Western Siem Pang Forest: natural wonder of the Kingdom of Cambodia

Western Siem Pang holds the largest sub-population of White-shouldered Ibis in the world (Jonathan C Eames)

By Editor, Tue, 04/09/2012 - 10:22

BirdLife International Cambodia Programme has just published a lavishly illustrated report revealing the global conservation importance of the proposed Western Siem Pang Protected Forest located in a remote area of northern Cambodia near the border with Laos.

The Biodiversity of the Proposed Western Siem Pang Protected Forest, Stung Treng Province, Cambodia collates for the first time all the biodiversity information gathered by BirdLife and partners over the last decade.

Covering expanses of deciduous and semi-evergreen forests along the Sekong River, Western Siem Pang is one of only a handful of sites worldwide that supports populations of an astonishing total of five Critically Endangered bird species: White-shouldered Ibis *Pseudibis davisoni* and Giant Ibis *Thaumatibis gigantea*, White-rumped *Gyps bengalensis*, Slender-billed *G. tenuirostris*, and Red-headed Vultures *Sarcogyps calvus*. The local populations of both ibis species amount to 25% of the global population. In the case of the White-shouldered Ibis Western Siem Pang holds the single largest sub-population in the world.

> *"The MacArthur Foundation believes Western Siem Pang is too important for the conservation of too many species to risk losing this site: but without action, loss is a serious risk and that is why we are working with BirdLife to support efforts to conserve this globally irreplaceable site", said Jörgen Thomsen, Director of Conservation and Sustainable Development Department of MacArthur Foundation.*

Western Siem Pang is currently unprotected and much of it is threatened by an economic land concession, which would destroy the forest and its wildlife. BirdLife and the Forestry Administration with support from the MacArthur Foundation and the Fondation Prince Albert II de Monaco are working towards a solution to ensure the long term sustainable management of the site.

> *"The Forestry Administration considers this report as a supporting document for the proposal to establish the site as a Protected Forest for sustainable forest and wildlife resource management and conservation in accordance with the National Forest Programme and meeting Cambodia's Millennium Developments Goals", said H. E. Chheng Kimsun, Delegate of the Royal Government, Chief of Forest Administration.*

Hard copies of the report are available at BirdLife Cambodia Office. For electronic copies, WSP Biodiversity report 2012 (PDF 6MB) Find out more about our work 0n tropical forests through the BirdLife Forests of Hope Programme.

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Comments

By Mike (not verified) on Wed, 19/09/2012 - 01:18

Interesting! I would love to visit this place!

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BirdLife participates in mainland China's first international bird fair

Wed, 16/04/2014 - 20:59

BirdLife International was recently invited to participate in the first International Bird Fair held in Fuzhou, in Fujian Province in south-east China. The event was a great success and was attended by an amazing 20,000 people from all walks of life.

Threatened 'biodiversity hotspot' in Indonesian forest sparks action from NABU and Burung Indonesia

Tue, 04/03/2014 - 10:09

BirdLife Partners in Germany (NABU) and Indonesia (Burung Indonesia), have initiated a new project to protect tropical forests on the Indonesian island of Sulawesi. The project will take place in Gorontalo where 68.5 percent of the province is still covered with forests characterised by a very high and unique biodiversity. For this reason, Gorontalo is listed among the world's 34 'biodiversity hotspots.'



The Biodiversity of the Proposed Western Siem Pang Protected Forest Stung Treng Province, Cambodia



August 2012

The Biodiversity of the Proposed Western Siem Pang Protected Forest Stung Treng Province, Cambodia

BirdLife International Cambodia Programme

August 2012

BirdLife International also gratefully acknowledge
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continuing conservation management of Western Siem Pang forest

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#9, Street 29 Tonle Bassac, Chamkarmon, Phnom Penh, Cambodia
P.O. Box 2686, Phnom Penh, Cambodia.

BirdLife International
Wellbrook Court, Girton Road, Cambridge, CB3 0NA, United Kingdom.

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The first draft of this report was initially compiled by Frank Lambert in early 2011. Following a survey of the eastern part of Western Siem Pang, whose biodiversity values were then largely unknown, in December 2011, the report was thoroughly revised and updated with new information by R. J. Timmins. Significant contributions to the data presented in the text were also made by David Buckingham, Jonathan C. Eames and Hugh L. Wright. The maps were drawn by Liam Costello and Ung Sochead. The report was designed and layout completed by Tran Thi Thanh Huong.

Thanks are due to members of BirdLife staff based at the Western Siem Pang field office, notably Lourn Bunpaeng, Mem Mai and Net Norin who, as the BirdLife monitoring team, collect and collate the monthly biodiversity data.

We are also grateful to David Ashwell, Andrea Claassen, Bou Vorsak, Gordon Congdon, Peter Paul van Dijk, Frédéric Goes, Douglas Hendrie, Keo Omaliss, Kry Masphal, James Maxwell, Pech Bunnat, Hugo Rainey and Phil Rundel.

We would like to thank His Excellency Cheng Kimsun, Head of the Forestry Administration and Mr. Men Phymean, Director of the Department of Wildlife and Biodiversity, Forestry Administration for their strong support to the project in Western Siem Pang.

This report is an output of the project entitled *Evaluating, consolidating and sustaining conservation of key sites in the Lower Mekong* which was funded by the John D. and Catherine T. MacArthur Foundation.

Abbreviations

asl	above sea level
km	kilometres
m	metres
ha	hectare

Acronyms

a.k.a	also known as
CCBA	The Climate, Community and Biodiversity Alliance
CEPF	Critical Ecosystem Partnership Fund
CVCP	Cambodian Vulture Conservation Project (and data attributed to the CVCP)
DDF	Deciduous Dipterocarp Forest (sometimes called Dry Deciduous Forest or Dry Dipterocarp Forest)
DNCP	Department of Nature Conservation and Protection, Ministry of Environment
FA	Forestry Administration in the Ministry of Agriculture, Forestry and Fisheries, Royal Government of Cambodia
IBA	(globally) Important Bird Area
ICF	International Crane Foundation
IUCN	World Conservation Union
JICA	Japan International Cooperation Agency
LCG	Local Conservation Group (also known as a Site Support Group (SSG)
MAFF	Ministry of Agriculture, Forestry and Fisheries
NDF	Nearly Deciduous Forest
NTFP	Non-timber Forest Product
REDD	Reducing Emissions from Deforestation and Degradation
RSPB	Royal Society for the Protection of Birds
SEF	Semi-evergreen Forest
SSG	Site Support Group (and data attributed to the SSG / LCG and BirdLife monitoring teams)
TGIS/TMF	Theme-based Financing Mechanism of the Dutch Ministry of Foreign Affairs
UTM	Universal Transverse Mercator – a grid-based geographic coordinate system for specifying locations on the surface of the Earth.
WPO	Wildlife Protection Office of the Forestry Administration in MAFF
WWF	Worldwide Fund for Nature
WCS	Wildlife Conservation Society
WSP	Western Siem Pang

Conventions and Terms used

BirdLife International implements a conservation programme in Cambodia. Throughout this report we refer to BirdLife.

Citation of wildlife data from Western Siem Pang: much of the data presented in this report has not previously been published even within 'grey literature' reports. For future clarity significant data or interpretations of the data are attributed to their primary source. There are six main sources of data derived from separate project related activities. For brevity these sources are abbreviated in the text. 'SSG' refers to data collected by the BirdLife SSG / LCG and later BirdLife monitoring teams and sometimes the source is given as such in the text (occasionally a specific team member is cited if the data is very specific in origin); 'CVCP' refers to data collected by the Cambodian Vulture Conservation Project, largely in the form of monthly reports compiled from data received from each of the restaurants; D Buckingham pers. comm. refers to data collected by Prach Pich Phirun and he in 2006; H L Wright pers. comm. refers to data collected during the course of his field work in Western Siem Pang; R J Timmins pers. comm. refers to data and observations made in Western Siem Pang in November 2003, May and December 2011, as well as data inferences relevant to Western Siem Pang that have come as a result of extensive field work in Indochina over the course of nearly two decades; J C Eames pers. comm. refers to data he has collected on numerous visits to Western Siem Pang since 2003.

Forestry Administration (FA): The government agency responsible for protecting Cambodia's forests and wildlife outside of protected areas.

Important Bird Area (IBA): An internationally important site for bird conservation, based on its importance for threatened, restricted-range, biome-restricted and/or congregatory bird species (Box 2).

Indochina as defined here encompasses only Cambodia, Laos and Vietnam (the former French Indochina), excluding the remainder of Southeast Asia.

Khmer names
We have chosen to present English translations of Khmer place names in italics, respecting the convention that they are non-English words that are not in common usage in the English language, for which standardized spellings do not exist. Where English and Khmer words appear in a compound name, such as Siem Pang Town or Sekong River we do not use italics. We have chosen to use *trapeang* over *trapaeng* and *viel* over *veal*.

Local Conservation Group (LCG: a.k.a Site Support Group): A group of stakeholders who work together to safeguard the biodiversity and wider environmental values of a site, as part of a broader network.

Non-timber Forest Product (NTFP): any commodity obtained from the forest that does not necessitate harvesting of trees. Examples include medicinal plants, honey, mushrooms, and

fuel wood.

Projected Coordinate System: Indian 1960 UTM Zone 48N

Taxonomy and Nomenclature: Plant taxonomy and nomenclature follow Dy Phon (2000) and Dy Phon and Rollet (1999). Mammal taxonomy follows IUCN (2011), although English names follow the guidelines of Duckworth and Pine (2003). Bird taxonomy, nomenclature and order follow Robson (2008) and Oriental Bird Club (2010), except *Thaumatibis gigantea* and *Asarcornis scutulata,* which are used in preference over *Pseudibis gigantea* and *Cairina scutulata*. Reptile species names follow Cox *et al.* (1998). Amphibian species names follow Neang Thy and Holden (2008) and IUCN (2010). Butterflies species names follow Monastyrskii (2005), Pinratana and Eliot (1996) and Pinratana (1981, 1983, 1985, 1988, 1992).

Threatened species: The three IUCN Globally Threatened levels are followed: CR – Critically Endangered, (being the highest level of threat), EN – Endangered and VU – Vulnerable. Details of the IUCN threat categories and criteria are to be found at http://www.iucnredlist.org/technical-documents/categories-and-criteria/2001-categories-criteria.Species in these three categories are considered threatened and are listed on the IUCN Red List of Threatened Species. Additionally there are species that have been classified as Near-threatened that may become Threatened in the short-term.

Trapeang*:* a seasonal or permanent static water body situated usually associated with Deciduous Dipterocarp Forest or grassland, frequently less than 1 ha in total area. *Trapeangs* are a critical landscape feature in the dry season because they provide water and feeding habitat for a host of different mammal and large bird species during this drought-prone time of year.

Viel: areas within the forest mosaic dominated by sedges and grasses and with only a sparse tree cover. *Viels* vary in size enormously from very small discrete forest glades, sometimes smaller than a hectare, to 'grasslands' of tens of hectares.

Foreword

The MacArthur Foundation believes Western Siem Pang is too important for the conservation of too many species to risk loosing this site: but without action loss is a serious risk and that is why we are working with BirdLife to support efforts to conserve this globally irreplaceable site.

The MacArthur Foundation recognizes the challenges confronting those trying to conserve Asia's biodiversity. That is why we have recently reaffirmed our commitment to supporting conservation in this region through our Conservation and Sustainable Development (CSD) programme, by committing to a further 10-year grant programme in the Greater Mekong basin and its headwaters. Beginning in 2012 we will focus on the lower Mekong Basin, including Cambodia.

The MacArthur Foundation believes that in order to secure a future for sites like Western Siem Pang new approaches to land management need to be tried. It is now clear that we will not conserve all of Asia's biodiversity by relying solely on traditional methods that depend on state interventions alone. Rather, new partnerships involving civil society and market mechanisms need to be pioneered. Developing solutions recognizing the economic benefits of wildlife and the landscape may be central to finding a workable mechanism to manage this and other sites. Although such approaches are commonplace in much of the world, they remain untested in Asia.

The MacArthur Foundation is proud to have supported the research behind this report and its production. As with all BirdLife's work, good science is at its basis and this report collates and presents all the currently available information on this site. Recent research and ongoing monitoring is informing the management of key species such as the White-shouldered Ibis and the three species of vulture. However, it is clear we know little about most of the wildlife found in Western Siem Pang and I hope that BirdLife and its Department of Wildlife and Biodiversity partners can more fully explore the north-east of the site which may support unknown populations of globally important species.

Jorgen Thomsen
Director, Conservation and Sustainable Development
MacArthur Foundation

បុព្វកថា

តំបន់ព្រៃឈើភាគខាងលិចស្ទឹមប៉ាង គឺជាតំបន់ព្រៃឈើដ៏មានសារសំខាន់មួយដែលនៅសេសសល់ក្នុងពិភពលោកសម្រាប់ធ្វើការអភិរក្សជីវចម្រុះ និងជាតំបន់មានសក្តានុពលសម្រាប់ការរស់នៅរបស់សត្វព្រៃគ្រប់ប្រភេទ ជាពិសេសក្រុមប្រភេទសត្វព្រៃជិតផុតពូជ ។ តាមការសិក្សាស្រាវជ្រាវពេលកន្លងមកបានបង្ហាញថា តំបន់នេះជាដែនជម្រកសំខាន់របស់ពពួកសត្វត្រយ៉ងចង្កឹកស ដែលជាប្រភេទមួយក្នុងចំណោមត្រយ៉ងចំនួនបីប្រភេទដែលជិតផុតពូជ និងសត្វស្លាបជិតផុតពូជចំនួនបួនប្រភេទផ្សេងទៀតក៏នៅមានវត្តមាននៅក្នុងតំបន់នេះដែរដូចជា ត្រយ៉ងយក្ស ត្មាតភ្លើង ត្មាតឆ្មោត និងត្មាតដេះ ។ ក្រៅពីនេះ តំបន់ព្រៃឈើភាគខាងលិចស្ទឹមប៉ាង បានជួយទ្រទ្រង់ដល់ការរស់រានរបស់ប្រភេទសត្វរមាំង និងខ្ទីង ដែលជាប្រភេទទទួលរងការគំរាមកំហែងនៅក្នុងប្រទេសកម្ពុជា ។ តំបន់ព្រៃឈើភាគខាងលិចស្ទឹមប៉ាង គឺជារបៀងជីវចម្រុះតភ្ជាប់ទៅនឹងឧស្សានជាតិវីរៈជ័យនៅភាគខាងកើតប្រទេសកម្ពុជានិងតំបន់ការពារធម្មជាតិសេពាន(Xe Pian) នៅភាគខាងត្បូងប្រទេសឡាវ ។ ម្យ៉ាងវិញទៀត នៅភាគខាងលិចគឺជាតំបន់ភ្នំនែ ព្រំប្រទល់ប្រទេសទាំងបីរវាងប្រទេសកម្ពុជា ឡាវ និងវៀតណាម ហើយមានតំបន់ការពារចំនួនបីធំៗទៀតគឺឧស្សានជាតិជូម៉ុរេ(Chu Mon Ray) នៃប្រទេសវៀតណាម តំបន់ការពារធម្មជាតិខេត្តដុងអំផាន (Dong Amphan) និងតំបន់ការពារណាមហ្គង (Nam Gong) នៃប្រទេសឡាវ ។ ដោយសារការតភ្ជាប់ តំបន់នេះទៅនឹងតំបន់ការពារផ្សេងទៀត ការអភិរក្សតំបន់ភាគខាងលិចស្ទឹមប៉ាងមិនត្រឹមតែអភិរក្សសត្វព្រៃក្នុងតំបន់ប៉ុណ្ណោះទេប៉ុន្តែថែមទាំងជួយបង្កើននូវតម្លៃនៃការអភិរក្សតំបន់ទេសភាពទាំងមូលជុំវិញ ។ បច្ចុប្បន្នតំបន់ព្រៃឈើភាគខាងលិចស្ទឹមប៉ាងបាននិងកំពុងទទួលរងនូវការគំរាមកំហែងដូចជា ការរានជីព្រៃឈើ និងការបរបាញ់សត្វព្រៃដែលជាកត្តាធ្វើឲ្យបាត់បង់ទីជម្រកសត្វព្រៃនិង ជីវចម្រុះ ។

ព័ត៌មាន ទាំងឡាយនៅក្នុងរបាយការណ៍នេះ គឺជាលទ្ធផលនៃការសិក្សាស្រាវជ្រាវជាបន្តបន្ទាប់អស់រយៈពេលជិតមួយទសវត្សរ៍ចាប់តាំងពីឆ្នាំ២០០៣ក្រោមកិច្ចសហការរវាងនាយកដ្ឋានសត្វព្រៃ និងជីវចម្រុះនៃរដ្ឋបាល ព្រៃឈើ និងអង្គការជីវិតសត្វស្លាបអន្តរជាតិ ។ រដ្ឋបាលព្រៃឈើយល់ឃើញថា ឯកសារដែលបានបងក្រង នេះគឺជាឯកសារជំនួយស្មារតីមួយដែលមានសារសំខាន់ក្នុងការរៀបចំដាក់តំបន់ ព្រៃឈើភាគខាងលិចស្ទឹមប៉ាង ជាតំបន់ព្រៃការពារដើម្បីគ្រប់គ្រងអភិរក្សធនធានព្រៃឈើនិងសត្វព្រៃប្រកបដោយនិរន្តភាពស្របតាមកម្មវិធីព្រៃឈើជាតិ និងគោលដៅអភិវឌ្ឍន៍សហស្សវត្សរបស់រាជរដ្ឋា ភិបាល កម្ពុជា ។

ប្រតិភូរាជរដ្ឋាភិបាលទទួលបន្ទុកប្រធានរដ្ឋបាលព្រៃឈើ

ឆេង គឹមសុន

Foreword

The Western Siem Pang proposed Protected Forest is one of the most important existing natural forest areas in the world for biodiversity conservation and especially endangered wildlife species. Based on the results of surveys it supports one of the three largest remaining populations of the Critically Endangered White-shouldered Ibis, and population of four other Critically Endangered bird species comprising the Giant Ibis, Red-headed Vulture, Slender-billed Vulture and White-rumped Vulture. In addition it supports one of largest known populations of the Endangered Eld's deer and Gaur in Cambodia. One reason Western Siem Pang supports forest resources and biodiversity of such importance is because pristine stretches of the Sekong River flow through it and its forests connect it to Virachey National Park to the east in Cambodia and Xe Pian National Protected Area in Laos to the north. Further to the east the mountainous area between Cambodia, Laos and Vietnam is largely covered by a further three protected areas Chu Mon Ray National Park in Vietnam, and Dong Amphan National protected Area and Nam Gong Provincial Protected Area in Laos. Therefore conserving Western Siem Pang will not only conserve the wildlife within it but its connectivity with other protected areas, increase the overall conservation value of the regional landscape. Recently, this area is facing the threat of illegal logging, land encroachment and hunting that lead to loss of forests, wildlife habitats and biodiversity.

All the information presented in this report are the results of the biodiversity research of nearly ten years, since 2003, undertaken jointly by the Department of Wildlife and Biodiversity of the Forestry Administration and BirdLife International. The Forestry Administration considers this report as a supporting document for the proposal to establish the site as a Protected Forest for Sustainable Forest and Wildlife Resource Management and Conservation in accordance the National Forest Programme and meeting Cambodia's Millennium Development Goals.

Chheng Kimsun
Delegate of the Royal Government
Chief of Forestry Administration

Executive summary

This report is a compilation of the wealth of information gathered on biodiversity in the proposed Western Siem Pang Protected Forest (hereafter Western Siem Pang) in north-east Stung Treng Province (Map 1.1). This information has been gathered over the course of nearly a decade, as a result of many varying activities, largely undertaken by BirdLife with assistance from its many partners. The report centres on an analysis of the significant biodiversity conservation values of Western Siem Pang, but also outlines the many serious threats now facing the area. As such the report provides the justification, if any were needed, for conserving the forests and wildlife of irreplaceable global significance that Western Siem Pang supports.

In August 2009, the Cambodian Ministry of Agriculture, Forestry and Fisheries began the procedure to formerly establish the area as a Protected Forest covering c. 149,710 ha. The process, however, is not yet complete. A large proportion of the area was and still is formally leased as a commercial agricultural concession to the Green Sea Agriculture Co., Ltd.

BirdLife has been active in the area since 2003; initiatives have focused strongly on local community involvement in basic wildlife and threat monitoring activities at the site. More recently formal wildlife protection activities have been established at the site, although only a single patrol team is active and only one Forestry Administration officer is on staff. Additionally BirdLife and its partners have undertaken a number of studies in the area, the most noteworthy of which have been studies of White-shouldered Ibis lead by H. L. Wright and the University of East Anglia, UK, and several assessments of the areas bird and mammal communities in 2002, 2003, 2006 and 2011.

Western Siem Pang is a lowland area with the highest elevation reaching little more than 300 m asl (Map 1.2). The central and southern portions comprise gently undulating plains overwhelmingly dominated by Deciduous Dipterocarp Forest. The northern areas in contrast are rugged hills covered in Semi-evergreen Forest. The plains are noteworthy for the significant extent of savannah-like Deciduous Dipterocarp Forest and grasslands (*viel* in Khmer), and also for the high density of forest pools (*trapeang* in Khmer).

Western Siem Pang is contiguous with both Virachey National Park, to the east in Cambodia, and the Xe Pian National Protected Area (NPA) in Laos to the north and east. Further to the west the mountainous tri-border area between Cambodia, Laos and Vietnam is largely covered by a further three protected areas Chu Mom Ray National Park in Vietnam, and Dong Amphan NPA and Nam Gong Provincial Protected Area in Laos. At well over 700,000 ha this landscape is one of the larger protected rugged landscapes in the region. A short stretch of the Sekong, one of the largest of all Mekong tributaries, passes through Western Siem Pang.

Two species of ibis, the White-shouldered Ibis *Pseudibis davisoni* and the Giant Ibis *Thaumatibis gigantea*, both Globally Threatened–Critically Endangered, have globally irreplaceable local populations within Western Siem Pang. These two species are the highest known conservation priorities within the area. The local populations of both are highly significant, each probably between 10–25% of the Global population. In the case of White-

shouldered Ibis, Western Siem Pang may well hold the single largest sub-population of the species that is known.

Western Siem Pang also represents a significant proportion of the range of the remnant Indochinese sub-population of three Globally Threatened–Critically Endangered vulture species. All three feed on carcasses within Western Siem Pang on a regular basis, and two, but probably all three breed within the area. BirdLife has been supplementary feeding vultures at a restaurant since 2004. The Western Siem Pang restaurant, for as yet unknown reasons, habitually hosts a larger proportion of the known Slender-billed Vultures *Gyps tenuirostris* than any of the other six regular restaurant sites. Western Siem Pang is one of only a handful of sites worldwide that supports populations of an astonishing total of five Critically Endangered bird species.

The dry forest plains also support significant populations of a number of other Globally Threatened species, most notably Lesser Adjutant *Leptoptilos javanicus*, Sarus Crane *Grus antigone*, Indian Spotted Eagle *Aquila hastata* and Great Slaty Woodpecker *Mulleripicus pulverulentus*. The area is also significant for its local populations of two Globally Threatened–Endangered mammals; Eld's Deer *Rucervus eldii* and Indochinese Silvered Leaf Monkey *Trachypithecus germani.*

The Semi-evergreen Forest of the northern hills has in general a less Threatened wildlife community. It still retains notable numbers of Yellow-cheeked Crested Gibbon *Nomascus gabriellae* and Gaur *Bos gaurus.*

The channel of the Sekong, in addition to being used by Giant Ibis and Globally Threatened Green Peafowl *Pavo muticus*, supports regionally significant breeding populations of sand-bar nesting River Tern *Sterna aurantia*, River Lapwing *Vanellus duvaucelii* and Great Thick-knee *Esacus recurvirostris*. However significant numbers lies outside the protected forest as currently planned, breeding on islands below Siem Pang town. The conservation significance of fish and other aquatic wildlife within Western Siem Pang is little known. However the Sekong has been identified as a high priority for fish conservation (Baltzer *et al.* 2001a, b). There is very little floodplain bordering the river, and only very minor tributaries of the Sekong flow through Western Siem Pang. There is however a potentially significant extent of 'rocky rapids' a riverine habitat often associated with localized fish endemicity (Baltzer *et al.* 2001a, b).

Many Deciduous Dipterocarp Forest species are not considered Threatened, simply because truly vast swaths of forest remain in Myanmar and Cambodia. However the fate that befell formerly extensive areas of dry forest in Thailand and Laos will surely also consume those of Cambodia and Myanmar. In fact this is already happening, both by piecemeal spread of rural villages, roads and agriculture and somewhat more threateningly by large scale agro-industry. The Western Siem Pang lowlands are threatened by both. The 70 year Green Sea Agriculture Co., Ltd land concession lease overlaps a considerable area of the Western Siem Pang lowlands (a total overlap of 82,755 ha); the area in fact of most significance to White-shouldered Ibis, the three vulture species, Lesser Adjutant, Sarus Crane, Indian Spotted Eagle and Eld's Deer. As currently planned the concession would have an irreversible negative impact on these and other species, resulting in many cases in their likely extirpation (Timmins 2011).

These are not the only threats to wildlife in Western Siem Pang. Many large mammals are now extirpated (Kouprey *Bos sauveli,* Tiger *Panthera tigris*) or close to extirpation (otters) due to trade driven hunting. But hunting effects many other species in a number of faunal groups and is in the short term the greatest threat to Western Siem Pang animal life. Particularly worrying appears to be a rising trend in use of poison to capture animals. This practice has already led to the death of over nine vultures and at least one Giant Ibis.

Local communities depend heavily on the natural resources of Western Siem Pang for their livelihood, but at the same time many of their activities result in incidental threats to wildlife. Particularly worrying are trends in incidental hunting as already mentioned, timber removal which is steadily degrading the forests and fishing and other harvests of aquatic life (from pools, streams and the Sekong) which are becoming heavily commercialised and almost certainly resulting in serious over-fishing.

Research suggests that White-shouldered Ibis may be integrally tied to foraging microhabitats strongly influenced by ungulate activity. This potentially puts the species at risk from changes in livestock and agricultural management, suggesting that the historical low intensity livestock and agricultural use patterns of the dry forests by local communities in Western Siem Pang may be crucial for maintaining this globally irreplaceable ibis population in the short to medium term.

Conserving large areas of lowland dry forest faces many challenges, not least the scarcity of financial resources needed for effective management. Alternative self sustaining land uses that protect biodiversity conservation values while also contributing to local community livelihoods, as well as satisfying the needs of other stakeholders, have yet to materialise for such large areas. Yet without concerted efforts from all stakeholders the Globally irreplaceable Western Siem Pang dry forest and wildlife communities face a bleak future.

សេចក្តីសង្ខេប

របាយការណ៍នេះគឺជាការចងក្រងនូវបណ្តាព័ត៌មានជីវចម្រុះដ៏មានតម្លៃនានានៅក្នុងតំបន់ស្នើរសុំដាក់ជាតំបន់ព្រៃការពារភាគខាងលិចសៀមប៉ាង (ពីនេះតទៅទៀតនឹងត្រូវបានហៅថាជាតំបន់ខាងលិចសៀមប៉ាង) ដែលស្ថិតនៅភាគខាងជើងឈៀងខាងកើតនៃខេត្តស្ទឹងត្រែង (ផែនទី ១.១)។ ព័ត៌មានទាំងឡាយក្នុងរបាយការណ៍នេះត្រូវបានធ្វើការប្រមូលផ្តុំ និងចងក្រងឡើងអស់រយៈពេលជិតមួយទសវត្សរ៍ដោយផ្អែកទៅលើលទ្ធផលនៃសកម្មភាពជាច្រើនផ្សេងៗគ្នា ដែលភាគច្រើនអនុវត្តដោយអង្គការជីវិតសត្វស្លាបអន្តរជាតិក្នុងតំបន់តណ្ឌចិន សហការជាមួយបណ្តាដៃគូរជាច្រើនទៀត ។ របាយការណ៍នេះផ្តោតសំខាន់ទៅលើការវិភាគតម្លៃនៃការអភិរក្សជីវចម្រុះដ៏មានតម្លៃ និងបង្ហាញឲ្យឃើញផងដែរនូវការគំរាមកំហែងដ៏ធ្ងន់ធ្ងរនានា ក្នុងតំបន់ខាងលិចសៀមប៉ាង ដែលបាននឹងកំពុងកើតមានហើយក៏ជាសក្តីកម្មមួយសម្រាប់ធ្វើការអភិរក្សសត្វព្រៃនិងព្រៃឈើដែលកំពុងមានវត្តមាននៅតំបន់នេះ និងមានតម្លៃសកលមិនអាចកាត់ថ្លៃបាន។

នៅខែសីហា ឆ្នាំ២០០៩ ក្រសួងកសិកម្ម រុក្ខាប្រម៉ាញ់ និងនេសាទ នៃប្រទេសកម្ពុជាបានចាប់ផ្តើមរៀបចំដាក់តំបន់នេះជាតំបន់ព្រៃការពារគ្របដណ្តប់នៅលើផ្ទៃដីចំនួន ១៤៩.៧១០ហិចតា។ តែទោះជាយ៉ាងណាក្តី ក៏ដំណើរការនៃការរៀបចំនេះនៅមិនទាន់ចប់សព្វគ្រប់នៅឡើយទេ ហើយមួយផ្នែកធំនៃតំបន់នេះបាននឹងកំពុងជួលស្របច្បាប់ក្រោមឈ្មោះថាជា ដីសម្បទានកសិកម្មទៅឲ្យក្រុមហ៊ុន Green Sea Agriculture Co., Ltd។

អង្គការជីវិតសត្វស្លាបអន្តរជាតិ បានចាប់ផ្តើមធ្វើការងារនៅក្នុងតំបន់នេះចាប់តាំងពីឆ្នាំ២០០៣ ដែលរាល់ការផ្តើមគំនិតនានាមានការចូលរួមពីសហគមន៍មូលដ្ឋាន ក្នុងសកម្មភាពអង្កេត និងស្រាវជ្រាវចំពោះការគំរាមកំហែងសត្វព្រៃ និងព្រៃឈើនៅមូលដ្ឋានជាក់ស្តែងរបស់ពួកគាត់។ នាពេលថ្មីៗនេះ សកម្មភាពការពារសត្វព្រៃមួយចំនួនត្រូវបានបង្កើតឡើងនៅក្នុងតំបន់នេះ ប៉ុន្តែមានក្រុមល្បាតតែមួយប៉ុណ្ណោះបាននឹងកំពុងធ្វើសកម្មភាពដោយមានការចូលរួមពីមន្ត្រីរដ្ឋបាលព្រៃឈើមួយរូប។ ជាមួយគ្នានេះ អង្គការជីវិតសត្វស្លាបអន្តរជាតិ និងដៃគូនានាក៏បានធ្វើការសិក្សាស្រាវជ្រាវជាច្រើននៅក្នុងតំបន់នេះ ក្នុងនោះមានការសិក្សាស្រាវជ្រាវគួរឲ្យកត់សម្គាល់អំពីសត្វត្រយ៉ងចង្កុំកសដែលដឹកនាំដោយ លោក H. L. Wright និងសាកលវិទ្យាល័យ East Anglia របស់ប្រទេសអង់គ្លេស និងមានការសិក្សាវាយតម្លៃមួយចំនួនទៀតលើថនិកសត្វ និងសត្វស្លាបក្នុងតំបន់នេះនៅក្នុងឆ្នាំ ២០០២ ២០០៣ ២០០៦ និង២០១១។

តំបន់ខាងលិចសៀមប៉ាងជាតំបន់ដីទំនាបមួយ ដែលមានរយៈកម្ពស់ខ្ពស់បំផុតប្រហែល ៣០០ម (ផែនទី ១.២)។ នៅផ្នែកកណ្តាល និងភាគខាងត្បូងនៃតំបន់នេះ ប្រកបទៅដោយវាលធំៗដែលមានសណ្ឋានដីខុសៗគ្នាបន្តិចបន្តួច ហើយគ្របដណ្តប់ស្ទើរទាំងស្រុងដោយព្រៃល្បោះ។ ផ្ទុយទៅវិញ នៅភាគខាងជើង

នៃតំបន់នេះគឺជាតំបន់កូនភ្នំតូចៗគ្របដណ្តប់ដោយប្រភេទព្រៃពាក់កណ្តាលស្រោង។ វាលជាច្រើនគ្របដណ្តប់ដោយប្រភេទព្រៃល្បោះ វាលស្មៅ និងសំបូរទៅដោយត្រពាំង។

តំបន់ខាងលិចសៀមប៉ាងគឺជាចំណុចតភ្ជាប់រវាងឧទ្យានជាតិវីរៈជ័យ នៅភាគខាងកើតនៃប្រទេសកម្ពុជា និងតំបន់ការពារធម្មជាតិសេពាន (Xe Pian) នៅភាគខាងត្បូងនៃប្រទេសឡាវ។ ម្យ៉ាងវិញទៀត នៅភាគខាងលិចជាតំបន់ភ្នំនៃព្រំប្រទល់ទាំងបីគឺ ប្រទេសកម្ពុជា ឡាវ និងវៀតណាម គ្របដណ្តប់ទៅដោយតំបន់ការពារបីធំៗគឺ ឧទ្យានជាតិជូម៉ុនរ៉ (Chu Mon Ray) នៃប្រទេសវៀតណាម តំបន់ការពារធម្មជាតិដុងអំផាន (Dong Amphan) និងតំបន់ការពារថ្នាក់ខេត្តណាមកុង (Nam Gong) នៃប្រទេសឡាវ។ ពោល វាគឺជាតំបន់ការពារទេសភាពដែលធំជាងគេមួយក្នុងតំបន់នេះ ដោយមានផ្ទៃដីជាង ៧00.000 ហិចតា។ ទន្លេសេកុងជាទន្លេដ៏ធំជាងគេមួយក្នុងចំណោមដៃទន្លេមេគង្គទាំងអស់ នោះគឺបានហូរកាត់តាមតំបន់ខាងលិចសៀមប៉ាងនេះផងដែរ។

នៅក្នុងតំបន់ខាងលិចសៀមប៉ាងនេះមានវត្តមានសត្វត្រយ៉ងពីរប្រភេទគឺ ត្រយ៉ងចង្កឹកស (*Pseudibis davisoni*) និងត្រយ៉ងយក្ស (*Thaumatibis gigantea*) ដែលជាប្រភេទជិតផុតពូជ និងមានការគំរាមកំហែងដ៏ធ្ងន់ធ្ងរ។ ចំនួនសរុបសត្វទាំងពីរប្រភេទ ដែលកំពុងមានវត្តមាននៅក្នុងតំបន់នេះគឺមានចំនួនច្រើនជាងតំបន់ណាៗទាំងអស់នៃពិភពលោក។ ប្រភេទសត្វទាំងពីរប្រភេទនេះត្រូវបានទទួលស្គាល់ និងផ្តល់អាទិភាពក្នុងការអភិរក្សខ្ពស់ជាងគេនៅក្នុងតំបន់នេះ។ តាមការអង្កេតស្រាវជ្រាវបានបង្ហាញថា ចំនួនសរុបនៃប្រភេទសត្វទាំងពីរនេះគឺមានចំនួនច្រើនគួរឲ្យកត់សម្គាល់ ដែលក្នុងមួយប្រភេទៗមានចំនួនប្រហែលពី១0% ទៅ ២៥% នៃចំនួនសរុបក្នុងពិភពលោក។ បើយើងគិតតែចំនួនប្រភេទសត្វត្រយ៉ងចង្កឹកសវិញ គឺនៅក្នុងតំបន់ភាគខាងលិចសៀមប៉ាងប្រហែលជាមានច្រើនជាងគេបំផុតនៅលើពិភពលោក។

តំបន់ភាគខាងលិចសៀមប៉ាងក៏បានបង្ហាញឲ្យឃើញផងដែរ ពីវត្តមានដ៏សំខាន់របស់អនុប្រភេទសត្វត្មាតឥណ្ឌូចិនចំនួនបីប្រភេទដែលជិតផុតពូជ និងមានការគំរាមកំហែងជាសកល។ ប្រភេទសត្វត្មាតទាំងបីប្រភេទនេះរស់នៅពឹងផ្អែកលើការស៊ីសាកសពសត្វនៅក្នុងតំបន់ភាគខាងលិចសៀមប៉ាង ហើយសត្វត្មាតចំនួនពីរប្រភេទ (ប្រហែលអាចទាំងបីប្រភេទ) ពងកូននៅក្នុងតំបន់នេះតែម្តង។ ចាប់ពីឆ្នាំ២00៤មក គម្រោងអភិរក្សសត្វត្មាតកម្ពុជា និងអង្គការជីវិតសត្វស្លាបអន្តរជាតិបានផ្តល់ចំណីបន្ថែមទៅឲ្យសត្វត្មាតទាំងនេះនៅអាហាដ្ឋានត្មាតមួយកន្លែង។ យើងមិនទាន់ដឹងអំពីមូលហេតុច្បាស់នៅឡើយទេថា ហេតុអ្វីបានជាប្រភេទសត្វត្មាតខ្មោត (*Gyps tenuirostris)* ចូលមកទទួលយកអាហារបន្ថែមនៅអាហារដ្ឋានត្មាតនៅតំបន់ខាងលិចសៀមប៉ាងមានចំនួនច្រើនជាងគេ បើប្រៀបធៀបទៅនឹងទីតាំងអាហារដ្ឋានប្រាំមួយកន្លែងផ្សេងទៀតដែលមានវត្តមាននៅទូទាំងប្រទេសកម្ពុជា។ តំបន់ខាងលិចសៀមប៉ាង ជាទីតាំងមួយក្នុងចំណោមទីតាំងដ៏តិច

តួចបំផុតក្នុងសកលលោក ដែលមានចំនួនសរុបនៃប្រភេទសត្វស្លាបជិតផុតពូជដល់ទៅចំនួនប្រាំប្រភេទ ដែលនេះជាការគួរឲ្យភ្ញាក់ផ្អើល។

ទំនាបព្រៃល្បោះនៃតំបន់ខាងលិចសៀមប៉ាងក៏បានជួយទ្រទ្រង់ដល់របាយប្រភេទសត្វ ដែលមានការគំរាមកំហែងជាសកលជាច្រើនទៀត ហើយអ្វីដែលគួរឲ្យកត់សម្គាល់នោះគឺប្រភេទសត្វត្រដក់តូច *(Leptoptilos javanicus)* ក្រៀល *(Grus antigone)* អកធំឥណ្ឌា *(Aquila hastata)* និងត្រសេះដំរី *(Mulleripicus pulverulentus)* ។ តំបន់នេះក៏បានទ្រទ្រង់ដ៏សំខាន់ដល់របាយនៃប្រភេទថនិកសត្វចំនួនពីរប្រភេទដែលជិតផុតពូជ និងមានការគំរាមកំហែងធ្ងន់ធ្ងរដូចជា សត្វមាំង *(Recervus eldii)* និងស្វាព្រោម *(Trachypithecus germani)*។

ព្រៃពាក់កណ្តាលស្រោងនៃតំបន់កូនភ្នំទាបៗ នៅភាគខាងជើងរបស់តំបន់ខាងលិចសៀមប៉ាង ជាទូទៅ មានវត្តមាននៃប្រភេទសត្វព្រៃដែលកំពុងមានការគំរាមកំហែងតិចតួច។ តំបន់នេះនៅតែទ្រទ្រង់ប្រភេទសត្វជាច្រើនគួឲ្យកត់សម្គាល់ដូចជា ប្រភេទសត្វតូចថ្ពាល់លឿង *(Nomascus gabriellae)* និងខ្ទីង *(Bos gaurus)* ។

