may otherwise be no peafowl left to protect.

Green Peafowl are already protected from hunting at all times under Lao law (Salter 1993).

A number of possible courses of action, which could run concurrently, are outlined below.

1 Site-specific protective measures

a) A pilot scheme by CPAWM staff is underway at Phou Khao Khouay NBCA, publicizing the fact that it is illegal to kill the birds or steal their eggs, and holding village meetings and consultations with village leaders to explain the significance of the few remaining peafowl. If this seems successful the same procedure should be followed as soon as possible in Dong Hua Sao and Xe Pian NBCAs, since although these are not known to be the largest populations, management staff are already available and established in these areas. Follow-up measures should be developed, depending on this initial work.

b) If further large populations are confirmed by future fieldwork at other sites priorities should be re-assessed and they should probably receive protective measures as quickly as possible.

c) The possibility of enabling tourists to view peafowl, especially the easily-accessible ones at Phou Khao Khouay NBCA, 90 minutes drive from the centre of the capital, is being examined by CPAWM. This might provide a small income to local people to compensate for the small financial benefits they forego by not killing the birds. There is no established ecotourism in Laos, and a limited presence of tourists in general, though this seems likely to change as official restrictions on travel outside the capital are reduced.

d) It is likely that carefully planned external assistance, both with funds and technical support, will be necessary to enable protected areas staff to achieve lasting improved protection of peafowl. Current management capacity is very limited and there is little scope for single-species projects within existing manpower and financial constraints.

2 Expansion of the protected areas system

a) Many peafowl are thought to be outside existing protected areas, especially in the catchment of the Xe Kong valley. NBCA status would not be conferred on an area simply for the presence of one species, but some of these sites are thought to support assemblages of many threatened species. Establishment of protected areas may improve the conservation status of the peafowl within them.

b) It may be appropriate to establish a protected area in north-eastern Cambodia, where peafowl are reported to occur, to form a trans-frontier reserve linked with Xe Pian NBCA. Further investigations are required.

3 Further field survey work

a) The sites where active measures are undertaken should be more thoroughly surveyed and the populations counted. This will provide a baseline to monitor the success of protection.

b) Wildlife surveyors in Laos should make it a high priority to assess the sizes of other reported peafowl populations as soon as possible. Phou Xiang Thong NBCA, Bolovens Southwest PPA and the other sites in the Xe Kong valley listed in this paper are of the highest priority for survey in this regard.

c) The possibility of as yet unreported populations should be investigated in regions with low population density and extensive lowland forest. Two possible areas are the east part of Savannakhet Province and neighbouring Xepon (Sepone) Province in Central Laos (area A on Figure 2) and the

south part of Champasak Province west of the Mekong in South Laos (area B on Figure 2).

d) There is limited survey expertise within CPAWM at present and it would be appropriate for outside teams to assist by conducting surveys in consultation with that body. It is essential that any survey conducted should be planned so as to offer useful training to CPAWM counterparts in the gathering and interpretation of data during the course of fieldwork.

4 Investigation of the impact of trade

a) Steps should be taken to determine whether Green Peafowl feathers or whole birds are being traded in significant quantities. The trade in birds or their feathers would contravene the terms of the Convention on International Trade in Endangered Species (CITES) if it were proven to occur into, for example, Thailand or Viet Nam (both parties to the convention). Laos is not yet a party to CITES, but should also attempt to investigate and, if appropriate, control the cross-border trade.

b) A method is needed to distinguish Green and Blue Peafowl train feathers.

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Tom D. Evans, 11a Yeoman Lane, Maidstone, Kent, ME14 4BX, U.K.
Robert J. Timmins, 25 Cradley Road, Cradley Heath, Warley, West Midlands, U.K.

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The occurrence of Grey Hypocolius *Hypocolius ampelinus* in Kutch, Gujarat, India

J. K. TIWARI, S. N. VARU and M. K. HIMMATSINHJI

Previous records of Grey Hypocolius *Hypocolius ampelinus* in the Indian subcontinent are given, and details of recent records from Kutch, Gujarat, India are detailed, with information on arrival and departure dates, behaviour, food and biometrics of trapped birds.

The earliest record of the occurrence of the Grey Hypocolius *Hypocolius ampelinus* in the Indian subcontinent was one collected on 6 March 1875 in Larkana district, Pakistan (Blanford 1875). It was next recorded by Duke on 26 April 1877 from Kalat in Baluchistan, Pakistan. There were apparently no further records until 14 November 1930 when Dr Salim Ali collected a specimen from Kihim, Colaba district, Maharashtra, India (Ali 1931). There was another gap of nearly 30 years before two were collected on 22 and 23 March 1960 at Kuar Bet, north of Pachham Island, on the edge of the Great Rann of Kutch (Shekar 1960).

Based on these records, Ali and Ripley (1987) described the species as a rare vagrant to the subcontinent. Roberts (1992) referred to Ali and Ripley's comments on status, but noted that recent sightings in Pakistan may indicate that it is an irregular but not uncommon visitor to the remote desert tracts in more southern latitudes of Baluchistan. He referred to a pair seen in 1942 by A. F. P. Christison at Dalbandin in the Chagai; more recently, he and R. Passburg had seen small parties of this species in the Hab valley region (west of Karachi) between 3 February and 6 March 1984, including a flock of 16 birds on 17 February. In the same locality Asad Ali and R. Passburg saw Hypocolius in some numbers in 1986 and 1989. Roberts saw 25 to 30 birds going to roost in pairs at Zangi Nawar lake in the Chagai desert on 1 May 1985; they behaved excitedly and called continuously.

J.K.T. studied the Grey Hypocolius for five seasons at Fulay village, Kutch (Fig. 1), whilst working on first the Bird Migration Study Project (1990-1991) and subsequently the Grassland Ecology Project (1992 onwards).

Situated between the villages of Chhari and Fulay, in the vicinity of the latter village, is a 5 km^2 patch of thin scrub jungle, most of which lies in a dry riverbed starting from near the former village. This was the main study area of the various activities of the Grey Hypocolius. S.N.V. (accompanied by some members of the Pelican Nature Club) was the first person to see this species in Kutch. This was a female in a *Salvadora persica* bush near Chhari-