

BirdLife International Vietnam Programme,
the Institute of Ecology and Biological Resources, and
Tay Ninh Provincial Department of Science, Technology and the Environment
with financial support from Danida

**A Rapid Bird and Mammal Survey of
Lo Go Sa Mat Special-use Forest and
Chang Riec Protection Forest,
Tay Ninh Province, Vietnam**

**Andrew W. Tordoff,
Pham Trong Anh,
Le Mang Hung,
Nguyen Dinh Xuan
and
Tran Khac Phuc**

This report is a technical output of the Danida-funded project *Improved conservation planning through institutional strengthening in Cambodia, Laos and Vietnam*

Hanoi, March 2002

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Acknowledgements

This report has been produced as a result of work funded by Danida, as part of the project *Improved Conservation Planning through Institutional Strengthening in Cambodia, Laos and Vietnam*. The BirdLife International Vietnam Programme and the Institute of Ecology and Biological Resources would like to take this opportunity to thank Danida and the Royal Danish Embassy, Hanoi for their support.

The authors would like to thank Mr Huynh Van Nghiep, Director, Mr Le Hoang, Vice-Director, and Ms Le Thi Han, Vice-Director of Tay Ninh Provincial Department of Science, Technology and the Environment. The authors would also like to thank Mr Tro, Director, Mr Tung, Vice-Director and Mr Son of Lo Lo Sa Mat Special-use Forest, and Mr Duong Van Tu of Khu An Ninh Trung Uong Cuc Historical Site for their help during the field survey.

The authors would also like to express their thanks to Dr Tran Triet of the Faculty of Biology, Vietnam National University, Ho Chi Minh City, for his support and advice.

Finally, the authors wish to thank Prof Dr Vu Quang Con, Dr Le Xuan Canh and Dr Nguyen Cu of the Institute of Ecology and Biological Resources for their strong support, which resulted in a successful field survey.

1. Introduction

This report presents the results of a rapid bird and mammal survey of Lo Go Sa Mat Special-use Forest and Chang Riec Protection Forest, Tay Ninh province, Vietnam, conducted by the BirdLife International Vietnam Programme and the Institute of Ecology and Biological Resources (IEBR), Hanoi, in cooperation with Tay Ninh Provincial Department of Science, Technology and the Environment (DOSTE), as part of the Danida-funded project *Improved conservation planning through institutional strengthening in Cambodia, Laos and Vietnam*.

1.1 Aim and objectives

The aim of the rapid bird and mammal survey was to assess whether one or both of Lo Go Sa Mat Special-use Forest and Chang Riec Protection Forest qualified as Important Bird Areas (IBAs). IBAs are areas of international importance for bird conservation that meet internationally recognised criteria. IBAs are not only important for birds, but typically support a wide range of other important animal and plant species.

The specific objectives of the survey were to:

- collect data on the status and distribution of bird species at Lo Go Sa Mat and Chang Riec, particularly globally threatened and restricted-range species;
- collect data on the status and distribution of mammal species at Lo Go Sa Mat and Chang Riec, particularly globally threatened species;
- evaluate threats to biodiversity and opportunities for conservation at Lo Go Sa Mat and Chang Riec.

1.2 Study area

The study area comprised two separate sites: Lo Go Sa Mat Special-use Forest and Chang Riec Protection Forest. Both sites are situated in Tan Bien district in northern Tay Ninh province, along the international border with Cambodia.

1.3 Itinerary

8-10 October 2001	Travelled to Ho Chi Minh City
11-19 October 2001	Surveyed Lo Go Sa Mat
20-22 October 2001	Surveyed Chang Riec
23 October 2001	Travelled to Tay Ninh town
24-27 October 2001	Travelled to Hanoi

2. Site descriptions

2.1 Lo Go Sa Mat

Lo Go Sa Mat Special-use Forest (11°19' to 11°40'N by 105°49' to 105°59'E) is located in Tan Binh, Tan Lap and Hoa Hiep communes, Tan Bien district, Tay Ninh province. Lo Go Sa Mat was included on Decision No. 194/CT of the Chairman of the Council of Ministers, dated 9 August 1986, which decreed the establishment of a 10,000 ha nature reserve at the site (MARD 1997). However, an investment plan for the site, prepared by Ho Chi Minh City Sub-FIPI in 1996 and approved by the Ministry of Agriculture and Rural Development (MARD) in 1997, proposed establishing a 16,754 ha cultural and historical site (BirdLife International and FIPI 2001). The status of the site is, therefore, unclear: it was decreed as a nature reserve but is currently managed as a cultural and historical site. Consequently, for the purposes of this report, Lo Go Sa Mat is referred to as a special-use forest, with the precise special-use forest category not stated.

A management board for Lo Go Sa Mat Special-use Forest was established in 1997, under the management of Tay Ninh Provincial Department of Agriculture and Rural Development (DARD). The management board currently has 60 members of staff, based at 14 guard stations.

To the south and east, the special-use forest is bordered by agriculture and human settlement. To the north and west, the special-use forest boundary follows the border road, which runs roughly parallel to the international border, about 1 km into Vietnam. The small strip of land between the special-use forest boundary and the international border is under the management of the border army.

Lo Go Sa Mat supports a mosaic of lowland semi-deciduous forest and lowland deciduous forest (which, because of poor soil and hydrology, is stunted and without a closed canopy), with smaller patches of lowland evergreen forest along watercourses and *Melaleuca* forest (BirdLife International and FIPI 2001). The site also supports a variety of wetland habitats, including both seasonally inundated grasslands (locally called *trang*), and permanent lakes (locally called *bau*). Other wetland habitats at the site include seasonally flooded forest, and permanent watercourses.

Two of the most extensive wetlands at the site are Trang Ta Not (11°39'N 105°51'E) and Trang Tan Thanh (11°40'N 105°53'E), both of which are located in the north of the special-use forest, adjacent to the international border. Both wetlands are about 250 ha in area, and comprise a mixture of reed and sedge beds, with smaller areas of stunted *Melaleuca* sp. (presumably occurring naturally). Reportedly, both wetlands are inundated for about five months per year, from September/October to January/February. During the period of the survey, they were inundated to an average depth of around 50 cm.

Significant areas of both Trang Ta Not and Trang Tan Thanh lie outside of the special-use forest, in the area managed by the border army. Trang Ta Not is bisected by both the border road and a recently constructed road, built with the intention of creating a new human settlement in the wetland. In 2000, construction began on a canal to drain part of the wetland, with the intention of converting it into agricultural land. In mid-2001, following a re-evaluation of the ecological values of the site by the provincial authorities, the canal construction was halted. However, the part of the canal that was completed has not yet been filled in, and appears to be affecting the hydrology of the wetland, by increasing the rate of drainage. In addition, the border army plan to convert the part of Trang Ta Not that lies outside of the special-use forest into fish ponds. Trang Tan Thanh, which is also bisected by the border road, is threatened by agricultural encroachment, both by Cambodian villagers and by Vietnamese militia units stationed in the area.

Other significant wetlands visited during the survey included Bau Dung Lon (11°38'N 105°57'E) and Bau Ba Diet (11°31'N 105°56'E), two permanent lakes, surrounded by an area of seasonally inundated grassland. Bau Dung Lon is 30 ha in area, while the area of Bau Ba Diet is 300 ha. Both of these wetlands, and, presumably, other wetlands not visited during the survey, are threatened by conversion to plantation forest and agriculture.

In addition to the wetlands mentioned above, the survey concentrated on three forest areas. The Da Ha area (11°35'N 105°53'E) is an area of relatively undisturbed semi-evergreen and evergreen forest, situated along the Sa Mat (Da Ha) stream. In this area, a number of large dipterocarp trees showed signs of resin collection. Forest Compartment No. 17 (11°39'N 105°53'E) contains a mosaic of semi-evergreen and seasonally flooded deciduous forest, surrounding Trang Ta Not and Trang Tan Thanh. Forest Compartment No. 25 (11°35'N 105°50'E) supports areas of heavily disturbed semi-evergreen forest in the west of the special-use forest.

Prior to 1993, the site was under the management of Hoa Hiep and Tan Binh Forest Enterprises, which conducted commercial timber extraction throughout the site. In addition, about 10 years ago, illegal timber extraction by local people was widespread, reportedly because the special-use forest boundary was not clearly defined. However, since the border road was built and the special-use forest management board was established, infringements of forest management regulations have reportedly decreased significantly. Indeed, the activities of the management board and the border army appear to be restricting infringements of forest management regulations to a low level. During the survey, around 10 Cambodians per day were observed entering the special use-forest for fishing, grazing cattle and buffaloes, and fuelwood collection, while small numbers of local Vietnamese people were encountered in the forest, engaged in such activities as hunting and fuelwood collection. At current levels, none of these activities are believed to have major impacts on biodiversity at the site.

In recent years, people have settled inside the special-use forest, in Ap Tan Nam village, Tan Binh commune, which is situated along the road between Tan Bien town and the Lo Go border crossing. These people reportedly left the area during past armed conflicts, and are now returning spontaneously to their old land. While, in 2000, the population of this settlement was only 30 households, it had increased to more than 100 households by October 2001 (Mr Tung, Vice-director of Lo Go Sa Mat Special-use Forest, verbally 2001).