ដៃទន្លេសេកុងត្រូវបានប្រើប្រាស់ដោយប្រភេទសត្វត្រយ៉ងយក្ស និងក្ងោក *(Pavo muticus)* ដែលជាប្រភេទសត្វកំពុងទទួលរងនូវការគំរាមកំហែង ហើយក៏បានទ្រទ្រង់ដល់ការរស់នៅ និងការបន្តពូជនៃប្រភេទសត្វដែលធ្វើសំបុកតាមផ្ទុកខ្សាច់ដូចជា សត្វរំពេទន្លេ *(Sterna aurantia)* ត្រដេវរីចទន្លេ *(Vanellus duvaucelii)* និងជង្គង់ក្រាស់ជំពុះខ្មៅ *(Esacus recurvirostris)* ផងដែរ។ តែទោះជាយ៉ាងនេះក្តី ក៏ប្រភេទសត្វទាំងនេះមួយចំនួនកំពុងតែបង្កាត់ពូជនៅតាមបណ្តោកោះមួយចំនួននៅខាងក្រោមទីប្រជុំជនសៀមប៉ាង ដែលស្ថិតនៅក្រៅតំបន់ភាគខាងលិចសៀមប៉ាង។សារសំខាន់នៃការអភិរក្សត្រី និងបណ្តាប្រភេទសត្វរស់នៅក្នុងទឹកនានា នៅក្នុងតំបន់ខាងលិចសៀមប៉ាងគឺមានព័ត៌មានតិចតួចនៅឡើយ។ តែទោះជាយ៉ាងណាក៏ដោយ ទន្លេសេកុងត្រូវបានគេទទួលស្គាល់ថាមានអាទិភាពខ្ពស់សម្រាប់ការអភិរក្សប្រភេទត្រី (Baltzer *et al.* 2001a, b)។ ផ្ទៃដីទំនាបលិចទឹកដែលព័ទ្ធជុំវិញទន្លេសេកុងគឺមានចំនួនតិចតួច ហើយអ្វូដែលហូរចាក់ទៅក្នុងទន្លេសេកុងក្នុង តំបន់ខាងលិចសៀមប៉ាងក៏មានចំនួនតិចតួចផងដែរ។ តែទោះជាយ៉ាងនេះក្តី ទន្លេសេកុងក៏មានជួរថ្មប៉ប្រះទឹកដែលជាទីជម្រកដ៏សំខាន់សម្រាប់ពពួកពូជត្រីនៅក្នុងតំបន់នេះ (Baltzer *et al.*2001a, b)។

ប្រភេទនៃព្រៃល្បោះជាច្រើនមិនត្រូវបានគេចាត់ទុកជាប្រភេទព្រៃ ដែលមានការគំរាមកំហែងនោះទេ នេះក៏ព្រោះតែទំហំដ៏ធំនៃព្រៃប្រភេទនេះមាននៅសល់នៅក្នុងប្រទេសភូមា និងកម្ពុជាយ៉ាងច្រើន។ តែទោះជាយ៉ាងណាក៏ដោយ យោងទៅលើលទ្ធផលដែលបានកើតឡើងកាលពីអតីតកាលចំពោះព្រៃល្បោះទំហំដ៏ធំក្នុងប្រទេសថៃ និងឡាវ នោះពិតជាបង្ហាញយ៉ាងច្បាស់ថា ប្រភេទព្រៃល្បោះដែលមាននៅក្នុងប្រទេសកម្ពុជា និង

ភូមានេះ នឹងត្រូវបានបំផ្លាញអស់ជាមិនខាន។ ជាការពិតណាស់ បញ្ហានេះបានកើតឡើងរួចទៅហើយ ដូចជាករណីនៃការពង្រីកភូមិឋាន ផ្លូវ និងផ្ទៃដីកសិកម្ម ហើយករណីមួយទៀតដែលមានការគំរាមកំហែងយ៉ាងខ្លាំងដែរនោះ គឺការអភិវឌ្ឍន៍ផ្នែកកសិឧស្សាហកម្មខ្នាតធំ។ តំបន់វាលទំនាបនៃតំបន់ខាងលិចសៀមប៉ាងត្រូវបានគំរាមកំហែងដោយករណីទាំងពីរនេះ។ ការជួលដីក្នុងរយៈពេលវែងជាលក្ខណៈសម្បទានទៅឲ្យក្រុមហ៊ុន Grean Sea Agriculture Co., Ltd បានគ្របដណ្តប់ទាំងស្រុងទៅលើផ្ទៃដីដ៏ធំនៃតំបន់វាលទំនាបក្នុងតំបន់ខាងលិចសៀមប៉ាង (ទំហំផ្ទៃដីសរុបដែលត្រួតពីលើមានចំនួន ៨២.៧៥៥ ហិចតា) ដែលតំបន់ទំនាបនេះមានសារសំខាន់យ៉ាងខ្លាំងបំផុតសម្រាប់ សត្វត្រយ៉ងចង្កុំកស សត្វត្មាតទាំងបីប្រភេទ សត្វត្រដក់តូច សត្វក្រៀល អកធំឥណ្ឌា និងសត្វមាំង។ ផ្អែកលើការធ្វើផែនការនាពេលថ្មីៗនេះបានឲ្យដឹងថា ការផ្តល់សម្បទាននេះអាចនឹងបង្ករឲ្យមានផលជាអវិជ្ជមានទៅលើប្រភេទសត្វទាំងនេះ និងប្រភេទផ្សេងៗទៀត ពោលអាចបណ្តាលឲ្យវិនាសផុតពូជតែម្តង (Timmins 2011)។

ដោយសារតែការបរបាញ់សត្វព្រៃ សម្រាប់ធ្វើអាជីវកម្មក្នុងតំបន់ខាងលិចសៀមប៉ាងបានធ្វើឲ្យសត្វព្រៃទទួលរងនូវការគំរាមកំហែង។ ពពួកថនិកសត្វធំៗជាច្រើនកំពុងតែបាត់បង់ និងផុតពូជនាពេលថ្មីៗនេះ (គោព្រៃ *Bos sauveli* និងខ្លា *Panthera tigris*) រីកស្ទើតែផុតពូជ (ប្រភេទសត្វកេ) ។ មួយវិញទៀត ការបបាញ់នេះក៏មានឥទ្ធិពលទៅលើប្រភេទសត្វផ្សេងៗទៀតជាច្រើន ក្នុងក្រុមប្រភេទសត្វព្រៃហើយវាជាការគំរាមកំហែងដ៏ខ្លាំងក្នុងរយៈពេលខ្លីមួយទៅលើជីវិតសត្វក្នុងតំបន់ខាងលិចសៀមប៉ាងផងដែរ។ ការព្រួយបារម្ភជាពិសេសគឺការកើនឡើងនូវនិន្នាការក្នុងការប្រើប្រាស់សារធាតុពុល ដើម្បីបំពុលចាប់យកសត្វផ្សេងៗ ដែលទង្វើបែបនេះបានបណ្តាលឲ្យមានការស្លាប់រួចហើយ នូវសត្វត្មាតជាងប្រាំបួនក្បាល និងត្រយ៉ងយក្សយ៉ាងតិចមួយក្បាល ។

សហគមន៍មូលដ្ឋានជាច្រើនពឹងផ្អែកទាំងស្រុងទៅលើធនធានធម្មជាតិ នៃតំបន់ខាងលិចសៀមប៉ាងសម្រាប់ជីវភាពរស់នៅរបស់ពួកគេ ក៏ប៉ុន្តែសកម្មភាពជាច្រើនរបស់ពួកគេ ក៏បណ្តាលឲ្យមានការគំរាមកំហែងដោយចៃដន្យទៅលើជីវិតសត្វព្រៃវិញដែរ។ ការព្រួយបារម្ភជាពិសេស គឺការបរបាញ់ជាលក្ខណៈចៃដន្យ ដូចដែលបានលើកឡើង ការកាប់ឈើដែលបង្ករឲ្យមានការបាត់បង់ព្រៃឈើ ការនេសាទត្រី និងការប្រមូលផលពីប្រភេទសត្វរស់នៅក្នុងទឹក (ពីត្រពាំង ព្រែក និងទន្លេ)ជាលក្ខណៈពាណិជ្ជកម្មនឹងនាំដល់ការនេសាទហួសកម្រិតដ៏ធ្ងន់ធ្ងរ។

ការសិក្សាស្រាវបានបញ្ជាក់ថា ការស្វែងរកចំណីរបស់សត្វត្រយ៉ងចង្កុំកស ប្រហែលជាមានការផ្សាភ្ជាប់ជាមួយនឹងពពួកមីក្រូសារពាង្គកាយដែលរងឥទ្ធិពលពីសកម្មភាពរបស់ក្រុមសត្វចតុបាត។ ការណែនាំបានបង្ហាញថា ការចិញ្ចឹមសត្វតាមបែបធម្មជាតិ និងការធ្វើកសិកម្មតាមទម្រង់ផ្សេងៗក្នុងព្រៃល្បោះដោយសហគមន៍មូលដ្ឋាននៅភាគខាងលិចនៃតំបន់ខាងលិចសៀមប៉ាង ប្រហែលជាមានតួនាទីសំខាន់ក្នុងរយៈពេលខ្លី ឬមធ្យម

ក្នុងការការពារ និងទ្រទ្រង់ដល់សត្វត្រយ៉ងដែលមានចំនួនដ៏ច្រើនក្នុងតំបន់នេះ។ ដូចនេះ បើមានការផ្លាស់ប្តូរវិធីចិញ្ចឹមសត្វ និងទម្រង់នៃការធ្វើកសិកម្មនោះ អាចបង្ករឲ្យប្រភេទសត្វទាំងនេះទទួលរងហានិភ័យយ៉ាងខ្លាំង។

ការអភិរក្សតំបន់ដ៏ធំនៃទំនាបព្រៃល្បោះ តែងតែមានការប្រឈមនឹងបញ្ហាជាច្រើនក្នុងនេះរួមទាំងបញ្ហានៃការខ្វះខាតថវិកាចាំបាច់សម្រាប់ការគ្រប់គ្រងប្រកបដោយប្រសិទ្ធភាពផងដែរ។ ការប្រើប្រាស់ដីធ្លីប្រកបដោយនិរន្តភាពអាចជួយអភិរក្សជីវចម្រុះដ៏មានតម្លៃ ក៏ដូចជាការចូលរួមចំណែកក្នុងការជួយទៅដល់ជីវភាពរស់នៅរបស់សហគមន៍មូលដ្ឋាន និងអ្នកពាក់ព័ន្ធនានា ដែលករណីនេះពុំទាន់មាននៅឡើយសម្រាប់តំបន់អភិរក្សនេះ។ ប្រសិនបើ មិនមានការខិតខំប្រឹងប្រែងរួមគ្នាពីអ្នកពាក់ព័ន្ធទាំងអស់នោះទេព្រៃល្បោះដែលមានតម្លៃគ្មានអ្វីមកជំនួសបាន និងពពួកសត្វព្រៃ នៅតំបន់ខាងលិចសៀមប៉ាងអាចប្រឈមនឹងអនាគតដ៏អាប់អួរមិនខាន។

Photo: Jonathan C Eames

Chapter 1
Introduction

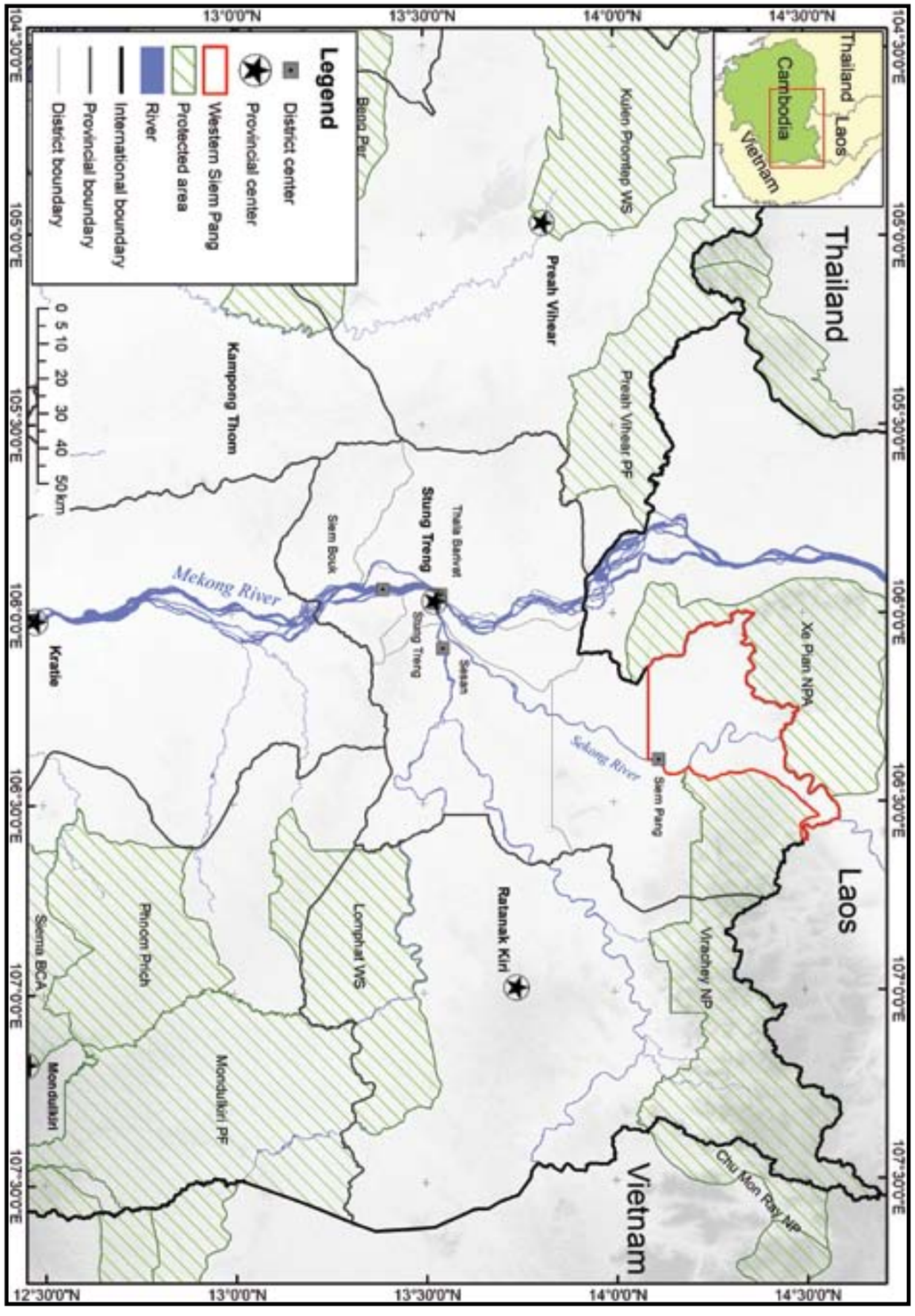
Purpose and Background

This report documents the globally significant biodiversity of the proposed Western Siem Pang Protected Forest (hereafter referred to as Western Siem Pang), in north-east Cambodia and the threats facing the area. The report seeks to provide the justification for protecting the irreplaceable biodiversity significance of the area, while recognising the need for optimal use of Cambodia's natural resources for the long-term benefit of the people of Cambodia. The assessment attempts to be as objective and thorough as possible to create an accurate picture of the current situation. The report is targeted in particular at local and national decision-makers to promote awareness of the ecosystem values and global significance of the area and the need for environmentally sensitive and appropriate approaches to economic development. National legislation permits establishment of a Protected Forest in the Siem Pang area. As such, it would form an integral part of the national permanent forest estate but not be a formal Protected Area; this would represent an ideal arrangement for local communities and Government while conserving the area's biodiversity and assisting global climate change mitigation by protecting forest carbon stocks.

On 21 August 2009, the Ministry of Agriculture, Forestry and Fisheries of Cambodia decided to proceed with a sub-decree to establish the Western Siem Pang Protected Forest for Genetic Conservation of Plants and Animals, covering 149,710 ha (Map 1.1). This event demonstrated the exceptional opportunity that the site offers, and the commitment of the Government to a new management vision. However, the process is not yet complete, threats remain and long-term management remains a challenge. It is hoped that the clear documentation of the areas biodiversity values in this report will enable decision-makers to complete this important process, and fully recognize Western Siem Pang as a Protected Forest for the Genetic Conservation of Plants and Animals.

Western Siem Pang is located in the far north-eastern Cambodia, in Stung Treng Province, adjacent to the international border with the Lao PDR (Laos) (Map 1.1 and 1.2). One of the Mekong's largest tributaries, the Sekong, flows through Western Siem Pang. This river is central to the local communities of Western Siem Pang and the culture and economy of the province as a whole. Western Siem Pang comprises a still largely forested lowland landscape that adjoins several existing protected areas both in Cambodia and Laos. To the north and west across the border in Laos lies the ecologically very similar Xe Pian National Protected Area (NPA), while across the Sekong river to the east in Cambodia lies Virachey National Park (NP). Together these three areas fit within an even larger contiguous area of protected areas including the Nam Gong Provincial Protected Area and Dong Amphan NPA areas in Laos, and *Chu Mom Ray* National Park in Vietnam. At well over 700,000 ha this landscape is one of the larger 'wilderness' protected landscapes in the region. The proposed Western Siem Pang Protected Forest covers a somewhat different area from the Western Siem Pang Important Bird Area, the later having no formal recognition within Cambodia (see Box). The IBA was designated on the basis of a review of bird species communities, as then known, in 2002–2003 (Seng Kim Hout *et al.* 2003b).

BirdLife has been active in the area since 2003; initiatives have focused strongly on local



Map 1.1. Western Siem Pang and its relationship with surrounding protected areas

community involvement in basic wildlife and threat monitoring activities at the site. More recently formal wildlife protection activities have been established, although only a single patrol team is active and currently only one Forestry Administration officer is on staff.

Box 1: Local Communities of Western Siem Pang

There are 14 villages in three communes, in the Western Siem Pang Important Bird Area. In 2006, the total population of these villages was 9,326 people (1,888 families). These communities cultivate wet-season rice and raise domestic animals such as cows and buffalos. Their animals are grazed freely in Western Siem Pang for most of the year. People typically supplement their farming activities by harvesting wild vegetables, fish and other animal life within the forests, along local streams and other wetlands and along the Sekong (Anon. 2007).

In contradiction to the 2009 decision by the Forestry Administration to proceed with a process to designate the area as a Protected Forest, a large agricultural concession granted to Green Sea Agriculture Co., Ltd (GSA), overlaps with a substantial proportion of Western Siem Pang (Map 1.3). The concession of 100,852 ha, granted by royal decree in November 2001, covers most of the Western Siem Pang area of highest conservation value, west of the Sekong River and south of the *O Khampha* (GSA undated). But included in the concession agreement, and outlined by a clarification in December 2006 were inclusion of buffer zones of 2 km surrounding the Laos border, a buffer zone 2.5 km from the Sekong river and 50 m from other streams and the exclusion of village and existing agricultural lands, as well as allocation of land for future agricultural development, in total leaving approximately 74,000 ha of land for concession development. To date there has been no indication that this 70 year concession lease will be cancelled, although a smaller concession that had been granted to another company, the Sekong Development Corporation, north of the *O Khampha* and east of the Sekong was cancelled in 2010. The Green Sea Concession lease agreement however stipulates that plantation development must proceed in yearly stages. Under the current plan this will mean that plantation activities in Western Siem Pang will not begin until 2020, and would not reach the northern-most areas until 2031 (Annex 1).

Surveys and other activities aided by local community involvement since 2002 has shown that Western Siem Pang is central to the remnant range of three species of Critically Endangered Asian vulture and supports globally irreplaceable local populations of two Critically Endangered species of forest ibis; White-shouldered Ibis and Giant Ibis. Indeed, the area has the largest known concentration of White-shouldered Ibises in the world. There are many other notable bird species in Western Siem Pang amongst the most significant being Indian Spotted Eagle, Lesser Adjutant and Sarus Crane. The Western Siem Pang area also supports a remnant community of the increasingly threatened sand-bar nesting birds, particularly River Tern and Great Thick-knee.

However, the conservation significance of Western Siem Pang is not confined to these birds; the area also supports significant local populations of Eld's Deer, and Indochinese Silvered Leaf Monkey, both Globally Endangered.

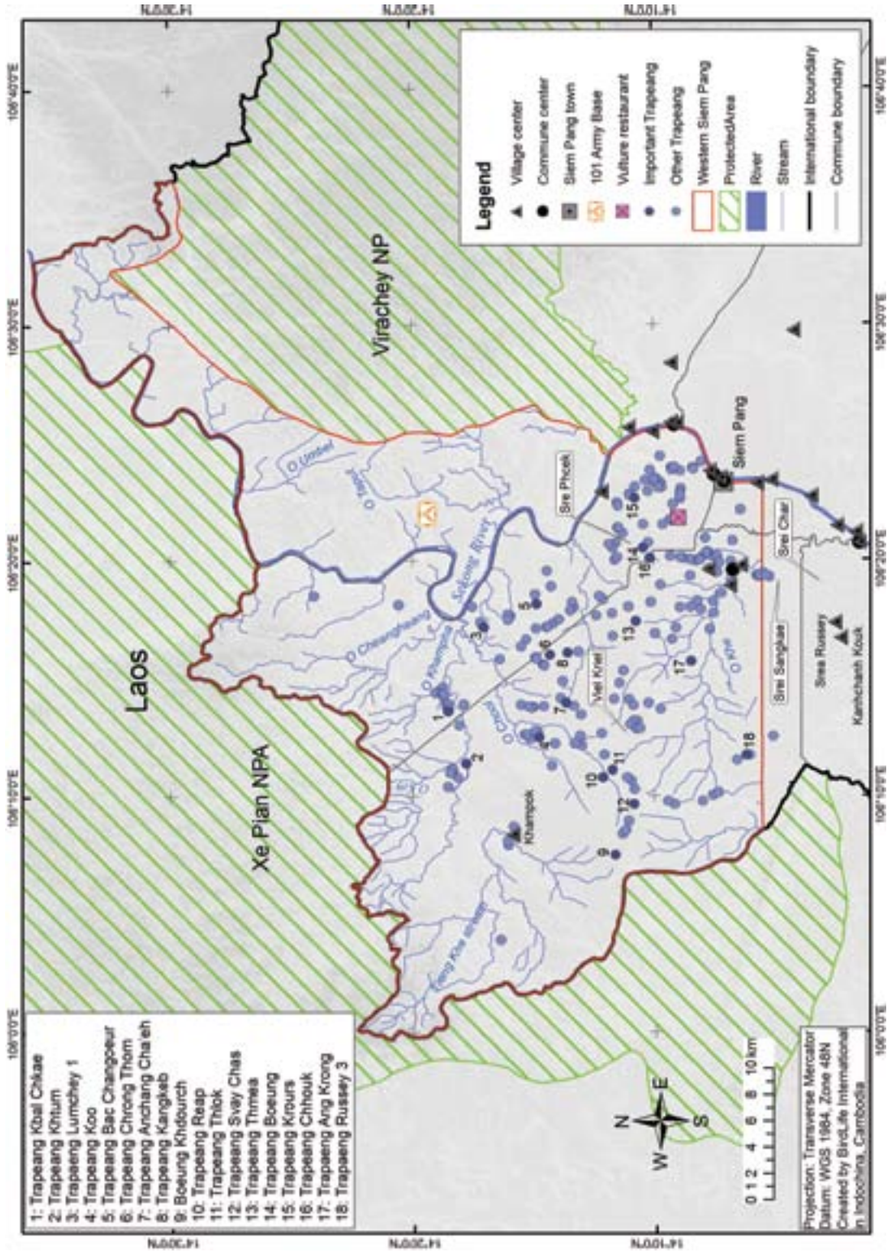
Box 2: Important Bird Area (IBA): An internationally important site for bird conservation, based on its importance for threatened, restricted-range, biome-restricted and/or congregatory bird species

High Conservation Value (HCV): a biological, ecological, social or cultural value of outstanding significance or critical importance at the national, regional or global scale. Areas containing globally, regionally or nationally significant concentrations of biodiversity values (e.g. endemism, endangered species, refugia) or globally, regionally or nationally significant large landscapes where viable populations of most if not all naturally occurring species exist in natural patterns of distribution and abundance are defined as HCV Areas. For more detailed definitions refer to the High Conservation Value (HCV) Resource Network http://hcvnetwork.

Siem Pang is one of five districts in the province, with 5 communes comprising 28 villages. Population in the district is low (Box 1), with all villages restricted to the lowlands. The largest villages are shown on Map 1.2. Most human settlement is concentrated around Siem Pang Town centre and in an area radiating out from it to the southwest (e.g the villages of *Kanchan Kouk* / *Sre Russei* / *Sre Char*) and west (Kheh village), and along the Sekong River. There are few villages away from the eastern areas mentioned above, but an extensive network of dirt tracks allows easy access to most lowland forest areas. In 2003, this network of tracks was considered to be sparse (Timmins *et al.* 2003a), but in recent years many new tracks have been added to the network largely because of increasing activity in the forests, especially increased logging utilising vehicles. A new road from Stung Treng to Siem Pang has built in 2009, and has subsequently had significant effects on local economies and settlement patterns, with much commercial traffic along the road taking natural resources to distant markets and bringing household, agricultural and fishing commodities to Siem Pang.

A study of seven villages within the Western Siem Pang IBA showed that Non-timber Forest Products (NTFP) such as fish and other animals, bamboo shoots and wild mushrooms are very significant in the diet of local people (Bou Vorsak 2007). From September to November, when agricultural products are reported to be scarce, villagers increasingly make use of forest resources both directly for food and indirectly as a means of cash income for purchase of food. The study suggested that the lives of some 250 families are significantly dependent on natural resources (Bou Vorsak 2007). Wright (2011) in a more detailed and controlled study concluded that "the forest was used by 97.7% of households and accounted for over half of the total net value of livelihoods". The study further found that livestock were a very significant capital asset for many families providing both financial security and potential economic gain. The study estimated that this asset "was equivalent to 73.9% of overall livelihood net value in grass-roof and 123.6% in metal-roof households". Elevations range from about 45 m asl in the lowland plains to about 385 m asl in the low hills on the Laos border

Box 3: BirdLife Cambodia Programme conducts wide ranging activities in Cambodia. Among other achievements, BirdLife has led the efforts that resulted in the protection of Boeung Prek Lapouv, one of the last grassland sites in the Mekong Delta.



Map 1.2. The main landscape features of Western Siem Pang

in the north-west. The landscape is a habitat mosaic dominated by Deciduous Dipterocarp Forest, with rice cultivation occurring near settlement and Semi-evergreen Forest found predominantly along tributaries of the Sekong River and in the low hills in the north. Other than relatively selective logging carried out at various times, Western Siem Pang still has an estimated 90% or greater cover of relatively intact forest. About half is Deciduous Dipterocarp Forest a fast disappearing biome characteristic of Southeast Asia, whilst approximately 40% comprises Semi-evergreen Forest. Shallow, usually seasonal, pools, known as *trapeangs* occur frequently within the Deciduous Dipterocarp Forest and vary greatly in size. Most of these *trapeangs* dry out during the driest period of the year, but in most years at least some *trapeang* still contain some water (H L Wright pers. comm.).

International Support

BirdLife and the Forestry Administration (FA) have been working together in Western Siem Pang since 2003 (Box 3). In September that year, the FA working in collaboration with the Stung Treng provincial authorities, organized a workshop on "Planning design for the management and conservation of wildlife, in particular, Globally Threatened bird species of the Important Bird Area (IBA) in Siem Pang" (Box 2). The workshop was strongly supported and within a few months BirdLife was able to secure international funding for the first of several projects in the area.

Between October 2003 and December 2010, Western Siem Pang has attracted about US$ 390,000 of international funding, with the main donors being the MacArthur Foundation, the Dutch Ministry of Foreign Affairs (DGIS/TMF), the Critical Ecosystem Partnership Fund (CEPF), the Jensen Small Grants Programme, the BirdFair–RSPB Preventing Extinctions Programme, the Ashden Trust, and the Ministry of Foreign Affairs, Taiwan. Since December 2010 BirdLife's conservation work at Western Siem Pang has been supported by the MacArthur Foundation and *Le fondation Prince Albert II de Monaco*.

Starting in early 2004, the MacArthur Foundation supported the implementation of a three-year project by BirdLife entitled *Conservation of Important Bird Areas in Indochina: Strengthening Site Support Groups to Conserve Critical Biodiversity*. The goal of this project was to establish a network of well-managed and protected Important Bird Areas (IBAs) in Indochina, thereby enabling the long-term conservation of the unique biological attributes of the Dry Forests of Cambodia and the Annamese Lowlands of Vietnam (BirdLife International 2006).

The project piloted an innovative, local-stakeholder-based approach to conservation, based on the 'Site Support Group' (SSG) model at six project sites, including Western Siem Pang and others in Vietnam. The SSG at Western Siem Pang originally consisted of eight members[1] that undertook monitoring and some management at the site with support and monitoring from a BirdLife Project Officer (Box 4). This project was implemented in collaboration with WPO/FA. The final review of the project, conducted in January and February 2006, concluded that the

[1] Two provincial FA staff and two commune leaders, one chief member of the district authority of Siem Pang district and three villagers

project had made significant contributions to biodiversity conservation, strengthened local governance and grass roots civil society development in both Vietnam and the Cambodian Dry Forests including Western Siem Pang. In addition, it piloted an approach to local-stakeholder-based conservation, SSGs, that has great potential to be refined and extended elsewhere.

Following the success of the establishment of the SSG's, the DGIS/TMF Small Grants Programme provided additional funding to BirdLife to continue this initiative under the auspices of another project: *Strengthened Community Natural Resource Management in Western Siem Pang IBA, Cambodia*. The goal of this project was to significantly improve the management of critical dry forest *trapeangs* in the Western Siem Pang IBA, thereby protecting biodiversity and assisting local communities reduce poverty. The project had two objectives, (1) to increase capacity among local communities to sustainably manage natural resources and develop best practices skills and (2) to facilitate the incorporation of natural resource needs and priorities of local communities into higher decision-making plans. Overall this project resulted in a perceived but unquantifiable improvement of the management at five high conservation value *trapeangs* (Box 2). This improved management may have assisted a number of households improve levels of household income. A small increase in the capacity of local communities to sustainably manage natural resources was also observed, along with a significant increase in awareness levels amongst them relating to the need to sustainably manage *trapeangs.* As a result of funding from the DGIS/TMF small grants programme communities in Western Siem Pang became much more aware of development pressures on the area and supportive of the proposal to establish the Protected Forest. If established, local communities believe that this will help them maintain their livelihoods, including access to *trapeangs*. There is widespread understanding that this option is preferable to them losing access to natural resources as a result of commercial agro-industry concession development (Bou Vorsak 2007).

The SSG[1] initiative was continued from 2006 by funding from the Jensen Small Grants Programme. This project phase entitled '*Strengthened Local Conservation Groups at three priority IBAs in Cambodia*' concluded in early 2009. The goals for Western Siem Pang were to strengthen Local Conservation Groups (LCGs), and to protect dry forest *trapeang* habitats for ibises and other threatened species.

Positive outcomes of the Jensen Small Grants-funded project included a proposal to establish the site as a Protected Forest that was approved by the Provincial Governor. The designation process allowed for capacity building among key stakeholders, in particular leading to an understanding of the global significance, and why long-term protection is important. As part of the project, environmental awareness posters were distributed to all relevant government and non-government stakeholders to assist in capacity building.

In 2008, funding was secured from the CEPF / BirdLife small grants fund for a PhD student from the University of East Anglia to study the Critically Endangered White-shouldered Ibis. At the same time, funds from BirdLife's Preventing Extinctions Programme enabled local people to participate in this research by providing the salary of a research assistant. These latter funds were also used to support LCGs to conduct population and habitat monitoring and allowed for additional education and awareness-raising. Whilst the global importance of Western Siem Pang and the international attention and funding that it has attracted has promoted and supported a number of local workshops for key stakeholders (in September 2003 and May 2007), this funding allowed for important follow up to these workshops within MAFF.

Box 4: Local Conservation Groups

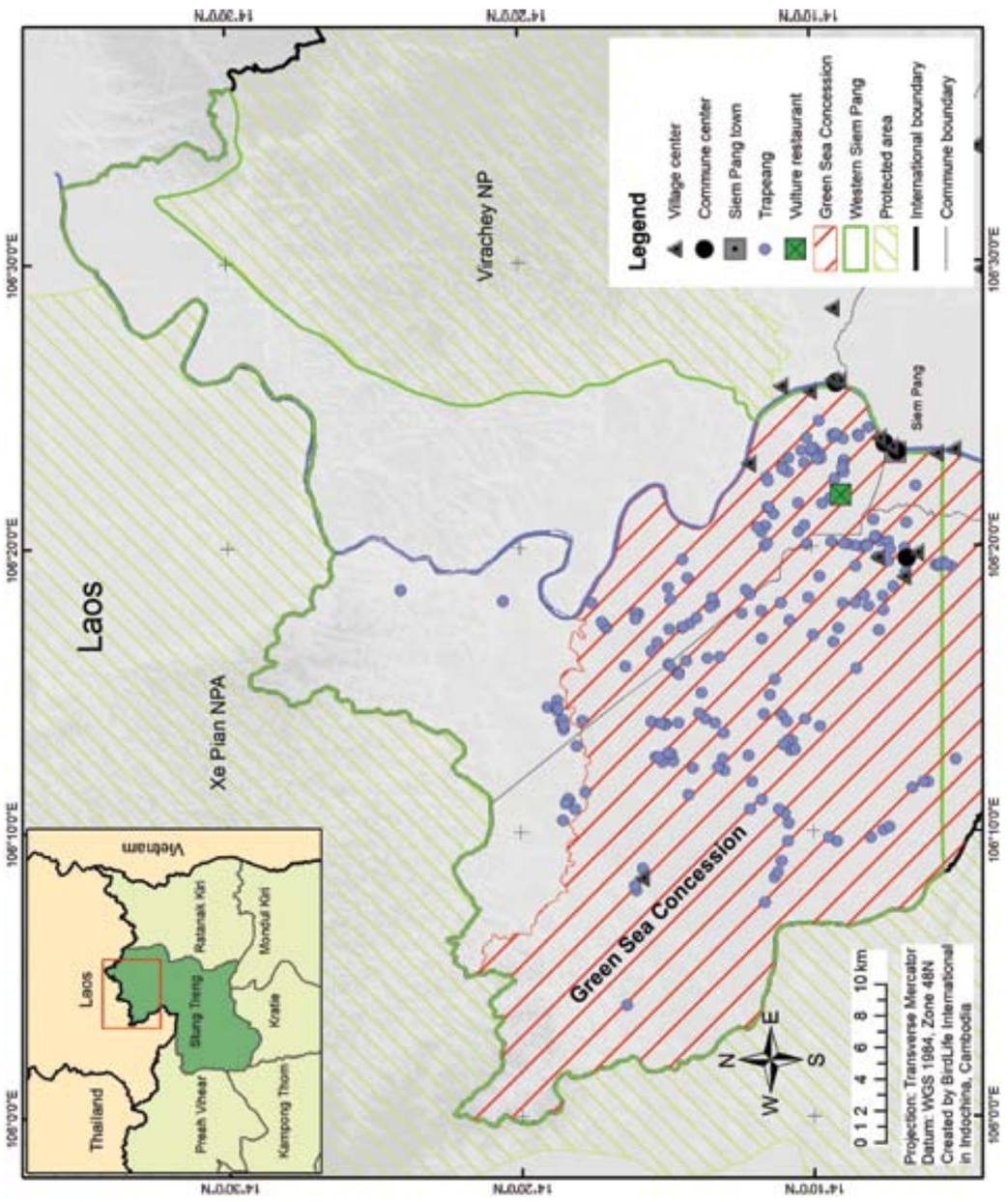
Local Conservation Groups (LCGs) (previously Site-support Groups) have been formed at selected villages to support managment of on-the-ground conservation activities in Western Siem Pang since BirdLife project activities began. LCG activities have included raising environmental awareness, law enforcement, and the monitoring of known populations of White-shouldered Ibis. Key members from the LCG have sine been recruited by BirdLife and form the monitoring team. The team is competent in carrying out conservation activities throughout the site. It is envisaged that the quality of the monthly monitoring and conservation activities that the team carry out will continue to improve once the Western Siem Pang Protected Forest is formally established.

Hence, in July 2008, a working group comprised of technical officers from the Stung Treng provincial authorities, officers of the district authorities and members of the local commune authorities was established. This working group made recommendations relating to the establishment of a "Protected Forest for the Genetic Conservation of Plants and Animals in WSP" (BirdLife International 2009b). These recommendations took special care to ensure eligibility under REDD, a possible source for future funding. They recommended boundaries that enclosed a total land area of 149,710 ha which overlapped with both land concessions that were in existence at that time, namely those of Green Sea Agriculture Co., Ltd (82,755 ha overlap) (Map 1.3) and of Sekong Development (9,850 ha overlap). The working group also undertook a social economic impact study, leading to the exclusion of 3,403 ha of residential and cultivation areas that were initially included in the proposed area. These recommendations were approved by the local authorities with the issuance of Stung Treng Provincial letter No. 424 S.L.K. dated 19 September 2008 which endorsed the designation of conservation area for Giant Ibis and other wildlife in Siem Pang District, Stung Treng Province).

Eight months later, on 21 May 2009, the Head of the Forest Administration signed a letter that proposed the designation of the "Protected Forest for Genetic Conservation of Plants and Animals, Siem Pang, Stung Treng Province" for consideration by MAFF. On 10 July 2009, the cabinet of MAFF under the chairmanship of H.E. Chhan Savut, Vice Secretary of State of MAFF, discussed a draft sub-degree on designating this area as Protected Forest. As a result of the discussion, participants agreed that further consideration was required by the MAFF's Steering Committee because the draft sub-degree on designating the Western Siem Pang Protected Forest overlapped in area with two economic land concession companies: Green Sea Industrial Co., Ltd and the Sekong Development Corporation.

Subsequently, the MAFF Steering Committee met on 20 August 2009, chaired by H.E. Ouk Sokhun (Secretary of State), with the participation of H.E. Ty Sokhun (then Head of the

[1] Under this project, the Site Support Groups became known as Local Conservation Groups



Map 1.3. Proposed Western Siem Pang Protected Forest showing the extent of overlap with the Green Sea Concession

Forestry Administration). The Steering Committee supported the proposal for establishment of Protected Forest in Western Siem Pang. It was agreed that, in relation to land overlap with the two economic land concession companies, the MAFF Minister would write a letter to propose that the Prime Minister designate Western Siem Pang as a "Protected Forest for the Genetic Conservation of Plants and Animals in WSP". This letter also strongly recommended that the government should either reduce the land concession area of Green Sea Industrial Co., Ltd to 10,000 ha (the maximum allowed under existing land law) and cancel the contract with Sekong Development Corporation, or should cancel in entirety the contracts of both companies since neither had implemented any activities despite this being part of their contract agreements with the State. It was also noted that the land concession that had been allocated to Green Sea Industrial Co., Ltd greatly exceeded the maximum that could be legally approved by existing land law (which is 10,000 ha).

It should be noted that the land concessions have been a hindrance in obtaining some international funding; JICA, for example, decided not to fund work in the proposed Protection Forest because of the overlap with the Green Sea concession (Bou Vorsak pers. comm. 2011). The project proposal to JICA focused on developing, piloting and implementing a natural resource management plan for Western Siem Pang.

Surveys and studies

Prior to 2002, anecdotal evidence such as the discovery of two juvenile White-shouldered Ibis in Siem Pang town (Seng Kim Hout *et al.* 2000, Anon. 2000), river bird surveys (e.g. C. Poole and J. W. Duckworth in Timmins *et al.* 2003a), and aerial overflights (e.g. Barzen 1994, 1995, 2004), as well as satellite imagery and low human population strongly suggested that the area might have global biodiversity significance, in particular for threatened forest-dwelling waterbirds. In May 2002 a collaborative five-day visit to the Western Siem Pang area, involving BirdLife, WPO, DNCP and WCS evaluated the potential conservation importance of the area (Tordoff *et al.* 2002). This survey produced several exciting results, including documentation of White-shouldered Ibis and reports of extant Eld's Deer.

In January 2003, Seng Kim Hout *et al.* (2003a) also made a short reconnaissance visit to the area as part of the Important Bird Areas project. The team conducted their brief surveys along the western Sekong River from Siem Pang district town to the *O Khampha* stream and along the Sekong River to near the border with Laos. Following this initial visit, the first biodiversity assessment of the Western Siem Pang area was undertaken in November 2002 by WWF, WPO, DNCP and WCS (Timmins *et al.* 2003a). The 12-day survey provided anecdotal evidence (mainly tracks) for the presence of a number of threatened mammal species and direct observation of a number of threatened bird species. Interviews also suggested that the area still supported Siamese Crocodiles *Crocodylus siamensis* at that time.