During a rapid field survey of Lo Go Sa Mat during December 1999, Le Trong Trai and Tran Hieu Minh (2000) received reports of the continued occurrence of the globally critically endangered Siamese Crocodile *Crocodylus siamensis* in the Vam Co river, which forms the international border with Cambodia, to the west of the special-use forest. However, these reports stated that the species was rare and that only small individuals were ever encountered (Le Trong Trai and Tran Hieu Minh 2000). During the current survey, it was not possible to make a night-time survey of this river because of security issues. However, according to Mr Tung, Vice-director of Lo Go Sa Mat Special-use Forest, more than one year ago, border army soldiers reported to him that Cambodian villagers had captured one crocodile in the Vam Co river, upstream of the special-use forest, inside Cambodia. Mr Tung was not aware of any more recent records of this species.

2.2 Chang Riec

Chang Riec Protection Forest (11°35' to 12°01'N by 106°00' to 106°07'E) is located in Tan Bien district, Tay Ninh province. Prior to 1999, the total area of the protection forest was around 16,000 ha. In that year, however, around 4,000 ha of forest in the south of the protection forest were converted to agriculture, mainly sugarcane. As a result, the total area of the protection forest is now only 11,659 ha, including 6,510 ha of natural forest, 824 ha of forest land managed for natural regeneration, 983 ha of plantation forest and 1,456 ha of new plantations. The principal species used for plantation forestry at the site are *Hopea* sp., *Dipterocarpus obtusifolius* and *Tectona grandis* (Anon. 1999).

The management objectives of Chang Riec Protection Forest are environmental protection and protection of the international border (Anon. 1999). The management board of the protection forest has six members of staff with government salaries and 41 members of staff with salaries covered by forest protection contracts. In addition, the management board has signed forest protection contracts with 341 households in the area. All funding for the management board comes from the national 661 Programme.

As is the case at Lo Go Sa Mat, the protection forest management board only manages the forest to the south of the border road. The area between the border road and the international border, which contains a portion of the largest wetland, is under the management of the border army. There is very little forest on the Cambodian side of the border, as a result of which, Cambodians reportedly cross the border to collect forest products from the Vietnamese side.

The habitats at Chang Riec are broadly similar to those at Lo Go Sa Mat, comprising lowland semi-evergreen and lowland deciduous forest, seasonally inundated grassland, and a range of secondary habitat types. However, the forest at Chang Riec appears to be more heavily disturbed than that at Lo Go Sa Mat, partly as a result of the higher density of roads, facilitating access to most parts of the site, and less strict enforcement of forest management regulations. In addition, there are fewer significant wetlands, and these appear to be more heavily disturbed by human activities.

During the survey, three significant areas of seasonally inundated grassland were visited; on the 1979 series, 1:50,000 scale map produced by the National Measurement and Mapping Agency, these are labelled Trapaeng Ang Khal, Beng Kas Andeth and Trapaeng Thnong. Trapaeng Ang Khal (11°43'N 106°02'E), which is locally called *Trang Ang*, is relatively undisturbed, and has a total area of about 20 ha. Beng Kas Andeth (11°41'N 106°00'E), which is situated adjacent to the international border, is larger, covering about 100 ha. This wetland has been bisected by a road, and a significant part of the portion south of the road has been destroyed by infrastructure development. Trapaeng Thnong (11°44'N 106°05'E), which is about 30 ha in area, is the most heavily disturbed of the three wetlands.

Within Chang Riec Protection Forest, there are two historical sites commemorating the revolutionary government of southern Vietnam, which was based in the area during the Second Indochina War. These sites are under the management of Tay Ninh Provincial Department of Culture and Information. One site is situated within Beng Kas Andeth; the other site is situated close to Trapaeng Thnong. At both sites, infrastructure development has taken place without any environmental safeguards, leading to the loss of significant areas of wetland habitat. Further infrastructure development is planned for both sites, which will undoubtedly lead to further loss of wetland habitat.

Chang Riec is separated from Lo Go Sa Mat by National Highway 22, which links Ho Chi Minh City with the border crossing to Kampong Cham province in Cambodia. For much of its length between Tay Ninh town and the international border crossing, this road is bordered on both sides by human settlement and agriculture. There is, however, a 5 km-long stretch south of the international border along which there is no human settlement; in this area, Chang Riec and Lo Go Sa Mat are separated by a belt of rubber plantation. In the future, it may be possible to convert part of this belt into natural forest, thereby re-establishing a habitat corridor between the two sites. At the present time, however, the natural habitat at the two sites is not contiguous.

3. Birds

3.1 Methods

Birds were surveyed by observation and identification of calls. Each day, surveying took place almost continuously from 06h00 to 18h00, except on 11 October, when only 30 minutes were spent at Trang Ta Not, and on 19 October, when Forest Compartment No. 25 was visited from 06h30 until 11h00. Survey effort alternated between periods of walking quietly and periods of fixed-point observation. At least one fixed-point observation was made at each of the major wetlands visited, with at least two hours spent on this activity in each case.

At Lo Go Sa Mat, data was collected on the relative abundance of different bird species, using a method based on that outlined in MacKinnon and Phillipps (2000). This method involved making a list of the first 10 species recorded (either by observation or by identification of call) then repeating the process to make subsequent lists, each of which included species irrespective of whether or not they had been included on a previous list. In order to generate sufficient data to plot species discovery curves, these 10-species lists were made in two broad habitat categories: wetland habitats and forest habitats. No attempt was made to make separate lists for different forest or wetland habitat types. At Chang Riec, due to the short amount of time available for the survey, 10-species lists were not made, and survey effort focussed simply on compiling a preliminary list of bird species occurring at the site.

At Lo Go Sa Mat, two days were spent surveying each of Trang Ta Not and Trang Tan Thang, one day was spent surveying each of Bau Ba Diet, Bau Dung Lon, Forest Compartment No. 17 and the Da Ha area, and half a day was spent surveying Forest Compartment No. 25. At Chang Riec, one day was spent surveying Trapaeng Ang Khal, half a day was spent surveying each of Beng Kas Andeth and Trapaeng Thnong, and one day was spent surveying a mosaic of lowland semi-evergreen and lowland deciduous forest close to the international border (11°43'N 106°02'E). In addition, at both sites, ad hoc observations were made en route to and from the survey sites.

At each site, a limited number of interviews were conducted with local people deemed, by the survey team, to have a good understanding of the avifauna of the area. Due to the limitations of this technique (see Timmins *et al.* 1999), detailed questions were restricted to the status of large, easily recognisable species, principally hornbills, galliformes and large waterbirds.

3.2 Results

Lo Go Sa Mat. A total of 132 bird species were recorded during the survey, including two species (Great Hornbill *Buceros bicornis* and Sarus Crane *Grus antigone*) that were provisionally recorded on the basis of interview information (Appendix 1). During previous surveys of Lo Go Sa Mat by Le Trong Trai and Tran Hieu Minh (2000), Jonathan Eames (*in litt.* 2001) and Andrei Zinoviev (*in litt.* 2002), an additional 45 bird species not recorded during this survey were recorded (Appendix 1). Therefore, the total number of species recorded at Lo Go Sa Mat to date stands at 177.

The records of Le Trong Trai and Tran Hieu Minh (2000) include four species (Mountain Imperial Pigeon *Ducula badia*, White-throated Fantail *Rhipidura albicollis*, Crested Myna *Acridotheres cristatellus* and Puff-throated Bulbul *Alophoixus pallidus*) that are not listed as occurring in Cochinchina by Robson (2000). The occurrence of these species at the site should be considered as provisional, particularly as two species (Mountain Imperial Pigeon and Puff-throated Bulbul) are very similar to species confirmed to be present during the current survey (Green Imperial Pigeon *D. aenea* and Ochraceous Bulbul *A. ochraceus*), and as the possibility of misidentifications cannot be ruled out (Appendix 1).

Of the 171 species confirmed to occur at Lo Go Sa Mat, 154 species (90% of the total) have also been recorded at Cat Tien National Park (Polet and Pham Huu Khanh 1999), the only significant terrestrial forest site in Cochinchina to have been relatively comprehensively surveyed ornithologically. This indicates a high degree of similarity between the avifaunas of the two sites, which is to be expected

given that Cat Tien supports most of the habitats found at Lo Go Sa Mat. The exception is lowland deciduous forest, which only occurs to a significant extent at Lo Go Sa Mat; nine of the species recorded only at Lo Go Sa Mat (Alexandrine Parakeet *Psittacula eupatria*, Blossom-headed Parakeet *P. roseata*, Spotted Owllet *Athene brama*, Yellow-footed Green Pigeon *Treron phoenicoptera*, Rufous-winged Buzzard *Butastur liventer* Red-billed Blue Magpie *Urocissa erythrorhyncha*, Rufous Treepie *Dendrocitta vagabunda*, Small Minivet *Pericrocotus cinnamomeus* and Purple Sunbird *Nectarinia asiatica*) are characteristic of this more open habitat type (Robson 2000).