As a result of the discovery of both Giant and White-shouldered Ibises in the area during 2002–2003, as well as other threatened wildlife including three species of vultures, Black-necked Stork *Epippiorhynchus asiaticus*, Sarus Crane and Eld's deer, Western Siem Pang was added to Directory of Important Bird Areas in Cambodia (Seng Kim Hout *et al.* 2003b).

Trapeang Chhouk (above, below and facing page below) is one of the larger and more important *trapeangs* for birds within Western Siem Pang and is one of over 200 *trapeangs* mapped in the area. The outline of old paddy fields is also visible from the air. The two images below and facing page below, illustrate the contrast between the dry and wet seasons. Photos: Jonathan C Eames

The Sekong River (above) flows through Western Siem Pang bisecting the site and dividing the mainly Deciduous Dipterocarp Forest and *trapeang*-rich landscape on the west bank from the semi-evergreen forest in the east. The riverine forest corridor supports its own wildlife community. Photos: Jonathan C Eames

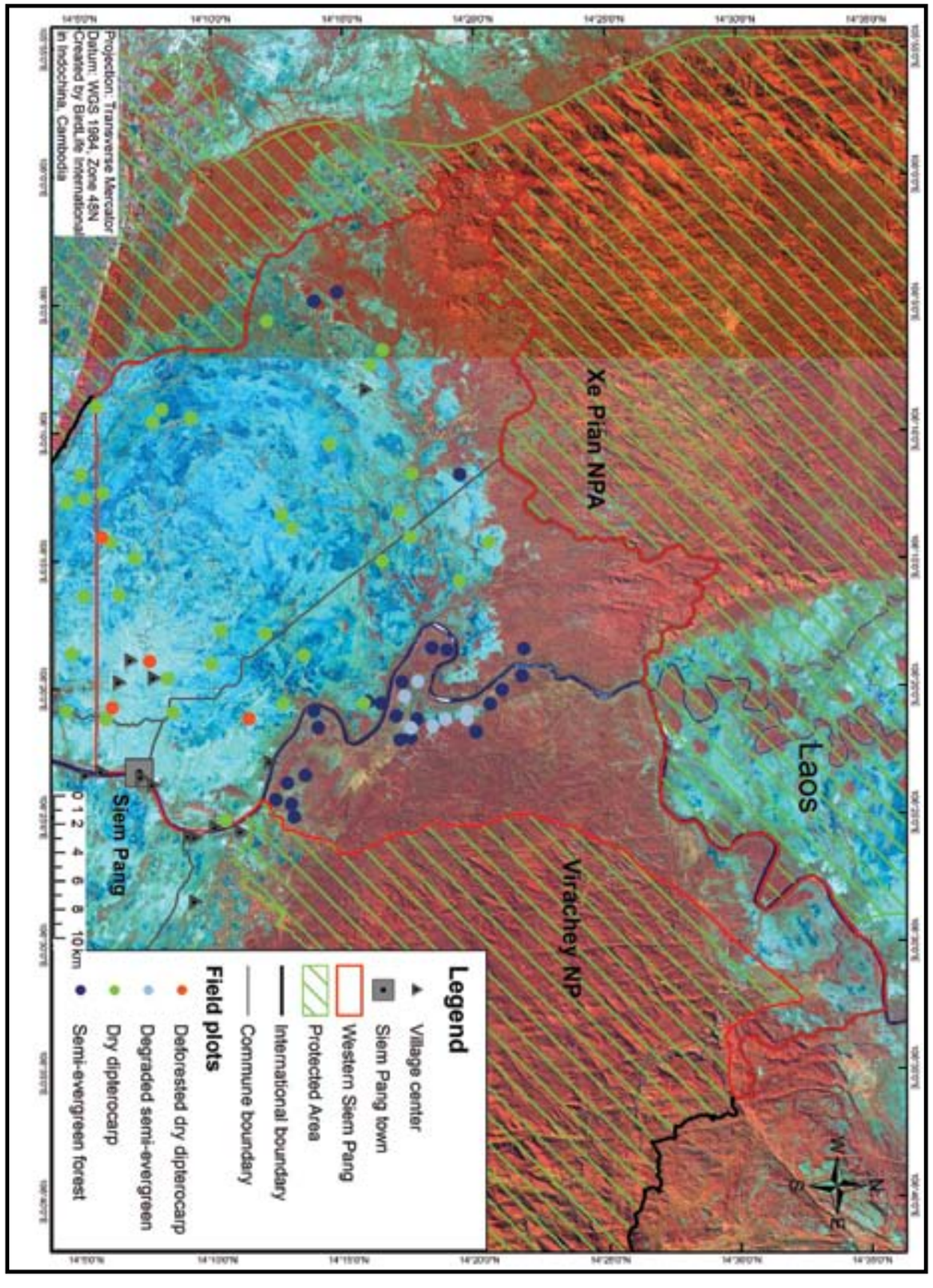
A more prolonged survey was conducted from October to December 2006 in collaboration with an ecologist from the Royal Society for the Protection of Birds (RSPB), BirdLife in the UK. The majority of the 42-day survey was spent in the central, southern and eastern plains, but eight days were spent in the lower hill fringe of the north close to the Sekong, and a further seven days were spent in the northern lowland plains investigating the *O Khampha*, its tributaries and the associated forest mosaic. During the survey the location of over 150 *trapeangs* was mapped, whilst an impressive 220 bird species were documented. Moreover, the birds recorded included at least 130 White-shouldered Ibis, representing an estimated 50% of the known total world population at that time (Buckingham and Prach Pich Phirun 2006).

In March 2007 H. L. Wright from the University of East Anglia, UK, with support from BirdLife began research on White-shouldered Ibis in Siem Pang District for an MSc Thesis (Wright 2008, Wright *et al.* 2010a, b). This now completed, he is currently undertaking further research on the ibis in pursuit of a PhD. As a result of the study, in addition to an understanding of the feeding ecology and population size and movements of White-shouldered Ibis (Wright 2008, Wright *et al.* 2010b), improvements in the monitoring protocol of the BirdLife monitoring team in Western Siem Pang have been made (e.g. Wright *et al.* 2010a). During the study, in February 2009, the first nests of White-shouldered Ibises were found and monitored, and the number of known individuals of this species at this site steadily increased (Wright *et al.* in press, H L Wright pers. comm.).

Due to its global conservation values Western Siem Pang was selected as a site for the BirdLife initiative called Forests of Hope; which seeks to avoid tropical deforestation and combating climate change. Under the Forest of Hope umbrella, BirdLife received funds from the Ashden Trust and the Ministry of Foreign Affairs, Taiwan to determine the feasibility of Cambodia designating Western Siem Pang as a potential REDD site. This initiative started during April 2009, when a forest inventory group undertook a forest carbon stock survey in Western Siem Pang with financial support from Permian Limited, UK. The project established 75 sample plots, mainly in Deciduous Dipterocarp Forest with also many in Semi-evergreen Forest (Map 1.4; Berry *et al.* 2009, Kry Masphal 2009).

The survey measured the size of a total of 1,064 live trees, 47 dead trees, and 169 pieces of coarse woody debris within Deciduous Dipterocarp Forest and Semi-evergreen Forest (Berry *et al.* 2009). The forest carbon stock in Western Siem Pang area was estimated to be around 25,545,000 tonnes of Carbon (tC) ± a 95% confidence interval of 7,733,000 tC, with an estimated potential annual net income generation of over US $ 200,000 (Berry *et al.* 2009).

Opportunistic wildlife observations have also been made during other project related activities. A number of significant observations in particular have been made by J. C. Eames throughout BirdLife's involvement at the site. In December 2011 a rapid two week assessment was undertaken of wildlife in areas in the far north of Western Siem Pang by R. J. Timmins (results included in this report). The survey focused on a suite of target species known or suspected to be present. The survey mostly covered areas never before, or only superficially, surveyed previously, covering especially the forest area east of the Sekong. Also unlike previous surveys the focus was directed towards Semi-evergreen Forests and the transitional habitat fringe with the lowland Deciduous Dipterocarp Forests. The northern most tongue of the



Map 1.4. Locations of sample plots for carbon stock assessment

Map source: Berry et al. *(2009). Note that the system of forest classification used by Berry et* al. *(2009), which was not referenced to any source, appears to differ somewhat from that used in this document; in particular 'degraded semi-evergreen' most probably refers to the Nearly-Deciduous Forest component of Semi-evergreen Forest and or in some cases even dense Deciduous Dipterocarp Forest (based on the locations of plots). Grid co-ordinates are based on the India–Thailand 1960 datum and a UTM zone 48 north projection.*

proposed protected forest could not be surveyed. The area was found, not unexpectedly, to be ecologically very similar to the adjacent Xe Pian NPA of Laos (see Duckworth *et al.* 1994, 1995, Thewlis *et al.* 1996, 1998, Timmins *et al.* 1993), but much more surprisingly wildlife status in the surveyed area was as good as if not better than wildlife status in Xe Pian NPA almost two decades previously (R J Timmins pers. comm.). In the interim 19 years the status of many large mammals and several birds has perilously declined in Xe Pian NPA (R J Timmins pers. comm.).

Costus sp. or Kaempferia sp.
Photo: Jonathan C Eames

Photo: Jonathan C Eames

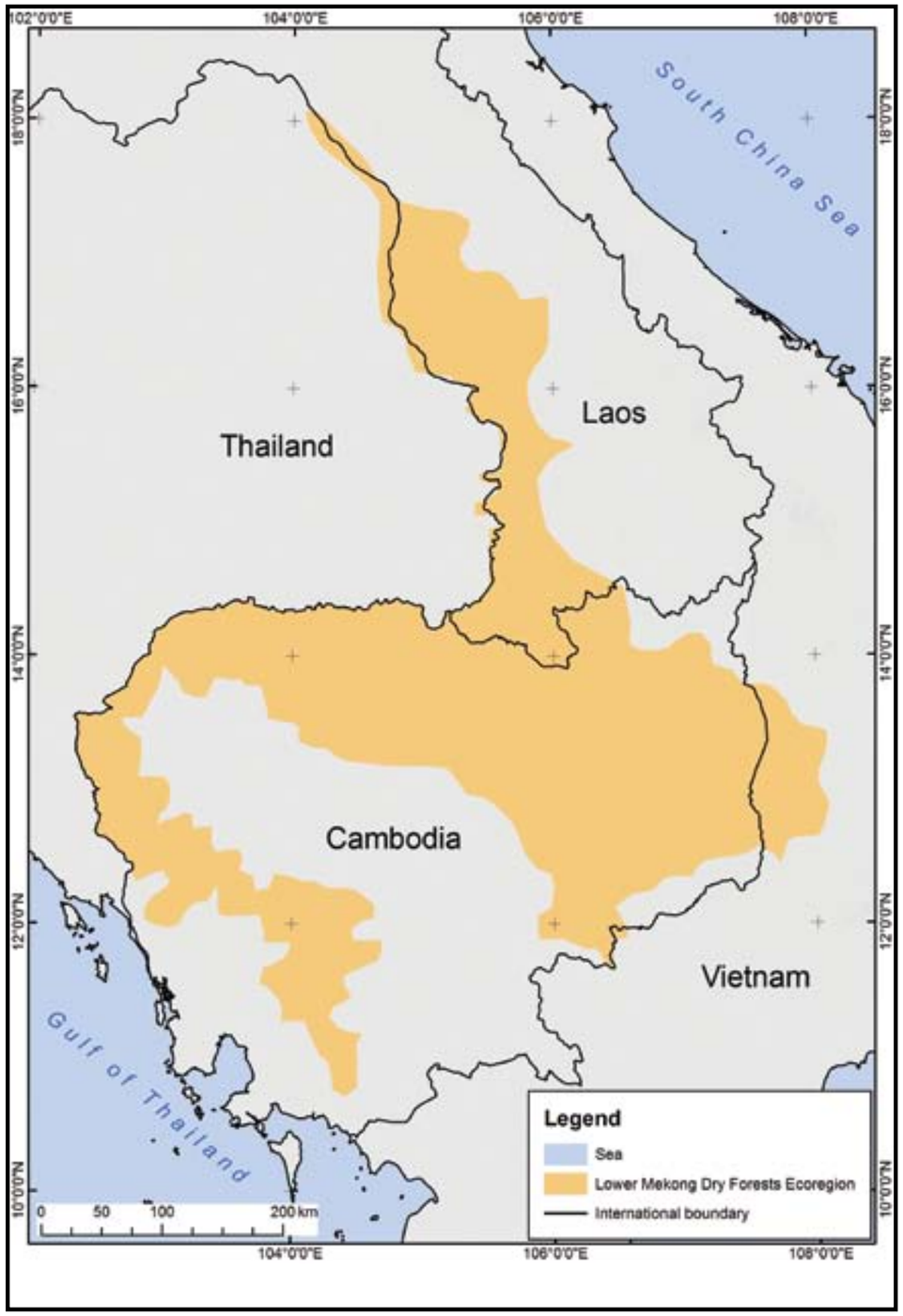
Chapter 2
Forests and other Wildlife Habitats

Western Siem Pang lies in what has been termed the 'dry forest' region of Indochina (Tordoff *et al.* 2005; see also Map 2.1). This region lies in the interior of Indochina, where a strongly monsoonal climate prevails with a long dry season and well-defined summer wet season. The dry forests once covered most of lowland Cambodia above the floodplains of the Mekong and Tonle Sap, and a largely unbroken swath still cloaks the northern third of the country. Deciduous Dipterocarp Forest dominates the dry forests, although the dry forest region consists of a mosaic of Deciduous Dipterocarp Forest and other forest types including Semi-evergreen Forest. The Deciduous Dipterocarp Forests and the complex association of other habitats constitute a distinctive and biologically rich biome, with a number of biome endemic species including all six of the only known deciduous Dipterocarpaceae trees (Rundel 2000; largely repeated in Rundel 2001, 2009).

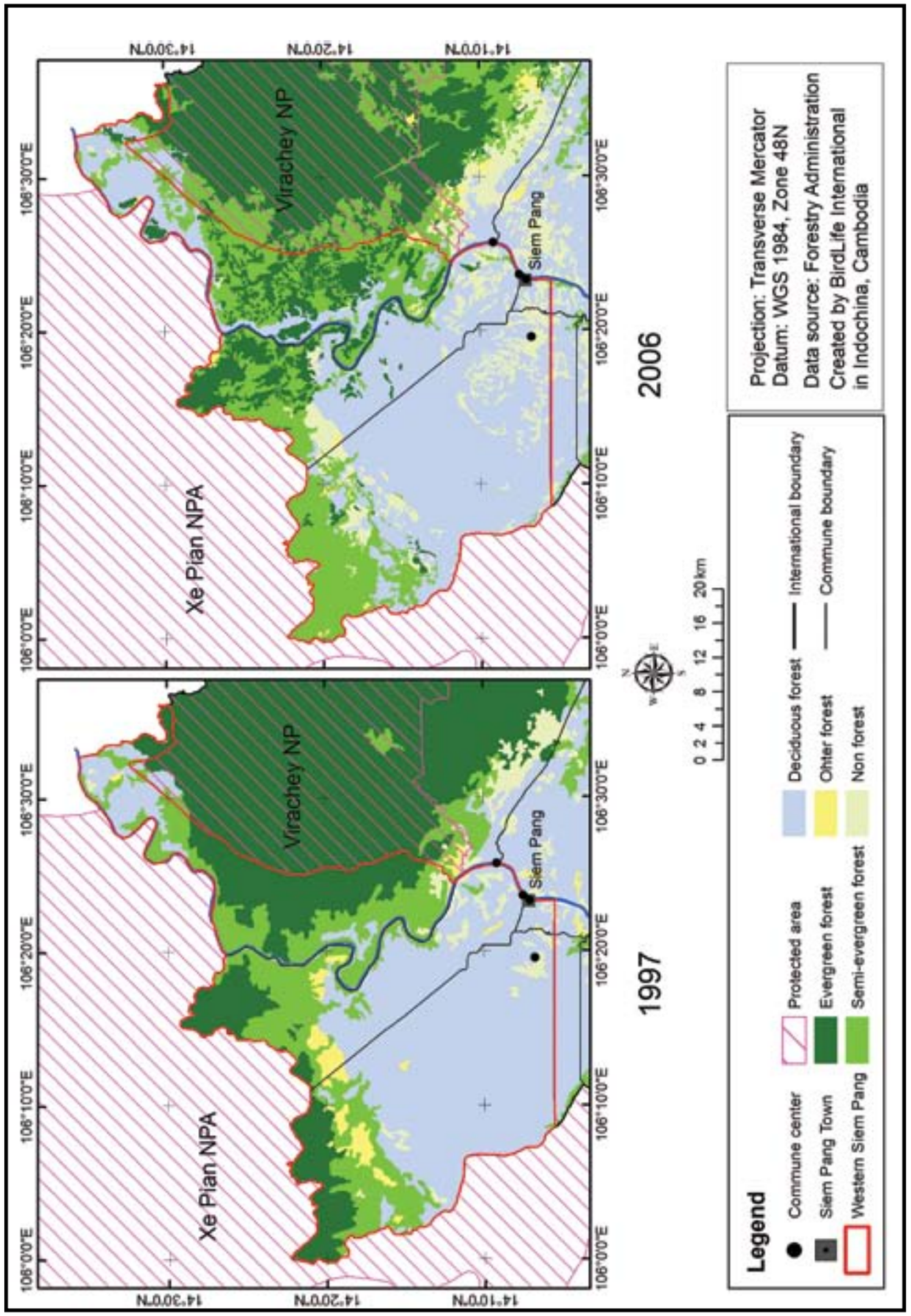
Unfortunately there are many varying forests classifications in use (e.g. Blasco and Bellan 1996, JICA 2002, Maxwell 2004; see Map 2.2), as well as alternative names for the same formations (e.g. dry dipterocarp forest, or even simply deciduous forest, for Deciduous Dipterocarp Forest, and even "deciduous dipterocarp-oak, seasonal, hardwood forest" in one scheme). Yet even for a non-specialist Deciduous Dipterocarp Forest is generally readily recognisable, thus while names might differ, there is relatively little dispute as to what is being referred to (but see Map 2.3). But of particular confusing terminology and classification are all of the other 'interior' lowland forest formations that are not Deciduous Dipterocarp Forest. This report follows Rundel (2000) in referring to at least the greater majority of these forests as Semi-evergreen Forest. But other systems have subdivided these, at times along what would appear very arbitrary lines. It is common in descriptions of land cover, especially the relatively recent proliferation of land cover maps to find reference to 'evergreen forest', often along side 'semi-evergreen forest' (see e.g. Map 2.3 based on JICA 2002). However truly evergreen forest, i.e. where deciduous species are 'ecologically' absent, does not occur in Western Siem Pang, and even in Indochina broad-leaf evergreen forest is restricted to very localised areas such as some swamp forests, montane areas and the eastern Annamites where there is no pronounced dry season (Rundel 2000, R J Timmins pers. comm.). There has been no systematic botanical work in Western Siem Pang, and although Berry *et al.* (2009: Masphal 2009: see Annex 2) made provisional identifications of plants largely based on matching indigenous names to compilations of known species and indigenous names, no vouchers specimens were collected. This list should thus be used with extreme caution until species can be verified by systematic botanical work, as many identifications could be incorrect. However composition of both Deciduous Dipterocarp Forest and Semi-evergreen Forest appears to be relatively uniform across their ranges with only minor geographically based differences evident (Rundel 2000), again suggesting that any botanical significance of the Western Siem Pang forests can only be determined after appropriate scientific study.

Map 2.1. Lower Mekong Dry Forests Ecoregion

Source WWF 2010a



Map 2.2. Different interpretations of vegetation cover at Western Siem Pang



Notes for map 2.2. *These maps were taken from DANIDA (2006). The source of the 'Forest Cover 1997' map is given as Mekong River Commission (2001; source not traced during compilation of the current report), with no source given for the map labelled 'Forest Cover 2006' (but it appears to be the land cover map commonly identified as 'JICA 2002'). In neither case are definitions of the vegetation types provided. Different interpretations of vegetation by different mapping projects on remote imagery can result in maps that appear very different and suggest change in vegetation in places where there has actually been no change. This is shown very clearly by the two very different interpretations of the vegetation covering the northern hills of Western Siem Pang and adjacent Virachey; areas that have not undergone any significant change in vegetation over the course of at least the last few decades. This difference in interpretation is probably due to two main factors; firstly a different 'threshold' value used between the two interpretations for defining the spectral difference between 'evergreen' and other forest types; secondly basing interpretation of the vegetation on remote imagery taken at different stages in the seasonal calendar between the two interpretations. Using the vegetation classification of Rundel (2000; see text) these northern hills would be considered covered by Semi-evergreen Forest.*

Deciduous Dipterocarp Forest dominates the lowland plains of Western Siem Pang. Deciduous Dipterocarp Forest trees in general are relatively short compared to those of Semi-evergreen Forest and naturally rarely attain diameters over 1 m dbh. The predominant tree species are all deciduous and large leaves a characteristic feature of this forest type. But within Deciduous Dipterocarp Forest there is considerable variation in formations. Western Siem Pang is particularly noteworthy for extensive areas of savannah-like Deciduous Dipterocarp Forest where tree density is often very sparse. Such 'savannahs' form a mosaic at the centre of Western Siem Pang, as well as a broad band in the northern lowlands on transition to the hilly Semi-evergreen Forest area. Timmins *et al.* (2003a) noted that the extent of this Deciduous Dipterocarp Forest type is very much greater than at any other lowland mosaic forest area surveyed by the primary author (including five discrete areas of eastern Cambodia and eight discrete areas of Laos; R J Timmins pers. comm.).

At the other end of the density spectrum are closed canopy, relatively tall Deciduous Dipterocarp Forest, as occurs generally only patchily in Western Siem Pang. Other variations include relatively dense Deciduous Dipterocarp Forest dominated by rather short trees, as is seen rather extensively around the *Viel Kriel* area of Western Siem Pang. There is also notable variation in the understorey of Deciduous Dipterocarp Forest. Savannah areas characteristically have sparse and relatively short graminoid cover. Deciduous Dipterocarp Forest on riparian terraces in contrast often has dense tall grass sometimes to over 2 m in height. A small deciduous bamboo *prich* (*Arundinaria* sp(p).) cloaks the ground in some areas, while others usually with a stony surface have a rich mix of shrubs, herbs and graminoids.

Deciduous Dipterocarp Forest is a fire adapted forest type (or fire climax) and the understorey of Deciduous Dipterocarp Forest usually burns annually. The majority of fires generally occur in the early dry season and are the result of anthropogenic activities, although ignition from lightening strikes undoubtedly also occurs at least occasionally. Despite the high fire frequency the Deciduous Dipterocarp Forest community appears well adapted, probably because fire frequency has been high for a considerable time, certainly for decades, most likely for centuries and probably millennia (Maxwell 1999, 2004, Timmins 2011).

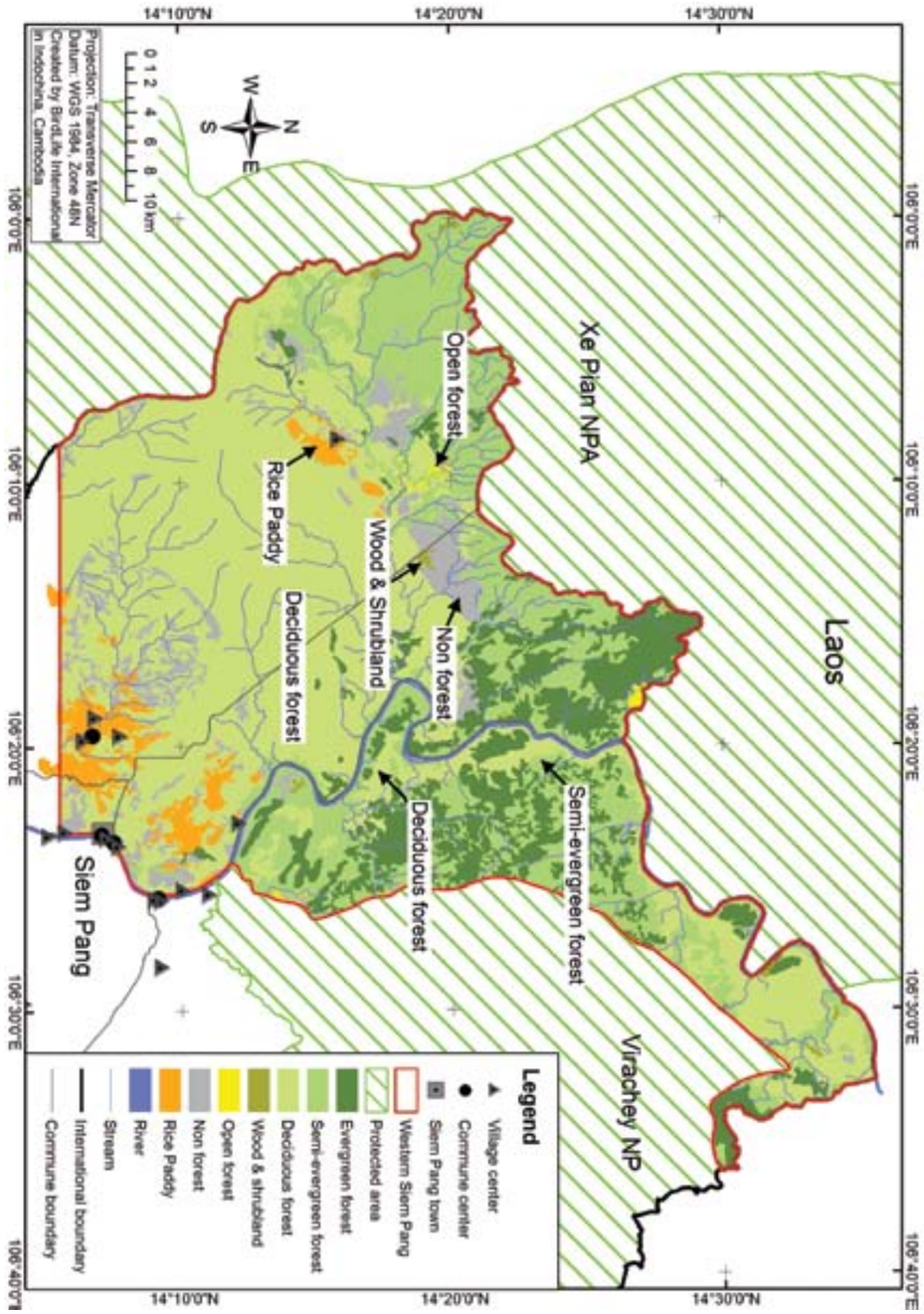
Some savannah like areas of central Western Siem Pang are often so sparsely covered in trees, that they are better termed grasslands. Elsewhere within the lowland mosaic, often very discretely defined, smaller open tree-less areas occur. Both types of grassland (although sedges are often common and sometimes dominant), small and large are referred to as *viel* in Khmer. The extent of *viels* in Western Siem Pang is a further noteworthy attribute of the area in the context of the dry forests of Indochina.

Probably the most noteworthy *viel* in a conservation context is *Viel Kriel*, which lies rather centrally, and is approximately one square km in extent. It was once an area of rice-paddies, now only folklore beyond any living memory, but supported by physical evidence in the form of a grid-like pattern of vegetation, especially straight lines of sparse trees and shrubs along nearly levelled bunds. Around its southern and western edge the tree density becomes progressively denser in a band of c. 200-500 m until it becomes relatively uniform short stature open canopy Deciduous Dipterocarp Forest, all with a thick, relatively tall-grass, mounded understory. To the east however this *viel* abruptly changes to sandy, sparsely vegetated, open savannah-like Deciduous Dipterocarp Forest on slightly higher terrain.

Notes for map 2.3. *The vegetation classification scheme on this map differs from that used in this report. Definitions for the vegetation classes have not been traced. The interpretation on the map has broad similarity to a map that might be created using the classification system of Rundel (2000), but there are significant differences. For example the JICA (2002) definition of 'deciduous forest' does not closely correspond with that of Deciduous Dipterocarp Forest as used here (see notes on map). This is presumably due largely to the fact that JICA's definition of 'deciduous forest' is primarily based on spectral signature, while Rundel's Deciduous Dipterocarp Forest is primarily based on a combination of floristics and physiognomy.*

Also associated with the Deciduous Dipterocarp Forests of Western Siem Pang are numerous relatively small forest pools, ranging in size from pools that are little more than buffalo wallows, several metres across, to pools over one-hundred metres in diameter. These pools are generally referred to as *trapeangs* in Khmer, as they are in this document. There has not been a systematic survey of all such wetlands, but the total number is almost certainly over 300. The greater majority of these are seasonal in their retention of water, but a few are permanent at least in the majority of years. Permanency however appears to correlate rather poorly with diameter of the pools (Timmins 2011, H L Wright pers. comm.). *Trapeangs* are frequently associated with *viels*, and for example the *Viel Kriel* area has five large *trapeangs*. These pools probably more than any other landscape feature characterises the high conservation significance of Western Siem Pang. Few other dry forest areas have such a high density of forest wetlands, and within the protected area system probably only the only Preah Vihear Protected Forest (PF) and a limited area in Kulen Promtep Wildlife Sanctuary (WS) have higher densities (R J Timmins pers. comm.; based in part on *trapeang* distribution as mapped on US military 1:50,000 scale maps of the 1960s).

Vegetation in any given wetland at Western Siem Pang varies widely even between similarly sized wetlands only tens of metres apart. For example in the *Viel Tbeng* area one *trapeang* examined by Timmins *et al.* (2003a) was found dominated by an emergent herb and a water lily-like aquatic plant, but an almost identical-sized *trapeang* within 150 m was dominated



Map 2.3 Vegetation map of the proposed Western Siem Pang Protected Forest
(Source: JICA 2002)

Typical small *trapeang* in Semi-evergreen Forest on 12 December 2008 (above). Deciduous Dipterocarp Forest at the height of the dry season photographed on 16 March 2011 (below). Photos: Jonathan C Eames.

Typical small *trapeang* in Deciduous Dipterocarp Forest photographed from the air on 10 December 2008 (above). Riverine forest along the Sekong River photographed on 2 February 2011 (below). Photos: Jonathan C Eames.

by the amphibious shrub *Sesbania* sp. (Box 5). *Trapeang* habitat conditions also show considerable differences between the early dry season and late dry season: all vegetation and water coverage decrease between October and April, and correspondingly, the coverage of bare substrate and shorter vegetation increase (Wright 2008).

Box 5: Water Buffalo and Wetland Vegetation

Domestic Water Buffalo have a clear influence on the two tall vegetation elements, the shrub *Sesbania sp*. and the very tall sedge that are common in wetlands within the area, particularly by keeping vegetation height low in areas that they frequent. They presumably also affect the composition of wetland plant species, through their grazing preferences and trampling. Wild ungulates such as Gaur, Banteng and deer presumably would have had the same effect prior to drastic reductions in their populations in the later part of the twentieth century.

Timmins *et al.* (2003a) surveyed the vegetation in and around 58 wetlands. The shrub *Sesbania* sp. was a particularly common element, with between c. 47-55% of wetlands having more than 5% cover; in many it was dominant. *Sesbania* appeared to be a favoured wetland food item for Domestic Water Buffalo, rarely reaching above the water surface at wetlands in areas with frequent signs of Domestic Water Buffalo. But in areas with little indication of Domestic Water Buffalo use it is often found in dense clumps, often over 250 cm tall. Also very evident in wetlands was a very tall sedge (Cyperaceae sp(p).; often over 2 m tall), with between c. 24-31% of wetlands having more than 5% cover. Unlike the *Sesbania* sp. it is not a major food item for Domestic Water Buffalo, although it is clearly trampled when there is heavy water buffalo use of wetlands. Sedges in general were dominant at c. 12-29% of wetlands (c. 8% excluding the very tall sedge; most other species rarely to over 1 m tall). Non-graminaceous herb cover over 5% or more of the surface was present at 16-19% of wetlands. Densely branched and leaved bruselaceous trees were not dominant at any wetland seen by Timmins *et al.* (2003a) although they were present at many.

Some wetlands are strikingly different from the majority, such as the discretely defined c. 250 m x 100 m (250 ha) *Bung Kdoik*. Situated in Nearly-deciduous Forest, it has fish, is permanent (most years) and covered in grasses and sedges with no sign of *Sesbania* sp. or the very tall sedge (Timmins *et al.* 2003a).

Western Siem Pang topography and geology have great bearing on the vegetation. The relatively flat lowlands, which have very gently undulating topography between 45-110 m asl, are underlain by sediments, mainly sandstones and shales, of presumed Mesozoic age (the age of the dinosaurs; Hutchison 1989, Fontaine and Workman 1997). These sedimentary rocks remain relatively undeformed by tectonic activity (R J Timmins pers. comm.). The northern hills, which rise to about 385 m asl in Western Siem Pang but higher further to the east and west, by contrast appear to be more complex in their origin and stratigraphy. Their origin is potentially much older, consisting basally of Precambrian (c. > 500 million years ago) Proterozoic metamorphic rocks of ancient continental crust (a fragment of ancient crust referred to as the Kontum Massif), interspersed with extrusive volcanic rhyolites of late Paleozoic–early Mesozoic age, and seemingly also highly deformed sedimentary rocks of the middle to late Mesozoic (Hutchison 1989, Fontaine and Workman 1997). The volcanism and deformation in these rocks bears witness to tectonic activity that shaped Indochina through

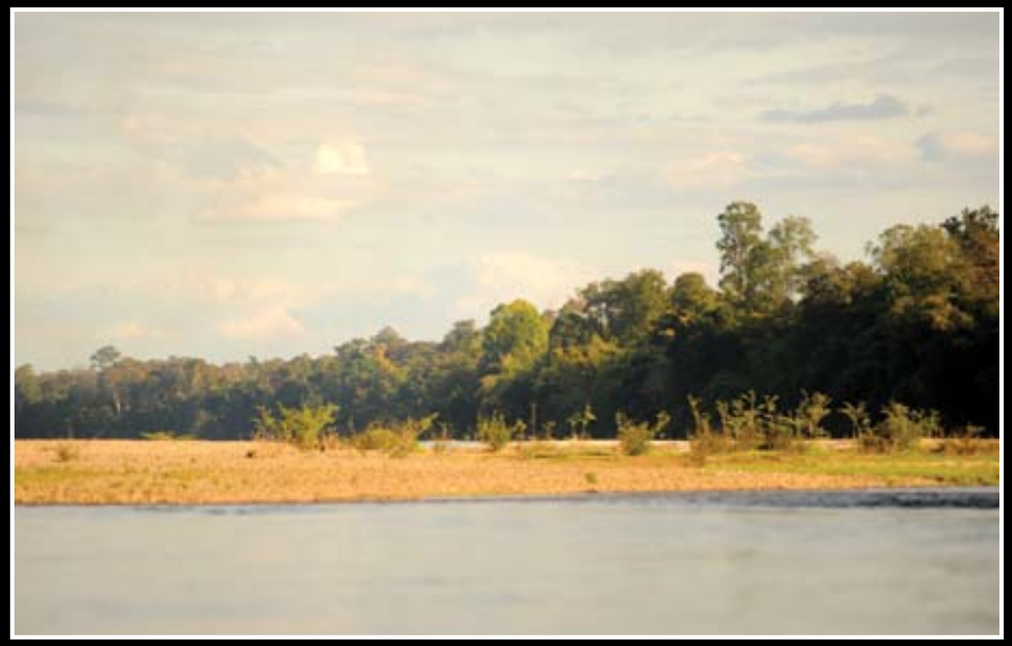
the Phanerozoic as the many constituent plates of the Earth's crust jostled with one another. This contrasting geology between the lowlands and the hills is very evident even on satellite images. The sedimentary layers of the lowland plains can be seen forming gentle concentric arcs in the overlying vegetation, while in the hills a rather regular 'grid' of angular valleys trending NW–SE and NE–SW mark the line of geological faults.

The relatively flat trending geology and topography of the lowlands in combination with the monsoonal climate has given rise to characteristic soils. Soil taxonomy is exceedingly complex and even more than vegetation classification differs markedly between different systems. However tropical monsoonal climates and their interaction with vegetation, topography and geology give rise to a series of soil types characterised by their chemistry and diagnostic horizons (Soil Set # 6 in FAO terminology (IUSS 2006); see also Bridges 1978, NRCS 1999). In these old but shallow soils drainage is impeded, resulting in localized wet season water-logging of soils and formation of a plinthite layer close to the surface. The plinthite layer consists of concentrated iron and aluminium oxides which have been leached from surrounding soil horizons and deposited higher in the seasonal water table in a process termed illuviation. Over time these deposits can form concretionary masses which upon prolonged drying and exposure to oxygen form solid nodules and even, where the plinthite layer is close to the surface, a solid 'hardpan' layer, termed laterite. These soils appear to favour Deciduous Dipterocarp Forest, through water-logging in the wet season, poor water retention in the dry season due to shallowness, and impediment of root growth by the plinthite layer (Timmins 2011). Soils with the shallowest and thickest plinthite layer appear to favour savannah like Deciduous Dipterocarp Forest (Timmins 2011). In some other areas soils appear to be so shallow (< 1 m to weathered bedrock) that soil structure is very simple (R J Timmins pers. comm.). But the resultant effect on vegetation is similar, poor drainage in the wet season, meagre water availability in the dry season and impediment to root development. Such shallow soils appear to be common in the northern band of Deciduous Dipterocarp Forest savannah (R J Timmins pers. comm.).

Where water-logging is particularly prevalent, but where soils are probably deeper and have better dry season water retention the Deciduous Dipterocarp Forest often appears to be relatively dense, although usually not fully closed canopy (R J Timmins pers. comm.). In such areas the soil surface has a mounded 'micro-topography' with considerable annelid worm activity in the form of 'towers' of worm casts. The understorey in such areas is often dominated by relatively tall grass. The tallest densest Deciduous Dipterocarp Forest characteristically occurs where soils appear to be relatively deep and probably relatively well draining and are characteristically associated with topographic rises and in some cases stream courses (R J Timmins pers. comm.). *Prich* is often the dominant understorey form in such areas.

This same combination of geology, climate and soils is probably also highly influential on the formation of *viels* and *trapeangs*, these conditions often favouring grasses and sedges over trees and shrubs (Timmins 2011). However, large mammals especially ungulates are also likely to have been highly influential in shaping both *viel* and *trapeang* characteristics of the landscape, through grazing and browsing, trampling and other damage to vegetation and wallowing (Box 9). *Trapeangs* in particular are likely to be highly dependent on ungulate activity, both to prevent infilling (by removal of sediment when animals wallow) and quite probably in maintaining an impermeable lining. The latter may be highly dependent on 'puddling', by

The Sekong River supports stretches with rapids, forested islands with riverine and Semi-evergreen Forest, as well as sand bars and large boulders. These photographs were taken on 10 December 2008 (above) and 2 February 2011 (below). Photos: Jonathan C Eames



animal wallowing and trampling, of the clay soil that forms the bed of a *trapeang* (Timmins 2011).

Semi-evergreen Forest is relatively restricted in distribution within Western Siem Pang to the hilly areas on the periphery, mainly in the north and more patchily in the west. Smaller patches either associated very infrequently with isolated small hills or quite commonly with stream courses, occur throughout Western Siem Pang. Semi-evergreen Forest however includes a diverse array of forest formations even within Western Siem Pang. One of the more hotly debated divisions lays between Semi-evergreen Forest formations that 'burn' on a relatively frequent basis and have a high frequency of facultative deciduous trees and those that do not. This document follows Rundel (2000) in grouping these highly deciduous, fire prone formations within the umbrella of Semi-evergreen Forest, but other authors have grouped them within Mixed Deciduous Forest, a forest type prevalent in monsoonal areas of northern Indochina and further afield (see also SUFORD 2010 sec. 2.4). Timmins and Ou Ratanak (2001; subsequently followed by Timmins *et al.* 2003a) coined the term Nearly-Deciduous Forest for these formations, largely to allow easy reference to them; the same approach is taken in this document.

Such Nearly-deciduous Forests do not appear to burn as frequently as Deciduous Dipterocarp Forest allowing periodic development of a dense understorey of shrub, sapling and herb growth, however when they do burn, as in Deciduous Dipterocarp Forest, the trees remain unharmed while the smaller stemmed plants of the understorey die back, most apparently resprouting from the rootstock (R J Timmins pers. comm.). This non-annual burning can lead one to the erroneous conclusion that fires are encroaching Semi-evergreen Forest, and that Deciduous Dipterocarp Forest is advancing at the expense of Semi-evergreen Forest. However there is little evidence to support such a view, especially within Western Siem Pang, where boundaries between Semi-evergreen Forest and Deciduous Dipterocarp Forest appear to be relatively static at least over the course of the last half century (Timmins 2011). These Nearly-deciduous Forests are the commonest type of Semi-evergreen Forest within the lowlands of Western Siem Pang, and are especially associated with stream courses (many very ephemeral), especially the Sekong and large streams (R J Timmins pers. comm.). In such areas they not infrequently form an intricate mosaic with tall non-burning Semi-evergreen Forest. Historically these forests would have been tall with many large trees, not infrequently to over two metres in diameter, especially *Dipterocarpus alatus* and other trees in the family, however almost all large mature individuals have now been removed (R J Timmins pers. comm.). One of the commonest large trees within these forests, especially in riparian environments, is now *Lagerstroemia* spp., a very distinctive genus of pale, flaky barked trees, not favoured by loggers. In other areas of Nearly-deciduous Forest however *Lagerstroemia* spp. can be strikingly rare (R J Timmins pers. comm.).

Once again geology and soils appear to be very influential in the distribution of these forests. Following Bridges (1978), much of the Semi-evergreen Forest is likely to overlie soils that have deeper profiles and are better draining than those of the Deciduous Dipterocarp Forest dominated plains (Timmins 2011). The association of Semi-evergreen Forest with stream courses and topographic rises is especially suggestive of the drainage characteristics of the soils. Nearly-deciduous Forest would appear to occupy a somewhat intermediate position between Deciduous Dipterocarp Forest and 'non-burning' Semi-evergreen Forest, with soil

At the start of the rainy season many herbs appear on the floor of the Deciduous Dipterocarp Forest. These include *Decaschista intermedia* a member of the Malvaceae (above), *Curcuma plicata* (above right) and *Kaempferia rotunda* (bottom right), both members of the Zingiberaceae. Photos: Jonathan C Eames.

moisture conditions incapable of maintaining understorey plant moisture levels high enough in the driest of years to prevent fire penetration (Timmins 2011).

Areas of low relatively flat topography within the hills, and relatively deep but probably young alluvial soils in the lowlands once would have supported tall Semi-evergreen Forest formations with a fairly low component of deciduous species, many large trees > 1 m dbh and an understorey with small shrubs, saplings and various small palms (R J Timmins pers. comm.). Such forests remain, but a majority of the large trees were removed at various times in the past. In stark contrast hilltops with rock outcropping and clearly very shallow soils support very stunted but dense Semi-evergreen Forest with few trees even over 30 cm dbh, and a high proportion of deciduous species (R J Timmins pers. comm.). Fire is however characteristically only very rare or absent in these latter very deciduous formations (in contrast to Nearly-deciduous Forest). Between these extremes of stature lies a continuum of Semi-evergreen Forest making any division into subcomponents rather arbitrary. One element of composition is also extremely variable within these 'non-burning' Semi-evergreen Forest formations, this being the presence (or not) of bamboo species. At least four species of bamboo are associated with the Semi-evergreen Forests of Western Siem Pang, each seemingly having its own niche within the apparent soil moisture gradient from tall to stunted Semi-evergreen Forest (R J Timmins pers. comm.). When present these bamboos are generally abundant and often the dominant under- and midstorey element. But tall Semi-evergreen Forest sometimes has and sometimes does not have a relatively tall, relatively nonbranching bamboo, and stunted Semi-evergreen Forest sometime has and sometimes does not have a small densely clumping deciduous bamboo (R J Timmins pers. comm.). What determines the presence or not of bamboo is very unclear.

One other bamboo species, the largest of all, a densely clumping spiny *Bambusa* sp. is very characteristically associated with the tops of riparian stream banks, quite often forming a narrow fringe and occasionally where soil conditions are suitable small thickets. Its affinities are rather broad and likely dependent on soil characteristics that characterise stream banks, rather than an association with a forest type *per se* (R J Timmins pers. comm.).

The banks and channel of the Sekong and other streams have characteristic rheophyte vegetation communities that vary most notably based on the width of the channel. Small seasonal streams characteristically have dense patches of a pandan and a small palm (*Arenga* or *Arenga*-like species) which are absent from the channel of the larger rivers (R J Timmins pers. comm.). Rheophyte communities along the Sekong are characterized by such species as *Homonoia riparia*, *Phyllanthus jullienii* and *Crateva magna* amongst others (R J Timmins pers. comm.).

Human activities have also played their part in shaping the land cover, influencing in particular fire regimes. In some locations such as *Viel Kriel* historical activities that have now ceased have left a perennial influence on tree cover (see above). Over the course of the last century, especially its latter half, logging within all of Western Siem Pang forests has removed the majority of the largest trees, this has disproportionately affected the tall Semi-evergreen Forest and Nearly-deciduous Forest of the lowland plains, although in several areas there is vigorous growth of younger trees to replace those lost. But even the Deciduous Dipterocarp

Forest has undoubtedly lost the majority of its old large trees, with those remaining largely measuring under 50 cm dbh. Less appreciated is the loss of large and old trees due to felling in order to capture cavity living animals such as monitors *Varanus*, and the felling of other trees such as nesting trees of large waterbirds to capture the young and the felling of fruit trees to enable easy collection of fruit.

Box 6: Threatened species: the IUCN Red List of Threatened species uses three main categories in which to list species that are Globally Threatened. These are: CR – Critically Endangered, (being the highest level of threat), EN – Endangered and VU – Vulnerable. Details of the IUCN Red List threat categories and criteria are to be found at http://www.iucnredlist.org/technical-documents/categories-and-criteria/2001-categories-criteria. Additionally there are species that have been classified as Near-threatened that may become Threatened in the short-term.

More extensive habitat modification has occurred closer to the Sekong and around villages where there are both long-established rice paddies and more recent clearance of vegetation for expansion of settlement, timber, fuel and new agricultural land. Thick bank-side perennial vegetation, which should probably be the natural cover on almost all stretches of the Sekong's bank, is in relatively good condition compared to similar rivers elsewhere in Indochina, but there are still large stretches where it has been lost or heavily degraded (Timmins *et al.* 2003a, R J Timmins pers. comm.).

A further under appreciated change in the forests is likely to be occurring as a result of very dramatic reductions in guilds of species whose ecology potentially significantly affects forest composition, such as the foraging and trampling activity of ungulates and seed dispersal of large bodied birds such as pigeons and hornbills (Timmins and Ou Ratanak 2001, Tordoff *et al*. 2005, Timmins 2011).

Photo: Jonathan C Eames

Chapter 3
Mammals

There has been relatively little study of the mammal fauna of Western Siem Pang, even of basic inventories, hampered in part by the resource intensive methods, in comparison to those for birds, that are needed to study the majority of mammal species. The situation is such that scientifically derived predictive inventories would provide a better baseline, than do the generally anecdotal and highly opportunistic records of an esoteric assortment of species that have incidentally been collected from the area for most mammalian families. However the status of a few mammal groupings, most notably primates and ungulates is reasonably well understood, as also is the status of the suite of the largest carnivores; big cats *Panthera*, bears and Dhole *Cuon alpinus*. The primary large bodied quarry species have severely depressed populations (e.g. Sambar *Rusa unicolor*), or in some cases have been extirpated (e.g. Kouprey), from decades of high levels of hunting, as witnessed by the low encounter rates of such species within the forests of Western Siem Pang.

Historically, the dry forests of Cambodia were full of wildlife, including many large bodied mammal species that are now extremely rare or already locally extinct (Wharton 1957, Timmins and Ou Ratanak 2001). The extensive lowland plains with a mosaic of Deciduous Dipterocarp Forest and Semi-evergreen Forest in peripheral areas, numerous *trapeangs*, and appreciable extents of seasonal river suggest Western Siem Pang would have supported good populations of a diverse array of ungulates and large carnivores (Wharton 1957, Timmins and Ou Ratanak 2001).

Based on interviews carried out in November 2000, Desai *et al.* (2002) noted that Asian Elephants *Elephas maximus* were common and widespread in the vicinity of Western Siem Pang even as late as the 1970's; prior to the war in the 1950's they were present even close to major towns like Stung Treng. They were still around in the early 80's but declined or disappeared in many areas by the mid/late 80's. Based on interviews, it would appear that Asian Elephants when still common used the major rivers including the Sekong (up until the 1970's) and regularly crossed the river. According to hunters living about 15 km south of Siem Pang, along the Sekong, there used to be seasonal movements of large mammals between the mountains (dry season) and the surrounding plains (wet season). Desai *et al.* (2002) actually found evidence of elephants in Western Siem Pang east of the Sekong, although their results suggested that use of areas to the east was occasional at best. Since that time there has been no further evidence of elephants in Western Siem Pang.

During surveys in the area of Western Siem Pang in November 2000 (Desai *et al.* 2002), evidence was obtained that suggested that on-going hunting and trapping had severely depleted the wildlife population of the entire area. During the course of the survey, Desai *et al.* (2002) encountered 39 sites where foot traps had been set for Tigers. These included some that appeared several years old and others that would have been set the previous year.

The recent presence of nine Threatened mammal species has been confirmed from Western Siem Pang, although several more are likely to be present (Table 3.1). At the present time, however, only five of these species can be considered to occur in 'viable' numbers, although some as yet undetected species probably have significant populations (e.g. Large Spotted Civet *Viverra megaspila*) (Table 3.1). A list of mammal species known to have occurred in Western Siem Pang is given in Annex 3. For most large ground-dwelling mammals camera-trapping now provides a relatively easy means of recording mammal presence, however interpreting status from camera-trap results for a number of species is still very difficult.

Table 3.1. Globally Threatened and Near-threatened Large Mammal Species that occurred or predictably occurred in Western Siem Pang

The presence of species in parenthesis has not been unequivocally confirmed.

English Name	Scientific Name	Last record	Status
Critically Endangered Species			
[Kouprey]	*[Bos sauveli]*	None	Extirpated; probably extinct
[Hairy Rhinoceros]	*[Dicerorhinus sumatrensis]*	None	Extirpated long ago
[Lesser One-horned Rhinoceros]	*[Rhinoceros sondaicus]*	None	Extirpated long ago
Endangered Species			
Yellow-cheeked Crested Gibbon	*Nomascus gabriellae*	2011	Common in extensive areas of SEF in the north
Indochinese Silvered Leaf Monkey	*Trachypithecus germaini*	2011	Uncommon in riparian SEF and NDF
[Douc sp.]	*[Pygathris sp.]*	None	Predictably marginal presence east of the Sekong only.
[Sunda Pangolin]	*[Manis javanica]*	2012	Still present although likely to be close to extirpation
Asian Elephant	*Elephas maximus*	2000	Extirpated; may still be present, although surely close to extirpation, within the greater Sekong landscape
[Banteng]	*[Bos javanicus]*	None	Probably extirpated or nearly so; may still be present, although surely greatly reduced, within the greater Sekong landscape
[Wild Water Buffalo]	*[Bubalus arnee]*	None	Extirpated
[Tiger]	*[Panthera tigris]*	None	Extirpated; may still be present, although surely close to extirpation, within the greater Sekong landscape

English Name	Scientific Name	Last record	Status
[Fishing Cat]	*[Prionailurus viverrinus]*	None	Predictably occurred and still present although population likely to be highly depressed
Dhole	*Cuon alpinus*	None	Still present although likely close to extirpation
[Hairy-nosed Otter]	*[Lutra sumatrana]*	None*	Possibly occurred, if so surely close to extirpation
Eld's Deer	*Recervus eldii*	2012	A population in central WSP
Vulnerable Species			
Northern Pig-tailed Macaque	*Macaca leonina*	2011	Present mainly in the SEF of the north, although population reduced
[Northern Slow Loris]	*[Nycticebus bengalensis]*	[2011]	Probably present throughout although population reduced
[Asian Black Bear]	*[Ursus thibetanus]*	None**	Probably extirpated; may still be present, although surely close to extirpation, within the greater Sekong landscape
[Sun Bear]	*[Helarctos malayanus]*	None**	Probably still present although likely to be close to extirpation
Sambar	*Rusa unicolor*	2011	Uncommon; population much reduced
Gaur	*Bos gaurus*	2011	Uncommon; population much reduced
[Clouded Leopard]	*[Neofelis nebulosa]*	None	Predictably still present (especially in the SEF of the north) although population likely to be much reduced
[Marbled Cat]	*[Pardofelis marmorata]*	None	Predictably present in extensive areas of SEF in the north
[Binturong]	*[Arctictis binturong]*	[2003]	Probably still present (especially in the SEF of the north) although population likely to be much reduced
[Large Spotted Civet]	*[Viverra megaspila]*	None	Probably uncommon in the lowlands
[Smooth-coated Otter]	*[Lutrogale perspicillata]*	None*	Possibly still present although surely close to extirpation
[Oriental Small-clawed Otter]	*[Aonyx cinerea]*	None	Possibly still present although surely close to extirpation
Near-threatened Species			
[Southeast Asian Mainland Serow]	*[Capricornis milneedwardsii]*	None	Predictably present although likely close to extirpation in extensive areas of SEF in the north
[Asian Golden Cat]	*[Pardofelis temminckii]*	[?]	Predictably present in extensive areas of SEF in the north
[Leopard]	*[Panthera pardus]*	None	Probably still present although likely close to extirpation
[Large Indian Civet]	*[Viverra zibetha]*	None	Probably uncommon throughout
[Hog Badger]	*[Arctonyx collaris]*	None	Probably still present although likely close to extirpation
[Eurasian Otter]	*[Lutra lutra]*	None*	Possibly occurred, if so surely close to extirpation
Black Giant Squirrel	*Ratufa bicolor*	2011	Uncommon, population much reduced, mainly in the SEF of the north

Notes: brackets indicate that there are no confirmed records of the species from the forests of Western Siem Pang; if a date occurs in the 'evidence' column it indicates that the species was recorded either very close to, but not within, Western Siem Pang or that captive animals have been observed.
Doucs have been recorded from the contiguous forest of Veun Sai-Siem Pang Conservation Area which lies relatively close to the southeast (Conservation International unpublished).
** Evidence of either Lutrogale or Lutra was found in 2011.*
*** Signs of bear sp(p). probably of over a year in age were found in December 2011.*
**** Based on a captive Asiatic Golden Cat found in Siem Pang town and assumed to have been caught locally.*

Key species accounts

Key species are defined here as those which are globally threatened (see Box). Global conservation status information in this section is based on the IUCN Red Data List (IUCN 2010).

Yellow-cheeked Crested Gibbon *Nomascus gabriellae* (Endangered)

The taxonomy of Indochinese gibbons has been rather tumultuous (see e.g. Duckworth 2008). Following Geissmann *et al.* (2007, 2008) the gibbons of Western Siem Pang would be considered Yellow-cheeked Crested Gibbons *N. gabriellae* on the basis of their morphological similarity to topotypical *N. gabriellae*. However, following analysis of songs it has been demonstrated that the gibbons of Xe Pian NPA in Laos and Virachey NP are vocally more similar to gibbons nominally recognised as the taxon *N. siki* Southern White-cheeked Crested Gibbon, of central Laos and Vietnam (Geissmann *et al.* 2007, Duckworth 2008). Very recently a new species of gibbon *N. annamensis* has been named based on a specimen from Sa Thay district of Kontum province Vietnam, a locality very close to the eastern border of Virachey NP (Van Ngoc Thinh *et al.* 2010). Van Ngoc Thinh *et al.* (2010) propose that this new species is the same as the taxon present in both Virachey NP and Xe Pian NPA. The proposed differences from both *N. gabriellae* and *N. siki* are based on acoustic and mitochondrial cytochrome b gene characters; morphologically there appears to be no significant difference from *N. gabriellae*. Whether *N. annamensis* is justifiably recognisable as a full species remains to be seen, Van Ngoc Thinh *et al.* (2010) give very little supporting evidence to dispel alternative explanations for their data. As Duckworth (2008) wrote "Across zoology, the enthusiasm to draw conclusions from analyses of mitochondrial DNA sometimes outstrips its responsible use"; this clearly applies to Van Ngoc Thinh *et al.* (2010) who fail to even disclose the sources of all but three (the type material) of their purported mitochondrial genes!

Pale-cheeked *Nomascus* gibbons range from northern Laos and Vietnam southwards to Cambodia. If *N. annamensis* were valid it might have the most extensive range of the nominal four pale-cheeked species, and would probably be the most numerous, with the healthiest global status, given the relatively large area of forest within its purported range of southern Laos and northern Cambodia that still supports gibbon populations (Duckworth 2008, R J Timmins pers. comm.). This would certainly be the case if Western Siem Pang gibbons were *N. gabriellae*. The major threat to Yellow-cheeked Crested Gibbon is hunting for trade of meat and medicinal derivatives, although live-capture, of young animals in particular, gives a profitable sideline of animals for the pet trade.

Within Western Siem Pang gibbons are restricted to Semi-evergreen Forest of the north, rarely if ever venturing into Deciduous Dipterocarp Forest. Gibbons were heard on three days west of the Sekong and even more frequently east of the river with multiple groups heard on most days by Desai *et al.* (2002). Timmins *et al.* (2003a) spent very little time in or close to suitable habitat, but recorded singing groups twice, once east of the Sekong from Phum Makpheung and once in forest north of the *O Khampha*. Although the population densities and trends of gibbons reported by Traeholt *et al.* (2005) are impossible to take seriously, their basic field data suggest that at the two sites sampled in western Virachey NP, very close to Western Siem Pang, multiple gibbon groups were heard sometime between 2001 and 2005 (survey dates are unfortunately not given). In November 2006, gibbons were detected in Western Siem Pang at UTM 0641702 1583080 and near 0614520 1577930, both west of the Sekong (D Buckingham pers. comm.). In December 2011 gibbons were heard from all campsites used, with multiple groups heard on all but one day (R J Timmins pers. comm.). In the observers experience such a high 'encounter' rate is exceptional, and directly comparable with calling densities experienced in Xe Pian NPA in 1993 (Duckworth *et al.* 1995). In fact, within the last decade of survey work in Indochina R. J. Timmins has not experienced even closely comparable calling densities of any *Nomascus* form, making the results both unexpected and astonishing. The lack of reported records from BirdLife project activities can certainly be attributed in great part to the fact that almost no field effort has been extended to sectors of Western Siem Pang suitable to gibbons.

High gibbon densities were found in Xe Pian National Biodiversity Conservation Area in the early 1990s, where there were an estimated 400–6,720 groups (Duckworth *et al.* 1995). However weak protected area management and high domestic and international demand for primate meat lead to a steady decline in the population (Duckworth 2008), and in recent years indications suggest that the Xe Pian population has plummeted further with widespread expiration of groups from many accessible parts of the area (K. Kounbouline and S. Chapman verbally to R J Timmins 2009–2010). Thus, the 2011 survey results are very encouraging and indicate that a significant gibbon population must also remain in remote southern areas of Xe Pian, as well also as Virachey NP. Both these two protected areas must have more substantial gibbon populations than Western Siem Pang, and together this very large Semi-evergreen Forest landscape is almost certainly still the stronghold for this taxon whether it be *N. gabriellae* or *N. annamensis*.

Indochinese Silvered Leaf Monkey *Trachypithecus germaini* (Endangered)

This leaf monkey was until recently considered conspecific with the more southerly distributed Sundaic Silvered Leaf Monkey *T. cristatus*, but recent taxonomic research has treated it as specifically distinct (Groves 2005, Nadler *et al.* 2008). The species primarily occurs in lowland habitats with a somewhat enigmatic habitat association. Many records are associated with riparian or other wetland associated forest types (such as swamp forest), but the species has also been found in Semi-evergreen Forest and Nearly-deciduous Forest patches within Deciduous Dipterocarp Forest dominated dry forest. However, surprisingly the species is scarce or absent from the interior of large blocks of Semi-evergreen Forest, even those at low elevation, suggesting an 'edge' or interface association for the species (Timmins *et al.* 2011, R J Timmins pers. comm.). The most major threat to this species is by far hunting, driven especially by both bushmeat and traditional "medicine" trade. Habitat loss could become a threat in the future given the current trends in lowland forest use and conversion.

The precise limits of distribution of this species are not clear. It has been reliably recorded from Cambodia, Vietnam, and from southern Laos. To the west of this, they extend to Kanchanaburi Province in southern Thailand across to the Bay of Bengal in Myanmar (Nadler

et al. 2008).

There are only a few sightings documented in Vietnam over the last 50 years, although this in part may be a result of limited surveys conducted in the species' range (Nadler *et al.* 2003). In Laos it is now highly localised having been extirpated it is thought from most of its former range, and no large continuous area is known to support a large population, and in fact it is with little doubt the most threatened primate in Laos (Timmins *et al.* 2011). It remains a widespread species in Cambodia, and in certain areas such as the lowlands of northern Mondulkiri, it may be the most common primate (Timmins and Ou Ratanak 2001). However, even in Cambodia it is now considered to be rare or uncommon in many lowland areas such as around the Tonle Sap and the Mekong above Stung Treng (Nadler *et al.* 2008, Timmins 2008b). In Thailand Indochinese Silvered Leaf Monkey is moderately common in several protected areas, but has declined significantly (Nadler *et al.* 2008). Overall, the impression is one of a significantly declining population throughout its range.

Indochinese Silvered Leaf Monkey *Trachypithecus germaini* photographed at Lomphat Wildlife Sanctuary on 5 November 2007. Photo: Jonathan C Eames

In 2003, J. C. Eames (*in litt*. 2011) photographed one animal being skinned beside the Sekong River. D. Buckingham saw the species twice, once a group in gallery forest along the lower reaches of the *O Khampha* (UTM 0638400 1580500), in November 2006 and once a group in a steep sided valley, in relatively tall stature Semi-evergreen Forest, adjacent to a relatively small rocky tributary stream in the lower hills (UTM 0643000 1592200). A group of c. 10 were observed in bamboo in riverine forest along the Sekong River on 2 February 2011 (J. C. Eames *in litt*. 2011). This apparent paucity of records may reflect the fact that almost all survey work has been undertaken in Deciduous Dipterocarp Forest areas in the central, eastern and southern portions of Western Siem Pang. However, a survey of the northern parts of Western Siem Pang in December 2011 encountered the species only twice despite it being a focal species of the survey and almost daily survey of suitable habitat. Also BirdLife project staff who regularly monitor the lowlands of Western Siem Pang north to the *O Khampha*, report that the species is only occasionally seen along the *O Khampha* when teams visit this area. Furthermore the species was notably not recorded by Timmins *et al.* (2003a). Taken together the information suggests that populations of the species are much reduced, but that viable populations probably remain both east and west of the Sekong.

Western Siem Pang would be capable of supporting a good population of this species given the

extensive gallery forests along the Sekong and the network of Semi-evergreen Forest associated with the *O Khampha* and other stream courses in the north and far west.

Sunda Pangolin *Manis javanica* (Endangered)

Sunda Pangolin *Manis javanica* skin photographed in Western Siem Pang on 28 January 2003. Photo: Jonathan C Eames

The species ranges over much of mainland Southeast Asia, from southern Myanmar through Laos, much of Thailand, central and southern Vietnam, Cambodia, to Peninsular Malaysia, Sumatra, Java and adjacent islands to Borneo. It is a species that is thought to have declined precipitously over much of its range, especially since 1990 when the commercial trade in pangolins began to escalate. Local people still report that this species occurs in Western Siem Pang and it is threatened by trade, but it is clearly now very uncommon. A complete pangolin skin was photographed in a shop in Siem Pang in 2003 (J. C. Eames *in litt*. 2011) and more recently one was reported to have been encountered by a BirdLife monitoring team in January 2011 (however details and corroboratory evidence are lacking), but they are apparently rarely observed by anyone. Two animals were confiscated from a hunter arrested in Western Siem Pang and photographed on 25 April 2012 (J C Eames pers. comm.). The provenance of these animals is uncertain. Whether any animals remain in Western Siem Pang remains to be seen.

Large Cats; Tiger *Panthera tigris* (Endangered) and **Leopard** *Panthera pardus* (Near-threatened)

The plight of the Tiger needs very little explanation, this once widespread and common species has undergone a truly spectacular decline, to the point where it now may no longer even occur in Cambodia; if it were to still occur it is on the very brink of extirpation. But into the early 1990's Tigers still probably occurred in almost all large forest blocks of Cambodia, although their numbers were probably already much reduced (Nowell *et al.* 1999, Timmins and Ou Ratanak 2001). However in the space of very few years this residual population was systematically eliminated by targeted hunting. In 2004, NGOs working on tiger conservation estimated that Cambodia's Tiger population was then no more than 11–50 individuals (Chundawat *et al.* 2010). The most recent confirmed evidence of Tigers from Cambodia

is from a camera-trap photograph taken in 2007 (T. Evans *in litt*. 2011). In hindsight this dramatic decline was not particularly surprising given the very high value of Tiger parts in trade, the ease with which Tigers can be found and the equal ease with which they can be trapped. This scenario was not unique to Cambodia, a similar fate appears to have befallen other Southeast Asian populations (e.g. Duckworth and Hedges 1998). For instance, R. J. Timmins routinely found field evidence of Tigers in surveys of large forest blocks in Laos in the 1990s, but has not found any evidence during surveys in the last decade.
Tigers were present in Xe Pian NPA in 1997 (Duckworth and Hedges 1998) and in Virachey to at least 2001. Desai *et al.* (2002) found fresh evidence of a Tiger in December 2000 relatively close to Western Siem Pang, while earlier in February 2000, again close to the western border of the National Park, Virachey rangers found signs at two locations which based on measurements taken would indicate Tiger (Maxwell 2000). Further evidence of Tigers in the west of Virachey was found in January and February 2001 (Seng Teak 2001). There has never been any confirmed evidence of Tigers found in Western Siem Pang, although Tigers must have once occurred. At the same time that Tigers were being confirmed in Virachey evidence of high hunting pressure was also being found. For instance Desai *et al.* (2002) found 39 traps (in various states of use or abandonment) reportedly set for Tiger (but capable of trapping other large species) during their survey of Western Siem Pang in 2000.

The majority of large cat prints that have been found in Western Siem Pang have been attributed to Leopard (*Panthera pardus)* which is a widespread but rare species in Cambodia and considered to be Near-threatened by IUCN (Henschel *et al.* 2008). However, due to overlap in size of prints between both smaller and larger cat species than Leopard and lack of appropriate documentation, these prints cannot safely be assigned to a particular species, nor even to be 'large cats' in the sense of *Panthera*. D. Buckingham was shown 'large cat' tracks at several locations in November 2006. One of these was photographed, on another at UTM 0641514 1592196 the main hind pad width was measured as 10 cm. If the latter print was not distorted or enlarged in any way its size would certainly suggest Tiger and undoubtedly be that of *Panthera*. During the December 2011 survey, tracks were found that the Cambodian members of the survey team speculated could be those of 'large cats'; one set indeed were those of a cat species, but probably too small for a Leopard, while the other set were most likely from a Domestic Dog. Such a rather startling inability to accurately evaluate mammal signs is in RJT's experience rather widespread amongst local people, even frequent forest users and 'hunters'. The only credible "recent" reports come from one of the monitoring team members, an ex-hunter, who reportedly personally killed a Tiger in Western Siem Pang in 1993-1994. He also reported second hand that a Tiger with cubs had been seen in Semi-evergreen Forest within Western Siem Pang area in 2004-2005. A "credible" report of Leopard, although again second-hand, comes from 2002, when two villagers were allegedly attacked in Western Siem Pang, one of whom was almost killed. Leopard tracks were reported by BirdLife monitoring staff in 2011 (J C Eames pers. comm.).

Dhole *Cuon alpinus* (Endangered)

Asiatic Wild Dogs, or Dhole, have a very large range that extends from the Indian Subcontinent to north-east Asia, Southeast Asia, Sumatra and Java. They are found in a wide variety of habitats; in Indochina they are known from both dry forest lowlands and extensive

Semi-evergreen Forest of hill and mountain areas. Their present distribution is highly fragmented and large parts, particularly of Vietnam and Thailand, are without any occurrence of Dholes, although they persist in a number of protected areas, where healthy groups were still occasionally observed in the recent past (e.g. Lambert and Graham 1997). A further symptom of their imperilled status appears to be that pack sizes have fallen from those that might have been considered normal in the past.

The Dhole is considered Endangered because the estimated wild population size is now suspected to have fallen below 2,500 mature individuals and is still declining, but more pertinently these remaining animals face many threats. The main threats facing this species include persecution, prey depletion and possibly disease transfer from domestic dogs (Durbin *et al*. 2008). Depletion of the prey base from uncontrolled hunting is a potentially serious problem across almost all of Cambodia, Laos, and Vietnam, including within protected areas.

Both Dhole and Golden Jackal overlap in their distribution within Cambodia and both occur within Western Siem Pang. Dhole are said to be occasionally encountered by local people, although evidence from Indochina in general suggests that local people are unable to distinguish this species from other canids, including domestic dogs, and canid tracks are routinely miss-identified. In the past, group size is reported to have been typically at least five individuals, but in recent years only pairs of animals have been reported. During the December 2011 survey of northern Semi-evergreen Forest areas, tracks confirmed to be those of Dhole from their considerable size (> 10 cm in length) were found only once, along a small stream in Semi-evergreen Forest. Another set of tracks of a single animal, only c. 7 cm from the rear of the hind pad to the tip of the furthest toe (i.e. not including the claw), may possibly have been from a Dhole, but some Domestic Dogs have equally large tracks (note Timmins *et al*. 1999 suggested that tracks larger than 7.5 cm could be considered as those of Dhole, but Domestic Dogs do occasionally show prints larger than this). The signs however appeared to be independent of those of people. Domestic Dog tracks were encountered throughout the survey area, but almost invariably were accompanied by those of people. Evidence for Dhole status in Western Siem Pang is equivocal, especially given that there has been no particular attempt to assess status in the lowlands south of the *O Khampha*. Given information on the species's status in other areas of Cambodia, it is most likely that its numbers are now very low and group size depressed. Pig and Red Muntjac populations in Western Siem Pang appear to be reasonably good, which together with the promising status of Eld's Deer in the central lowland area of Western Siem Pang indicates that there is a reasonable prey base for Dhole recovery, although increased levels of protection are needed for both prey and Dhole to recover. It is worth noting that a population of Dhole was found in forest contiguous with Virachey National Park, the protected area adjoining Western Siem Pang, in 2007 (Conservation International 2007) and they were also present to the north in Xe Pian NPA, Laos, in the late 1990's (Steinmetz 2004). The present status in Xe Pian NPA is unknown.

Sun Bear *Helarctos malayanus* (Vulnerable) and **Asian Black Bear** *Ursus thibetanus* (Vulnerable)

Asian species of bear are threatened throughout most of their extensive ranges by high levels

of persecution. They are hunted primarily for their gall bladders, widely believed in parts of Asia to have medicinal properties, and for their skin and other body parts. They are also caught alive for the many menageries and increasingly for bear farms that are now a feature of some countries in Southeast Asia – usually the mother is killed and the cubs captured alive (Conservation International 2007). In Cambodia both species are now highly localized and typically rare, although Asian Black Bear is likely to be the rarer and more localised of the two.

At least one of these threatened bears probably still occurs within Western Siem Pang, and without doubt both occurred historically, although Asian Black Bear probably was never more than an occasional visitor to the extensive Deciduous Dipterocarp Forests. Locals report that there are still bears in the northern Semi-evergreen Forest areas, and that they still find evidence of bears there. BirdLife staff however have not found any evidence of bears from the lowlands. Bear foraging signs in the form of an arboreal bees nest that had been partially destroyed were seen on 17 November 2006 by D. Buckingham at UTM 0615550 1578730. During the December 2011 survey of the northern areas one tree cavity and one arboreal termitary, both in Semi-evergreen Forest east of the Sekong, were found ripped open by bears. One of these feeding signs was thought to be only approximately a year or younger in age, while the other may have been several years in age. Where bears are still reasonably common, recent and even fresh feeding evidence is usually easily found; this was the situation in some areas of Laos in the 1990's (R J Timmins pers. comm.). However, R. J. Timmins has not observed fresh or recent bear signs since 1998 (Timmins *et al.* 1999). Clearly bears are very scarce and perhaps only itinerant visitors to Western Siem Pang at present.

Sun Bear is by far the more numerous of the two species recorded by camera-trapping in Cambodia in the last decade, and it also appears to predominate in trade, it is thus most likely that any bears remaining within Western Siem Pang would be this species (R J Timmins pers. comm.).

Otters (unknown species)

Potentially four species may have been present in Western Siem Pang; ranging in global status from Globally Near-Threatened to Endangered. The ecological niches of all four are very imprecisely known within Southeast Asia, making speculation as to which may or may not have been present, along with past status and potential habitat partitioning between the species impossible (e.g. Dersu and Associates 2008, Timmins and Sechrest in press). All four species are heavily persecuted regionally for a variety of reasons. As a result there has been widespread local extirpation of all species especially from anthropogenic dominated lowlands (R J Timmins pers. comm.). Their conservation is further hampered by forest centric protected area systems.

Little attention has been paid to otters in Western Siem Pang. D. Buckingham saw an otter when the team disturbed it at the edge of the *O'Khampa* (UTM 0063195 1580738) on 19 November 2006. The animal was wet and its fur 'slicked down' rather than forming clumped bunches. During the December 2011 surveys otters were a target species, which resulted in evidence being found in a single location of what appeared to be an itinerant individual. Fresh tracks of a single animal moving determinently upstream were found along the *O Taput* (R J Timmins pers. comm.). Signs are not readily identifiable to species, and the signs found were consistent with Smooth-coated Otter *Lutrogale perspicillata* (Globally Threatened – Vulnerable) or Hairy-nosed Otter *Lutra sumatrana* (Globally Threatened – Endangered); however R. J. Timmins is unfamiliar with tracks of the regional race of Eurasian Otter *Lutra lutra* (Globally Near-Threatened). Otter signs are easily found when search for if animals are present, and the paucity of signs found is a clear indication of the scarcity of otters in Western Siem Pang (R J Timmins pers. comm.).

Sambar *Rusa unicolor* (Vulnerable)

Sambar has a wide distribution as far west as India and east as far as Kalimantan (Indonesian Borneo), although distribution within this range is now highly fragmented. In Cambodia, the species is now rare as a result of hunting. As a consequence of sustained declines across its range caused primarily by hunting for meat and antlers, but augmented by habitat loss and fragmentation, the species is considered to be Vulnerable. The status of the species in Cambodia is particularly startling when compared to similarly sized mammals, and its decline has outpaced that of many of them. For instance in the eastern plains of Cambodia Sambar numbers are, at a landscape level, lower than those of wild oxen (Timmins and Ou Ratanak 2001, Gray *et al.* 2011, O'Kelly *et al.* in prep.). This perilous status is almost certainly the result of targeted hunting of the species and its high value in trade.

Sambar overlaps with the superficially similar Eld's Deer throughout almost all of the historical range of the latter (Timmins *et al.* 2008a), however the two species have quite different habitat preferences. Indochinese Eld's Deer favour savannah and mesic grassland habitats (although not tall riparian grasslands), while Sambar has an apparent preference for riparian forests and ecotones between dense and more open forest formations. While the occurrence of Eld's Deer was always patchy, Sambar probably at one time utilised almost all lowland and lower hill forest types to some degree.

Sambar appears to be rare and un-naturally localised in Western Siem Pang, where few sightings have been made in recent years. Sambar antlers were photographed in Siem Pang town in January 2003 (J. C. Eames *in litt.* 2011) but their exact provenance is unsure though they were likely to be of local

Sambar *Rusa unicolor* photographed in Western Siem Pang on 28 January 2003. Photo: Jonathan C Eames

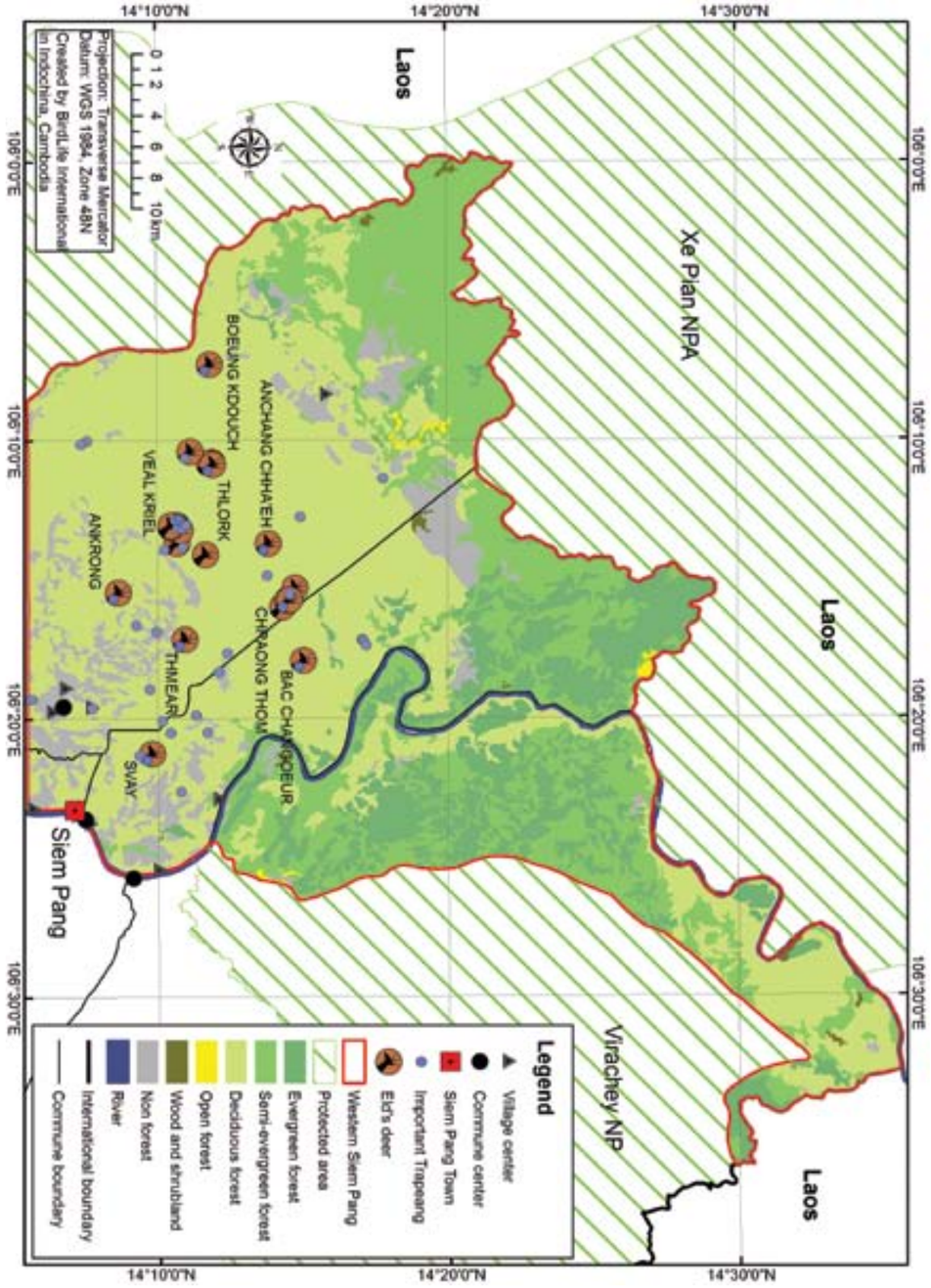
origin. Two Sambar briefly on 25 April 2011 in semi-evergreen forest (J C Eames pers. comm.). H. L. Wright has heard, but never seen Sambar in Western Siem Pang. Local monitoring team members report last seeing Sambar in 2003-2004, in Semi-evergreen Forest. In the 1990's local communities reported that they more regularly encountered this species, usually in small groups of up to four animals, and generally only in denser, more evergreen areas of forest. Tracks have been tentatively identified on a number of occasions, but due to the similarity of Sambar and other ungulate tracks, most such records can only be treated as tentative. During the December 2011 survey of northern areas Sambar tracks, positively identified to species were recorded on most days usually on several occasions, but the majority of signs found were 'old' (>1 week; R J Timmins pers. comm.).