During the survey, a total of 88 species were recorded in forest habitats, on a total of 30 lists (Figure 1). The most commonly recorded species in these habitats were Green-eared Barbet *Megalaima faiostricta* (included on 15 lists, or 50% of the total), White-crested Laughingthrush *Garrulax leucolophus* (14 lists, 47%), Spotted Dove *Streptopelia chinensis* (13 lists, 43%), Ashy Drongo *Dicrurus leucophaeus* (11 lists, 37%), Greater Racket-tailed Drongo *D. paradiseus* (10 lists, 33%), Black-naped Monarch *Hypothymis azurea* (10 lists, 33%), Red-breasted Parakeet *Psittacula alexandri* (nine lists, 30%) and Thick-billed Green Pigeon *Treron curvirostra* (eight lists, 27%).

A number of species recorded in forest habitats, including Oriental Pied Hornbill *Anthracoceros albirostris*, Alexandrine Parakeet, Green Imperial Pigeon and three species of green pigeon *Treron*, were notably more abundant at Lo Go Sa Mat than at many other protected areas in Vietnam. As all these species are particularly susceptible to hunting, this is an indication that levels of hunting at Lo Go Sa Mat, at least of bird species, are relatively low.

During the survey, a total of 94 species were recorded in wetland habitats, on a total of 38 lists (Figure 1). The total number of species recorded in wetland habitats is higher than that for forest habitats, partly because the figure includes a number of forest edge species. The most commonly recorded species in wetland habitats were Spotted Dove (included on 32 lists, or 84% of the total), Barn Swallow *Hirundo rustica* (22 lists, 58%), Black Drongo *Dicrurus macrocercus* (20 lists, 53%), White-throated Kingfisher *Halcyon smyrnensis* (17 lists, 45%), pond heron species *Ardeola* sp. (16 lists, 42%), Cattle Egret *Bubulcus ibis* (13 lists, 34%) and Indian Roller *Coracias bengalensis* (13 lists, 34%).

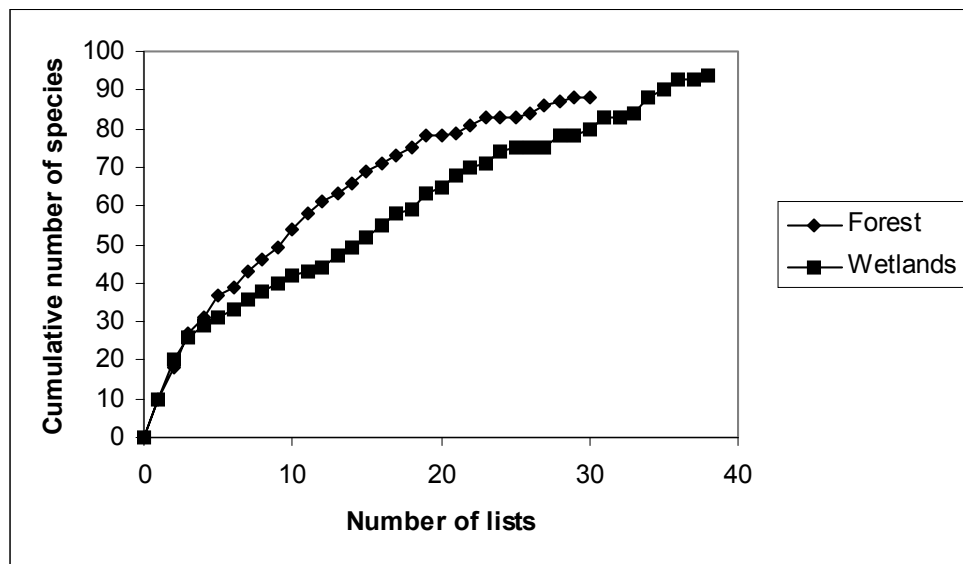


Figure 1: Bird species discovery curves for forest and wetland habitats at Lo Go Sa Mat

Sixteen species of waterbird were recorded at Lo Go Sa Mat during the survey. The most abundant waterbird species recorded were Asian Openbill *Anastomus oscitans* (a maximum count of 120 at Trang Ta Not on 15 October 2001), pond heron species (a maximum count of 39 at Trang Tan Thanh on 13 October 2001), Cattle Egret (a maximum count of 24 at Trang Tan Thanh on 13 October 2001) and Lesser Whistling Duck *Dendrocygna javanica* (a maximum count of 22 at Trang Ta Not on 13 October 2001).

Of the 177 species recorded at Lo Go Sa Mat to date, four species are listed in the *2000 IUCN Red List of Threatened Species* (IUCN 2000) as globally threatened or near-threatened, and eight species are listed in the *Red Data Book of Vietnam* (Anon. 1992). Furthermore, Lo Go Sa Mat supports two (Germain's Peacock Pheasant *Polyplectron germaini* and Grey-faced Tit Babbler *Macronous kelleyi*) of the three restricted-range species that define the South Vietnamese Lowlands Endemic Bird Area (EBA) (Stattersfield *et al.* 1998). Therefore, Lo Go Sa Mat qualifies for inclusion within this EBA.

Of the eight species listed in the *2000 IUCN Red List of Threatened Species* (IUCN 2000) or the *Red Data Book of Vietnam* (Anon. 1992) recorded at Lo Go Sa Mat to date, four are characteristic of forest habitats (Siamese Fireback *Lophura diardi*, Germain's Peacock Pheasant, Great Hornbill and Barbellied Pitta *Pitta elliotii*) and four are characteristic of wetland habitats (Stork-billed Kingfisher *Halcyon capensis*, Sarus Crane, Asian Openbill and Woolly-necked Stork *Ciconia episcopus*). On the basis of available information, therefore, the wetland habitats at Lo Go Sa Mat should be considered to be at least as important for bird conservation as the forest habitats.

Chang Riec. A total of 75 species were recorded at Chang Riec during the survey. Because of the difference in survey effort between the two sites, however, no conclusions should be drawn from the fact that fewer species were recorded at Chang Riec than at Lo Go Sa Mat. In fact, because the diversity and condition of habitats are similar at the two sites, the overall bird diversity of the two sites should be expected to be similar also. Indeed, only three species recorded at Chang Riec are not known from Lo Go Sa Mat, and this probably reflects the incompleteness of survey coverage at that site, rather than any underlying difference in species composition.

One significant difference between the bird faunas of the two sites that does appear to exist is that a number of the larger, rarer species found at Lo Go Sa Mat appear to no longer occur at Chang Riec. In fact, only one species recorded at Chang Riec is listed in the *Red Data Book of Vietnam* (Anon. 1992) and the *2000 IUCN Red List of Threatened Species* (IUCN 2000).

Based on the information available, the forest habitats at Chang Riec appear to support a rich bird fauna, although a number of key forest birds, including Great Hornbill and Green Peafowl *Pavo muticus*, have reportedly been eradicated as a result of over-hunting. However, a number of hunting-sensitive species are still relatively abundant, for example Oriental Pied Hornbill, Siamese Fireback and Thick-billed Green Pigeon. Providing hunting is controlled, populations of these species are still large enough to recover.

The wetland habitats at Chang Riec are less important for bird conservation than those at Lo Go Sa Mat. Some areas have been converted into agricultural land, while others are threatened by infrastructure development. As a result, the larger, rarer waterbird species that occur at Lo Go Sa Mat do not seem to occur at Chang Riec, although some species may occur at other times of the year. It is important to prevent further loss of wetland habitat at Chang Riec, and to conduct further studies to better understand the conservation importance of these wetlands.

In addition to habitat loss, the most significant threat to bird diversity at Chang Riec is hunting. Due to the high density of roads in the site, most forest areas are easily accessible to hunters. Even though the forest protection department and the border army have the right to control hunting and the responsibility to do so, anti-hunting regulations are not strictly enforced, and hunters operate in the area with apparent impunity. Hunters were encountered frequently during the survey, and, given the level of hunting activity, it is, perhaps, surprising that so many species susceptible to hunting still remain. Hunting, together with disturbance, has probably been responsible for the loss of many of the key species from the area, and, if left unchecked, will lead to the loss of those key species that still remain.

Key species accounts

Siamese Fireback *Lophura diardi*

Lo Go Sa Mat. On 14 October 2001, a single male and three females were observed in semi-evergreen forest in Forest Compartment No. 17.

Chang Riec. On 20 October 2001, a single male was observed in semi-evergreen forest, crossing the road 1.5 km north-east of Beng Kas Andeth.

Germain's Peacock Pheasant *Polyplectron germaini*

Lo Go Sa Mat. At 13h00 on 17 October 2001, a single bird was heard calling in semi-evergreen forest close to Bau Dung Lon. This was the only record of the species made during the survey. Given the fact that the timing of the survey did not coincide with the breeding season of this species, it may be that this shy and secretive species is more common at Lo Go Sa Mat than this single record suggests but was under-recorded because it was calling infrequently. Further studies are required during the breeding season to collect more information on the status and distribution of this species at the site.

[**Great Hornbill** *Buceros bicornis*]

Lo Go Sa Mat. Forest guards at Lo Go Sa Mat reported the occurrence of this species, which they consistently distinguished from other hornbill species. They reported that the species was much rarer than Oriental Pied Hornbill and that it was restricted to remote areas of the special-use forest. Because the survey team was not granted permission to stay overnight in the forest, it was not possible to visit these areas and confirm the presence of the species.