Eld's Deer *Rucervus eldii* (Endangered)

Eld's Deer in Laos, Vietnam and Cambodia historically occurred in a variety of more open, grass-dominated habitats. By far the greatest extent of suitable habitat occurs in the dry forest, specifically savannah-like Deciduous Dipterocarp Forest and *viels* (Wharton 1957; Tordoff *et al.* 2005, Timmins and Duckworth 2008).

In Cambodia, this shy and now highly localised and scarce species has been detected mainly through the use of camera traps. The same method was used to confirm presence in Western Siem Pang in 2003 (Timmins *et al.* 2003a). Tracks probably of this species encountered in the area during surveys conducted in 2003, in conjunction with reports from local people and analysis of habitat from satellite images suggested that there are probably several, and perhaps even many, small remnant groups scattered over a wide area of Western Siem Pang, both north and south of the *O Khampha* (Timmins *et al.* 2003a). Since that time only incidental data has been collected on the Eld's Deer, for example during the work of the BirdLife monitoring team and the more detailed studies of the White-shouldered Ibis. Monthly monitoring by BirdLife during 2009 encountered Eld's Deer on ten occasions with up to five animals seen together. They were recorded at *Trapeang Ang Krong*, *Viel Kriel*, *Trapeang Thlok*, *Trapeang Chrong Thom*, and *Trapeang Thmea*, with most encounters at *Viel Kriel* (Map 3.1). Similar results were obtained in 2010, with eleven encounters, up to four Eld's Deer seen together and *Viel Kriel* proving again to be the most reliable place to find the species, with three observations. The other sites where they were encountered were *Trapeang Thlok*, *Anchang Chha'eh*, *Boeung Khdourch*, *Bac Changoeur*, and *Trapeang Chrong Thom* (Map 3.1). However, these incidental records appear to give a relatively poor reflection of the status of the species as evidenced by other project work in 2011. Up to 20 were observed over a week in 2010 (J. C. Eames *in litt.* 2011), and during a short site visit by R. J. Timmins in May 2011, four groups totalling at least nine animals (all likely to have been separate individuals) were seen in a single day. During the same five day visit, fresh and recent signs, of Eld's Deer were commonly found in the central area of Western Siem Pang centred around the *Viel Kriel* area, however none were found further northeast in the region south of the *O Khampha*, or in the eastern plains forest that lie relatively close to habitation or rice fields (R J Timmins pers. comm.).

These latter observations in particular suggest that there is now a relatively large population in the central heart of Western Siem Pang, probably numbering substantially over 50 animals.



Map 3.1. Distribution of Eld's Deer within Western Siem Pang

Female Eld's Deer with current dependant young and possibly same (a male) from the previous year (above). Part of a herd of 12 Eld's Deer (left and below) photographed at Western Siem Pang on 11 March 2010. Photos: Jonathan C Eames

Male Eld's Deer anointing himself with mud (above) and dry grass (below) during the rut. Photographed in Western Siem Pang on 11 March 2010. Photos: Jonathan C Eames

This strongly suggests that hunting pressure in this area since 2003 has remained low and the Eld's Deer population is stable if not even increasing. This is further corroborated by the behaviour of animals; during the May 2011 site visit the majority of animals seen, although cautious, reacted and retreated relatively slowly upon detection, often allowing clear observation for up to a few minutes. This is uncharacteristic of heavily hunted animals, which in general detect human presence before they themselves are detected, and retreat so rapidly that it is generally difficult to determine precisely the species involved.

However, the December 2011 survey of areas north of the *O Khampha*, suggested that there are no longer any Eld's Deer in this section of Western Siem Pang, which was also corroborated by interviews with local people familiar with the area. Tordoff *et al.* (2002) and Seng Kim Hout *et al.* (2003a) both received recent first hand reports of Eld's Deer from this area, and the latter team found tracks that were likely to have been those of Eld's Deer. Thus while the heart of Western Siem Pang has experienced a degree of protection most likely due to project activities especially the work of BirdLife and the participation of local community members in other conservation-focused activities, the wildlife in the northern areas has been in significant decline.

Banteng *Bos javanicus* (Endangered)

A once fairly widely distributed species, and locally common in historical times, Banteng is now largely reduced to small isolated populations, most of which are still in decline: the world population may now number fewer than 5,000 animals. Only a single subpopulation of more than 500 animals (estimated), and only 6–8 subpopulations of more than 50 animals, are known, with the single largest subpopulation in the eastern plains of Cambodia and 4–5 on Java and perhaps two in Thailand (Timmins *et al.* 2008b).

In Cambodia, Banteng are estimated to have declined by 90% or more between the late 1960s and the early 1990s. At this latter time they still remained widespread, although in generally low numbers, in the lowland forests of the north and east, and also, probably somewhat more sporadically, in the south and west including the Cardamom Mountain range (Heng Kimchhay *et al.* 1998; Timmins and Ou Ratanak 2001). From at least this time onwards the most substantial Banteng population has been centred on Mondulkiri Province where in the late 1990s at least several hundred to perhaps over a thousand Banteng survived in a forested landscape of over 15,000 km² (Timmins and Ou Ratanak 2001; Tordoff *et al.* 2005). Further declines took place from the early 1990s, and as of 2007 the most significant population by far in Cambodia remained that in Mondulkiri Province, still thought to be hundreds of animals (Timmins *et al.* 2008b). Earlier estimates for Mondulkiri have been recently corroborated by Gray *et al.* (2011).

Research in Xe Pian, in adjacent Laos, has shown that Banteng present there in the late 1990's showed a strong affiliation with drier and more open habitats, especially Deciduous Dipterocarp Forest, despite increased vulnerability to hunting in these areas. Banteng were not found within large expanses of Semi-evergreen Forest (Steinmetz 2004). This is characteristic of Banteng throughout Indochina and contrasts with Gaur which are generally associated with larger expanses of Semi-evergreen Forest, although they also make use of Deciduous

Dipterocarp Forest (Duckworth and Hedges 1998, Timmins and Ou Ratanak 2001). This difference in habitat use has a very significant bearing on status; Banteng populations have been much easier to hunt than Gaur simply because of the openness of their preferred habitat, augmented by the preferential clearance of dry forest areas over hill Semi-evergreen Forest (R J Timmins pers. comm.), a pattern common to species characteristic of the dry forest (e.g. Duckworth *et al.* 2005).

There has never been a confirmed record of the species from Western Siem Pang, although it must have occurred. Signs of Banteng or Gaur (the two species are not demonstrably separable with confidence on the basis of footprints), have been sporadically found by BirdLife staff. D. Buckingham photographed oxen tracks near *Trapeang Kbal Chkae* (UTM 0632612 1581848) in November 2006. Tracks of presumed wild oxen, in areas of predominantly Deciduous Dipterocarp Forest / Nearly-deciduous Forest were seen twice during routine monitoring in 2010, once at *Boeung Khdourch* (UTM 0621411 1569505) on 4 April, and once at *Trapeang Koo* (UTM 0630324 1575308) on 18 June (SSG). Also in July 2010 what appeared to be a herd of approximately 14 wild oxen (reported as the Khmer name associated with Gaur) had passed through Deciduous Dipterocarp Forest within Western Siem Pang (SSG). Even in December 2011 tracks of a single oxen (presumed to be either Gaur or Banteng) was found in Deciduous Dipterocarp Forest north of the *O Khampha* (R J Timmins pers. comm.). Also as recently as 2007, a group of 6-7 Banteng was reported (using the Khmer name associated with Banteng) to have been seen by a local ex-hunter, and there are still occasional reports from the remotest parts of Western Siem Pang (SSG). But as species become rarer and even after their extirpation increasingly erroneous reports are likely to occur as a natural consequence of human nature. At the present stage reports from local communities should be given little weight and viewed with extreme caution. Thus field indications since 2003 have been of small numbers mainly single animals, if indeed they were Banteng at all. It is possible that a few animals might remain, although the species is almost certainly ecologically extinct at the site with no possibility of recovery unless by immigration of animals from adjacent areas. But this is very similar to the situation in many comparable areas of Cambodia. Current indications suggest that Banteng subpopulations in adjacent areas of Laos and Cambodia are not faring any better than those in Western Siem Pang. It seeming even more unlikely that any could remain in Xe Pian NPA given the apparently higher hunting pressure there (see gibbon account), while Conservation International (unpublished) working in *Veun Sai-Siem* Pang Conservation Area on the southwestern border of Virachey NP has failed to detect the species. Western Siem Pang is hence of relatively low priority for the species, although with adequate protection and enforcement the habitat in much of Western Siem Pang is ideal for the species if they could ever be re-introduced.

Gaur *Bos gaurus* (Vulnerable)

The population of the subspecies *Bos gaurus laosiensis* that occurs in Myanmar, Laos, Vietnam, Cambodia, Thailand, and West Malaysia (and presumably southern China) has declined precipitously, especially in Indochina and Malaysia, and perhaps also in Myanmar and China (Duckworth and Hedges 1998). The decline is likely to have been well over 70% over the last three generations (generation length is estimated at 8–10 years).

Until 2011 the presence of Gaur in Western Siem Pang had not been confirmed, although it was clear that the species must have occurred and probably was still present despite verifiable evidence. Gaur trophies were photographed in Siem Pang town in January 2003 (J. C. Eames *in litt*. 2011), but their exact provenance and age was uncertain although they were likely to be of local origin. The prior lack of confirmation was almost certainly due in large part to the focus of project activities in Deciduous Dipterocarp Forest areas where Gaur were probably scarce and or itinerant visitors, and the project methods used.

As with Banteng, Gaur was reportedly still relatively common in Western Siem Pang as recently as the 1990s. Tracks of presumed wild oxen have been occasionally found in the lowlands (see Banteng account), but the northern hilly areas have essentially remained unexplored. Local people have reported presence of Gaur more frequently than Banteng (based on the use of Khmer names associated with the species), with a majority of reports from northern areas especially the hilly Semi-evergreen Forest, although most reports are probably based on tracks found rather than actual animals seen (R J Timmins pers. comm.). During the December 2011 survey of northern areas a small herd of at least five Gaur was seen close to the *O Cheangheang*. Signs of wild oxen were found widely through the survey area, with the exception of areas close to the Sekong and in extensive Deciduous Dipterocarp Forest. In most areas fresh and recent signs were found, and evidence of small groups were found both east and west of the Sekong. Purely on the basis of predominant habitat and the known preferences of the wild oxen, most signs are likely to be attributable to Gaur, although Banteng cannot be completely ruled out. Although numbers of wild oxen are clearly below natural levels even in these hilly Semi-evergreen Forest, the result is very encouraging, especially as it implies that hunting levels are still relatively moderate compared with regional trends.

Although Gaur readily use dense forest areas, it seems likely that highest densities are supported by areas of mosaic habitats, as such the northern areas of Western Siem Pang, where there is an intricate mosaic of Deciduous Dipterocarp Forest, Nearly-deciduous Forest and other forms of Semi-evergreen Forest, provide ideal habitat for the species. This suggests that although Gaur numbers are also likely to be significant within the adjacent remote core areas of Semi-evergreen Forest of both Xe Pian NPA and particularly Virachey NP, there is unlikely to be a very large source population to augment that within Western Siem Pang. Gaur have been repeatedly documented in Virachey National Park, including recent years and more recently still in the Veun Sai-Siem Pang Conservation Area (Conservation International 2007, Conservation International unpublished data). However in Xe Pian National Protected Area, the status of Gaur is bleaker and animals have now almost certainly been eradicated from the accessible ecotone areas that characteristically lay around the edge of the protected area. The last confirmed documentation there was in 2001 (J. W. Duckworth *in litt*. 2011).

Wharton (1968) concluded that Gaur "prefer foothill tracts of sub-humid or deciduous forest adjacent to savannah forest, glades or other open terrain affected by man and fire thus co-existing with and exploiting low human populations in hill zones with moderate to heavy rainfall". The majority of the 125–150 Gaur studied in Kanha National Park (India) ranged over an area of at least 78 km^2; and these animals typically travelled 3.2–4.8 km a day (Schaller 1967). In West Malaysia Gaur home ranges have been estimated to be between 13 km^2 and 137.3 km^2 (Duckworth *et al.* 2008).

Other large mammals

Most of the globally non-threatened mammals that are known to occur in Western Siem Pang are medium to small bodied species, the largest of them being Golden Jackal *Canis aureus,* Long-tailed Macaque *Macaca fascicularis* , Red Muntjac *Muntiacus vaginalis* and wild pigs *Sus*. Small mammal species seen regularly by researchers at the site include Berdmore's Squirrel *Menetes berdmorei*, Variable Squirrel *Callosciurus finlaysonii*, Northern Treeshrew *Tupaia belangeri*, Common Palm Civet *Paradoxurus hermaphroditus* and Siamese Hare *Lepus peguensis*.

Although not threatened at a global level, hunting and trade is certainly impacting some of the species at the site. Monkeys, in particular, have been the targets of an international trade in live mammals for meat and medicine (see Threats section of this report) and more recently for use as laboratory animals in East Asia (Timmins 2008b). As a consequence, Long-tailed Macaque and Indochinese Silvered Leaf Monkeys are now much scarcer than in the past.

Golden Jackal *Canis aureus* (above) scavanging at a vulture restaurant at Western Siem Pang on 3 July 2007. This species is an infrequent visitor to vulture restaurants and is more frequently heard calling at dawn and dusk from the forest. Wild Pig *Sus scrofa* (right) is common and widespread at Western Siem Pang and usually encountered in large herds. Photos: Jonathan C Eames.

Male and female White-shouldered Ibis revealing differences in bill length.
Photo: Jonathan C Eames

Chapter 4
Birds

Bird species richness

Approximately 300 bird species have now been recorded in Western Siem Pang, and further species will undoubtedly be found (Annex 4). Of the species known to occur, fourteen have been classified as Globally Threatened (Table 4.1.) and another eight species are Near-threatened. These latter species could become Threatened in the future. One Near-threatened species, Black-bellied Tern *Sterna acuticauda* was extirpated in recent times (Goes *et al.* 2010). A comprehensive list of birds recorded at the site up until December 2011 is provided in Annex 4.

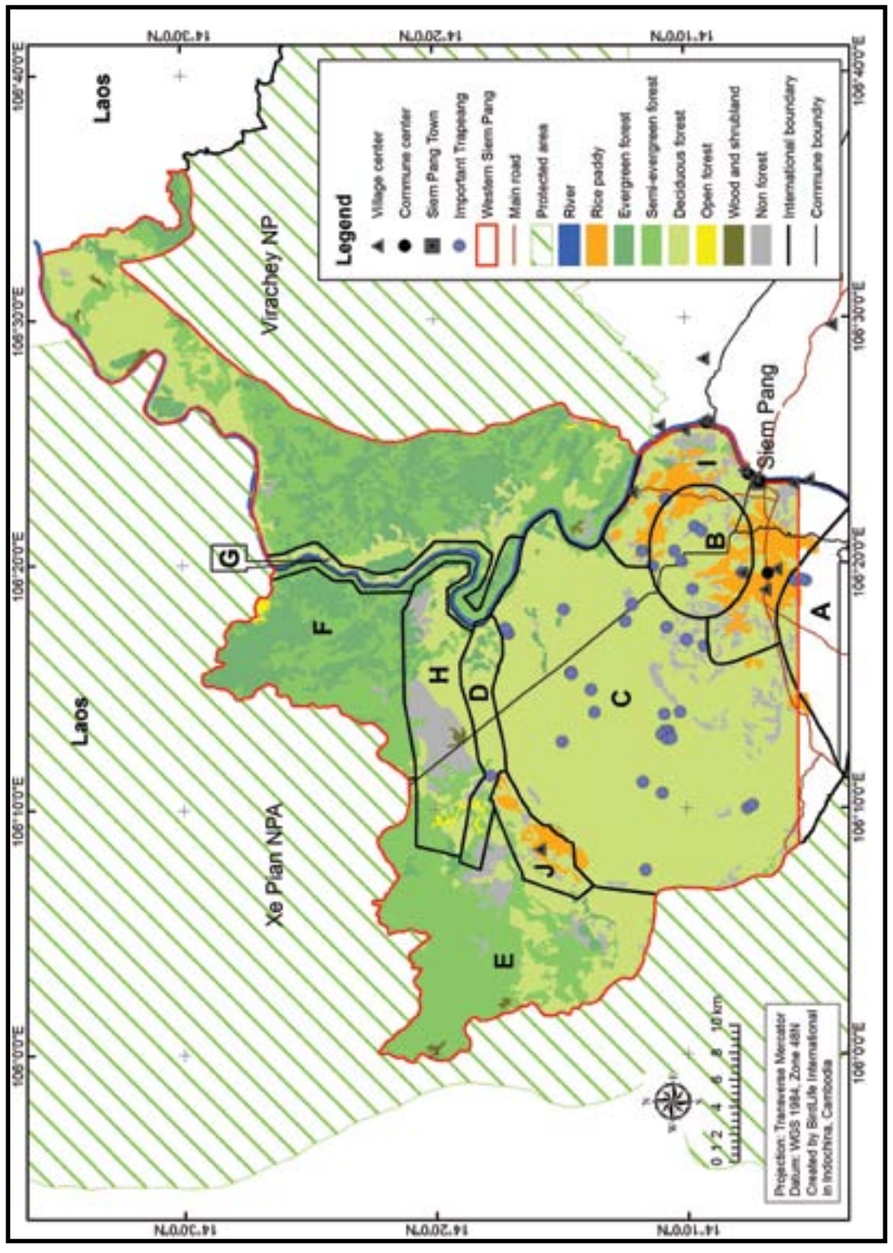
Box 7: Vulture Restaurant – a feeding station for vultures where a cow or domestic buffalo is killed specifically for consumption by vultures. These restaurants are organized at various sites across noreastern Cambodia as part of the Cambodia Vulture Conservation Project (WCS 2010a).

Table 4.1. Globally Threatened and Near-threatened Bird Species occuring in Western Siem Pang

Scientific Name	English Name
Critically Endangered Species	
Thaumatibis gigantea	Giant Ibis
Pseudibis davisoni	White-shouldered Ibis
Sarcogyps calvus	Red-headed Vulture
Gyps bengalensis	White-rumped Vulture
Gyps tenuirostris	Slender-billed Vulture
Endangered Species	
Pavo muticus	Green Peafowl
Asarcornis scutulata	White-winged Duck
Leptoptilos dubius	Greater Adjutant
Vulnerable Species	
Leptoptilos javanicus	Lesser Adjutant
Grus antigone	Sarus Crane
*Aquila clanga**	Greater Spotted Eagle
Aquila hastata	Indian Spotted Eagle
Mulleripicus pulverulentus	Great Slaty Woodpecker
*Emberiza aureola**	Yellow-breasted Bunting
Near-Threatened Species	
Lophura diardi	Siamese Fireback
Ephippiorhynchus asiaticus	Black-necked Stork
Ichthyophaga humilis	Lesser Fish-eagle
Ichthyophaga ichthyaetus	Grey-headed Fish-eagle
Polihierax insignis	White-rumped Falcon
Motacilla samveasnae	Mekong Wagtail
Picus rabieri	Red-collared Woodpecker
Ploceus hypoxanthus	Asian Golden Weaver

** migrant species.*

Two bird communities in Western Siem Pang are particularly noteworthy both from a global and national context in terms of their wildlife conservation significance. The first of these is that associated with Deciduous Dipterocarp Forest (Annex 5). This was once a widespread community through the dry forests of mainland Southeast Asia, with many characteristic species and several endemics (e.g. Black-headed Woodpecker *Picus erythropygius*, White-rumped Falcon *Polihierax insignis*). Its definition like almost all in biology is not exactly clear cut as closely similar communities occur in phytologically closely related monsoonal forest types in the Sundas (notably on Java) and in eastern South Asia (the *Sal* forests), and even within mainland Southeast Asia there are regional difference, for instance a characteristic Myanmar dry-zone community with notable local endemicity. Regional status reviews have highlighted the fact that a number of species characteristic of Deciduous Dipterocarp Forest are either in significant decline or naturally patchy in their occurrence. The majority of these species are not yet considered Globally Threatened, largely because Deciduous Dipterocarp Forest still covers extensive areas of Cambodia and Myanmar, but these species are likely to be useful as indicators of Deciduous Dipterocarp Forest communities with Global conservation



Map 4.1. Areas within Western Siem Pang that were surveyed for birds in 2006

significance for maintenance of intact communities and indirectly as surrogate indicators of functionally (relatively) intact Deciduous Dipterocarp Forest communities. The significance of this community was discussed rather briefly by Tordoff *et al.* (2005 sec. 3.3.1) and in further depth in a Laos context by Timmins (2009) and SUFORD (2010). A number of the species highlighted by the latter two reviews as potential indicators of conservation significant Deciduous Dipterocarp Forest communities in a Laos context are in a Cambodian context still widespread and common in many areas. However these lists (see Annex 5) give a starting point to make comparative assessments across Cambodian Deciduous Dipterocarp Forest landscapes. Even within a Cambodian context several species in addition to the relatively well documented Globally Threatened species (see Key Species Accounts) appear localised or scarce, for instance Rufous-bellied Woodpecker *Dendrocopos hyperythrus* (recorded from WSP) and Pale-caped Pigeon *Columba punicea* (not recorded from WSP), although there has as yet not be a systematic national review. The Deciduous Dipterocarp Forest community so far detected within Western Siem Pang appears to be comparably rich and relatively intact with few obvious omissions compared to other Deciduous Dipterocarp Forest landscapes within Cambodia (see Annex 5).

The other significant bird community within the context of Western Siem Pang is that associated with the rivers and streams. A large proportion of the bird species within this community are Globally Threatened and an even larger proportion appear to be at least regionally in significant decline (Tordoff *et al.* 2005, Timmins 2006, 2008a). The Western Siem Pang area includes a relatively short stretch of the Sekong, but for many of the species of conservation significance the downstream stretch of the Sekong is likely to be of equal and in some cases perhaps higher significance. For a small suite of species the smaller streams of Western Siem Pang are particularly significant. A high proportion of species are showing clear or apparent signs of significant decline (see below) in Western Siem Pang or the downstream stretches of the Sekong, and four species White-winged Duck *Asarcornis scutulata*, River Tern, Black-bellied Tern *Sterna acuticauda* and Masked Finfoot *Heliopais personata* are either extirpated or likely very close to extirpation (the latter not recorded from Western Siem Pang, although it surely occurred in recent times). Despite the precarious status of so many species, Western Siem Pang and the associated downstream stretch of the Sekong still support a bird community of high Global significance and very high regional significance.

Key species accounts

Global conservation status information in this section is based on the 2010 version of an international dataset managed and updated by BirdLife on an ongoing basis (BirdLife International 2010, IUCN 2010). Key species are defined here as those that are Globally Threatened. In the following accounts, the areas (A-F) within Western Siem Pang that are referred to are areas of Western Siem Pang that were surveyed in 2006 (Buckingham and Prach Pich Phirun 2006) and are shown on Map 4.1.

Giant Ibis *Thaumatiibis gigantea* (Critically Endangered)

Giant Ibis is a Critically Endangered species with a known world population estimated as at

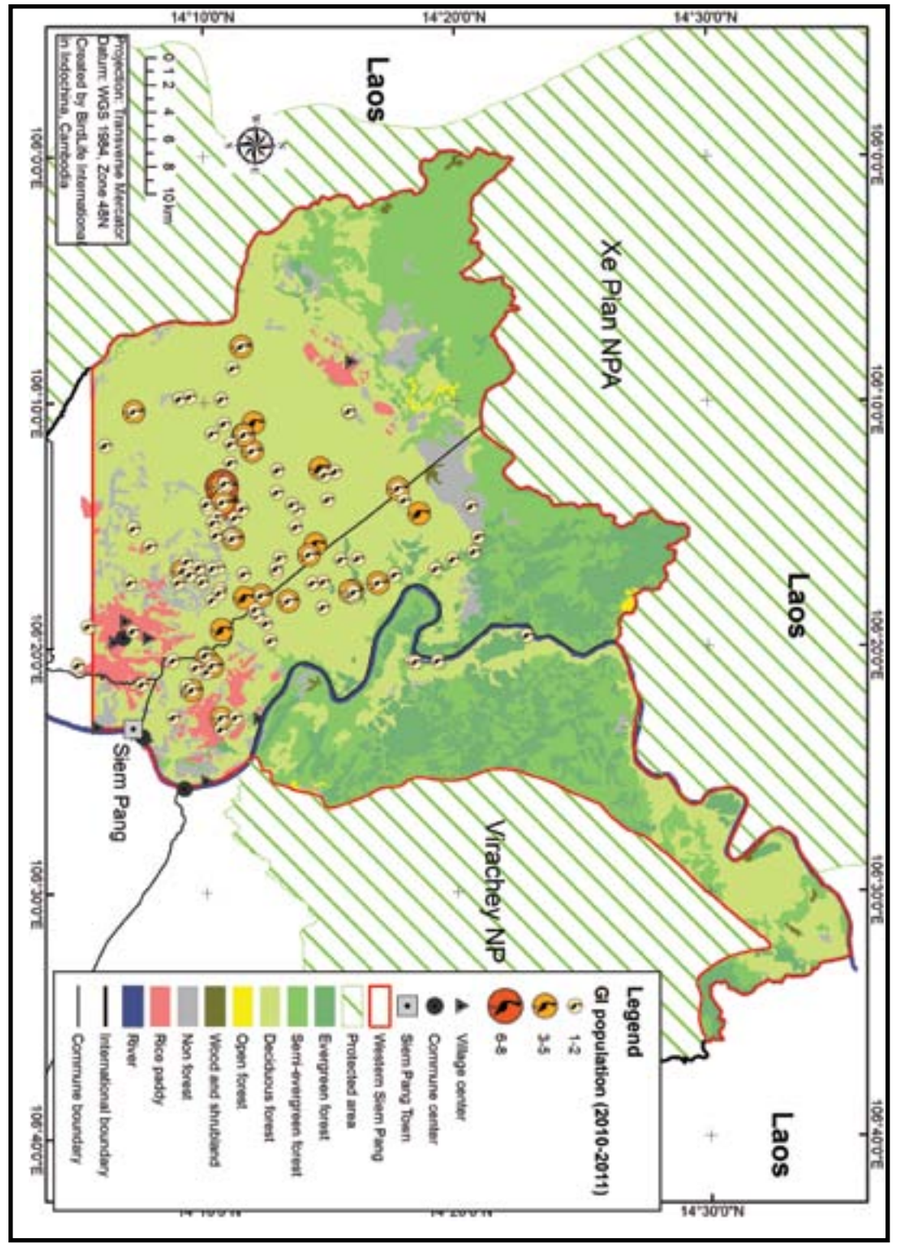
"minimum" 100 breeding pairs (BirdLife International 2010), although this figure like many estimates based on incidental data is likely to be a considerable under estimate (see White-shouldered Ibis species account; R J Timmins pers. comm., Keo O. *in litt*. 2012). However, the numbers remaining are relatively irrelevant given the enormous threats the species faces throughout its tiny global range; whether the total is 1,000 or 250 the outlook is the same. Its historical range spanned southern Vietnam and southeast and peninsular Thailand, where it is now extinct. It may also now be extinct or nearly extinct in Laos. Hence it is now considered to be a species for which future survival will be entirely dependent upon its conservation in Cambodia. A significant proportion of the birds surviving undoubtedly occur outside of protected areas (Tordoff *et al*. 2005, R J Timmins pers. comm.), and there is little hope that these can ever be protected, their loss from the global population is relatively inevitable. This leaves the species's fate within six protected areas, in addition to Western Siem Pang, in Cambodia. The species appears to occur at relatively low density in all[1] and have ecological and behavioural traits that suggest above average sensitivity to ongoing threats that face all of these areas.

Both D. Buckingham and R. J. Timmins surveying Western Siem Pang in the early dry season of 2006 and 2011 respectively, experienced repeated sightings and or vocal records of Giant Ibis from localized areas. In particular both surveyors noted that presumed pairs (or family groups) gave characteristic dueting calls in the early morning shortly after dawn from approximately the same location on consecutive days. Based on these observations it seemed likely that birds were using relatively small areas at the times of the surveys, and that it was not unreasonable to assume that most records of Giant Ibis from areas at times only a few km or less apart were likely to involve separate birds. Keo Omaliss (*in litt*. 2012) suspects that around the breeding season birds have relatively short ranging patterns, frequently being observed foraging close to nesting sites.

Based on the above assumption D. Buckingham considered that at least 30 individual Giant Ibis were recorded during the 2006 survey. Geographically these were distributed as follows: three duos (one of the duos heard twice and seen once), a trio and a single bird along the lower 15 km of the *O Khampha*; two duos (one duo heard calling on three separate days) and a trio along c.18 km of the Sekong north of the *O Khampha* (but none seen downriver); three duos and two singles at *trapeang* in the central plains of Western Siem Pang (area C); two duos (both heard on two consecutive days) frequenting the Tieng Khe stream and nearby *trapeang* (area E); and a single bird, twice, at *Trapeang Chhouk* (area B).

During monthly monitoring activities that covered the central plains of Western Siem Pang in 2009 and 2010, small numbers of Giant Ibis were reported almost every month, being generally recorded on less than half of the survey days per month. Birds were observed more frequently in 2010 than in 2009, but this seems most likely due to methological differences between the two years. Birds were most commonly observed as singles, duos or trios and only occasionally in larger groups; the largest of which in 2010 were seven birds at *Trapeang Khtum* (UTM 0628751 1580553) in the beginning of January, seven birds at *Viel Kriel* (UTM 628294 1569353) on 24 January, and eight there on 9 September. In 2009 the largest group was of

[1] Although not at a density of > 0.1 bird per km2 as implied by the population estimates; a density which would leave them almost impossible to detect



Map 4.2. Distribution of Giant Ibis at Western Siem Pang

Source: BirdLife data

five, seen on the 19 December at *Trapeang Khtum* (SSG). During other project activities up to 16 individuals were recorded between 4–16 March 2010, with up to five birds photographed together (J. C. Eames *in litt*. 2011).

During the December 2011 survey birds were seen or heard on eleven separate occasions (R J Timmins pers. comm.). Signs presumed to be most likely from Giant Ibis were ubiquitous along the *O Cheangheang*. This supposition being supported by what appeared to be three separate groups audible in the early morning from a camp on the 12 December, and one possibly two groups (almost certainly different from those on the 12th) audible on two mornings further up the river on the 13 and 14 December (R J Timmins pers. comm.). Additionally birds also were seen at four widely separated points along the river, two perhaps three of the locations corresponding with locations from which birds were heard. Together the evidence suggested that along the surveyed portion of the *O Cheangheang* there were probably five or more 'groups', presumably pairs (+/- young). They were also seen at two separate locations along the Sekong, and at a *trapeang* complex north of but relatively close to the *O Khampha*. Probing signs, thought most likely to be those of Giant Ibis, were also found on small side tributaries of the Sekong at another relatively separate location and along the *O Taput*. Along the latter stream moulted feathers further corroborated the identification. The extent of records and signs found during such a short duration survey, together with the implication of multiple records from relatively localised sections of the *O Cheangheang* (as noted above) strongly suggests ten or more 'groups' within the survey area (R J Timmins pers. comm). This acords well with the findings of D. Buckingham, but it should be noted that R. J. Timmins did not survey the *O Khampha* or central plains, while D. Buckingham did not survey the *O Cheangheang* or *O Taput*. Both R. J. Timmins and D. Buckingham recorded a significant number of birds only on the basis of their distinctive vocalisations, given predominantly in the dawn and to a lesser extent dusk hours, suggesting that birds are potentially easily overlooked (by presence in suitable unsurveyed habitat patches within general survey areas) by surveys conducted when birds are not calling.

The northern lowlands of Western Siem Pang, including the area east of the Sekong, the *O Khampha* and its tributaries, the Sekong upstream of the latter and the further small tributaries of the Sekong in this northern portion clearly, support a significant Giant Ibis population most probably numbering over 50 birds. The numbers present on the central plains by comparison are harder to estimate, especially as there has been no even semi-systematic survey. Dry season feeding habitat is potentially more restricted in total area and certainly numerically scarcer (e.g. at a lower density) in the landscape than in the northern lowlands, and this presumably would have an influence on the density of ibis. From both the surveys of D. Buckingham and H. L. Wright and BirdLife monitoring activities it appears that certain *trapeangs* are particularly favoured by the species, suggesting as yet underemined effects on the density and distribution of birds. The scanty evidence suggests tens of pairs at least, and perhaps given the large area and the large number of *trapeangs*, many of which are never or only very infrequently visited by monitoring teams, the numbers in this area could be equivalent to those in the northern lowlands associated with streams (*albeit* at a lower density). The distribution of all known records of Giant Ibis are shown in Map 4.2.

This extent of *trapeang* and stream habitats in the lowlands suggests that Western Siem Pang has a natural capacity to support high densities of the species in comparison to many other dry

A pair of Giant Ibis *Thaumatiibis gigantea* (above) foraging alongside a White-shouldered Ibis showing size difference and different foraging strategies. Study of Giant Ibis (below). Photos: Jonathan C Eames

forest areas. Two protected areas, Preah Vihear Protected Forest and Kulen Prumtep Wildlife Sanctuary, appear to have similar and perhaps even more favourable habitat (500 *trapeangs* within 40 km^2 in one sector), as well as documented large populations of Giant Ibis (Relatively consistently 20 or more, and up to 41 nests are found annually in this combined area (WCS unpublished data); and a ball park estimate being upwards of 200 birds in these two areas (Keo Omaliss *in litt*. 2012)). Of the other protected areas likely supporting significant Giant Ibis populations suitable habitat is relatively extensive in Mondulkiri Protected Forest and Lomphat WS, but data are lacking on the current status of the species in both, while in Phnom Prich WS and Seima Biodiversity Conservation Area suitable habitat is largely localised and unlikely to support populations as significant as that in Western Siem Pang (Timmins and Ou Ratanak 2001, R J Timmins pers. comm.). The recent discovery of Giant Ibis in the Sre Ambel valley of the coastal southwest of Cambodia (Keo Omaliss *in litt*. 2012) essentially does not change the conclusions of Tordoff *et al.* (2005), and nor is it likely to significantly change the global conservation status of the species (see Timmins and Sechrest in press).

The species ecology is poorly known, but scant evidence suggests that birds may be relatively sedentary throughout the year. Larger groupings seem rare, with monitoring teams, D. Buckingham and R. J. Timmins largely recording singles, duos or trios. The largest number of birds recorded in a day is 16 (J C Eames pers. comm.). Both R. J. Timmins and D. Buckingham both independently concluded from the location of survey records, clearly at times representing different groups of birds, present at times within one kilometre of each other, that densities along the *O Khampha* and *O Cheangheang* could be relatively high, with perhaps groups every few km or less. Within the central plains it is far less clear to what extent birds might range, but this presumably depends to some extent on the density and seasonality of *trapeangs* in various sectors.

Giant Ibis are wet season breeders, but there has never been a concerted effort to find and monitor nests within Western Siem Pang. The only information on breeding appears to come from a single nest that was found and monitored during the wet season of 2010. One chick successfully fledged from this nest. In addition two juveniles were seen, by the monitoring team, with a pair of adults in early December 2009 at *Trapeang Chhouk*, and begging juveniles were reported by the SSG at this location also in late 2011 (BirdLife monitoring team, H L Wright pers. comm.). A begging juvenile was photographed being fed by an adult at *Trapeang Thlork* on 13 March 2010 (J C Eames pers comm.).

Giant Ibis appears to be somewhat more wary, and potentially sensitive to disturbance, than White-shouldered Ibis and several observers have noted that the species is recorded less often from forest areas frequented by people, despite the presence of apparently suitable feeding habitat, both in Western Siem Pang (Buckingham and Prach Pich Phirun 2006, D Buckingham pers. comm., H L Wright pers. comm.) and from other dry forest areas (R J Timmins pers. comm., Keo Omaliss *in litt*. 2012).

In Western Siem Pang Giant Ibis have a range of feeding habitats at both *trapeangs* and streams, and has been flushed from the Sekong river (J C Eames pers. comm.). At *trapeangs* they commonly feed at the wet muddy margins but sometimes in deep water (where a featherless head is an advantage) (J. C. Eames *in litt*. 2011). *Trapeangs* with tall and extensive vegetation that have no or very few open patches seem to be avoided (D Buckingham pers.

comm.), but the range of *trapeang* types and microhabitats that they utilise appears to be more extensive than that of White-shouldered Ibis (H L Wright pers. comm), and for instance they do readily use *trapeangs* with extensive tall vegetation where grazing and wallowing have created openings allowing birds access and they also forage in water covered substrates. They also extensively forage in *viels*, especially during the wet season (R J Timmins pers. comm., H L Wright pers. comm., Keo Omaliss *in litt*. 2012). Along streams (including the Sekong) they appear to favour muddy banks, especially those covered in worm casts, but have also been observed foraging on sandy bars and shoals (R J Timmins pers. comm., D Buckingham pers. comm.). Observations suggest that during their breeding season, when the forest is wet, they prey to a large extent on the numerous earthworms that frequent the forest floor (H L Wright pers. comm.). During the dry season they have been observed feeding on eels and frogs (Box 8) at *trapeangs* (J. C. Eames *in litt*. 2011), and also crabs and leeches extracted from wet sticky mud (H L Wright pers. comm.). Observations elsewhere suggest that they also feed on insects, such as grasshoppers, which become seasonally abundant in *viels* and *trapeangs* vegetation during the wetter periods of the year (R J Timmins pers. comm.).

Giant Ibis found poisoned at *Trapeang Svay Toych* on 11th January 2009. Photo: BirdLife.

The species apparent sensitivity coupled with its reliance during the dry season on localised *trapeang* and stream habitats, places the species at potentially severe risk from the increasing human use of these same habitats within Western Siem Pang (Timmins 2011, Wright 2011).

White-shouldered Ibis *Pseudibis davisoni* (Critically Endangered)

White-shouldered Ibis was once widely but patchily distributed across much of Thailand, Laos, south and central Vietnam and Cambodia, parts of Myanmar and Borneo, and south-west Yunnan, China, but declined dramatically during the 20th century. Habitat loss has been compounded by hunting of adult birds, eggs and chicks for food, and disturbance, leading to the loss of secure feeding, roosting and nesting areas. The species is extinct in Thailand and China and there are no recent records from Myanmar, and it is almost certainly extinct as a breeding species in Vietnam and probably also in Laos. Breeding birds now only occur in northern and eastern Cambodia and East Kalimantan, Indonesia (BirdLife International 2010). Probably 90% of the existing population is in Cambodia, and within Cambodia, one of the most important sites is Western Siem Pang (Table 1.1.). White-shouldered Ibis distribution

Recent monitoring of the White-shouldered Ibis has revealed that Western Siem Pang is globally the single most important site for this species. Outside the breeding season the species forms flocks which facilitates monitoring.
Photos: Jonathan C Eames

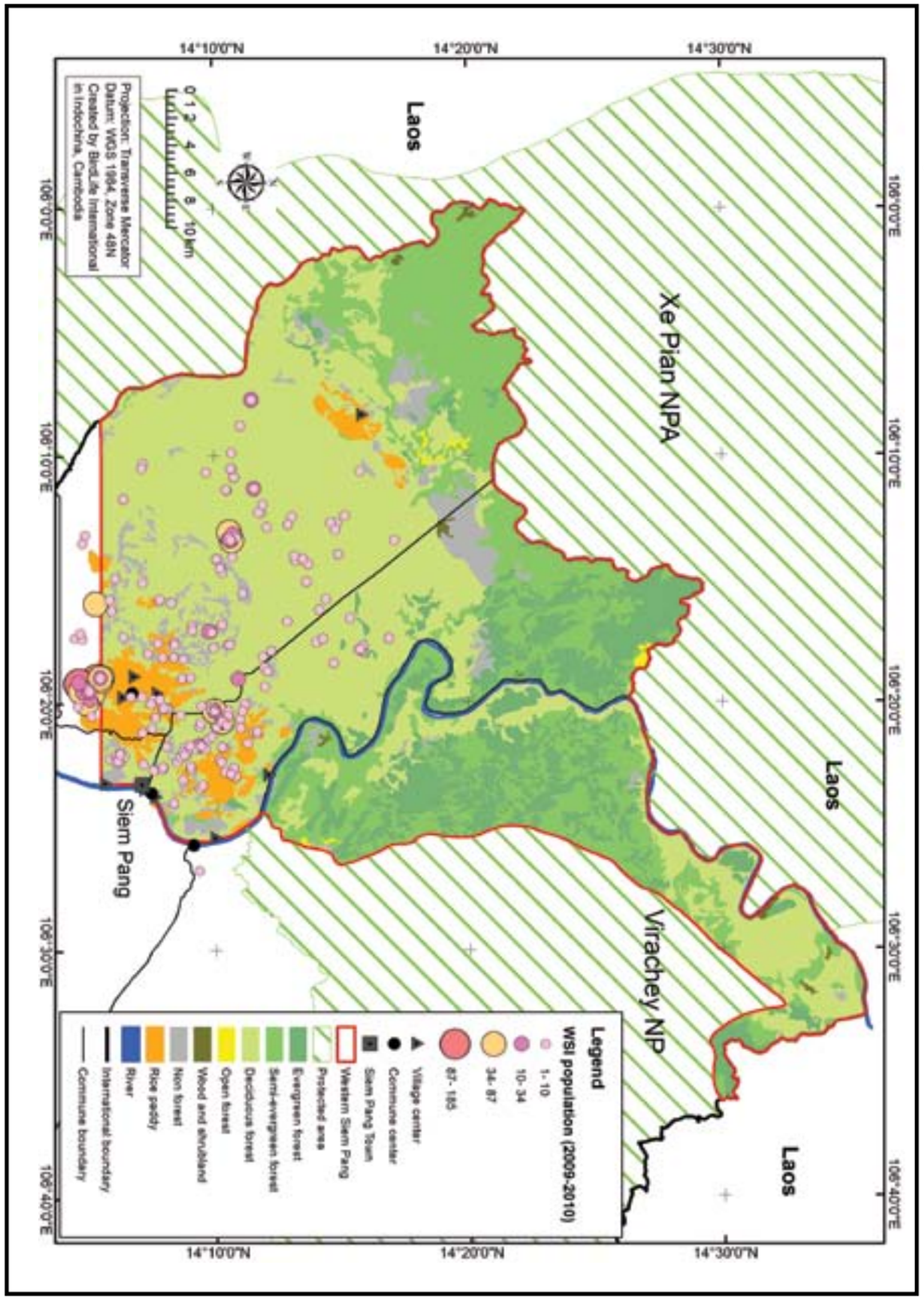
in Western Siem Pang is shown on Map 4.3.

Table 1.1. Summary of White-shouldered Ibis counts across Cambodia July to October 2010

Site/Date	12/13 July	9/10 August	14/15 September	19/20 October
Western Siem Pang	200	218	226	180
Lomphat WS	99	172	118	185
Kulen Prumtep WS	25	33	34	32
Central Mekong*	46	6	87	124
Total counted	**370**	**429**	**465**	**521**
% of birds in WSP	*54*	*51*	*49*	*35*

** The section from Kratie to Stung Treng. (Source: BirdLife International Cambodia Programme)*

The first White-shouldered Ibis national census was conducted by BirdLife on 27 July 2009 in collaboration with WWF, WCS, FA and the General Department of Administration for Nature Conservation and Protection (Wright *et al.* 2010a). The census was conducted at four sites (Western Siem Pang, Lomphat Wildlife Sanctuary, Kulen Promtep Wildlife Sanctuary, the central section of the Mekong River from Kratie to Stung Treng) and resulted in 310 White-shouldered Ibis being recorded. Subsequently, the national census has increased in scope and the total number of birds counted has been increasing each year. The initial surveys, which were carried out in July and August, are considered to have undercounted birds in comparison to later censuses undertaken in September-October, because communal roosting behaviour appears to reach a peak in the later part of the wet season (H L Wright pers. comm.; see Table 1.1). The maximum count in two years of wet season roost counts at Western Siem Pang was 226 birds on 15th September 2010 (Table 1.1). These were all counted at the same time, and 220 were all at the same site (Wright *et. al.* in press). In the wet season, this main flock usually roosts at either *Srei Sangkae* (UTM 0642123 1557738), or the nearby site of *Srei Char* (UTM 0642378 1553797). These two roost sites are primarily along the southern border of Western Siem Pang (Map 4.3), and indeed some of the big roosts in past years have been recorded from the border or just outside of the proposed Protected Forest area.



Map 4.3. Locations and numbers of White-shouldered Ibis Nov 2009–Sept 2010

Source: BirdLife data

White-shouldered Ibises breed in Western Siem Pang during the dry season (in contrast to Giant Ibis and other large waterbirds). During the breeding season birds disperse through the lowland Deciduous Dipterocarp Forest. Following reports from local people, thirteen nests were located in 2008–2009. Seven nests successfully fledged 14 chicks. Five nests failed and at least two chicks died. Success was only 35% for incubation and brooding, but was 100% once the chicks were large and no longer accompanied by an adult at the nest. In 2009–2010, 24 nests were found, whilst in 2010–2011, 20 White-shouldered Ibis nests had been found by mid-February, and more were expected to be found (H L Wright pers. comm.). In Western Siem Pang they have been found nesting in only two species of dipterocarp tree. These particular tree species lose their leaves very early in the dry season and are therefore green again when the ibises breed; they are also amongst the tallest trees in the Deciduous Dipterocarp Forest. Elsewhere however in Cambodia other tree species are used (R J Timmins pers. comm.).

The feeding ecology of the species has been the focus of research as it appears that the species foraging niche might be relatively narrow resulting in sensitivity to landuse changes (Wright 2008, Wright *et al.* 2010b). During the dry season in Western Siem Pang the species largely forages in *trapeangs*, but does not forage in substrates covered in water. Frogs and various species of fish appear to be predominant food items and during breeding the species apears to rely heavily on frogs pried out of cracks in drying *trapeangs* to provision their chicks (Wright 2008). *Trapeang* microhabitats favoured by the species appear to be significantly correlated with *trapeangs* experiencing relatively high levels of use by Domestic Water Buffalo. During the wet season birds also forage in *viels* and savannah Deciduous Dipterocarp Forest and fallow rice paddies, again largely avoiding microhabitats with significant water cover. There may also be a significant correlation between such foraging sites and levels of use by domestic livestock.

The Western Siem Pang population of White-shouldered Ibis is certainly one of the three known largest populations in Cambodia and Globbally; it seems unlikely that further similarly large populations will be found, although undoubtedly small local populations still remain undetected in Cambodia. The accuracy of the roost censuses in approximating local populations depends greatly on local roosting behaviour and the ability to find roosts, so comparing between the three main sites requires caution. Each has similar numbers and each is essentially irreplaceable.

Red-headed Vulture *Sarcogyps calvus* (Critically Endangered)
White-rumped Vulture *Gyps bengalensis* (Critically Endangered)
Slender-billed Vulture *Gyps tenuirostris* (Critically Endangered)

The three vulture species are treated together here because of very similar status both globally and regionally. All three species suffered severe and rapid declines in South Asia within the last decade prompting the listing of all three as Globally Threatened–Critically Endangered. These declines have been primarily linked with feeding on carcasses of animals treated with the veterinary drug diclofenac (BirdLife International 2009c). This drug can be lethal to vultures. Fortunately this drug has never been widely used in Indochina (Clements *et al.* in press).

However the Southeast Asian subpopulations of these three species have been in decline for decades, with concerns raised for their future fate before the advent of the declines in South Asia (e.g. Thewlis *et al.* 1998, Timmins and Men Soriyun 1999). By the late 1990s it was clear that the only remaining subpopulations of each in Indochina and Thailand with any viability were small residual populations centred on northern Cambodia. The reasons for decline, in Indochina at least, have been attributed primarily to reductions in carcass availability (Pain *et al.* 2003, C. Poole *et al.* unpublished), however it seems likely that a suite of characters were involved. Carcasses had certainly been declining as wild ungulate populations crashed across the region and as abattoir practices changed; changes in domestic livestock management in some areas may have further reduced carcass availability of domestic livestock. But disturbance and occasional persecution of vultures as the human population rose, seems likely to have augmented the effect of carcass scarcity. This seems especially likely to have been the case as vulture numbers fell and human numbers increased, making rare persecution events both more likely and more damaging to the vulture populations. Persecution has probably taken many forms, occasional shooting of birds and nest robbery of eggs and chicks (Clements *et al.* in press). More recently however 'accidental' poisoning of birds appears to have become the most prevalent of threats (Clements *et al.* in press).

Birds in the northern Cambodian centred populations were suspected to range widely over the greater proportion of the residual ranges of all three species (Timmins and Ou Ratanak 2001), and marking of birds has subsequently corroborated this supposition (Clements *et al.* in press; see also Map 4.3). This fact more than any other has effectively made conservation management of these residual populations at the landscape level of all of northern Cambodia a necessity. Since 2004 vulture restaurants (see Box) and local stakeholder awareness raising activities have been run in several areas, including Western Siem Pang, and nest protection initiatives started in a smaller number, co-ordinated by the Cambodian Vulture Conservation Project (Clements *et al.* in press).

Other than the vulture restaurant (Box 7) there has been little focus on vultures at Western Siem Pang, and thus records away from the restaurant have largely been collected on an incidental basis in connection with project activities centred on the central lowland plains. Vulture sightings are generally concentrated within the eastern and southern lowland plains, the area where livestock densities are highest and where the vulture restaurant is run. But vulture ranging patterns are likely to be both very fluid as well as not easily predictable, and the nest sites that have been found (see below) have been in remoter regions of the lowlands of Western Siem Pang. In 2004 a reported die-off in the Western Siem Pang wild pig population appeared to be correlated with increased rates of sightings of vultures by the BirdLife monitoring team (Table 4.2). Not only were the numbers recorded elevated (Table 4.2), but birds were seen in areas where they characteristically had rarely been observed (D Buckingham pers. comm.). The 2005 dry season also apparently saw many vultures feeding on livestock carcasses away from the restaurant (Kry Masphal and Chea Ngeth 2005).

Tordoff *et al.* (2002) received reports of a vulture 'roost', north of the *O Khampha* and only c. 2 km from the 101 Army Base along the Sekong. A visit to the site in late May 2002 by these authors found evidence of recent use, but no birds present at the time. Seng Kim Hout *et al.* (2003a) also visited the site on 25 January 2003, again finding evidence of recent use, but no birds present. In December 2011 the site was again visited, and although no vultures were

Red-headed Vulture *Sarcogyps calvus* (above) and Slender-billed Vulture (below). Both species have been proven to breed in Western Siem Pang and monthly counts of the latter are the highest in Cambodia. Photos: Jonathan C Eames

present, it was clear that the site had recently been used by birds. Apparently between 2003 and 2011 the site has not been visited during project activities. The reported roosting trees have clearly been used over a long period as the upper branches are bent and only sparsely leaved. The trees are on the edge of an ill-defined *viel* within an extensive area of very open savannah-like Deciduous Dipterocarp Forest. The *viel* has several pools, one of which has a bare gently sloping shallow edge where birds reportedly drink and bathe. This reported behaviour was corroborated by numerous vulture-like footprints (dissimilar from those of large waterbirds and peafowl) and several feathers that appeared very likely to be those of vultures. The social and breeding behaviour of vultures in Indochina is still poorly known (Clements *et al.* in press), but roosting sites have been recorded in the vicinity of *Gyps* nesting colonies elsewhere in Cambodia (H. Rainey *in litt*. 2012), suggesting that the Western Siem Pang roost site may be indicative of undetected nesting.

Probably the greatest threat to vultures both in Western Siem Pang and Cambodia in general is poisoning. In January 2005, one Red-headed and three White-rumped Vultures died in Western Siem Pang after consuming a reportedly 'nuisance' dog that had been poisoned. In March 2010, eleven vultures (7 White-rumped, 3 Slender-billed and 1 Red-headed) were found poisoned at *Trapeang Krours* (648608-1568064) after feeding on the carcass of a dog that was suspected of being poisoned after feeding on poisoned rice deliberately placed to kill waterbirds for human consumption (J C Eames pers. comm.). Poisoning for unknown reasons was also strongly suspected in the death of a Giant Ibis (see that species account). Furthermore, RUPP (in prep.) found during interviews conducted in villages along the Sekong, that the use of poisoned bait to kill and or capture birds, presumably for human consumption, was very widely reported to be taking place. In January 2009 a dead vulture found burnt and hidden near the vulture restaurant clearly implicates human persecution; although the means of execution and reason remain obscure (BirdLife monitoring data). Later still, just outside Western Siem Pang, in early July 2009 three White-rumped Vultures were found dead close to the rice fields of Srea Russey village (SSG). Further afield in the 2008–2009 field season nine White-rumped Vultures and three Red-headed Vultures were found poisoned (Pech Bunnat and Rainey 2009). The nine White-rumped Vultures were poisoned as a result of feeding on a buffalo that had died after drinking water poisoned by people to catch fish. The other cases were thought to be the result of vultures feeding on nuisance dog carcasses that had been deliberately poisoned (Pech Bunnat and Rainey 2009). To date the Cambodian Vulture Conservation Project has detected 31 vulture mortalities due to poisoning and four mortalities of birds killed by other means (Clements *et al.* in press). Poisoning of wildlife would appear to be on the increase and is now probably the most serious short-term threat to wildlife of high conservation significance in Western Siem Pang.

Table 4.2. Counts of the three resident vultures during monthly vulture restaurants in Western Siem Pang

Year	Red-headed	Slender-billed	White-rumped	*Gyps* (combined)**
2011	3.4, 1–5	17.0, 3–39	48.8, 27–86	65.8, 34–125
2010	4.5, 2–7	20.2, 4–31	41.8, 23–63	62, 27–89
2009	4.7, 2–7	19.3, 7–34	36.8, 23–63	56.2, 39–97
2008	3.3, 1–7	16.6, 4–28	37.5, 22–51	54.2, 26–73
2007	4.6, 1–8	9.5, 0–21	30.8, 14–56	40.4, 15–72
2006	4.6, 1–8	11.1, 2–31	30.8, 14–56	41.8, 16–74
2005*	3.4, 2–5	10, 0–28*	14.3, 1–30*	27.3, 9–60
2004	9.3, 4–18	11, 2–28	37.8, 16–86	48.8, 20–114

* In 2005 many counts came from carcasses found incidentally in the forest; one carcass was found with 60 *Gyps*, this is not included within the figures. **Identification of *Gyps* to species in the early years was potentially problematic, and thus the figures should be viewed with caution.

Red-headed Vulture appears to be significantly less wide ranging than the two *Gyps* species, which appear to routinely travel over 100 km between feeding sites (Clements *et al.* in press), in comparison Red-headed possibly uses a significantly smaller 'home-range'. Records both in Western Siem Pang and in northern Cambodia as a whole appear to be in general more widespread and uniformly distributed across the landscape (Clements *et al.* in press), and numbers at the restaurants lower than White-rumped (Tables 4.2 and 4.4). However, in contrast the species appears more likely than the other two species to be seen at other carcasses within the landscape (D Buckingham pers. comm., BirdLife monitoring data). The difference in ranging behaviour of this species compared with that of the *Gyps* suggests that the censuses conducted at the restaurants (Table 4.4) probably represent a significant underestimate of the total Indochina sub-population of this species, as the sparse distribution of restaurant sites (see Map 4.3) probably results in significantly large areas where 'resident' Red-headed Vultures rarely visit restaurants (R J Timmins pers. comm.; see also Clements *et al.* in press). In fact a more accurate sub-population total is likely to be obtained from summing the maximum yearly counts at each restaurant. The counts from the Western Siem Pang restaurant (Table 4.2) and nesting data (Table 4.3) suggest approximately eight birds with 'home-ranges' overlapping Western Siem Pang. However, D. Buckingham thought it was likely, on the basis of incidental survey records and the numbers seen at the vulture restaurant, that a minimum of 15 birds was present in Western Siem Pang in November 2006. The restaurant counts also suggest that the local population has been relatively stable, but not increasing, although the numbers recorded in 2011 give some cause for concern, especially in view of known poisoning events. However, four nests had been found earlier in the dry season (Table 4.3).

Nests of this species have been found sporadically in Western Siem Pang. During forest monitoring by the SSG, two nests, in close proximity were reportedly found in the west of the central plains (0627314, 1570443) in 2004 (Kry Masphal and Chea Ngeth 2004). Nests were also reportedly found on 22 March and 1 May 2005 (0627334, 1570427 and 0637895, 1556178; Kry Masphal and Chea Ngeth 2005), with nests reportedly of vulture species also being found on the 21 March and 10 May 2005 (0646996, 1566005 and 0648167, 1562393). In February 2006 two nests in the eastern lowlands (at 0642507, 1568430 where one nestling was present on 21 February; and 0645693, 1567119 where an adult was flushed from the nest on 22 February; Mem Mai verbally to D Buckingham). One nest was found in the 2010 dry season north of *Trapeang Anchang Cha'eh* and this successfully fledged two chicks (Table 4.3) (BirdLife monitoring data). However, two chicks would be highly unusual and this may be in error (Clements *et al.* in press). Four nests were found in the 2010-2011 dry season (H L Wright pers. comm.). Other evidence to date from Cambodia suggests that Red-headed Vultures nests are not geographically closely associated, although a few nests have been found associated with those of *Gyps* vultures (Clements *et al.* in press).

Table 4.3. Breeding data for Red-headed Vulture in Western Siem Pang from late 2009 onwards

Season and date found	Site*	Birds fledged*	Reason for failure
09–10, 28 March	Trapeng Anh Chanh Chres (0632809, 1573020)	1	-
10–11, 16 Nov	T. Reap (627308, 1570454)	1?	-
10–11, 21 Nov	T. Anchangchaas (632811, 1573010)	0	?
10–11, 6 Jan	T. Kangkeb (636818, 1573148)	0	?
10–11, 8 Jan	Prolay Chrey (639210, 1570557)	0	Nest damaged by unknown factor

Source: CVCP monthly and annual reports.
* Locations are verbatim from monthly and annual CVCP reports.
** See Clements *et al.* (in press) for methods.

Table 4.4. Yearly census results for the three resident vultures from all restaurants across northern Cambodia

Year	# restaurants	Red-headed Vulture	Slender-billed Vulture	White-rumped Vulture
2011	6	39	45	183
2010	8	46	45	201
2009	7	43	41	182
2008	7	48	51	191
2007	7	40	26	160
2006	7	58	33	149
2004	7	42	34	90

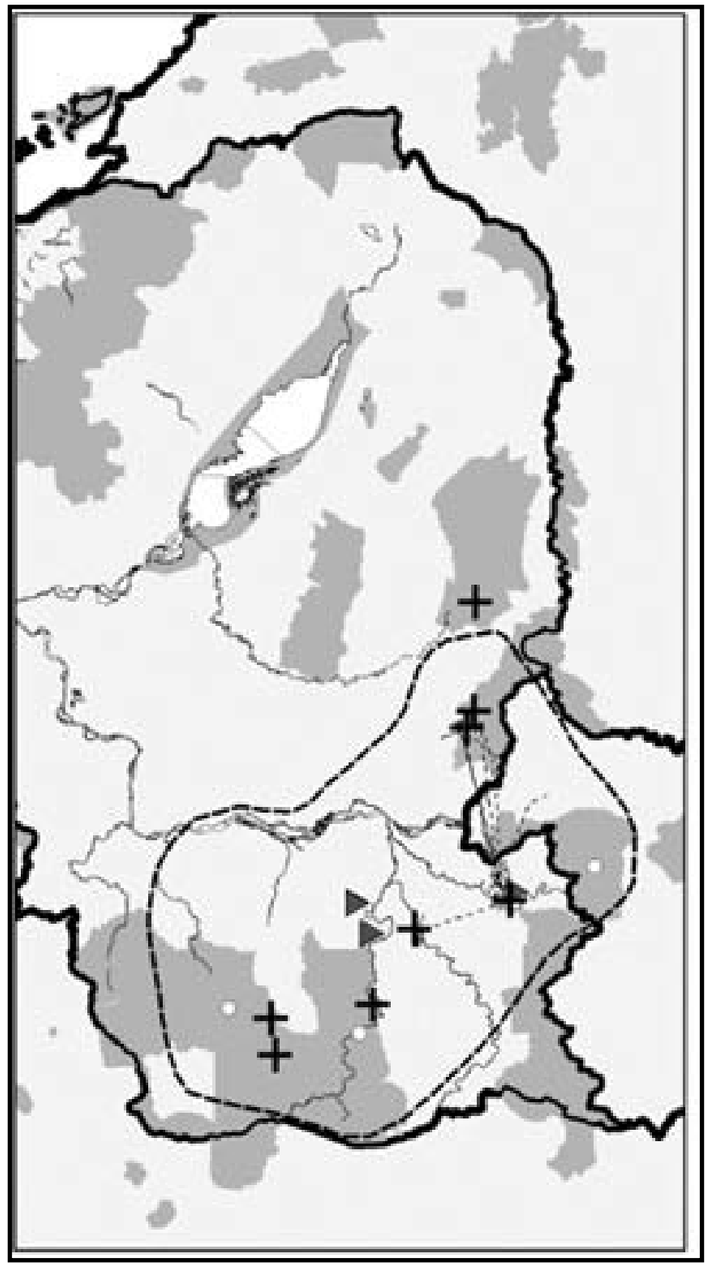
No census was conducted in 2005; note that increases in number of the two *Gyps* species from 2004–2008 must largely reflect changes in vulture behaviour towards restaurants rather than a population increase; the increase from 2009–2010 does not reflect the number of restaurants, as no vultures of any species were recorded from one restaurant. Source: WCS unpublished data.

White-rumped Vulture is globally the most widespread of the three species, and was formerly described as possibly the most abundant large bird of prey in the world, with a global population numbering several million (although this claim was never substantiated with data). However, following the dramatic declines, its global population is now estimated to be below 10,000 (BirdLife International 2010). It is also the most numerous of the three species in the Indochinese population (Table 4.4) and the species seen in largest numbers at Western Siem Pang (Table 4.2). Western Siem Pang appears to roughly attract 25% of the Indochinese subpopulation of the species indicating that it is a crucial component of the species range (Tables 4.2 and 4.4).

No nests of this species have yet been recorded with certainty in Western Siem Pang, although Kry Masphal and Chea Ngeth (2005) reported that an SSG member had seen nests in the 2003–2004 dry season. The species appears to be at least a semi-colonial nester, using tall trees often near prominent landscape features such as rivers or hills (Clements *et al.* in press, CVCP). Colonies of up to 28 nests have been located at a number of areas throughout the dry forests of Northern Cambodia (Clements *et al*. in press, CVCP).

The Slender-billed Vulture was only recently split from another species (Rasmussen and Parry 2001), as such it has the smallest global range of the three resident Cambodian vultures, being distributed from Nepal and India to Southeast Asia. It is also the least numerous of the three species in the residual Indochinese population (see Red-headed account and Table 4.4). Western Siem Pang appears to routinely attract a high proportion, c. 50 %, of the Indochinese

Map 4.4 The hypothesised range of Slender-billed Vulture in Indochina showing the movements of two satellite-tracked individuals caught in Preah Vihear Protected Forest in May 2005



Source: Clements et al. *in press*

Notes: feeding stations (crosses); nesting sites (triangles; see Table 4.5). The movements patterns of the two birds are indicated by different line styles; note that the birds were only tracked for a relatively short periods and therefore the data do not likely represent the majority of area covered by them even within a year. Existing national level protected areas are shaded grey. Source: Clements et al. (in press).

subpopulation of the species in recent years indicating that it is a crucial component of the species range (Tables 4.2 and 4.4).

A single nest of the species was found in Western Siem Pang in January 2010 (Table 4.5). Elsewhere in Cambodia the species appears to be at least a semi-colonial nester, often using tall trees, although there is no evidence as yet of mixed *Gyps* species colonies (Table 4.5; Clements *et al.* in press, CVCP). The reasons why Western Siem Pang consistently attracts a large proportion of the Indochinese subpopulation of this species is not understood, despite this being a priority for understanding the species conservation needs. If it were an indication of the proximity of breeding sites, and if a high proportion of birds nested within or close to Western Siem Pang, Western Siem Pang would have very high significance for the conservation of the species.

Table 4.5. Known nesting sites of Slender-billed Vulture in Cambodia and numbers of birds fledged

Site #	Season, and date found / visited	Area	# nest	Location*	# birds fledged**
1***	06–07, 10 Jan / 3 Feb	*'Seasan' Stung Treng	7-10	Phnom Taprom (650575– 651347, 1479460–1479809)	0
2	07–08, 17 Dec	Lomphat WS	6	Tul Trapeang Veng (Sre Angkrong area) (0667981, 1487667)	4
1***	08–09, 26 Jan	*'Mondulkiri'	3	Phnom Taprom (0651062, 1479546)	3
2	08–09, [10] 23 Jan	Lomphat WS	4	Veal Angkrong (0668078, 1487374)	4
1	09–10, 28 Jan / April	*'Mondulkiri'	3	Phnom Taprom mountain (0651278, 1479577)	3
2	09–10, 18 / 29 Jan/ April	Lomphat WS	4	Veal Ang Krong (0667923, 1487705)	4
3	09–10, 14 /26 Jan / April	Western Siem Pang	1	(0644701, 1567413)	1
2?	10–11, 22 / 27 Mar	Lomphat WS	2	Sre Angkrong	1?
3	10–11, 9 Dec / 1 April	Western Siem Pang	1	Sre Phcek (643965, 1568137)	0?

Source: CVCP monthly and annual reports.
* Locations are verbatim from monthly and annual CVCP reports. The nest site is actually in Mondulkiri province, but close to the Sesan feeding site which is in Stung Treng Province.
** See Clements *et al.* (in press) for methods.
*** Initially in December 2006 this site was reported to have 3 nests of White-rumped Vulture, but in the "Jan and Feb_07" CVCP report they are identified as Slender-billed. The monthly report records these birds as Slender-billed Vulture, but the 08–09 annual report lists them as White-rumped!

Green Peafowl *Pavo muticus* (Endangered)

This beautiful pheasant was once described as the commonest game bird in Indochina (Delacour and Jabouille 1925), but is now declining and has an increasingly fragmented population (Brickle *et al.* 2008, Goes 2009), except in Cambodia where there is still good continuity in the subpopulation across the vast tracts of northern and eastern dry forest; there is no discontinuity from Western Siem Pang all the way west to Phnom Kulen WS and south to the southern border of Kratie (R J Timmins pers. comm.). However, even in Cambodia numbers are undoubtedly rapidly declining, especially as 'progress' in the form of roads and land concessions increasingly fragment the species remaining range allowing hunters easy access to birds. With the possible exception of Myanmar, by far the greatest proportion of the Global population remains in Cambodia, simply because vast tracts of occupied habitat still remain. The species is already extirpated from Malaysia and peninsular Thailand and probably so from north-east India and Bangladesh (BirdLife International 2009a).

Within Indochina site specific distribution of birds has been shown to be closely correlated with water sources (Brickle *et al.* 1998). It is thus no surprise that the majority of records of the species are associated with the Sekong and tributaries that retain channel pools through the dry season. D. Buckingham recorded peafowl at three locations along the Sekong; up to six females and one displaying male were seen on two occasions at a large sandbank (*Koh Dat*) in the northern stretch of the Sekong (0645000 1582000); other birds were seen on the relatively undisturbed eastern banks of the Sekong at 0645733 1578299 (three females and one male) and 0647440 1571860 (a pair). Birds around *Phum Nava* reportedly regularly visited the village rice fields to feed. Eight females were seen here, roosting in a tall tree by the *O Khampha* on 20 November (D Buckingham pers. comm.). In December 2011 two upriver boat journeys in the late afternoon close to dusk, covering the stretch from the 101 Army Base down to Siem Pang town on the one occasion and down to the mouth of the *O Thmor-roluey* on the other, recorded groups of 5 and 1, and 3 and 1, peafowl respectively along the banks of the Sekong. During the same survey vocalisations and footprints presumed to be those of peafowl were commonly recorded from the vicinity of the *O Cheangheang*, *O Taput* and some of the smaller tributaries.

The species probably rarely ventures deep within Semi-evergreen Forest, or along small rocky upper tributary stretches within extensive areas of Semi-evergreen Forest. They have not been detected widely or frequently in the central, eastern or southern plains, away from larger streams or the Sekong itself (H L Wright pers. comm.), presumably a consequence of insufficient water sources (*trapeangs*, even permanent ones, seemingly not sufficient to sustain perennial populations), or perhaps factors related to Semi-evergreen Forest ecotone distriution. The species distribution in Western Siem Pang and the habitat features of greatest

Green Peafowl is commonly recorded along the Sekong River but rarely recorded away from it. It's status at Western Siem Pang is unknown. Photo: Jonathan C Eames.

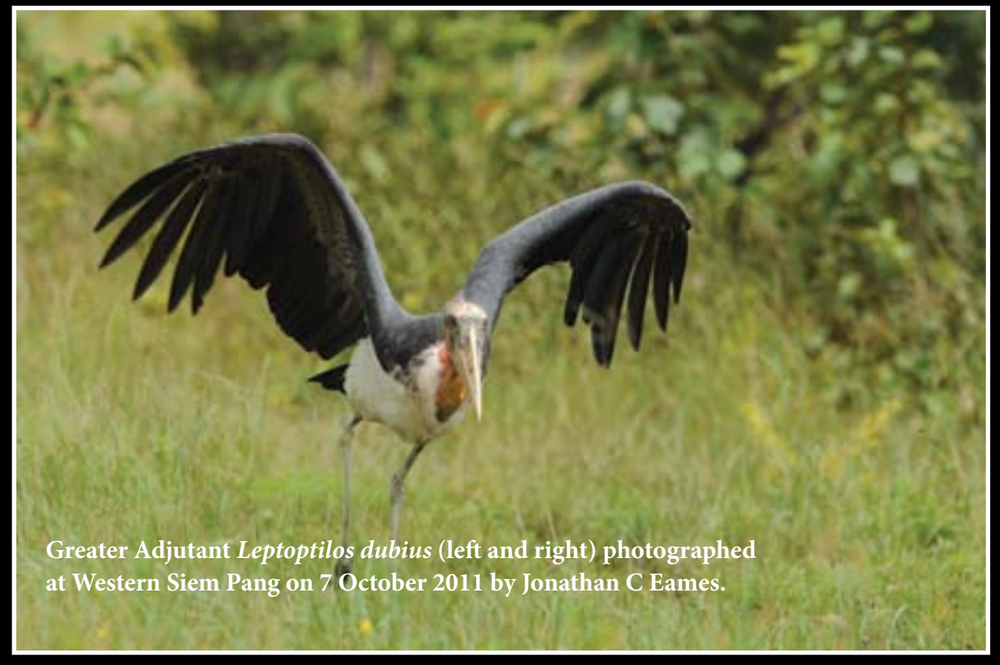
significance to it thus closely mirror those of Indochinese Silvered Leaf Monkey and to a somewhat lesser extent Giant Ibis. Birds seen along the Sekong often appeared relatively unconcerned by passing boat traffic, suggesting hunting pressure is not particularly high. This behaviour of the birds in conjunctions with the distribution of records and the numbers seen clearly indicates that Western Siem Pang supports a significant population of the species.

White-winged Duck *Asarcornis scutulata* (Endangered)

This specialized forest duck is listed as Endangered because it has a very small and fragmented population which is globally undergoing a very rapid and continuing decline as a result of loss of and disturbance to wetland habitats. However in Indochina the primary threat to the species, and the reason for decline, is hunting (Tordoff *et al.* 2005). There has not been a comprehensive analysis of recent records, but highly speculative estimates (2007) suggest that Cambodia probably supports about 10% of the world population, which is considered be less than 1,000 individuals (BirdLife International 2010). The species is poorly known in Indochina largely because of a paucity of efforts to conserve the species or even establish its status. The only reasonably well tracked local population, that on the Nakai Plateau in Laos, has shown a severe decline and may now be extirpated (Dersu and Associates 2008).

Reports of the species from several areas of Western Siem Pang have occasionally been received, although these records cannot be treated as confirmed, they are probably indicative of trends in the species. Early reports included birds in the *Viel Kriel* area and areas in the southern lowlands (Kry Masphal and Chea Ngeth 2004), but given the obvious identification errors in the bird lists presented these records should be considered with extreme caution. There has only been one confirmed record of the species from Western Siem Pang of a single bird flushed from a small wooded island in the lower *O Khampha* at 0634488 1581713 on 22 November 2006 (D Buckingham pers. comm. and Mem Mai verbally to J C Eames 2011). During that survey birds were also reported from a further three locations along the *O Khampha* by three different people. However, since that time there have been no further records, despite a concentrated effort to detect the species along the *O Khampha* in 2010 (J. C. Eames verbally 2011). Likewise, no evidence of the species was found despite focused surveys of the Sekong and three tributaries, the *O Cheangheang*, *O Umbel* and *O Taput*, in December 2011.

The Pian river area in Laos, including the Xe Pian NPA, had in the 1990s one of the two best documented White-winged Duck population remaining in Indochina, which given the large extent of suitable wetland habitat within a forested landscape lead Tordoff *et al.* (2005) to highlight this area as a priority area for the species. However, most of the wetlands used by ducks within this area of Laos have fallen through the cracks of the conservation initiatives within the area, and although there have been no surveys that could assess duck status since the late 1990s, other indications suggest significant declines in many wildlife species within the general area (see gibbon account this report). There are however still remote river stretches within both Xe Pian NPA and Virachey NP, suggesting that this, at times elusive, duck may not have yet been extirpated from the greater landscape. If the species favoured habitats can be well protected in Western Siem Pang this gives hope that the species might one day recover.



Greater Adjutant *Leptoptilos dubius* (left and right) photographed at Western Siem Pang on 7 October 2011 by Jonathan C Eames.

Greater Adjutant *Leptoptilos dubius* (Endangered)

This long-lived species was previously widespread and common across much of South and continental Southeast Asia but declined dramatically during the first half of the 20th century. It is known to breed only in India (at least 650-800 birds in Assam), and at Prek Toal on the Tonle Sap Lake shore (c. 50 pairs) and Kulen Promtep Wildlife Sanctuary (c. 15-20 pairs), in Cambodia. Huge numbers once bred in Myanmar but there have been just two recent reports, in 1998 and in 2006. There have been no confirmed records from Laos in recent years. Breeding success in recent seasons has been extremely poor in Assam: the number of nests in colonies is declining sharply, but for unknown reasons.

Greater Adjutants can be surprisingly difficult to separate from Lesser Adjutants especially in flight, making interpretation of early records from Western Siem Pang difficult. The species is a known carrion feeder, and since 2006 birds have been visiting the vulture restaurant (CVCP), where their identification can be clearly determined. A group of five birds were present in that year, and numbers have steadily increased since then with up to 44 birds present in 2011 (Table 4.6; CVCP). Birds begin to appear in Western Siem Pang June to August, with numbers gradually increasing to a peak in October. They then rapidly move away with only one record of birds each from November and December restaurants, in 2008 when two birds appeared to remain in the area.

Table 4.6. Numbers of Greater Adjutant visiting the vulture restaurant in Western Siem Pang

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2006										5		
2007										12		
2008								5	4	7	2	2
2009						1		7	3	14		
2010										2		
2011							1	5	30	44		

Blank cells indicate that no birds were seen at the restaurant. Source: CVCP monthly reports.

The species is occasionally reported from *trapeangs* within the area, and these reports show a similar pattern to that observed from the restaurant with a peak August–September, suggesting correct identification in many cases. However January to May reports should be considered with caution given the lack of confirmation from the restaurant.

The pattern of occurrence is strongly suggestive of wandering individuals that breed elsewhere

in Cambodia. The breeding season at Prek Toal is January to June, although birds start to return in November. In the northern plains, the species breeds earlier, from November (nesting) to April (fledged) (F. Goes *in litt*. 2010).

Although Western Siem Pang appears to be only a part of the non-breeding range of the species, the increasing numbers are very encouraging, and with appropriate protection it is possible that a colony might establish in the future. Colony establishment will depend on proactive protection of nesting sites, as this and all other large waterbirds are particularly vulnerable to persecution while nesting. The presence of two other colonial nesters, Lesser Adjutant and *Gyps* vultures, could potentially provide a nucleus of 'encouragement' for Greater Adjutants, but as breeding colonies of the former species are not yet secure within Western Siem Pang, the first step is attention to the conservation needs of these.

Lesser Adjutant *Leptoptilos javanicus* (Vulnerable)

Lesser Adjutant has a wide range from the Greater Sunda Islands through Southeast Asia to India and Nepal. In many areas, drainage and conversion of wetland feeding areas, agricultural intensification, increased pesticide use and disturbance, and hunting and collection of eggs, chicks and adults are major threats that are causing considerable declines in numbers, although in Indochina the only serious threat has been persecution (R J Timmins pers. comm.). The global population had been estimated at 6,500-8,000 individuals, of which the Cambodian population was believed to be in the order of 2,500-4,000 individuals, but the true population size is (or was until very recently) probably significantly higher (R J Timmins pers. comm.).

Lesser Adjutants occur throughout the lowlands of Western Siem Pang. During the dry season they rely on *trapeangs* and streams to forage, but in the wet season, when even wheel ruts become frog breeding habitat, adjutant use of the dry forest becomes much more widespread. Birds are relatively shy and rapidly fly on detection of people, and this may possibly be the reason why there are few if any records of the species foraging along the Sekong, although food availability might be another factor. The species is usually encountered during a day's survey in the central lowland plains. An estimated 35-45 birds were present in November 2006 (D Buckingham pers. comm.), but this species is highly mobile so it is very difficult to estimate numbers with any precision. Lesser Adjutants can be surprisingly difficult to separate from Greater Adjutants especially in flight, suggesting that monitoring records should be viewed with some level of caution, however basic patterns seem likely to be accurate. During monthly monitoring in 2010, small numbers (usually less than six) were observed at various *trapeangs* in the area every month (Table 4.7). Numbers appeared to increase from June to December, perhaps indicating an influx of birds. The maximum number seen was 40 at Trapeng Boeung in December. By comparison numbers in 2009 seemed generally lower with less evidence of an 'influx' of birds (Table 4.8).

Table 4.7. Monitoring team observations of Lesser Adutants and their group sizes in 2010

Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
# obs.	10	13	5	5	2	19	21	24	24	24	12	14
Max.	10	4	11	3	4	22	20	21	10	19	12	40
Min.	2	1	3	1	1	1	1	1	1	2	1	2
Average	3.4	2.6	5.4	1.6	2.5	5.3	7.2	6.7	4.1	5.1	5.6	8.3

Table 4.8. Monitoring team observations of Lesser Adutants and their group sizes in 2009

Month	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
# obs.	17	19	11	13	18	12	11	18	15	9	17	8
Max.	8	10	5	11	4	4	4	17	6	6	9	15
Min.	1	1	2	1	1	1	1	2	1	1	1	1
Average	3.5	4.1	3.6	2.8	2.3	2.4	2.1	4.1	2.4	2.3	3.2	4.8

Lesser Adjutant is a common resident throughout Western Siem Pang. Photo: Jonathan C Eames

A few small colonies of a few breeding pairs have been reported (BirdLife monitoring data). However, the only well documented colony was one found in early November 2002 (Timmins *et al.* 2003a). The colony was small, approximately five nests, and occupied two trees to the east of the *O Koy*. Young birds appeared to be present in at least two of the nests (Timmins *et al.* 2003a). Reports of two other presumed adjutant colonies were reported during the same survey, in both cases nests had reportedly been raided by people. This and all other large waterbirds are particularly vulnerable to persecution while nesting. This latter threat, along with poisoning (accidental and deliberate) are the main immediate threats to the species in Western Siem Pang.

Sarus Crane *Grus antigone sharpii* (Vulnerable)

This elegant bird has three disjunct populations; one in the Indian subcontinent, one in Southeast Asia and the other in northern Australia. The nominate race, in the Indian subcontinent, numbers 8,000-10,000 individuals whilst the Australian population (*gilliae*) is estimated at less than 10,000 birds. Subspecies *sharpii* occurs only in Southeast Asia where its range has declined dramatically and it is now confined to Cambodia, extreme southern Laos (possibly breeding) and southern Vietnam (non-breeding), with the total number estimated to be from 800 to 1,000 birds, and Myanmar, where there are about 500-800 birds (BirdLife 2010). It is extinct in Thailand, Malaysia, the Philippines and China. Widespread hunting and egg collection augmented by habitat fragmentation and human population growth are believed to have been the main causes of decline (WCS 2010b).