Stork-billed Kingfisher *Halcyon capensis*

Lo Go Sa Mat. Single Stork-billed Kingfishers were observed at Trang Tan Thanh on 13 and 15 October 2001, and at Bau Dung Lon on 17 October 2001.

[**Sarus Crane** *Grus antigone*]

Lo Go Sa Mat. Border army soldiers based close to Trang Ta Not reported that they observed five Sarus Cranes at this wetland in 1999. On 16 April 2001, a Sarus Crane that had a satellite transmitter fitted at Tram Chim National Park one month earlier was tracked to 11°39'N 105°51'E, coordinates which correspond to Trang Ta Not at Lo Go Sa Mat. According to the satellite tracking data provided by the International Crane Foundation, the bird appeared to stop at Lo Go Sa Mat en route between its non-breeding area at Tram Chim and its breeding area in Ratanakiri province, Cambodia (Dorn Moores *in litt.* 2001). It is not known whether any other birds stopped at Lo Go Sa Mat together with the one with a satellite transmitter fitted.

Eagle species *Aquila* sp.

Lo Go Sa Mat. On 15 October 2001, a single *Aquila* eagle was seen flying over an area of flooded deciduous forest in Forest Compartment No. 17. The bird was observed for a period of about one minute from underneath the forest canopy, as it glided slowly. On the basis of size and wing shape, the bird was unmistakably an *Aquila* eagle. However, because of the poor viewing conditions, identification to species level was not possible. On the basis of known distributions, Greater Spotted Eagle *A. clanga* and Imperial Eagle *A. heliaca* (both of which are globally threatened) would seem the most likely candidates, although the possibility that the bird was a Steppe Eagle *A. nipalensis* or Tawny Eagle *A. rapax* (both of which are vagrants to South-East Asia) cannot be ruled out. Further speculation about the identity of the bird would be unwise.

Asian Openbill *Anastomus oscitans*

Lo Go Sa Mat. Between 17h15 and 17h45 on 11 October 2001, at least 30 Asian Openbills were observed coming to roost in a single tree on the edge of Trang Ta Not. Also at Trang Ta Not, on 12 October 2001, 70 birds were observed soaring over the wetland at 14h30, five were observed soaring at 15h40, 19 were observed soaring at 16h00, and 27 were observed at roost at 17h30; it is not clear whether or not all these records refer to separate groups of birds. Between 06h30 and 08h30 on 13 October 2001, 47 birds were observed at Trang Ta Not. Between 06h40 and 08h40 on 14 October

2001, two birds were observed at Trang Tan Thanh. At 17h30 on 15 October 2001, 120 birds were observed roosting in five dipterocarp trees on the edge of Trang Ta Not.

As no Asian Openbills were observed feeding during the survey, it is not clear whether they were feeding inside the special-use forest, in the buffer zone between the special-use forest boundary and the international border, or inside Cambodia.

The remains of a dead Asian Openbill were observed at the headquarters of Lo Go Sa Mat Special-use Forest on 11 October 2001. This bird had reportedly been confiscated from a hunter by management board staff several months earlier.

The only other site in Vietnam known to support Asian Openbill is U Minh Thuong National Park in Kien Giang province, where there is known to be a breeding colony (Safford *et al.* 1998). During a survey of this site in 1999, a maximum of 73 birds were recorded (Buckton *et al.* 1999).

Woolly-necked Stork *Ciconia episcopus*

Lo Go Sa Mat. This species was not recorded during the survey. However, a single Woolly-necked Stork was observed by Jonathan Eames at Trang Ta Not on 30 January 2001 (J. C. Eames *in litt.* 2001).

Bar-bellied Pitta *Pitta elliotii*

Lo Go Sa Mat. On 18 October 2001, at least three birds were heard calling in semi-evergreen forest in the Da Ha area.

Grey-faced Tit Babbler *Macronous kelleyi*

Lo Go Sa Mat. On 16 October 2001, a single bird was observed in a mixed species feeding flock in semi-evergreen forest to the west of Bau Ba Diet.

Key species not recorded

Orange-necked Partridge *Arborophila davidi*

Lo Go Sa Mat qualifies for inclusion within the South Vietnamese Lowlands EBA, based on the occurrence of Germain's Peacock Pheasant and Grey-faced Tit Babbler. It is, however unlikely that Lo Go Sa Mat supports a population of Orange-necked Partridge, the third restricted-range species that defines this EBA, because the site does not support suitable habitat: broadleaf evergreen forest and semi-evergreen forest, bamboo, and secondary growth, from 140 to 250 m asl (Robson 2000).

Green Peafowl *Pavo muticus*

Mr Duong Van Lung, a member of the management board of the An Ninh Trung Uong Cuc Historical Site, reported that this globally vulnerable species had occurred at Chang Riec as recently as 1994 or 1995 but was now extinct at the site. Management board staff and forest guards at Lo Go Sa Mat also reported that the species no longer occurred in the area.

Bengal Florican *Houbaropsis bengalensis*

There are recent records of this globally vulnerable species from two sites in the Mekong Delta of Vietnam: Tram Chim National Park and the Ha Tien plain (BirdLife International 2001). Both Lo Go Sa Mat and Chang Riec support areas of seasonally inundated grassland, the preferred habitat of this species (Robson 2000), and nothing should be inferred from the fact that this species was not recorded during the survey, as the level of inundation was too high for the species to use these habitats. However, while it is possible that the species occurs during the breeding season from March to October, the naturally low density of this species and relatively small area of available habitat make it unlikely that either site supports a significant population.

White-shouldered Ibis *Pseudibis davisoni*

There are recent records of this globally critically endangered species from the Ha Tien plain and Cat Tien National Park (BirdLife International 2001). While the ecology of this species is poorly

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understood, Lo Go Sa Mat supports similar habitats to those in which the species has been recorded at Cat Tien National Park: wetlands in lowland semi-evergreen forest. As there is currently no site in mainland South-East Asia known to support a viable population of this species, any population found at Lo Go Sa Mat would be of the highest international significance.

Giant Ibis *P. gigantea*

There have been no records of this species from Vietnam since 1931, and it is now believed to be extinct, at least as a breeding bird (BirdLife International 2001). This species still occurs at scattered localities in the northern and eastern plains of Cambodia (BirdLife International 2001), and, while it is unlikely, it is not impossible that non-breeding birds may disperse to Lo Go Sa Mat.

Spot-billed Pelican *Pelecanus philippensis*

There are a number of recent records of this species from wetland areas in southern Vietnam, all of which are presumed to be non-breeding visitors from colonies in Cambodia (BirdLife International 2001). As Lo Go Sa Mat supports suitable habitat for this species, it is possible that it occurs as a visitor. In order to confirm this, it would be necessary to conduct a survey of wetlands at the site during the period from July to September.

Lesser Adjutant *Leptoptilos javanicus*

In southern Vietnam, this species is a rare breeding bird, with a total population believed to be less than 50 birds (BirdLife International 2001). There are only two known colonies: at Cat Tien and U Minh Thuong National Parks (BirdLife International 2001). However, it is possible that Lo Go Sa Mat supports a few pairs of this species, as the site supports suitable habitat.

3.3 Conclusions

Lo Go Sa Mat qualifies as an Important Bird Area (IBA) because it meets the following criteria:

Criterion A1: The site regularly holds significant numbers of a globally threatened species, or other species of global conservation concern.

Given the extent of available habitat at the site, it is probable that Lo Go Sa Mat supports significant populations of Germain's Peacock Pheasant and Siamese Fireback. Two additional globally threatened species, Sarus Crane and Great Hornbill, were provisionally recorded during the survey. Further studies are, however, required to determine whether the site regularly supports significant populations of these species. Furthermore, Lo Go Sa Mat may support significant populations of several other globally threatened species, including the critically endangered White-shouldered Ibis. Again, further studies are required to assess the status of these species at the site.

Criterion A2: The site is known or thought to hold a significant component of a group of species whose breeding distributions define an EBA or secondary EBA.

Lo Go Sa Mat is known to support populations of two of the three restricted-range species that define the South Vietnamese Lowlands EBA (Stattersfield *et al.* 1998): Germain's Peacock Pheasant and Grey-faced Tit Babbler. Lo Go Sa Mat probably does not support the third restricted-range species found in the EBA, Orange-necked Partridge, as the site does not support suitable habitat for this species.

Criterion A3: The site is known or thought to hold a significant component of the group of species whose distributions are largely or wholly confined to one biome.

Ten species recorded at Lo Go Sa Mat are restricted to the Indo-Malayan Tropical Dry Zone Biome: Lineated Barbet *Megalaima lineata*, Blossom-headed Parakeet, Yellow-footed Green Pigeon, Rufous-winged Buzzard, Racket-tailed Treepie *Crypsirina temia*, Small Minivet, Black-collared Starling *Sturnus nigricollis*, Sooty-headed Bulbul *Pycnonotus aurigaster*, Streak-eared Bulbul *P. blanfordi* and Plain-backed Sparrow *Passer flaveolus*.

A further 10 species recorded at Lo Go Sa Mat are restricted to the Indochinese Tropical Moist Forests Biome: Scaly-breasted Partridge *Arborophila chloropus*, Siamese Fireback, Red-vented Barbet *Megalaima lagrandieri*, Green-eared Barbet, Bar-bellied Pitta, Crow-billed Drongo *Dicrurus annectans*, Hainan Blue Flycatcher *Cyornis hainanus*, Vinous-breasted Starling *Sturnus burmannicus*, Stripe-throated Bulbul *Pycnonotus finlaysoni* and Grey-eyed Bulbul *Iole propinqua*.

The occurrence of a significant number of species from each of two different biomes at Lo Go Sa Mat reflects the mosaic of lowland semi-evergreen forest and lowland deciduous forest at the site. The bird fauna contains components characteristic of both habitat types.

4. Mammals

4.1 Methods

Mammals were surveyed by direct observation, by identification of tracks and traces, by identification of remains or captive individuals, and by interviews with local people. Each day, daytime surveys were made between 06h30 and 15h00, and nighttime surveys were made between 19h00 and 23h00. Daytime surveys concentrated on observing diurnal mammals and mammal sign. Nighttime surveys concentrated on observing nocturnal mammals. At Lo Go Sa Mat, mammal surveys were made of the following areas: Trang Ta Not, Bau Ba Diet and the Da Ha area. At Chang Riec, mammal surveys were concentrated along the border road between the Sa Mat and Chang Riec border crossings, and around Bridge 15 forest guard station (11°41'N 106°00'E).

At both Lo Go Sa Mat and Chang Riec, interviews were made with local people. The information provided by the interviewees was supported by identification of hunting trophies and captive mammals.

List of interviewees

Lo Go Sa Mat

1. Mr Huynh Tan Dat, Da Ha forest guard station
2. Mr Nguyen Van Than, Da Ha forest guard station
3. Mr Lam Van Tam, Da Ha forest guard station
4. Mr Truong Van Chung, Da Ha forest guard station
5. Mr Nguyen Van Chinh, Tan Binh commune
6. Mr Luu Van Tai, Tan Binh commune
7. Mr Nguyen Van Nhat, Tan Binh commune
8. Mr Luong Van Da, Hoa Hiep commune
9. Mr Luong Van La, Hoa Hiep commune

Chang Riec

1. Mr Cao La Kham, Bridge 15 forest guard station
2. Mr Duong Van Lung, management board of the An Ninh Trung Uong Cuc Historical Site
3. Mr Le Van Tho, Tan Lap commune

4.2 Results

A total of 34 species, in 18 families and seven orders, were recorded during the survey (Appendix 2). Of these species, 10 are listed in the *Red Data Book of Vietnam* (Anon. 1992) and eight are listed in the *2000 IUCN Red List of Threatened Species* (IUCN 2000) (Table 1).

According to local people who had lived in the area for a long period, prior to the 1970s, Lo Go Sa Mat formed part of a very large block of forest, and supported a very rich and abundant mammal fauna. In this period, large mammals, such as Tiger *Panthera tigris*, Leopard *P. pardus*, bears *Ursus* spp. and Sambar *Cervus unicolor*, were very common in the area. As a result of extensive habitat loss and uncontrolled hunting, however, Tiger, Leopard, gibbon *Hylobates* sp. and Dhole *Cuon alpinus* have become extinct in the area, and Sambar and Sun Bear *Ursus malayanus* are now both extremely rare.

Table 1: Mammal species recorded during the survey listed in the Red Data Book of Vietnam or the 2000 IUCN List of Threatened Species

Species	Anon. 1992	IUCN 2000
Sunda Colugo <i>Cynocephalus variegatus</i>	R	
Slow Loris <i>Nycticebus coucang</i>	V	DD
Lesser Slow Loris <i>N. pygmaeus</i>	V	VU
Pig-tailed Macaque <i>Macaca nemestrina</i>	V	VU
Crab-eating Macaque <i>M. fascicularis</i>		NT
Silvered Leaf Monkey <i>Semnopithecus cristatus</i>		DD
'Black-shanked' Douc Langur <i>Pygathrix nemaesus nigripes</i>	V	EN
Sun Bear <i>Ursus malayanus</i>	E	DD
Large-toothed Ferret-badger <i>Melogale personata</i>	R	
Jungle Cat <i>Felis chaus</i>	E	
Red Giant Flying Squirrel <i>Petaurista philippensis</i>	R	
Particoloured Flying Squirrel <i>Hylopetes alboniger</i>	R	EN

Notes: E = Endangered; V = Vulnerable; R = Rare as per Anon. (1992); EN = Endangered; VU = Vulnerable; NT = Near Threatened; DD = Data Deficient as per IUCN (2000).

Since the establishment of the special-use forest management board, further loss of forest habitat at Lo Go Sa Mat has largely ceased. However, while hunting pressure has reportedly reduced since the establishment of the management board, it has yet to be reduced to levels where it no longer poses a threat to mammal populations. Evidence of continued hunting at Lo Go Sa Mat, with both guns and snares, was encountered throughout the survey. For instance, on 17 October 2001, a group of hunters with a snared Lesser Malay Mousedeer *Tragulus javanicus* was encountered in the forest close to Bau Dung Lon.

The situation at Chang Riec is significantly worse than at Lo Go Sa Mat. Hunters seem to have unrestricted access to the site, as evidenced by the fact that several groups of hunters were observed operating during the daytime on each day of the survey. At both sites, the problem of hunting is compounded by the flat topography and good road access to most forest areas.

Key species accounts

Lesser Slow Loris *Nycticebus pygmaeus*

Lo Go Sa Mat. On 18 October 2001, a group of hunters carrying guns was encountered leaving the Da Ha area. Later on the same day, a freshly killed Lesser Slow Loris was found on a forest trail in this area. In addition, a captive individual was observed in a local person's house.

Pig-tailed Macaque *Macaca nemestrina*

Lo Go Sa Mat. On 18 October 2001, a group of around 20 individuals was observed in the Da Ha area (N 11 34 154 E105 52 751). In addition, a captive individual was observed at the headquarters of the special-use forest management board.

Crab-eating Macaque *M. fascicularis*.

Lo Go Sa Mat. A captive individual was observed in a local person's house.

'Black-shanked' Douc Langur *Pygathrix nemaesus nigripes*

Lo Go Sa Mat. Forest guards reported the occurrence of this species in the Da Ha area.

Chang Riec. Local people reported the presence of this species at the site.

Silvered Leaf Monkey *Semnopithecus cristatus*

Lo Go Sa Mat. Local people reported the presence of this species at the site.

Sun Bear *Ursus malayanus*

Chang Riec. The skin of a Sun Bear reportedly killed four years earlier in Chang Riec Protection Forest was observed in the Sa Mat border army station. No more recent first-hand reports of this

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species were received from local people. It is undoubtedly very rare at both Chang Riec and Lo Go Sa Mat and may already be extinct at the former site.

Jungle Cat *Felis chaus*

Lo Go Sa Mat. Local people reported the occurrence of this species at the site. This species has a very limited distribution in Vietnam, with the only historical records being from Tay Ninh province (Dang Huy Huynh *et al.* 1994).

Particoloured Flying Squirrel *Hylopetes alboniger*

Lo Go Sa Mat. Two captive Particoloured Flying Squirrels, reportedly captured in Lo Go Sa Mat, were observed in a house in Hoa Hiep commune.

4.3 Conclusions

Both Lo Go Sa Mat and Chang Riec support sufficient areas of suitable habitat to support viable populations of a number of mammal species of conservation concern, including Lesser Slow Loris, Pig-tailed Macaque, 'Black-shanked' Douc Langur and Particoloured Flying Squirrel. As a result of continued hunting pressure at both sites, however, populations of these species are undoubtedly depressed well below the carrying capacity of these sites. At Chang Riec in particular, hunting threatens to eradicate the remaining populations of key mammal species.

5. Recommendations

5.1 Lo Go Sa Mat

1. Although the level of hunting at Lo Go Sa Mat appears to be low relative to that at Chang Riec, most of the key mammal and birds species recorded at the site are highly susceptible to this threat. Therefore, the present activities of the special-use forest management board to control hunting with guns, catapults and snares should be maintained and strengthened.
2. The wetlands at Lo Go Sa Mat are very important for bird conservation, as they support a number of key bird species not found in other habitats at the site. These wetlands also have economic values, as they control flooding, release water into river systems during the dry season, provide supplies of fish and other resources for local communities, and have high potential for ecotourism. Wetlands are also the most fragile habitats at Lo Go Sa Mat, because they are highly susceptible to conversion to agriculture, planting of trees, or changes in the water regime following the construction of roads and canals. Consequently, all such activities should be prohibited within wetland areas at the site.
3. A number of important wetland areas currently lie outside of Lo Go Sa Mat Special-use Forest, between the special-use forest boundary and the international border. These areas, which are under the management of the border army, are threatened by conversion to agriculture and fishponds. Either the management responsibility for these wetlands should be transferred to the special-use forest management board, or safeguards should be introduced to prevent their conversion to other land-uses.
4. The capacity of the special-use forest management board to manage wetland resources should be increased through a programme of classroom-based and hands-on training in wetland management and ecological monitoring, supported by provision of key items of equipment and study visits to sites where effective wetland management practices have been implemented, such as Cat Tien National Park.
5. Without an appreciation of the biodiversity and socio-economic values of Lo Go Sa Mat among stakeholders at all levels, there is a risk that development visions inconsistent with biodiversity conservation, such as human settlement and conversion to agriculture, will be pursued at the site. Consequently, awareness of the biodiversity and socio-economic values of the site should be raised among all stakeholders.
6. Lo Go Sa Mat Special-use Forest is currently managed as a cultural and historical site, a designation that does not provide for adequate protection of the biodiversity values of the site. Because of the high biodiversity, socio-economic and historical values, high ecotourism potential, and good accessibility of Lo Go Sa Mat, a more appropriate special-use forest designation would be that of national park. The provincial authorities should, therefore, prepare a national park investment plan for submission to the Ministry of Agriculture and Rural Development. Technical support for the preparation of this investment plan could be provided by one or more of the following organisations: Ho Chi Minh City Forest Inventory and Planning Sub-Institute, the BirdLife International Vietnam Programme, the Institute of Ecology and Biological Resources, and the College of Natural Sciences at Vietnam National University, Ho Chi Minh City.
7. Further bird survey work at Lo Go Sa Mat should concentrate on wetland habitats, as these habitats may support a number of key species not yet recorded at the site, including Spot-billed Pelican, White-shouldered Ibis and Lesser Adjutant. Further survey work in forest habitats is unlikely to reveal a significant number of additional key species but may confirm the presence of Great Hornbill, and would allow the status and distribution of Germain's Peacock Pheasant to be assessed.