During the non-breeding season in Indochina, cranes congregate largely in a few main wetland sites associated with the Mekong Delta and Mekong and Tonle Sap floodplains, as well as the *Ang Tropeang Thmor* Sarus Crane Conservation Area, but move between sites during the course of the season and between years. Crane counts conducted across key non-breeding congregation sites in Cambodia and Vietnam in 2010 indicated a population of at least 864 cranes (WCS 2010b). Almost all of these cranes are surmised to breed within the dry forest of Cambodia (R J Timmins pers. comm.).

Table 4.9. Monitoring team observations of Sarus Cranes and their group sizes in 2010

Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
# obs.	2	2	0	1	0	3	2	3	0	0	1	1
Max.	3	2	0	2	0	2	6	3	0	0	2	3
Min.	2	2	0	2	0	1	3	1	0	0	2	3

Sarus Crane photographed in Western Siem Pang on 18 April 2012.
Photo: Jonathan C Eames

Table 4.10. Monitoring team observations of Sarus Cranes and their group sizes in 2009

Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
# obs.	5	2	1	2	1	0	1	1	1	0	1	2
Max.	4	3	2	3	2	0	2	2	2	0	2	4
Min.	2	3	2	2	2	0	2	2	2	0	2	4

The species is rarely (although annually) encountered at Western Siem Pang (Tables 4.9 and 4.10), suggestive that both a few birds are resident (rather than migratory), but also that only a small number of pairs are present. However, the latter assumption requires care, and may in fact be inaccurate. Despite the known minimum population size, evidence of a comparable number of breeding pairs in northern and eastern Cambodia (where the greater majority are presumed to breed) has not been found. This suggests that the vast majority of nesting pairs go undetected during the wet season when they breed. The species, despite its size can be secretive and overlooked during the breeding season (J. C. Eames *in litt*. 2011). Hence the species is very likely to be under recorded at Western Siem Pang. Only further focused studies will determine the species true breeding status at Western Siem Pang. The species is perhaps the most vulnerable of the large waterbirds to nest raiding by humans, as it nests on large mounds of vegetation, which the parents create within shallow wetlands. Most accounts of nests given by local people are associated also with collection of the eggs.

Greater Spotted Eagle *Aquila clanga* (Vulnerable)

This species occupies a huge but fragmented range across much of the Palearctic, breeding in the north from Finland to China and migrating south during the winter months. Passage or wintering birds occur in small numbers over a vast area, including central and eastern Europe, parts of Africa, the Middle East, South and Southeast Asia. Birds winter over a vast area from Kenya to Japan. However, the population is now probably less than 10,000 individuals. In the wintering range, this species shows a preference for open habitats.

This species is reported to have been a fairly common winter visitor to Cambodia (BirdLife International 2001), but evidence suggests it is now much rarer. Whilst there is only one confirmed record of this species from Western Siem Pang, of a bird photographed on 11 February 2010 (H L Wright pers. comm.), it may be overlooked through confusion with Indian Spotted Eagle. This bird is presumed to have been on migration and it seems likely that it could regularly occur in the Western Siem Pang area on passage. They usually winter in wetland habitats.

Indian Spotted Eagle *Aquila hastata* (Vulnerable)

The species was only recently split form recognized Lesser Spotted Eagle *A. pomarina* (Parry

Indian Spotted Eagle (above) and Greater Spotted Eagle *Aquila clanga* (below). Both photographed in Western Siem Pang by Jonathan C Eames and Hugh L Wright respectively.

et al. 2002), and ascertaining its true status and distribution is hampered by identification problems; many recent records of this species in its potential global range are thought to actually relate to Greater Spotted Eagle. It apparently occurs at very low density and nowhere is it common; the world population is believed to be less than 10,000 individuals, mainly over the lowlands of the northern half of the Indian subcontinent.

It is a powerful, tree-nesting predator that seizes its, mostly mammalian, prey from the ground whilst quartering usually over forested areas. It also eats frogs and birds (IUCN 2010). There have been sporadic records of *Aquila* eagles from Western Siem Pang since 2002, with records in January, April, May, June and November (Tordoff *et al.* 2002; Seng Kim Hout *et al.* 2003a; Timmins *et al.* 2003a, D Buckingham pers. comm., J C Eames pers. comm.). Initial records, prior to the splitting of the Indian Spotted Eagle, were provisionally assigned to Great Spotted Eagle *A.clanga* and Lesser Spotted Eagle *A. pomarina*. Most of the smaller *Aquila* eagles recorded in Siem Pang are now suspected to be Indian Spotted Eagle, and more recently, J. C. Eames (*in litt*. 2010) has confirmed photographically that this species is definitely present. However, many of the early records of *Aquila* eagles cannot be assigned to either species.

Small *Aquila* eagles that were probably Indian Spotted Eagles were observed on four occasions in November 2006, in Deciduous Dipterocarp Forest; at *Viel Kriel* (0632025 1567489), *Srae Sangkae* village (0641781 1558446), near Siem Pang (0650000 1560386) and at *Trapeang Russey* #3 (0629454 1559195) (D Buckingham pers. comm.). H. L. Wright has observed many *Aquila* eagles, showing the signs that they are Indian Spotted, throughout the dry-season, although the actual number of birds involved is uncertain. The last three sites are close together so the same bird may have been involved. J. C. Eames (verbally) has seen the species several times in Western Siem Pang and photographed the species there on 15 November 2007 and 15 June 2010., They were occasionally seen around *Trapeang Russey* #3 in January-February 2011 (H L Wright pers. comm.).

Despite the difficulty of identification and the taxonomic confusion, small *Aquila* eagles are not know to be common anywhere within Indochina or Thailand (R J Timmins pers. comm.). In fact prior to recent observations of birds at Western Siem Pang and the Tonle Sap area, it had been assumed that small *Aquila* eagles were only non-breeding winter visitors to the region. Breeding has now been confirmed in the Tonle Sap area and is presumably also attempted at Western Siem Pang. As an apparently low density dry forest species, the long-term conservation of this species in the region will almost certainly depend on maintaining large lowland dry forest protected areas.

Great Slaty Woodpecker *Mulleripicus pulverulentus* (Vulnerable)

This is a widespread bird with large area requirements and is declining throughout its range (from India to Borneo; it is now very rare in Thailand and increasingly localised in Laos). Lammertink *et al.* (2009) presented data strongly suggesting that the species ecology was dependent on large mature trees, raising serious concern for the long-term future of the species.

The species occurs commonly in the plains of Western Siem Pang with usually one or two

groups detectable within an average day's survey (R J Timmins pers. comm., D Buckingham pers. comm.). The species is generally scarce in extensive dense tall Semi-evergreen Forest of Indochina, as appears to also be the case in the northern areas of Western Siem Pang (R J Timmins pers. comm.). But the species probably reaches highest densities in areas of Western Siem Pang where there is a concentration of tall Deciduous Dipterocarp Forest, Nearly-deciduous Forest and other forms of riparian associated Semi-evergreen Forest. It is a gregarious species and at Western Siem Pang groups of up to seven birds have been seen (D Buckingham pers. comm.).

Western Siem Pang represent very good habitat for the species and the large size of the area makes it a potentially important area for long-term conservation of the species.

Yellow-breasted Bunting *Emberiza aureola* (Vulnerable)

This species is a non-breeding visitor to northern South Asia and most of mainland Southeast Asia, with a huge breeding range across the northern Palearctic region. It is considered to be Vulnerable because, although it remains abundant locally, anecdotal evidence suggests that overall it has undergone a very rapid population decline owing mainly to trapping on wintering grounds. It is present in Western Siem Pang in small numbers during March and April (H L Wright pers. comm.), which is the period of migration. No specific threats to the species are known from Western Siem Pang, nor is the wintering population there likely to be of particular significance.

Selected riverine and other wetland associated bird species accounts

This section details the status of select species of riverine and other wetland associated bird species that appear to be regionally in decline (those in Global decline have been covered in the preceding section; see Thewlis *et al.* 1998, Tordoff *et al.* 2005; Timmins 2006, 2008a). GNT means Globally Near-threatened, Thailand NT means Near-threatened in Thailand, Thailand Vu means Vulnerable in Thailand, Laos ARL means At Risk in Laos and Laos PARL means Probably At Risk in Laos.

Notably seven species whose former range almost certainly covered Western Siem Pang or associated downstream stretches of the Sekong, have not been recorded. These seven species are: Cotton Pygmy-goose *Nettapus coromandelianus,* Spot-billed Duck *Anas poecilorhyncha,* Ruddy Kingfisher *H. coromanda,* Collared Kingfisher *Todiramphus chloris,* Masked Finfoot *Heliopais personata,* Golden-crested Myna *Ampeliceps coronatus* and Black-headed Munia *L. malacca* and their absence seems likely to be the result of past and ongoing anthropogenic threats. A further species Black-bellied Tern *Sterna acuticauda*, recorded on one occasion along the Sekong (Claassen 2004), appears now to have been extirpated from northern Cambodia, and probably all of Indochina (Goes *et al.* 2010). Furthermore a number of species are also showing evidence of decline within Western Siem Pang (see below).

White-bellied Woodpecker *Dryocopus javensis* Thailand-NT, Laos-PARL

Recorded no details given by Seng Kim Hout *et al.* (2003a). D. Buckingham recorded pairs or single birds on six occasions along the *O Khampha*, and found the species at three other locations in the eastern lowland plains (area B). Not common, but fairly frequently detected, usually in association with Nearly-deciduous Forest, even small patches amidst Deciduous Dipterocarp Forest (H L Wright pers. comm.). The species was only recorded twice during the December 2011 survey (R J Timmins pers. comm.). The number of records presented here does not accurately reflct the abundance of this bird at Western Siem Pang (J C Eames pers. comm.).

Stork-billed Kingfisher *Halcyon capensis*

Concern for this species has only been recently raised (Fuchs *et al.* 2007, Dersu and Associates 2008). Timmins *et al.* (2003a) considered the species 'common', by implication seen daily in suitable habitats. D. Buckingham recorded twenty-three birds between the mouth of the *O Khampha* and *Phum Nava* on 19 November 2006. The species was also observed along the Sekong and in the central plains. In December 2011 the species was recorded daily along the *O Cheangheang* and *O Taput* with approximately six separate birds recorded along the surveyed sections of each. But birds were not found along the *O Umbel* or a few very small tributary streams, and along the Sekong Stork-billed Kingfishers were only seen on two occasions.

Pied Kingfisher *Ceryle rudis* Laos-ARL

Even in the early years of survey the species was relatively scarce along the Sekong. Claassen (2004) recording a single group of two and Timmins *et al.* (2003a) recording 2–4 groups. H. L. Wright has observed the species only very infrequently along the Sekong. Tordoff *et al.* (2002), C. Poole and J. W. Duckworth in Timmins *et al.* (2003a), Seng Kim Hout *et al.* (2003a) and D. Buckingham did not record the species. None were recorded in December 2011 along the upper reaches of the Sekong.

Blue-tailed Bee-eater *Merops philippinus* Laos-PARL

This species is a common riverine breeder along the Cambodian Mekong (Timmins 2006, 2008b), but appears not to have been recorded along the Sekong. However a single bird was seen in a *viel* in the northwest of the lowlands in 2006 (D Buckingham). In May 2011 several groups of up to nine or more birds were seen in Deciduous Dipterocarp Forest of the central and eastern plains on two days in the area (R J Timmins pers. comm.) and the species has been found quite often in areas of taller Deciduous Dipterocarp Forest (H L Wright pers. comm.). Up to 20 birds, including juveniles, were recorded between 16-22 April 2012 at *Viel Kriel* (J C Eames pers. comm.).

Brown Fish Owl *Ketupa zeylonensis* Thailand-NT, Laos-PARL

D. Buckingham flushed one individual from close to a *trapeang* at (0627123 1561083) in the central lowlands on 9 November 2006. An individual was seen and photographed at *Viel Kriel* on several dates, including March 14, 2011 (J C Eames pers. comm.). An unidentified fish owl was also seen by R. J. Timmins in December 2011.

Buffy Fish Owl *Ketupa ketupu* Thailand-NT, Laos-LKL

D. Buckingham flushed one individual from trees by pools in a dried up stream-bed in Deciduous Dipterocarp Forest north of the *O Khampha* (0634094 1582444) on 22 November 2006. The bird was noticeably smaller than the Brown Fish Owl seen earlier in the month (c.80% as bulky), more heavily marbled above, with dark and buff blotches approximately equal in size and square-looking, compared to the Brown, which had a greater area of dark colouration and more complex, intricate pattern of streaks and bars (D Buckingham pers. comm.).

Spotted Wood Owl *Strix seloputo* Thailand-VU, Laos-LKL

H. L Wright has had 4–8 sightings in total, with a maximum of 2 birds, including a regular roost just south of *Trapeang Kok* 2. These birds were photographed on 15 March 2010 (J C Eames pers. comm.). The species has been heard calling at *Viel Kriel* (J C Eames pers. comm.).

Eurasian Thick-knee *Burhinus oedicnemus* Thailand-NT, Laos-LKL

There are few records of this elusive species the first being of two birds on a large sedimentary feature *Koah Tbeng* in the Sekong on the 27 November 2002 (D. Wilson in Timmins *et al.* 2003a). Single pairs were also seen in old rice fields, near *Trapeang Kok* 2 and at *Toul Srae Sangkae* (H L Wright pers. comm.).

Great Thick-knee *Esacus recurvirostris* Thailand-CR, Laos-ARL

The current trend in status of this species in Western Siem Pang and regionally is difficult to assess. The species is difficult to survey systematically due to its cryptic behavior and nocturnal and crepuscular activity. The species has been detected routinely during surveys along the Sekong (Tordoff *et al.* 2002, Seng Kim Hout *et al.* 2003a, Claassen 2004, D Buckingham pers. comm.), with the highest total being of at least 14 birds detected, this itself considered a likely significant underestimate (Timmins *et al.* 2003a). Most larger sedimentary features in the Sekong, that have moderate to extensive growth of rheophyte shrubs, are likely to support breeding birds and during the December 2011 survey birds were found associated with all four of such channel features extensively surveyed. The latter is suggestive of a minimum total of eight birds within the proposed boundaries of Western Siem Pang (R J Timmins pers. comm.). Although apparently still occurring in reasonable numbers the species is likely to be

Spotted Wood Owl *Strix seloputo* (above) is probably widespread throughout the Deciduous Dipterocarp Forest. Grey-headed Fish-eagle *Ichthyophaga ichthyaetus* (below) has declined along the Sekong River. This individual was photographed at *Trapeang Boeung* on 1 November 2006. Photos: Jonathan C Eames

Black-necked Stork (above) is a rare bird at Western Siem Pang and breeding is not proven. Up to ten pairs of River Tern (below) nest on *Koh Thbeng* in the Sekong River. Photos: Jonathan C Eames

very vulnerable to reported hunting of riverine birds using poisoned baits (RUPP in prep.). The species is also very vulnerable to nest robbery, damage and or abandonment in areas of frequent human use. This level of human use would apply to almost all medium to large sedimentary features and rocks seen in the channel in December 2011.

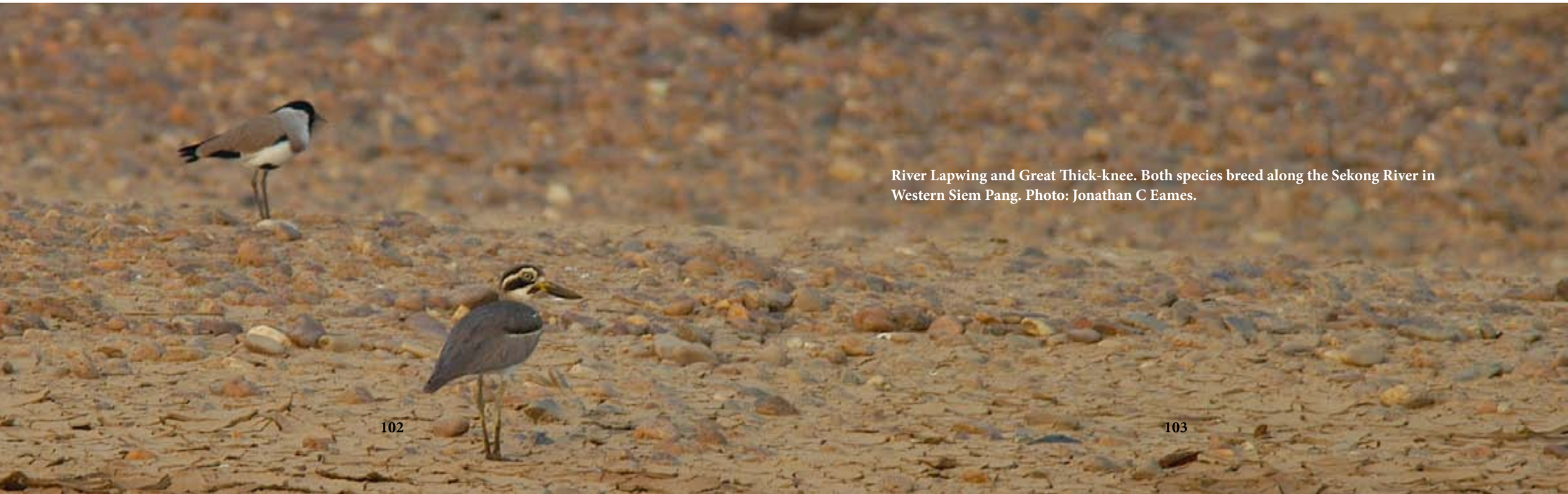
River Lapwing *Vanellus duvaucelii* Thailand-VU, Laos-ARL

Very high counts of the species were recorded along the Sekong in 2002, which were even considered to be underestimates of the true numbers present, because of the difficulty of detecting birds on large well vegetated sedimentary features in the channel (Table 4.11; Timmins *et al.* 2003a). But other counts both before and relatively shortly after recorded less than half the number of birds, for rather inexplicable reasons (Table 4.11; C. Poole and J. W. Duckworth in Timmins *et al.* 2003a, Tordoff *et al.* 2002, Claassen 2004). Observed, no details given by Seng Kim Hout *et al.* (2003a). D. Buckingham surveyed almost the entire length of the Sekong on the 2 and 3 December 2006 and recorded 18 birds north of the *O Khampha* (peak counts on other dates in brackets; 24 on 23 November); 12 birds between the *O Khampha* and Siem Pang town (14 on 19 November); and 26 birds between Siem Pang and Stung Treng. During the December 2011 survey a minimum of 39 birds were estimated to be present between Siem Pang town and the Laos border, with approximately 33 of these birds above the *O Khampha*. The estimate represented the amalgamation of several trips along the river, and a few foot based exploratory surveys of large channel sedimentary features. This count was thought to be a considerable underestimate (perhaps less than 70% of the birds present) as fewer than half of the large sedimentary features within the river channel were systematically surveyed. However if the large features had not been checked on foot, roughly only four birds would have been found between Siem Pang town and the *O Khampha*, and 20–25 north of there.

Table 4.11. River Lapwing counts along the Sekong

Date	River stretch	
	Stung Treng to Siem Pang*	Above Siem Pang
February 2000	33	-
May 2002	14	21
Early November 2002	72+	-
Late November 2002**	70	-
March and April 2004	27	-
November-December 2006	26	30(-38)
December 2011	-	39+***

See text for sources
*if multiple surveys were done the maximum count is given.
**D. Wilson in Timmins *et al.* (2003a)
***Includes a slightly longer river stretch, all the way to the mouth of the Pian river, than for the other two counts, with approximately 8 birds in this additional stretch.



River Lapwing and Great Thick-knee. Both species breed along the Sekong River in Western Siem Pang. Photo: Jonathan C Eames.

The current status and trend in numbers is hard to determine. Numbers (see Table 4.11) show no clear decline, but the large sedimentary features and rock outcroppings in the Sekong have essentially prevented a truly systematic survey being done, making the 'incomplete' counts difficult to compare. The large number of fishing camps established on sedimentary features and rocks in the channel in December 2011 (essentially no larger feature was free from at least one camp) suggests breeding success would be very low.

River Tern *Sterna aurantia* Thailand-CR, Laos-ARL

In early February 2000, 71 birds were recorded between Stung Treng and Siem Pang (C. Poole and J. W. Duckworth in Timmins *et al.* 2003a). Tordoff *et al.* (2002) observed totals of 31 and 20 birds along the Sekong river between Stung Treng town and Siem Pang town on 19 May and 24 May 2002 (respectively), with a further 11 birds seen between Siem Pang town and a point 3 km downstream of the Laos border on 22 May. Timmins *et al.* (2003a) observed at least 43 birds in November 2002 between Stung Treng town and Siem Pang town. Observed, no details given by Seng Kim Hout *et al.* (2003a). Claassen (2004) observed up to 40 birds in March and April 2004 between Stung Treng and Siem Pang, with a concentration of an estimated ten breeding pairs on Koah Tbeng. D. Buckingham noted an apparent increase in number of birds over the period from late October to early December 2006 (see Table 4.12). On the 2 December one duo and seven singles were seen upriver of the 101 Army Base, with one duo and three singles from the base down to Siem Pang town. On the 3 December 14 birds mainly as singles were seen from Siem Pang town down to Stung Treng. H. L. Wright made several counts at various times over the course of three years, and other counts have been made by other visitors to Siem Pang (see Table 4.12).

Table 4.12. River Tern counts along the Sekong

Date	River stretch	
	Stung Treng to Siem Pang*	Above Siem Pang
February 2000	71	-
May 2002	31-20	11
November 2002	20-45	-
November 2002[1]	38-44	-
March and April 2004	38-40	-
October 2006[2]	3	-
November 2006[2]	-	c.8
December 2006	14	14

Date	River stretch	
Late March 2008[3]	12-24	-
Mid April 2008[3]	21	-
Mid May 2008[3]	6	7-13**
Early November 2009[3]	5	-
Late Jan 2010[4]	8	-
Early February 2011[3]	-	1
December 2011	-	0

See text for sources, except: 1: D. Wilson in Timmins *et al.* (2003a); 2: D. Buckingham pers. comm.;
3: H L Wright pers. comm.; 4: F. Goes *in litt.* (2012);
*Where both up- and down stream counts were made both totals are given.
**Combined two day counts

No birds were detected during the December 2011 survey, which is surprising as water levels had dropped enough to expose large areas of sedimentary features in the channel, and experience elsewhere suggests birds generally have begun to return to breeding stretches in significant numbers by late December (R J Timmins pers. comm.). A decline in numbers especially from the early 2000 observations appears to be certain based on these relatively opportunistic records. This decline is further corroborated by the information obtained from interviews by RUPP (in prep.). Very worrying declines in birds breeding along the Mekong are also evident since systematic surveys were undertaken in 2007 (A. Claassen *in litt.* 2012). The large number of fishing camps established on sedimentary features and rocks in the channel in December 2011 (essentially no larger feature was free from at least one camp) suggests if birds are still present that successful breeding would be very unlikely.

Brahminy Kite *Haliastur indus* Laos-ARL

Observed, no details given by Timmins *et al.* (2003a), but not by Tordoff *et al.* (2002). Observed, no details given by Seng Kim Hout *et al.* (2003a). No birds were detected during the December 2011 survey. Three records of a juvenile in the Siem Pang area in late 2006, may have involved a single bird, one of the observations was of a bird investigating the vulture restaurant (D Buckingham pers. comm). Birds were seen occasionally by H. L. Wright with more observations in the early dry season than in the late dry season. In late 2009 there may well have been a nest not far from *Pong Kreal* village as adults were seen regularly and reportedly a nest was disturbed by people (H L Wright pers. comm.). An immature bird was photographed attempting to rob a Giant Ibis at *Trapeang Thlork* on 13 March 2010 (J C Eames pers. comm.).The species appears to be only an occasional visitor to the upper reaches of the Sekong.

White-bellied Sea-eagle *Haliaeetus leucogaster* Thailand-NT, Laos-ARL

The species has only been detected once, a sub-adult was observed for about five minutes soaring over the Sekong on 23 January 2003 (UTM 0643512 1591450) (Seng Kim Hout *et al.* 2003a).

Lesser Fish-eagle *Ichthyophaga humilis* GNT

Seng Kim Hout *et al.* (2003a) observed a single bird over the Sekong at UTM 0642985 1586984 on the 26 January 2003, and two birds along the Sekong on 27 January at UTM 0644527 1593101. H. L. Wright observed only a single bird, along the *O Khampha*. Unidentified fish-eagles have been recorded on a number of occasions and some of these records might have pertained to this species (see Grey-headed Fish-eagle account). No birds were detected during the December 2011 survey.

Grey-headed Fish-eagle *Ichthyophaga ichthyaetus* GNT

On 23 May 2002, two Grey-headed Fish Eagles were heard calling and observed soaring over an area of Deciduous Dipterocarp Forest with scattered wetlands (UTM 0636616 1582858; Tordoff *et al.* 2002). Earlier on 22 May 2002, a single unidentified fish eagle *Ichthyophaga* sp. had been observed on the western bank of the Sekong river (UTM 0643651 1591686). Seng Kim Hout *et al.* (2003a) observed a single bird along the Sekong at UTM 0633880 1521376 on 28 January. Timmins *et al.* (2003a) recorded the species on a number of occasions along the *O Khampha*, with records almost certainly relating to three separate 'groups', one being a presumed pair around the confluence of the *O Chool*. Timmins *et al.* (2003a) also recorded fish-eagle vocalizations (best considered unidentified) from a further two widely seperated locations within Western Siem Pang, one in the far west of the central plains, the other close to the Sekong in the vicinity of *Phum Makpheung*. D. Buckingham observed at least four birds, presumed to represent two breeding pairs, along the *O Khampha* in November 2006, but did not detect fish-eagles in the central plains associated with *trapeangs*, nor along the Sekong. H. L. Wright recorded the species infrequently flying over the Sekong or on two occasions flying very high over the Deciduous Dipterocarp Forest dominated lowlands, and once saw one very very high over *Trapeang Boeung Kdouch* coming from the west. No fish-eagles were detected during the December 2011 survey, despite a survey focus on streams potentially capable of supporting this or the former species.

The lack of recent records along the Sekong is at least indicative of a decline.

Black-necked Stork *Ephippiorhynchus asiaticus* GNT

This species is now almost certainly rarer regionally than either of the two Globally Threatened forest ibises (Timmins 2008b).

There are occasional sightings of the species in Western Siem Pang throughout the year, suggesting resident status. Despite speculation by Timmins *et al.* (2003a), there appears to be no substantial evidence that the species makes significant seasonal movements within Cambodia, with the exception of birds occurring on the Tonle Sap floodplain displaced by floodwaters.

Five Black-necked Storks were observed in western Siem Pang district during the ICF aerial survey on 5 September 2001: two at UTM 0636616 1582858, two at UTM 0636958 1582703 and one at UTM 0630859 1559229 (P. Davidson *in* Tordoff *et al.* 2002, ICF unpublished data). Seng Kim Hout *et al.* (2003a) observed a single adult, disturbed from a sandbar along the Sekong at UTM 0640356 1582669 on 27 January 2003. D. Buckingham found only three adults: a pair foraging in *Trapeangs* #2 and #3 in *Viel Kriel* (0632045 1567774) on 28 October and one by *Trapeang Lumchey*#1 (0639144 1579227, near the mouth of the *O Khampha)* on 11 November. H. L. Wright has probably only seen them 5-6 times in c. 16 months in Siem Pang. The anecdotal records suggest a decline, in that there were sightings of 3 birds 4-5 years ago, then 2 birds 2-3 years ago, and only 1 bird in 2011 (H L Wright pers. comm.). Records are scattered suggesting quite a lot of movement around the central plains, although the distribution of more recent sightings also suggest perhaps more than one group of birds were involved, as also indicated by the early ICF data. For example the more recent records cluster in two main areas, *Viel Kriel* and the northeast close to the lower reaches of the *O Khampha*. In 2010 while observing a *trapeang* only a few km from the Laos border, over the course of several days, H. L. Wright observed a pair on several occasions flying in from far to the west, potentially from Laos.

Plain Martin *Riparia paludicola* Thailand-VU, Laos-ARL

The species has only been reported once, presumably involving birds seen along the Sekong (Tordoff *et al.* 2002).

Wire-tailed Swallow *Hirundo smithii* Thailand-NT, Laos-PARL

Approximately six birds were found by D. Buckingham along the Sekong above the 101 Army Base. In December 2011 a mimimum of nine birds, associated with three different rocky sections, were estimated in this same stretch up to the Laos border. This is the only stretch of the Sekong with extensive amounts of suitable breeding habitat.

Starlings and mynas form an important element in the grassland bird fauna. Black-collared Starling *Sturnus nigricollis* **(above left) and Vinous-breasted Starling** *Sturnus burmannicus* **(above right) are two common species. Zebra Dove** *Geopelia striata* **is a recent colonist at Western Siem Pang. Photos: Jonathan C Eames**

Plain-backed Sparrow *Passer flaveolus* **(above right), Indochinese Bushlark** *Mirafra erythrocephala* **(bottom left) and Chinese Francolin** *Francolinus pintadeanus* **(bottom right) are all characteristic species of open Deciduous Dipterocarp Forest and grassland at Western Siem Pang. Photos: Jonathan C Eames**

Mekong Wagtail *Motacilla samveasnae* GNT

Small numbers occur along the length of the Sekong associated with shrubby sedimentary features in the channel. The highest count appears to be that of Claassen (2004) who recorded 17 birds. Although even this count is likely to be a considerable underestimate of the breeding numbers present, the Sekong population is likely to be relatively insignificant compared with that of the Mekong in Cambodia (Timmins 2006).

Streaked Weaver *Ploceus manyar* Thailand-NT

Timmins *et al*. (2003a) recorded five birds at a *trapeang* in the central plains, but nest structures thought possibly to be those woven by Streaked Weaver (but perhaps Asian Golden see below) were seen at three *trapeangs*, suggesting the species was possibly commoner than the one record suggested. However, the species was not detected by Tordoff *et al.* (2002) or D. Buckingham. H. L. Wright has only ever recorded small numbers (c. 4–5) associated with other weaver species.

Baya Weaver *Ploceus philippinus* Thailand-NT, Laos-PARL

Timmins *et al.* (2003a) recorded two flocks (c. 30+ and c. 50+) of non-breeding Baya and or Asian Golden Weavers and one small flock (c. 8) of weaver sp. in the central plains. Additionally three nests presumed to be from this species were seen at one *trapeang*. D. Buckingham suspected the species to be common in the central plains (see next species account), and 24 nests were seen at a total of 10 *trapeangs* (two of the *trapeangs* also having Golden Weaver nests present).

Asian Golden Weaver *Ploceus hypoxanthus* GNT

This appears to be the commonest of the weavers present in Western Siem Pang (D Buckingham pers. comm.). Timmins *et al*. (2003a) recorded two flocks of non-breeding Baya and or Asian Golden Weavers and one small flock of weaver sp. Additionally nests possibly of this species were seen at a number of *trapeangs*. D. Buckingham found approximately 520 non-breeding Baya and or Asian Golden Weavers at 27 of the *trapeangs* visited during the survey, and suspected that there was little if any duplicate counting of birds between *trapeangs*. The largest flock recorded was of c. 80 birds at *Viel Kriel Trapeang* #4. All but one male Asian Golden Weaver were in non-breeding plumage, making identification to species unreliable. However a total of 35 Asian Golden Weaver nest were found at 8 *trapeangs*. The biggest concentration of Asian Golden nests was at *Trapeang Svay Chas* (0625695 1567735; 18 nests). Based on the characteristic structure of the nests the ratio of Asian Golden to Baya was approximately 35:24 (D Buckingham pers. comm.). Nesting Golden Weavers appear relatively numerous in the tall central vegetation of *trapeangs* in May, but Baya Weavers appear to have a somewhat different nesting season making comparison difficult (H L Wright pers. comm.).

Nesting birds and non-breeding aggregations are only generally found at those *trapeangs* with tall emergent vegetation, especially those with tall sedge and or the shrub *Sesbania* sp. This is because birds feed on the grass and sedge seeds and nest within the tall vegetation. As such there is likely to be an inverse relationship between weaver numbers at *trapeangs* and the extent of use by domestic livestock especially buffaloes as was noted by both Timmins *et al.* (2003a) and D. Buckingham.

Elongated Tortoise *Indotestudo elongata* at Western Siem Pang. Photo: Jonathan C Eames

Chapter 5
Other wildlife in Western Siem Pang

With the exception of birds and mammals, even basic information on other faunal groups within the Western Siem Pang is generally lacking. However this reflects a paucity of such information region wide in many cases. The following outlines what is known of three groups for which some baseline information is available, namely reptiles and amphibians, and butterflies.

Reptiles and Amphibians

Indochina represents an area of high amphibian and reptile diversity but is also an area of limited knowledge regarding the true species diversity, distribution and status of its herpetofauna. This is especially true of Cambodia, where scientific research has been hampered by previous civil conflict. Prior to 2000, very few surveys for amphibians or reptiles had been conducted anywhere in the country. The absence of information on Cambodia's amphibians is reflected in a 2004 Global Amphibian Assessment, which listed 135 species for Vietnam (including 34 endemics), 129 species for Thailand (9 endemic), 65 species for Laos (3 endemic), but only 43 species (3 endemic) for Cambodia. This low total for Cambodia compared to neighboring countries merely goes to demonstrate how little survey work has been done in the region (Conservation International 2007). Research and survey efforts since 2004 has resulted in a much better understanding of the amphibian fauna, including the discovery of new endemic species (mostly in the Cardamom mountains). As of 2008, 62 species of amphibian were known to occur (Neang Thy and Holden 2008), whilst by the end of 2010, there were 70-71 species (J. Holden verbally 2011). Of these, at least 6-7 species are known to be endemic to Cambodia (Neang Thy and Holden 2008).

Rugulose Bullfrogs *Hoplobatrachus rugulosus* on sale in Siem Pang town. Photo: Jonathan C Eames

No surveys undertaken in Western Siem Pang have focused specifically on reptiles or amphibians. As a consequence, the herpetofauna of the area still remains very poorly known. However, various observers have made anecdotal observations and taken photos of snakes and frogs. A list of the species of reptile and amphibian that have been reliably identified in Western Siem Pang is provided in Annex 6. A number of amphibian species are important in the diets of local communities at certain times

Large numbers of Common Asian bullfrog *Kaloula pulchra* (above) and Truncate-snouted burrowing frog *Glyphoglossus molossus* (below) emerge after the first rains in April. Photos: Jonathan C Eames

of year, such as Regulose Bullfrog *Hoplobatrachus rugulosus*, which is sold in Siem Pang at seasonally. Amphibians are also important in the diet of some of the threatened waterbirds in Western Siem Pang (see Box).

Box 8: Frogs and ibises in Western Siem Pang

Some of the frog species of the proposed Western Siem Pang Protected Forest appear to be very important to the White-shouldered Ibis, providing it with food during the breeding season. As the dry season progresses, these frogs (e.g. Paddy Frog *Fejervarya limnocharis*) burrow into the deep cracks in the mud around the *trapeangs*, where they presumably survive for the entire dry season. The long, curved bill of the ibises allow them to extract frogs from within these cracks (H L Wright pers. comm).

Brief targeted herpetofaunal surveys in Virachey NP (Conservation International 2007) recorded approximately 26 amphibian and 35 reptile species, including several that may be new to science and several others that had never previously been recorded from Cambodia. Based on these survey results, it seems likely that if targeted herpetological surveys were to be conducted in Western Siem Pang then many additional species are likely to be found.

Of the 13 species of reptiles and 10 species of amphibians confirmed to date in Western Siem Pang, only three are considered Globally Threatened. However, the presence of an unidentified Caecilian (*Ichthyophis* sp.) is very worthy of note since these seldom found amphibians, which have a snake-like appearance, are often endemic to relatively small areas. The following paragraphs provide information on the three Threatened species (Box 6) that are known to occur, as well as Siamese Crocodile, which has been suspected of occurring in Western Siem Pang in the recent past (Timmins *et al.* 2003a). Local community members in Western Siem Pang report that there are two soft-shelled turtle species in the area, but *Pelochelys* has yet to be confirmed although it surely occurred in the Sekong in the past and may still do so (R J Timmins pers. comm.). Species confirmed from Virachey NP include the Asian Giant Pond Turtle *Heosemys grandis*, which must have once occurred in Western Siem Pang and may still do so (R J Timmins pers. comm.). At least two individuals of this species were confiscated from a hunter and released into the Sekong on 1 May 2012 (J C Eames pers. comm.). But perhaps the species which Western Siem Pang may one day be considered most significant for is the Yellow-headed Temple Turtle *Hieremys annandalii*, a lowland species known from forested streams and wetlands; it must surely have previously occurred in Western Siem Pang, which would appear to have much suitable habitat and perhaps may yet still survive in small numbers (R J Timmins pers. comm.).

Elongated Tortoise *Indotestudo elongata* (Endangered)

This distinctive species (Asian Turtle Trade Working Group 2000a) was first recorded in Western Siem Pang in November 2002 (Timmins *et al.* 2003a). Individual animals have been confiscated from the wildlife trade in Western Siem Pang and released in April 2011 and May 2012 (J C Eames pers. comm). The species occurs from the Indian subcontinent to West Malaysia and Indochina. In Cambodia, they have been recorded in many areas of the northern and eastern dry forest plains as well as in the Cardamom Mountains (WWF 2010b, R J Timmins pers. comm.). Elongated Tortoises are under intense pressure throughout their range

Land Monitor *Varanus bengalensis* at Western Siem Pang (left) and Paradise tree snake *Chrysopelea paradisi* devouring a Tokay gecko *Gekko gecko* (above right) photographed in Yok Don National Park, Vietnam on 19 May 2002. This species is confirmed from Western Siem Pang.
Photos: Jonathan C Eames

Giant Asian pond turtle *Heosemys grandis* (above) and Reticulated python *Python reticulatus* (right) both confiscated from the trade in Western Siem Pang in April and May 2012.
Photos: Jonathan C Eames

due to over-harvest for food and the pet trade. This species is listed in CITES Appendix II.

Southeast Asian Box Turtle *Cuora amboinensis* (Vulnerable)

This aquatic turtle is found from Bangladesh and India through Myanmar to Indochina and Indonesia. It is considered Endangered in Cambodia because of the trade for food and pets (Asian Turtle Trade Working Group 2000b). It has reportedly been occasionally encountered in Western Siem Pang. A young animal was seen in the *O Taput* in December 2011; the species is probably rare even in remote areas of Western Siem Pang (R J Timmins pers. comm.).

Asian Softshell Turtle *Amyda cartilaginea* (Vulnerable)

Asian Softshell Turtle inhabits a variety of freshwater habitats from ponds and lakes to rivers and canals in Indochina and Thailand to the Malay Peninsula and the Greater Sunda Islands. The security of a wide distribution and its occurrence in protected areas is offset by specific demand for this species in the consumption trade. It was traded at estimated levels of tons per day in the year 2000 (Asian Turtle Trade Working Group 2000c.) and there is no reason to suppose that demand has declined. There is at least one record of the species from Western Siem Pang, a captive animal photographed and released by J. C. Eames. The status of this species within Western Siem Pang is unknown but it is thought to be uncommon to rare.

Asian Softshell Turtle *Amyda cartilaginea* trapped and released on the Sekong River on 27 January 2003 in Western Siem Pang. Photo: Jonathan C Eames

Siamese Crocodile *Crocodylus siamensis* (Critically Endangered)

In November 2000, hunters reported catching a crocodile the previous year in the *O Khampha* and *O Khe* Rivers (Desai *et al*. 2002), and although it was suggested that perhaps small numbers of Siamese Crocodiles still survived in the *O Khampha* in 2003 (Timmins *et al*. 2003a), to date no verification of this has been obtained. All reports obtained by R J Timmins in 2011 were many years old mostly involving sightings of incidents of animals captured in the late 1990s or early 2000s. Human use of the *O Khampha* is now so high that it seems inconceivable that the species could still survive in this stream (R J Timmins pers. comm.). The December 2011 survey of several small stream in the remoter areas of Semi-evergreen Forest in the hills, suggests that crocodiles are unlikely to persist in these either, because of a general lack of suitable habitat; the streams are small, seasonal and generally have a high gradient with very few permanent pools (R J Timmins pers. comm.).