8. Further surveys are required to determine the status and distribution of key mammal species at the site, particularly 'Black-shanked' Douc Langur, Silvered Leaf Monkey, Jungle Cat and Particoloured Flying Squirrel. If the site is found to support viable populations of any of these species, appropriate conservation actions should be taken, including awareness raising activities, and strengthening enforcement of anti-hunting regulations.

5.2 Chang Riec

1. In the short term, hunting is the biggest threat to animal populations at Chang Riec, particularly those of primates, Siamese Fireback and Oriental Pied Hornbill. Therefore, measures to control hunting, such as conservation awareness activities and enforcement of forest management regulations, should be introduced immediately.
2. In the long term, habitat degradation and loss are the biggest threats to biodiversity at Chang Riec. These threats are particularly significant for species dependent on wetland habitats, which are the most susceptible to disturbance. Consequently, all key wetland areas at the site should be inventoried, mapped and afforded appropriate management status.
3. Due to the heavily disturbed nature of the habitats and the high levels of hunting, coupled with the relatively small area of the site, Chang Riec may not be an appropriate site for special-use forest status. However, with stronger enforcement of forest management regulations, it would be possible to maintain the biodiversity values of the site, without changing its management status. To this end, no further infrastructure development should take place at the site without an independent environmental impact assessment.

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Appendix 1: List of bird species recorded at Lo Go Sa Mat Special-use Forest and Chang Riec Protection Forest

No.	Common Name	Order, Family, Genus and Species	Lo Go Sa Mat	Chang Riec	Notes		
					1	2	3
		Galliformes					
		Phasianidae					
1	Chinese Francolin	<i>Francolinus pintadeanus</i>	1,3,4	1			
2	Scaly-breasted Partridge	<i>Arborophila chloropus</i>	1,3	1			
3	Red Junglefowl	<i>Gallus gallus</i>	1,2,3,4	1			
4	Siamese Fireback	<i>Lophura diardi</i>	1,4	1	NT	T	
5	Germain's Peacock Pheasant	<i>Polyplectron germaini</i>	1		VU	T	RRS
		Anseriformes					
		Dendrocygnidae					
6	Lesser Whistling-duck	<i>Dendrocygna javanica</i>	1	1			
		Turniciformes					
		Turnicidae					
7	Barred Buttonquail	<i>Turnix suscitator</i>	3,4	1			
		Piciformes					
		Picidae					
8	Grey-capped Pygmy Woodpecker	<i>Dendrocopos canicapillus</i>	1,4				
9	White-bellied Woodpecker	<i>Dryocopus javensis</i>	4	1			
10	Greater Yellownape	<i>Picus flavinucha</i>	2,3				
11	Laced Woodpecker	<i>P. vittatus</i>	4				
12	Common Flameback	<i>Dinopium javanense</i>	1,4				
13	Greater Flameback	<i>Chrysocolaptes lucidus</i>	1,4				
14	Bay Woodpecker	<i>Blythipicus pyrrhotis</i>	3				
15	Heart-spotted Woodpecker	<i>Hemicircus canente</i>	1				
		Megalaimidae					
16	Red-vented Barbet	<i>Megalaima lagrandieri</i>	4				
17	Lineated Barbet	<i>M. lineata</i>	1,2,4	1			
18	Green-eared Barbet	<i>M. faiostricta</i>	1,2,3,4	1			
19	Blue-eared Barbet	<i>M. australis</i>	1,4				
20	Coppersmith Barbet	<i>M. haemacephala</i>	1,2				
		Bucerotiformes					
		Bucerotidae					
21	Oriental Pied Hornbill	<i>Anthracoceros albirostris</i>	1,2,3,4	1			
22	[Great Hornbill]	[<i>Buceros bicornis</i>]	5		NT	T	
		Upupiformes					
		Upupidae					
23	Common Hoopoe	<i>Upupa epops</i>	1,4				
		Trogoniformes					
		Trogonidae					
24	Orange-breasted Trogon	<i>Harpactes oreskios</i>	1				
		Coraciiformes					
		Coraciidae					
25	Indian Roller	<i>Coracias benghalensis</i>	1,2,4	1			
26	Dollarbird	<i>Eurystomus orientalis</i>	1,2,4	1			
		Alcedinidae					
27	Common Kingfisher	<i>Alcedo atthis</i>	1,3	1			

No.	Common Name	Order, Family, Genus and Species	Lo Go Sa Mat	Chang Riec	Notes		
					1	2	3
28	Oriental Dwarf Kingfisher	<i>Ceyx erithacus</i>	1				
		Halcyonidae					
29	Banded Kingfisher	<i>Lacedo pulchella</i>	1,4				
30	Stork-billed Kingfisher	<i>Halcyon capensis</i>	1			T	
31	White-throated Kingfisher	<i>H. smyrnensis</i>	1,3,4	1			
32	Black-capped Kingfisher	<i>H. pileata</i>	1,3				
		Cerylidae					
33	Pied Kingfisher	<i>Ceryle rudis</i>	3				
		Meropidae					
34	Blue-bearded Bee-eater	<i>Nyctornis athertoni</i>	1,4				
35	Green Bee-eater	<i>Merops orientalis</i>	1	1			
		Cuculiformes					
		Cuculidae					
36	Plaintive Cuckoo	<i>Cacomantis merulinus</i>	4				
37	Asian Koel	<i>Eudynamys scolopacea</i>	2,3				
38	Green-billed Malkoha	<i>Phaenicophaeus tristis</i>	1,3,4	1			
		Centropodidae					
39	Greater Coucal	<i>Centropus sinensis</i>	1,2,3,4	1			
40	Lesser Coucal	<i>C. bengalensis</i>	1,3	1			
		Psittaciformes					
		Psittacidae					
41	Vernal Hanging Parrot	<i>Loriculus vernalis</i>	1,4	1			
42	Alexandrine Parakeet	<i>Psittacula eupatria</i>	1,2				
43	Blossom-headed Parakeet	<i>P. roseata</i>	1,4				
44	Red-breasted Parakeet	<i>P. alexandri</i>	1,2,3,4	1			
		Apodiformes					
		Apodidae					
45	Brown-backed Needletail	<i>Hirundapus giganteus</i>	1	1			
46	Asian Palm Swift	<i>Cypsiurus balasiensis</i>	1,3,4	1			
47	Fork-tailed Swift	<i>Apus pacificus</i>	3				
		Hemiprocnidae					
48	Crested Treeswift	<i>Hemiprogne coronata</i>	2	1			
		Strigiformes					
		Strigidae					
49	Asian Barred Owlet	<i>Glaucidium cuculoides</i>	1,2,4	1			
50	Spotted Owlet	<i>Athene brama</i>	2				
51	Brown Hawk Owl	<i>Ninox scutulata</i>	4				
		Eurostopodidae					
52	Great Eared Nightjar	<i>Eurystopodus macrotis</i>	4				
		Caprimulgidae					
53	Large-tailed Nightjar	<i>Caprimulgus macrurus</i>	1	1			
		Columbiformes					
		Columbidae					
54	Spotted Dove	<i>Streptopelia chinensis</i>	1,2,3,4	1			
55	Red-collared Dove	<i>S. tranquebarica</i>	1,4				
56	Emerald Dove	<i>Chalcophaps indica</i>	2,3,4	1			
57	Pink-necked Green Pigeon	<i>Treron vernans</i>	4				
58	Orange-breasted Green Pigeon	<i>T. bicincta</i>	1				
59	Pompadour Green Pigeon	<i>T. pompadora</i>	4				

No.	Common Name	Order, Family, Genus and Species	Lo Go Sa Mat	Chang Riec	Notes		
					1	2	3
60	Thick-billed Green Pigeon	<i>T. curvirostra</i>	1,3,4	1			
61	Yellow-footed Green Pigeon	<i>T. phoenicoptera</i>	1				
62	Green Imperial Pigeon	<i>Ducula aenea</i>	1,2,4				
63	[Mountain Imperial Pigeon]	[<i>D. badia</i>]	3				
		Gruiformes					
		Gruidae					
64	[Sarus Crane]	[<i>Grus antigone</i>]	5		VU	V	
		Rallidae					
65	Red-legged Crane	<i>Rallina fasciata</i>	1				
66	White-breasted Waterhen	<i>Amaurornis phoenicurus</i>	1,4				
67	Watercock	<i>Gallicrex cinerea</i>	1				
		Ciconiiformes					
		Scolopacidae					
68	Pintail Snipe	<i>Gallinago stenura</i>	1				
		Charadriidae					
69	Grey-headed Lapwing	<i>Vanellus cinereus</i>	1				
70	Red-wattled Lapwing	<i>V. indicus</i>	1,4				
		Glareolidae					
71	Oriental Pratincole	<i>Glareola maldivarum</i>	1,4				
		Accipitridae					
72	Osprey	<i>Pandion haliaetus</i>	1,3				
73	Black Baza	<i>Aviceda leuphotes</i>		1			
74	Oriental Honey Buzzard	<i>Pernis ptilorhynchus</i>	1,4	1			
75	Black-shouldered Kite	<i>Elanus caeruleus</i>	1,3,4	1			
76	Brahminy Kite	<i>Haliastur indus</i>	3				
77	Crested Serpent Eagle	<i>Spilornis cheela</i>	1,3,4				
78	Eurasian Marsh Harrier	<i>Circus aeruginosus</i>	1	1			
79	Crested Goshawk	<i>Accipiter trivirgatus</i>		1			
80	Shikra	<i>A. badius</i>	1,2,3,4	1			
81	Japanese Sparrowhawk	<i>A. gularis</i>	4				
82	Rufous-winged Buzzard	<i>Butastur liventer</i>	1,4				
83	Eagle species	<i>Aquila</i> sp.	1				
84	Changeable Hawk Eagle	<i>Spizaetus cirrhatus</i>	1,4				
		Podicipedidae					
85	Little Grebe	<i>Tachybaptus ruficollis</i>		1			
		Ardeidae					
86	Little Egret	<i>Egretta garzetta</i>	1,3	1			
87	Grey Heron	<i>Ardea cinerea</i>	1,3				
88	Purple Heron	<i>A. purpurea</i>	1,2,3				
89	Cattle Egret	<i>Bubulcus ibis</i>	1,3,4				
90	Pond heron species	<i>Ardeola</i> sp.	1,2,3,4	1			
91	Black-crowned Night Heron	<i>Nycticorax nycticorax</i>	3				
92	Yellow Bittern	<i>Ixobrychus sinensis</i>	1				
93	Black Bittern	<i>Dupetor flavicollis</i>	1				
		Ciconiidae					
94	Asian Openbill	<i>Anastomus oscitans</i>	1			R	
95	Woolly-necked Stork	<i>Ciconia episcopus</i>	2			R	

No.	Common Name	Order, Family, Genus and Species	Lo Go Sa Mat	Chang Riec	Notes		
					1	2	3
		Passeriformes					
		Pittidae					
96	Bar-bellied Pitta	<i>Pitta elliotii</i>	1			T	
		Irenidae					
97	Asian Fairy Bluebird	<i>Irena puella</i>	1,3,4				
98	Blue-winged Leafbird	<i>Chloropsis cochinchinensis</i>	1,4	1			
99	Golden-fronted Leafbird	<i>C. aurifrons</i>	1,4				
		Laniidae					
100	Brown Shrike	<i>Lanius cristatus</i>	1,4	1			
101	Burmese Shrike	<i>L. colluriooides</i>	1,4	1			
		Corvidae					
102	Red-billed Blue Magpie	<i>Urocissa erythrorhyncha</i>	1				
103	Rufous Treepie	<i>Dendrocitta vagabunda</i>	1,4				
104	Racket-tailed Treepie	<i>Crypsirina temia</i>	1,4	1			
105	Black-naped Oriole	<i>Oriolus chinensis</i>	1,3,4	1			
106	Black-hooded Oriole	<i>O. xanthornus</i>	1,3,4	1			
107	Large Cuckooshrike	<i>Coracina macei</i>	1,2,4	1			
108	Black-winged Cuckooshrike	<i>C. melaschistos</i>	2,4	1			
109	Ashy Minivet	<i>Pericrocotus divaricatus</i>	4				
110	Small Minivet	<i>P. cinnamomeus</i>	4				
111	Scarlet Minivet	<i>P. flammeus</i>	4				
112	Bar-winged Flycatcher-shrike	<i>Hemipus picatus</i>	1,4	1			
113	[White-throated Fantail]	[<i>Rhipidura albicollis</i>]	3				
114	Black Drongo	<i>Dicrurus macrocercus</i>	1,3,4	1			
115	Ashy Drongo	<i>D. leucophaeus</i>	1,4	1			
116	Crow-billed Drongo	<i>D. annectans</i>	1,4	1			
117	Bronzed Drongo	<i>D. aeneus</i>	1,3,4	1			
118	Spangled Drongo	<i>D. hottentottus</i>	1,2,4	1			
119	Greater Racket-tailed Drongo	<i>D. paradiseus</i>	1,2,3,4				
120	Black-naped Monarch	<i>Hypothymis azurea</i>	1,4	1			
121	Asian Paradise Flycatcher	<i>Terpsiphone paradisi</i>	1	1			
122	Common Iora	<i>Aegithina tiphia</i>	4	1			
123	Great Iora	<i>A. lafresnayeii</i>	1,4	1			
124	Large Woodshrike	<i>Tephrodornis gularis</i>	2,4				
		Muscicapidae					
125	Asian Brown Flycatcher	<i>Muscicapa dauurica</i>	1,4	1			
126	Hainan Blue Flycatcher	<i>Cyornis hainanus</i>	4				
127	Siberian Blue Robin	<i>Luscinia cyane</i>	1,4				
128	Oriental Magpie Robin	<i>Copsychus saularis</i>	1,3	1			
129	Common Stonechat	<i>Saxicola torquata</i>	1,4				
130	Pied Bushchat	<i>S. caprata</i>	1				
		Sturnidae					
131	Black-collared Starling	<i>Sturnus nigricollis</i>	1,3,4				
132	Vinous-breasted Starling	<i>S. burmannicus</i>	1,4				
133	Common Myna	<i>Acridotheres tristis</i>	1	1			
134	White-vented Myna	<i>A. cinereus</i>	3				
135	[Crested Myna]	[<i>A. cristatellus</i>]	3				
136	Hill Myna	<i>Gracula religiosa</i>	1,4	1			

No.	Common Name	Order, Family, Genus and Species	Lo Go Sa Mat	Chang Ricc	Notes		
					1	2	3
		Sittidae					
137	Velvet-fronted Nuthatch	<i>Sitta frontalis</i>	3				
		Hirundinidae					
138	Barn Swallow	<i>Hirundo rustica</i>	1,2,4	1			
139	Red-rumped Swallow	<i>H. daurica</i>	3				
		Pycnonotidae					
140	Black-headed Bulbul	<i>Pycnonotus atriceps</i>	4				
141	Black-crested Bulbul	<i>P. melanicterus</i>	1,3,4				
142	Red-whiskered Bulbul	<i>P. jocosus</i>	3				
143	Sooty-headed Bulbul	<i>P. aurigaster</i>	1,4	1			
144	Stripe-throated Bulbul	<i>P. finlaysoni</i>	1,4	1			
145	Streak-eared Bulbul	<i>P. blanfordi</i>	1,4	1			
146	[Puff-throated Bulbul]	[<i>Alophoixus pallidus</i>]	3				
147	Ochraceous Bulbul	<i>A. ochraceus</i>	1,2,4	1			
148	Grey-eyed Bulbul	<i>Iole propinqua</i>	4				
		Cisticolidae					
149	Rufescent Prinia	<i>Prinia rufescens</i>	4				
150	Grey-breasted Prinia	<i>P. hodgsonii</i>	4				
151	Yellow-bellied Prinia	<i>P. flaviventris</i>	4				
152	Plain Prinia	<i>P. inornata</i>	1	1			
		Sylviidae					
153	Lanceolated Warbler	<i>Locustella lanceolata</i>	1				
154	Common Tailorbird	<i>Orthotomus sutorius</i>	1	1			
155	Dark-necked Tailorbird	<i>O. atrogularis</i>	1,4	1			
156	Radde's Warbler	<i>Phylloscopus schwarzi</i>	1				
157	White-crested Laughingthrush	<i>Garrulax leucolophus</i>	1,2,4	1			
158	Abbott's Babbler	<i>Malacocincla abbotti</i>	4				
159	Buff-breasted Babbler	<i>Pellorneum tickelli</i>	1,4				
160	Puff-throated Babbler	<i>P. ruficeps</i>	1,4				
161	Scaly-crowned Babbler	<i>Malacopteron cinereum</i>	1,4	1			
162	Large Scimitar Babbler	<i>Pomatorhinus hypoleucos</i>	1				
163	Striped Tit Babbler	<i>Macronous gularis</i>	1,2,3,4	1			
164	Grey-faced Tit Babbler	<i>M. kelleyi</i>	1				RRS
165	Chestnut-capped Babbler	<i>Timalia pileata</i>	4	1			
166	Black-browed Fulvetta	<i>Alcippe grotei</i>	1,2,4				
167	White-bellied Yuhina	<i>Yuhina zantholeuca</i>	1				
		Alaudidae					
168	Indochinese Bushlark	<i>Mirafra marionae</i>	1,4				
		Nectariniidae					
169	Scarlet-backed Flowerpecker	<i>Dicaeum cruentatum</i>	1				
170	Ruby-cheeked Sunbird	<i>Anthreptes singalensis</i>	1,4	1			
171	Purple-naped Sunbird	<i>Hypogramma hypogrammicum</i>	1,4				
172	Purple-throated Sunbird	<i>Nectarinia sperata</i>	1,4	1			
173	Olive-backed Sunbird	<i>N. jugularis</i>	1,4	1			
174	Purple Sunbird	<i>N. asiatica</i>	4				
175	Crimson Sunbird	<i>Aethopyga siparaja</i>	1				
		Passeridae					
176	Plain-backed Sparrow	<i>Passer flaveolus</i>	4				
177	Eurasian Tree Sparrow	<i>P. montanus</i>	1,3,4	1			

No.	Common Name	Order, Family, Genus and Species	Lo Go Sa Mat	Chang Riec	Notes		
					1	2	3
178	Wagtail species	<i>Motacilla</i> sp.	1				
179	Paddyfield Pipit	<i>Anthus rufulus</i>	1				
180	White-rumped Munia	<i>Lonchura striata</i>	1,4				

Bird names, sequence and species limits follow Inskipp *et al.* (1996) except for Scaly-breasted Partridge *Arborophila chloropus*, Black-browed Fulvetta *Alcippe grotei* and Indochinese Bushlark *Mirafra marionae*, which follow Robson (2000).

Lo Go Sa Mat: 1 = Recorded by A. W. Tordoff and Le Mang Hung, 11-19 October 2001; 2 = Recorded by J. C. Eames, 30 January 2001; 3 = Recorded by Le Trong Trai and Tran Hieu Minh 25-29 December 1999; 4 = Recorded by A. Zinoviev 18 October - 9 November 2001; 5 = Reliable first-hand report by local people to A. W. Tordoff and Le Mang Hung.

Chang Riec: 1 = Recorded by A. W. Tordoff and Le Mang Hung, 19-22 October 2001.

Brackets [] denote that a species was provisionally recorded.

Notes 1: VU = Vulnerable; NT = Near-threatened as per BirdLife International (2001).

Notes 2: V = Vulnerable; R = Rare; T = Threatened as per Anon. (1992).

Notes 3: RRS = Restricted-range Species as per Stattersfield *et al.* (1998).

Appendix 2: List of mammal species recorded at Lo Go Sa Mat Special-use Forest and Chang Riec Protection Forest

No.	Common Name	Order, Family, Genus and Species	Local Name	Data Source	Notes		
					1	2	3
	Pangolins	Pholidota					
	Pangolins	Manidae					
1	[Sunda Pangolin]	[<i>Manis javanica</i>]	<i>Trut</i>	I			+
	Treeshrews	Scandentia					
	Treeshrews	Tupauidae					
2	Northern Smooth-tailed Treeshrew	<i>Dendrogale murina</i>	<i>Nhen</i>	O			++
	Flying Lemurs, Colugos	Dermoptera					
	Flying Lemurs, Colugos	Cynocephalidae					
3	[Malayan Flying Lemur]	[<i>Cynocephalus variegatus</i>]	<i>Cheo bay</i>	I		R	+
	Primates	Primates					
	Lorises	Loridae					
4	[Slow Loris]	[<i>Nycticebus coucang</i>]	<i>Cu lan</i>	I	DD	V	+
5	Lesser Slow Loris	<i>N. pygmaeus</i>	<i>Cu lan</i>	S	VU	V	++
	Old-World Monkeys	Cercopithecidae					
6	Pig-tailed Macaque	<i>Macaca nemestrina</i>	<i>Tam vong</i>	O,S	VU	V	++
7	Crab-eating Macaque	<i>M. fascicularis</i>	<i>Khi duoi dai</i>	S	NT		+
8	[Silvered Leaf Monkey]	[<i>Semnopithecus cristatus</i>]	<i>Nho noi</i>	I	DD		+
9	['Black-shanked' Douc Langur]	[<i>Pygathrix nemaus nigripes</i>]	<i>Doc duoi trang</i>	I	EN	V	+
	Carnivores	Carnivora					
	Bears	Ursidae					
10	[Sun Bear]	[<i>Ursus malayanus</i>]	<i>Gau cho</i>	S	DD	E	+
	Weasels and Martens	Mustelidae					
11	[Yellow-throated Marten]	[<i>Martes flavigula</i>]	<i>Chon nui</i>	I			+
12	[Large-toothed Ferret-badger]	[<i>Melogale personata</i>]	<i>Chon heo</i>	I		R	++
13	[Otter species]	[<i>Lutra/Lutrogale/Aonyx</i> sp.]	<i>Rai</i>	I			+
	Civets	Viverridae					
14	[Large Indian Civet]	[<i>Viverra zibetha</i>]	<i>Chon cao coc</i>	I			+
15	[Small Indian Civet]	[<i>Viverricula indica</i>]	<i>Chon lang lau</i>	I			+
16	Common Palm Civet	<i>Paradoxurus hermaphroditus</i>	<i>Chon muop</i>	S			++
	Mongoose	Herpestidae					
17	Small Asian Mongoose	<i>Herpestes javanicus</i>	<i>Chon den</i>	O			++
	Cats	Felidae					
18	[Jungle Cat]	[<i>Felis chaus</i>]	<i>Meo rung</i>	I		E	+
19	[Leopard Cat]	[<i>Priailurus bengalensis</i>]	<i>Meo rung</i>	I			+
	Even-toed Ungulates	Artiodactyla					
	Pigs	Suidae					
20	Wild Boar	<i>Sus scrofa</i>	<i>Heo rung</i>	T			++
	Mouse-deer, Chevrotains	Tragulidae					
21	Lesser Malay Mouse-deer	<i>Tragulus javanicus</i>	<i>Cheo cheo</i>	S			++
	Deer	Cervidae					
22	Sambar	<i>Cervus unicolor</i>	<i>Nai</i>	S			+
23	Indian Muntjak	<i>Muntiacus muntjak</i>	<i>Mang</i>	S			+

No.	Common Name	Order, Family, Genus and Species	Local Name	Data Source	Notes		
					1	2	3
	Rodents	Rodentia					
	Non-flying Squirrels	Sciuridae					
24	Black Giant Squirrel	<i>Ratufa bicolor</i>	<i>Soc den</i>	O			+
25	Inornate Squirrel	<i>Callosciurus inornatus</i>	<i>Soc cay</i>	O			++
26	Cambodian Striped Tree Squirrel	<i>Tamiops rodolphii</i>	<i>Soc chuot</i>	O			++
27	Red-cheeked Squirrel	<i>Dremomys rufigenis</i>	<i>Soc dat</i>	O			+
28	Indochinese Ground Squirrel	<i>Menetes berdmorei</i>	<i>Soc</i>	O			++
	Flying Squirrels	Pteromyidae					
29	Red Giant Flying Squirrel	<i>Petaurista philippensis</i>	<i>Chon bay</i>	O		R	+
30	Particoloured Flying Squirrel	<i>Hylopetes alboniger</i>	<i>Soc bay</i>	S	EN	R	+
	Mice, Rats, etc.	Muridae					
31	House Mouse	<i>Mus musculus</i>	<i>Chuot nhat nha</i>	O			++
32	Chestnut Rat	<i>Niviventer fulvescens</i>	<i>Chuot rung</i>	O			++
	Old World Porcupines	Hystricidae					
33	Malayan Porcupine	<i>Hystrix brachyura</i>	<i>Nhim</i>	S			+
	Hares, Rabbits and Pikas	Lagomorpha					
	Hares and Rabbits	Leporidae					
34	Burmese Hare	<i>Lepus peguensis</i>	<i>Tho rung</i>	O			++

Mammal names, sequence and species limits follow Corbet and Hill (1992).

Brackets [] denote that a species was provisionally recorded.

Data source: O = observed in the wild; S = remains or captive individual seen; T = tracks or traces seen; I = recorded at interview.

Notes 1: EN = Endangered; VU = Vulnerable; DD = Data Deficient as per IUCN (2000).

Notes 2: E = Endangered; V = Vulnerable; R = Rare as per Anon. (1992).

Notes 3: ++ = relatively abundant; + = relatively rare.

Appendix 3: Provisional list of reptile and amphibian specimens collected at Lo Go Sa Mat Special-use Forest and Chang Riec Protection Forest

The following specimens were collected during the rapid survey, and are currently held at IEBR. All identifications are provisional.

Amphibians

1. *Rhacophorus leucomystax*
2. *Kaloula pulchra*
3. *Bufo galeatus*

Reptiles

1. *Mabuya multifasciata*
2. *Hemidactylus frenatus*
3. *Enhydris enhydris*
4. *Ahaetulla prasina*
5. *Dendrelaphis pictus*
6. unidentified snake species 1
7. unidentified snake species 2
8. *Indotestudo elongata*
9. unidentified turtle species