Butterflies

No specific survey for butterflies has been undertaken in Western Siem Pang. However, the area supports a diverse butterfly fauna, and anecdotal observations and photographs taken by field workers have identified 47 species to date (Annex 7). None of these species are listed as Globally Threatened by IUCN (2010). The significance of Western Siem Pang to butterfly conservation remains unknown and cannot be ascertained from the incidental records so far made.

Photo: Bou Vorsak

Chapter 6
Threats To Western Siem Pang

Landscape scale loss of dry forest

In the long-term the greatest threat to biodiversity in Western Siem Pang is unquestionably degredation and conversion of the lowland plains to other forms of landuse. Currently this is set to occur as the result of the legally established commercial agri-buisness Green Sea Agriculture Co., Ltd[1], who have a 70 year lease for a 100,852 ha concession. The concession overlaps considerably in extent with the proposed Western Siem Pang Protected Forest. Indeed, almost the entire Deciduous Dipterocarp Forest dominated lowlands, so vital to the ibises and other threatened species, is currently within the Green Sea Concession area – a total area of overlap of 85,036 ha. Although, in theory plantation development might be conducted to minimise impacts on Western Siem Pang's wildlife, as discussed by Timmins (2011), in practice it constitutes a very serious threat to all threatened species within the concession area.

However, even if Western Siem Pang were not part of an agricultural concession, conversion of the lowland plains to other landuses seems very likely to be inevitable in the absence of effective protection. Such conversion would likely proceed in a piecemeal fashion, extending out from villages, existing agricultural areas and roads. Such expansion is especially likely to be in the form of satellite settlements and fenced in small-holdings, a pattern evident in areas where 'rural development' has been ongoing for longer than in Western Siem Pang. The hilly Semi-evergreen Forest areas are far less threatened in this respect, as current prescedents suggest that there is much less pressure on conversion of hill areas, especially in dry monsoonal regions of Indochina.

Timber extraction

The forests of Western Siem Pang have been exploited for many years, but patterns appear to have changed. Most large commercially valuable timber (i.e. dipterocarps and legumes) was removed either during later parts of the French colonial era or during the Khmer Rouge period (R J Timmins pers. comm.). During such periods good timber was so abundant that what was left was still visually impressive; many large trees were obviously not worth the time and effort to log. By 2003 timber extraction was probably at a relatively low level compared with both former and latter times, the resources needed to remove timber other than for local construction being probably prohibitively high (Timmins *et al.* 2003a). This appeared to be the case also in 2006 with almost all extraction close to settlements or along the Sekong (Buckingham and Prach Pich Phirun 2006). Since that time, evidence suggests that illegal timber extraction has increased once again, since local monitoring teams in Western Siem Pang reported illegal activities related to timber almost monthly in 2009-2010. During 2009, BirdLife monitoring teams detected 27 cases of activities related to illegal logging (mostly cut trees or luxury wood that was confiscated) during a total of 47 days on which monitoring was carried out. During 2010, 13 infringements relating to illegal logging activities were reported during 23 days monitoring within the Western Siem Pang IBA (from January to mid-September). In 2011 the evidence seen suggested a very significant resurgence in logging activities, with a greater proportion of the local population involved, largely aimed at commercial markets. Logging

[1] This company was previously known as Green Sea Industry Co., Ltd.

Luxury wood smuggling by local communities is increasingly common throughout Western Siem Pang. Much of it allegedly cut in Laos. Photos: Bou Vorsak

was now removing the last vestiges of large trees (other than a few non-commercially valuable ones), and harvesting select smaller species with high value (e.g. rosewood) (R J Timmins pers. comm.). The value of rosewood in particular is so high that new roads have been specially cut into and through the northern hilly Semi-evergreen Forest areas across even into Laos. Evidence of active logging activity was found on a daily basis in 2011, with logging crews heard in the forest on most days and logs in transport seen on many days (R J Timmins pers. comm.). Rosewood logging appeared past its peak in most (but not all) areas, with a second wave of activity targeting rosewood stumps left from the first wave over the majority of the forest areas visited (R J Timmins pers. comm.). This appears to be a pattern common to the region, but Western Siem Pang would appear to be lagging behind other areas in the timing of rosewood removal (R J Timmins pers. comm.). This current logging is being carried out very openly. Large volumes of rosewood were being removed on a daily basis in December 2011 (R J Timmins pers. comm.). However once, rosewood has been depleted other timber species will undoubtedly be harvested. It was noticeable in may tall Deciduous Dipterocarp Forest, Nearly-deciduous Forest and other riparian Semi-evergreen Forest areas that regrowth post-logging in the 1990s, and before, has been vigourous and that many dipterocarp trees are undoubtedly reaching sizes that will encourage future logging (R J Timmins pers. comm.).

Less nefarious logging and degredation of the forests closer to villages is taking place, as local construction needs in particular increase, but also due to high demand for firewood. Many of the targeted trees are relatively small making the practice seem more benign than the 'export' focused logging of larger trees and valuable timbers, but it's effect on forest structure is likely to be serious.

Areas of Deciduous Dipterocarp Forest where these activities are concentrated, mostly near existing communities, are full of felled trees, the majority of which are largely intact (F. Lambert pers. obs.). It seems that in the vast majority of cases, much less than 30% of the trees that are felled are actually used, and the remains of these trees, which litter the ground during the early dry season, are turned to ash during dry season fires, so that no evidence that these trees even existed is evident (H L Wright pers. comm.).

Harvest of wild animals

Harvest of wild animals takes various forms some activities are relatively benign, while others are extremely serious in their consequences to Western Siem Pang wildlife. Furthermore the legality of many activities is a relatively grey area, 'subsistence use' is often considered legitimate even for species experiencing overharvesting characteristics. Local consumption of wild animals, especially fish and other aquatic life lies at the heart of local cultures making changes to consumption patterns and harvest practices challenging to achieve. Disaggregating the main factors and their causes, even when dealing with harvest threats to single species, can be especially problematic because of the complex inter-linkage between local peoples' forest uses and because of the considerable and growing grey area that exists between 'subsistence' use of wildlife and commercial use. Many threats result relatively indirectly from other primary forest use activities. The main reasons for people from local communities to visit forest areas can be grouped into seven main activities:

- Rice farming at paddies within the forest

- Timber extraction (commercial, local construction and firewood)
- Fishing (commercial and local consumption)
- Resin collection (commercial)
- Targeted hunting of highly prized animals species (other than fish; commercial and local consumption)
- Livestock management
- Collection of non-animal and non-timber forest products (mainly local consumption)

However many of these activities are opportunistically combined, especially hunting of prized animal species and fishing. This is because opportunistic hunting of many animals is easily done as and when opportunities arise. Several factors are in the context of Western Siem Pang of especial concern; each is discussed below.

The most recently identified threat within Western Siem Pang is poisoning of animals, which from relatively anecdotal evidence appears to be on the rise. Its impact has already been startling with at least nine vultures and one Giant Ibis dead within Western Siem Pang, and poisoning perhaps responsible for other vulture deaths (see species' accounts). It would appear to have the potential to become the most serious of short-term threats to the area, although very little is currently understood about its extensiveness or its driving force(s). Known incidents have so far been sporadic, but as a new threat it is not known if perhaps it is often going undetected. The most intensive effort to determine the dynamics of current poisoning has been that of the CVCP, largely due to the growing number of incidences of vultures being poisoned (Clements *et al.* in press). Investigated cases suggest poisoning has resulted from a number of causes, none intentionally targeting vultures. Cases have involved poisoned bait set out to kill waterbirds for human consumption, or water sources poisoned to capture fish, in both cases dogs and buffalo unintentionally eating the bait or drinking the water and thus dying, to be secondarily fed upon by vultures (Clements *et al.* in press, CVCP). RUPP (in prep.) during interviews with local people along the Sekong received almost ubiquitous reports of poisoning being speculated as a primary cause in the decline of various river and wetland birds. Apparently use of poisoned bait to capture river and wetland birds is widespread. The birds are apparently captured mainly for local consumption. Reportedly various organs (presumably the liver and intestines in particular) are removed and discarded to prevent poisoning of people, but reportedly this discarded poisoned meat often leads to secondary death of scavenging species (Pech Bunnat *in litt*. 2012). Similar reports of poisoning for fish resulting in secondary deaths of other animals were received from southwest Cambodia (Timmins and Sechrest in press). Occasionally poisoning may be more accidental, as CVCP have gathered accounts of poison being used to kill dogs (presumably rabid or similarly unhealthy animals), resulting in secondary death of scavengers (Clements *et al.* in press, CVCP).

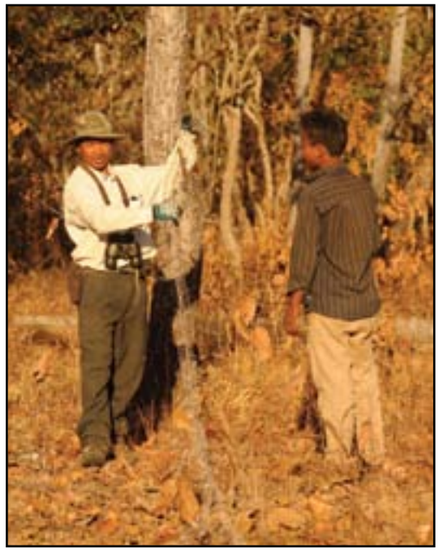
The rate and scale of illegal exploitation of animals has increased rapidly in Indochina in recent years, due to increasing domestic and international demand, the latter especially from China and Vietnam, fuelled by growing economic wealth in the hands of an increasingly 'urban' populace (BirdLife International 2010b). National and regional wildlife trade has the greatest potential to threaten wildlife within Western Siem Pang. If it were not for such trade Tigers, elephants, wild oxen and crocodiles would still be visibly present in the lowlands of Western Siem Pang, and pangolins, otters and turtles would not now be only

The vulture population at Western Siem Pang is very vulnerable to extermination in a single catastrophic poisoning incident. The last such documented event was on 1 March 2010 when 7 vultures (right) were killed outright. Two further birds were rescued, rehabilitated and released (left and below). Photos by Nicolas Cornet

This Indochinese Silvered Leaf Monkey *Trachypithecus germaini* (below) was shot and then skinned by soldiers at a Cambodian Army post on the Sekong River on 26 January 2003. Confined to riverine forest at this site, the species is vulnerable to local extinction. Photo: Jonathan C Eames

exceptionally encountered. Other species remain in relatively high numbers that are still threatened by trade, this includes in particular primates. Around 2005, a trade-network in monkeys reached Western Siem Pang, with monkeys being exported to Laos and Vietnam where they commanded high prices of around US$ 50 per animal. Initially at least capture of Long-tailed Macaques outside of protected areas was 'legal' and condoned by the Cambodian government; the animals being exported for laboratory animal demand in East Asia (Timmins *et al.* 2003a, Timmins 2006). During the 2006, surveys evidence of this trade was seen along the *O Khampha* and a man found in the process of catching Long-tailed Macaques in Semi-evergreen Forest near *Boeung Kdouch* (UTM: 0621845-1569188) (Buckingham and Prach Pich Phirun 2006). Reportedly prior to 2006 various local people had tried to stop this practice (for example the former chief of *Khampok* village), but because the trade remained legal, no action could be taken by local police or Forestry Administration staff. The specific trade in Long-tailed Macaques had by December 2011 appeared to have dissipated and several groups were encountered along the Sekong and other streams surveyed. But a lucrative trade in medicinal primate derived substances remains in East Asia, suggesting that the gibbon and leaf monkey populations of Western Siem Pang may at any time (if not already) become the target of this trade. The majority of the birds of high conservation significance are not the focus of lucrative wildlife trade, however this should not lead to complacency as at various time in the past there has been suggestions of trade in live birds as curios for private menageries and exhibits for zoos (ibises and cranes in particular; Timmins *et al.* 2003a). Some use of vultures in traditional medicine appears to exist (Clements *et al.* in press) suggesting the need for continual evaluation of wildlife trade and vulture status.

For numerically small animal populations even incidental persecution events are serious. Western Siem Pang has a large human population in association with it, while all five Critically



A joint BirdLife and Royal Military Police patrol confiscates nets from hunters after Siamese Hare *Lepus peguensis*. Photos: Jonathan C Eames

Endangered bird species number at most in the low hundreds of individuals. Although guns usage was much reduced by largely voluntary gun reduction schemes a decade or more ago, guns are still relatively easily obtained. Furthermore evidence of incidental hunting of birds and mammals and reptiles in the forests is commonplace. Plucked remains of birds are not infrequently encountered at campsites for instance (Buckingham and Prach Pich Phirun 2006, R J Timmins pers. comm.). A White-shouldered Ibis nest was found destroyed as recently as January 2009, the cause suspected nest robbery (BirdLife monitoring team data, 2009). Nesting large waterbirds, vultures and Indian Spotted Eagles are particularly easy targets for incidental hunting. In the far west and northeast hunting by Laos nationals is probably of greater concern than that by local communities, especially as these communities are difficult to target for awareness raising and for wildlife protection incentive linkages. In 2008 the fresh remains of several Eld's Deer in the possession of hunters from Laos were brought to the attention of the Pakse Provincial Agriculture and Forestry Office; the deer (which are thought extirpated in southern Laos) had reportedly been hunted in Siem Pang (Pakse PAFO staff verbally to R J Timmins). In March 2009, for example, the BirdLife monitoring team confiscated three guns and four captive monkeys from Laos who had illegally crossed the border to hunt wildlife. And in September 2006, two groups of hunters from Laos were caught by police, border guards and forestry officials in possession of guns and monitor lizards. Dogs are often not recognised as a serious threat to wildlife, but the ubiquitous presence of dogs associated with the majority of human activities, is of serious concern. Dogs are particularly threatening to ground nesting birds (e.g. Sarus Crane, River Tern and River Lapwing), several ground-living mammals (e.g. Eld's Deer and Hog Badger) and turtles, either alone or in combination with their owners.
All of those species listed above are now seriously threatened in Western Siem Pang largely because of their small populations and the ease with which they can be opportunistically harvested by the ever growing human population.

Significant fishing activity takes place along the length of the Sekong River including the area within Western Siem Pang. Buckingham and Prach Pich Phirun (2006) reported that there was, in 2006 an active export operation of fish over the border to Laos. Although, in later years there also seems to be increasing export of fish to Stung Treng, especially since construction of the new road. Much attention is given to illegal fishing practices such as use of poison, explosives and electricity to capture fish, partly because of the indiscriminate nature of such practices, in killing all species and size classes of fish in the vicinity. Prior to 2006, explosives were reportedly used to kill fish on a daily basis along the Sekong through Western Siem Pang, and perhaps elsewhere. But apparently in 2006 the chief of the 101 Battalion Border Army command reportedly put an end to fishing with explosives. Whether fishing with explosives (or poison) still occurs within Western Siem Pang is unknown, but probably occurs to some extent. However, electro-fishing has recently increased in intensity and extent within Western Siem Pang (H L Wright pers. comm.). Electro-fishing in the 2009–2010 dry season was apparently so intensive that fish stocks in local streams and smaller rivers were depleted to such an extent that local communities were reportedly unable to catch sufficient fish to make such activity commercially viable in the 2010–2011 dry season (H L Wright pers. comm.). However from a conservation perspective the majority of IUCN Red Listed Cambodian freshwater fish are actually threatened by supposedly legal fishing methods, such as gill netting. In fact the threat posed by any fishing method is related to the extent of its use (both over time and space), and the species effected. Gill nets are very effective at catching fish, and

The Deciduous Dipterocarp Forest is an anthropogenic fire-climax.
Photo: Jonathan C Eames

the extent of their use greatly exceeds any of the illegal methods. Literally there are quite probably well over 2 million net-metre-hours of gill net use within Western Siem Pang on an annual basis, and at any time during the dry season it is estimated that probably between 2–10 km of gill nets are in use in the Sekong between Siem Pang town and the Laos border. Many of the Red Listed fish are large bodied migratory species, species that gill nets are especially adept at catching. The significance of Western Siem Pang to fish conservation is unknown and a detailed analysis of potential significance outside of the scope of this review, but clearly fishing practices legal and illegal are unsustainable.

However fishing is not just an issue for fish species, it is also a serious factor in the status of a number of bird species, as well as to a lesser extent turtles and otters. Effects on these species are both direct, and indirect. For sandbar nesting birds the effects are essentially indirect, resulting from large numbers of people and dogs using rivers and camping in the channel, deliberately and accidentally taking and destroying eggs and chicks, and otherwise disrupting breeding behaviour (Timmins 2008a). Every large channel sedimentary feature and rocky outcrop from Siem Pang town to the Laos border had at least one and often multiple temporary fishing camps established in December 2011, with additionally many more established along the river banks. For otters and turtles, and to an unknown degree birds, the effects are direct capture, especially on baited hooks and in 'fish'-traps, but also to some extent also by gill nets (Timmins and Sechrest in press). To add to this already substantial list of detrimental effects of current 'legal' fishing methods are all of the other potentially harmful incidental forest uses that accompany the presence of people within the forest. Since the areas used by fisher-people are also favoured habitat for species such as Giant Ibis and leaf monkeys, there is considerable cause for concern. Therefore, whilst subsistence fishing is clearly an important activity for local people, it is debatable as to whether it should be allowed in Western

Siem Pang if it has a commercial element.

One further practice in the harvest of animals deserves greater attention, namely the felling of trees in order to capture animals, especially cavity using species. This has serious consequences for a number of species, especially monitors *Varanus*, a prized catch amongst local communities, with moderate trade value. But its effects are potentially much more insidious as many of the trees felled are large mature trees, with dead boughs and cavities that are niches for many other species. Such trees are often ignored by logging and in some areas represent a high proportion of the remaining large mature trees. Thus this activity in combination with logging is resulting in significant changes to forest structure. Until at least recently the capture of macaques also often involved substantial tree felling to corral monkeys within a small area for easy capture.

Fire

The degree to which fire is a threat rather than a beneficial and integral system component is highly debated (e.g. Stott 1988, Maxwell 2004, Timmins 2011), however despite its prevalence and frequency very little study has been made of the consequences of current fire regimes. However there is much evidence to suggest that fire has been widespread and frequent for many decades at least, potentially much longer (Maxwell 1999, 2004, Timmins 2011). Long-term changes in fire regime would undoubtedly result in biotic changes, but these changes would likely benefit some species, but be detrimental to others. Fires potentially reduce dry season fodder availability for herbivores at a time when environmental conditions are already stressful, fires further aggravating the situation by removing cover in which animals can rest and hide (e.g. Desai *et al.* 2002). But fire is often cited as a tool to encourage vigorous new understorey growth for both livestock and wild ungulates. When numbers of wild ungulates were much higher it is possible that fire patterns were somewhat different because the grazing, browsing and trampling action of ungulates reduced available fuel biomass for fires (R J Timmins pers. comm.). Reduced burning might well help ungulates given their current depressed situation, but it could also have unwanted and unpredicted side effects. Full fire suppression, as opposed to fire management, could potentially be dangerous, although at present this would anyway be impossible to achieve. But even ill conceived, poorly researched fire policy that significantly changes the status quo could itself be a potential threat to Western Siem Pang. Reference to fires spreading into Semi-evergreen Forest and leading to conversion to deciduous forest types are not uncommonly seen in the literature. But such references appear to have little substance (Timmins 2011) and one of the few documented studies of post fire recovery of Semi-evergreen Forest suggests that this 'fear' is unfounded (Baker *et al.* 2008). This has also been the general experience of R. J. Timmins over the course of many years of fieldwork within the dry forests.

Livestock management and agricultural intensification

Traditional livestock husbandry practices are currently likely to be of high (beneficial) significance to the dry forests communities, largely because the traditional pastoral system of allowing Domestic Water Buffalo to wander freely for much of the time in the lowlands mimics the activity of a now largely eradicated wild buffalo and oxen community. Wallowing and grazing by Domestic Water Buffalo and to a lesser degree Domestic Oxen is almost certainly of significant benefit to *trapeang* dynamics and vegetation development in general within the dry forests especially on *veil* (Wright 2008, 2010b, Timmins 2011). In consequence the interaction of buffalo, *trapeang* and *veil* vegetation benefit threatened large waterbirds, in particular it would seem White-shouldered Ibis (Wright 2008, 2010b). Such traditional pastoral systems however do not lend themselves to modernisation, and there are already trends suggesting reductions in ownership of both buffalo and oxen and consequently falling numbers of animals, as well as potentially intensification of livestock practices by a few individuals (Wright 2011). The future significance and level of threat posed by changes in livestock husbandry are poorly known, but current indications suggest enough cause for concern that the situation must be closely monitored.

Other land-use changes impacting wildlife include agricultural intensification, resulting in increasing homogeneity of agricultural lands and greater use of chemicals (e.g. Round 2008). Changes in livestock husbandry might also lead to overstocking and overgrazing in some areas, although this is pure speculation at present. Although both agricultural intensification and changing livestock management practices have potentially only minor significance to the majority of regional forest dependent wildlife (lowland aquatic systems have potentially much greater sensitivity), predicted changes in both land-uses represent potentially major future threats to Western Siem Pang, especially the ibises.

Box 9: Grazing and White-shouldered Ibises

The importance of open habitat structures to foraging White-shouldered Ibis suggests grazing is important in providing suitable foraging habitat (Wright *et al.* 2010). Historically, Deciduous Dipterocarp Forest in Cambodia supported substantial populations of large herbivores, including Asian Elephant, wild Water Buffalo, Gaur and Banteng (Wharton, 1968). Asian Elephant were extirpated in Western Siem Pang in the 1980s (the last elephants reportedly shot in 1983-1985) and Gaur and Banteng are now very scarce. Greatly reduced activity of wild herbivores may, however, be compensated for by widespread domestic cattle and water buffalo. Despite the importance of livestock grazing in opening up vegetation to foraging ibis after profuse wet season growth, grazing may have other negative seasonal effects. By the late dry season *trapeangs* with greater livestock density have less vegetation (of any height) and greater extent of disturbed mud. Given the White-shouldered Ibis's preference for low vegetation, the concentration of livestock at *trapeangs* may reduce their suitability at this time.

Domestic water buffalo have replaced their wild ancestor in the Deciduous Dipterocarp Forest ecosystem and help maintain the value of *trapeangs* to wildlife like Giant ibis through their wallowing and grazing activities. Photos: Jonathan C Eames

Invasive species

Although not yet a problem, one certain serious future threat is the invasion of wetlands by the shrub *Mimosa pigra*. At present it is a rare colonist along the Sekong, its seeds likely travelling down river from Attapu and Xe Kong towns in Laos, whence it got to the Sekong after hitch hiking along the road system of Laos (R J Timmins pers. comm.). This invasive species has the capacity to quickly affect all of the *trapeangs* in the area and would cause serious problems for the ecosystem. The species is rapidly spreading through the wetlands of Laos and Cambodia carried largely by rivers and inadvertently by the activities of people, and thus prevalent in particular along the regions road networks (R J Timmins pers. comm.). The only way to prevent this from happening is to have a monitoring and eradication programme, coupled with local awareness raising and this should clearly be a priority for future management of the area (R J Timmins pers. comm.).

Hydropower development on the Sekong

It is not within the scope of this document to review consequences and threats from hydropower development. Projects are planned both upstream and downstream of Western Siem Pang. None to the authors' knowledge will directly impact Western Siem Pang in the sense of a reservoir replacing the current river, but undoubtedly aquatic faunas in Western Siem Pang will be adversely affected by far ranging impacts of these projects such as disruption of migratory patterns etc. (see for instance Dersu and Associates (2008) for a site specific detailed assessment of predicted hydropower development impacts on wildlife). Impacts on species such as sandbar nesting birds are hard to predict, but potentially most concerning would be erratic flow patterns within the dry season that could result in nests or chicks being washed out, or changes in river ecology resulting in reduced prey species for these birds.

Rainy season herbs include the purple *Utricularia delphinoides* (Lentibulariaceae) and delicate white *Eriocaulon sp.*. Photo: Jonathan C Eames

Holarrhena curtisii (Apocynaceae)Photo: Jonathan C Eames

Chapter 7

Discussion: The global significance of Western Siem Pang for wildlife conservation

The greatest significance of Western Siem Pang for wildlife conservation lies unquestionably with its populations of the two ibis species. Both populations are essentially irreplaceable. Loss of these populations would greatly increase the extinction risk for both species, and could perhaps even seal this fate for Giant Ibis.

Giant Ibis occurs at relatively low density, utilizes rare and localized habitats on a landscape scale and appears to be particularly sensitive to human disturbance. In the long-term its conservation is absolutely dependent on large protected areas with minimal human disturbance. However there are few such areas, all facing similar threats (Tordoff *et al.* 2005). The relative importance of the remaining sub-components of the Giant Ibis population are not easily prioritisable. Densities and population size may differ markedly between sites due to differences in habitat and threat factors, although there has been no systematic quantification. Western Siem Pang potentially has one of the largest and densest populations; observers regularly record the species throughout the area. Western Siem Pang has a high density of forest *trapeangs*, only Preah Vihear PF and a limited area in Kulen Promptep WS have higher densities, while the rivers and streams crossing the northern lowlands add very significantly to the suitability of the area to Giant Ibis. Giant Ibis sub populations and habitat in the established protected areas in Cambodia cannot be considered secure in the long-term, especially as economic development pressure for forest conversion is very high, while increasingly scarce, external international aid is necessary to protect these areas.

Whatever the relative sizes of the remaining sub-populations of White-shouldered Ibis, that in Western Siem Pang is without any doubt one of the three most important globally, the other two being the one in Kalimantan and the one associated with the 'Central' Cambodian Mekong. Not one of these three populations could be considered secure even in the short-term, justifying the highest of threat levels–Critically Endangered. There are a number of smaller populations residing in protected areas, notably Kulen Promptep WS, Mondulkiri Protected Forest, Lomphat WS and Siema Biodiversity Conservation Area. But only in Kulen Promptep WS is there any serious protected area management consideration being taken for the species, suggesting that the fate of the populations in the other areas is far from secure, given the species apparent micro habitat requirements. As with Giant Ibis habitats in Western Siem Pang appear near ideal for the species, making the area a clear choice for long-term conservation of White-shouldered Ibis.

The fate of the Indochinese vulture population does not reside in any one area rather it will likely depend on maintaining a network of protected areas amidst 'vulture-aware' rural landscapes. Western Siem Pang is central to the remnant range of all three Critically Endangered species and provides known relatively secure nesting and roosting areas. Although, the significance of the high numbers of Slender-billed Vultures using Western Siem Pang is not understood, it clearly argues for maintaining the integrity of Western Siem Pang. In the long-term Red-headed Vulture, with its apparent greater dispersion across landscapes and potentially smaller ranging patterns, may prove to have the highest conservation needs and be the most difficult of the three species to conserve, requiring potentially more so than the two *Gyps* species large protected tracts of dry forest.

Indian Spotted Eagle falls within a similar conservation category to Red-headed Vulture. Although the species ranging patterns are probably relatively small, the species appears to

occur at very low density, probably at least in part tied to a narrow ecological niche. Low-density species will at least in the me dium-term be highly dependent on preservation of large tracts of dry forest. Some such species may theoretically be able to use mosaics of forest and agriculture, but until there are widespread 'nature-friendly' rural policies and a 'nature-aware' local populace, conservation of these species rests with their protection in large effectively managed protected areas.

The Eld's Deer population is likely to be one of the largest remaining regionally and perhaps might number in the low hundreds of animals, other similarly significant populations within protected areas with some level of protection include those in the Northern Plains, Mondulkiri Protected Forest and the Savanakhet Eld's Deer sanctuary in Laos. As with the ibis Western Siem Pang represents near-ideal habitat for the species.

Western Siem Pang represents very suitable habitat for a suite of other large waterbirds, all of them threatened regionally and most threatened globally, namely Woolly-necked Stork, Black-necked Stork, Lesser and Greater Adjutant and Sarus Crane. The future significance of local populations of all within Western Siem Pang could be high as the wetlands and rivers of the lowlands have the potential to support high numbers. Black-necked Stork and to a lesser extent Sarus Crane are further apparently low density species whose fate may be highly dependent on maintaining large protected landscapes.

Although the Western Siem Pang population of Indochinese Silvered Leaf Monkey is by no means the most significant, the species is so threatened that any protected populations have conservation value for long-term conservation of the species.

Concerns have recently been raised for the status and trends in of some sub populations of Great Slaty Woodpecker. Comparisons have been drawn between the species ecology and that of two now extinct large woodpeckers, Imperial and Ivory-billed Woodpeckers *Campephilus imperialis* and *C. principalis*. The latter two species are thought largely to have become extinct due to the loss of large tracts of forest with old mature trees that provided the foraging niches for these woodpeckers. White-bellied Woodpecker at least regionally appears to be showing similar trends to Great Slaty. Although White-bellied is perhaps less dependent on large mature trees than Great Slaty, its association with lowland riparian forests puts it at high risk from rampant riparian centric land development and conversion. Extensive tracts of mature forest with large trees and extensive lowland riparian forests are now increasingly becoming scarce and are only likely to survive in well protected conservation areas. Western Siem Pang still has extensive 'mature' forest and much riparian forest that is recovering from waves of selective logging in the past.

Several smaller woodpeckers may have similar ecological needs to these larger species, and elsewhere globally relatively small woodpeckers can also be tied to niches only provided by 'mature' forests (for example the Red-cockaded Woodpecker *Picoides borealis* of North America). Three small species, Rufous-bellied Woodpecker, Spot-breasted Woodpecker *Dendrocopus analis* (formerly Fulvous-breasted) and Yellow-crowned Woodpecker *Dendrocopos mahrattensis* all have rather patchy regional distributions with a concentration of recent records from the still expansive dry forests in Cambodia. The apparent pattern of

absence or scarcity in fragmented dry forest landscapes is certainly suggestive of ecological sensitivity to processes associated with fragmentation. It has been speculated (e.g. SUFORD 2010) that one possible factor might be high fire frequency and thus rapid elimination of dead trees from the landscape. A potentially more prevalent factor however, may be the elimination of large and older trees in areas with high levels of human use. Old trees in particular tend to have a more diverse set of ecological niches, such as dead branches, trunk cavities etc. than do young trees. This elimination is clearly associated with demand for timber products, but an equally destructive and significant loss especially for species such as woodpeckers is the felling of (living) trees with cavities in order to capture wildlife such as monitor lizards. Together the removal of large trees for timber and the felling of trees to capture wildlife, in combination with high fire frequency, in heavily used forest areas, undoubtedly largely removes the 'dead wood' niche required no doubt by many species other than woodpeckers. Western Siem Pang still has a structurally rich dry forest cover with an often obvious 'old tree' component, but there are clear signs, especially around the more heavily used eastern lowland plains, that the structural richness of these forests is being reduced by both timber removal and 'old tree' removal in search of wildlife. Such structural richness is only likely to be preserved in areas where management is actually focused on such conservation needs and in areas large enough to encompass the inherent varying scales of heterogeneity within the dry forests.

All five woodpeckers (as taxonomically currently recognised) occur in other biomes, and thus their fate does not solely rest with the fate of the dry forests. But their status in the dry forests can likely be used as a surrogate for the status of dry forest community elements that are just not possible to evaluate at present. Thus their decline in the dry forest should be considered as a warning indicator of insidious changes, potentially more threatening than the declines in species threatened simply by human persecution, as they are likely to indicate changes in the actual fabric of the dry forests.

Many dry forest species are not considered threatened for the simple reason that structurally rich, 'mature' dry forests are still relatively extensive in both Cambodia and Myanmar. The history and fate of formerly extensive dry forest in Laos and Thailand, is clear evidence of the probable future for those in Cambodia and Myanmar. Large areas of dry forest are already rapidly being lost in Cambodia due to unprecedented rates of land conversion, and it will surely only be time before other dry forest species are evaluated as Globally Threatened.

For practical purposes the dry forests and specifically the Deciduous Dipterocarp Forest wildlife communities can be divided into two main units, that remaining in eastern Thailand and Indochina and that in Myanmar and adjacent areas of northern and western Thailand (see discussion in Tordoff *et al*. 2005 sec. 1.3). There are biological differences, although relatively minor at the higher vertebrate level, between these two areas (for instance potentially the resident species of bush lark *Mirafra* are different and Giant Ibis is at least now restricted to the former), but functionally they are now separate due to extensive anthropogenic conversion of the dry forests through the heart of Thailand and northern Laos. These two facts alone warrant conservation of representative areas in both.

As can be seen by reference to Annex 5, the Deciduous Dipterocarp Forest bird community of Western Siem Pang is rich with few of the potential indicator species absent. This is yet more reason to consider Western Siem Pang a good area for conservation of representative

The Deciduous Dipterocarp Forest supports 16 species of woodpecker. Laced Woodpecker *Picus vittatus* is shown here. Photo: Jonathan C Eames

dry forest communities. This fact has already been recognised both by designation of the area as a BirdLife Important Bird Area (the Western Siem Pang IBA) and even more convincingly by the analysis of Tordoff *et al.* (2005) who recognised Western Siem Pang as a component of the 'Xe Kong Plains' multi-foci priority area. This priority area was by definition "assessed as having high potential to support full communities and taxa populations of forest habitats" (Tordoff *et al.* 2005)

An under appreciated component of Western Siem Pang is its riverine wildlife communities. Assessment of the aquatic communities of the Sekong and other aquatic environments of Western Siem Pang is outside of the scope of this review, but it is widely known for instance that the fish fauna of the Sekong is of high conservation value (Box 2) and that there are many species of high conservation priority (Baltzer *et al.* 2001a, b). The short stretch of the Sekong through Western Siem Pang still has high residual conservation value to several riverine species of birds, especially sandbar nesters. This significance is however but a component of a larger network of imperilled river systems supporting similar residual riverine bird populations. Conserving populations in Western Siem Pang will likely be dependent on also the success of efforts elsewhere on the Sekong (e.g. the River Tern colony at *Koah Thbeng*) and further afield.

There is much focus on illegal fishing activities, but probably as detrimental to wildlife, in many cases potentially more so, are what are generally considered 'legal' fishing activities, often indirectly, but also directly. Unfortunately present human uses of the Sekong through Western Siem Pang are largely incompatible with conservation of wildlife, although sensible conservation of this stretch of the Sekong could potentially in the long-term benefit local communities.

Western Siem Pang, like an astounding proportion of lowland Cambodia, still retains the visage of a time capsule. Its wildness is likely reminiscent of similar areas in Thailand a half century or more ago, and is very clearly comparable to the status of the adjacent Xe Pian NPA, in Laos, twenty years ago. Wildlife status in Western Siem Pang in 2011 was similar to and in the case of several species, better than that of the ecologically similar and adjacent Xe Pian NPA, in Laos, in 1993. But the future can be readily foretold by looking at Thailand and southern Laos today, except that without proactive protection it will not likely take a half century to catch up with Thailand and very probably Western Siem Pang would catch up to Xe Pian in less than a decade.

The forests of Western Siem Pang are very important for the livelihoods of local communities and the dry forests themselves are in certain ways dependent on the traditional uses of local people, especially livestock husbandry (Wright 2011). But there is grave danger that this beneficial relationship will be tipped out of balance. Large-scale land concessions are not the only threat to Western Siem Pang, small-scale activities, resulting in piecemeal degradation and conversion, in the long-term are likely to envelop the lowlands with much the same effect on biodiversity. This is the same fate that has overcome most dry forest areas in Laos for instance. Social and economic changes are already placing increasing pressures on the natural resources of Western Siem Pang, largely for short-term gains in the form of lucrative wildlife products such as rosewood and fish (Timmins 2011, Wright 2011). Local people and Cambodians in general deserve better living standards, however short-term gains from destruction and conversion of the lowland dry forest and natural resource exploitation, ultimately in the long-term is likely to leave the region poorer with fewer options and irrevocably compromise Cambodia's natural resources and biodiversity.

A number of alternative, 'wildlife friendly' land uses have been postulated for lowland areas of Indochina, with the aim of revenue generation sufficient to sustain management activities necessary to maintain wildlife conservation values and in many cases also to provide economic incentives to local communities. But, no such schemes have yet come to fruition on a scale large enough to protect an area such as Western Siem Pang. The REDD initiative offers a potential means of revenue generation. But as concluded for Western Siem Pang (Bou Vorsak and J. C. Eames verbally 2011), REDD is unlikely to provide revenues to compete with the economic incentives (both 'hidden' and open) that drive conversion type land uses. Thus while REDD could provide additional revenues for management of a protected area, it is unlikely in an Indochina context to generate enough revenue to provide a healthy profit for a commercial entity, when the cost of forest management and protection is taken into account. Schemes involving eco tourism or more specialized big game viewing, game 'farming' and trophy hunting each requires substantial investment and a long-term vision, which it would seem the private sector are not yet willing to take. Likewise commercial 'sustainable' forestry either on a private sector basis, or community run, would also require long-term investment before any significant income could be generated.

There is a such no 'easy' solution to the wildlife protection dilemma, and for the time being it will remain a question of convincing government, civil society in general and locally communities in particular, that wildlife should be conserved for their intrinsic value, while relying largely on external donor aid to provide the necessary financial support for effective management and protection of the area.

Although the Green Sea Concession has the potential to be an overwhelming threat to Western Siem Pang, capable of essentially destroying its wildlife conservation value (Timmins 2011, Annex 2), the legal framework in which it was created could also potentially be seen as an opportunity in the short-term. The provisions of the lease suggest that Western Siem Pang is legally protected from concession development until 2020, and the northern third of Western Siem Pang cannot be developed until 2030 (GSA undated; Annex 1). Most protected areas in Cambodia do not have such protection for the same time period. Furthermore apparently the concession lease agreement, stipulates inclusion of buffer zones of 2 km surrounding the Laos border, a buffer zone 2.5 km from the Kong river and 50 m from other streams, and the exclusion from concession development 'good forest for wildlife', as outlined by an official government clarification in December 2006. What happens in reality and what was written on 'paper' can be very different, but at least the formal concession agreement provides a useful starting point. BirdLife and partners have theoretically eight years to work with the Cambodian Government, Green Sea Agriculture Co., Ltd and other stakeholders to identify critical areas for wildlife to be excluded from the concession, and to further advocate for and develop national policies on integration of wildlife conservation and concession management. Furthermore this time could be used to research best practices in plantation management, and crop productivity within dry forest situations, so that any plantation development results in optimal land use, rather than expensive failure of crops, which would result in serious negative consequences for wildlife, concession stakeholders and local communities. This legal window also potentially gives time to explore and research alternative land uses that would be more compatible with wildlife, while ensuring generation of much needed income for local communities and private sector investors.

Photo: Jonathan C Eames

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Annex 1. Clearance schedule for the zone of overlap between Western Siem Pang and the Green Sea Concession

Table A1. Clearance schedule for the zone of overlap between Western Siem Pang and the Green Sea Concession (based on GSA undated)

First year of plantation development	Area and intended crops	Western Siem Pang landscapes affected
Year 13 (2020)	Block 6 of Zone II: 2,500ha, including rubber 250ha, acacia 700ha, Teak 650ha, Jatropha 500ha and sugar cane 400ha.	Southern most third of the zone of overlap
Year 14 (2021)	Block 7of Zone II: 2,500ha, including rubber 150ha, acacia 800ha, Teak 650ha, Jatropha 500ha and sugar cane 400ha.	Southern most third of the zone of overlap
Year 15 (2022)	Block 1 of Zone III: 2,500ha, including rubber 200ha, acacia 750ha, Teak 650ha, Jatropha 500ha and sugar cane 400ha.	Central area of the zone of overlap
Year 16 (2023)	Block 2 of Zone III: 2,500ha, including rubber 150ha, acacia 800ha, Teak 650ha, Jatropha 500ha and sugar cane 400ha.	Western central area along Laos border
Year 17 (2024)	Block 3 of Zone III: 2,500ha, including rubber 100ha, acacia 850ha, Teak 650ha, Jatropha 500ha and sugar cane 400ha.	Central area of the zone of overlap
Year 18 (2025)	Block 4 of Zone III: 2,500ha, including rubber 150ha, acacia 800ha, Teak 650ha, Jatropha 500ha and sugar cane 400ha.	Viel Kriel area in central area of the zone of overlap
Year 19 (2026)	Block 5 of Zone III: 2,500ha, including rubber 100ha, acacia 850ha, Teak 650ha, Jatropha 500ha and sugar cane 400ha.	Viel Kriel area in central area of the zone of overlap
Year 20 (2027)	Block 6 of Zone III: 2,500ha, including rubber 100ha, acacia 800ha, Teak 700ha, Jatropha 500ha and sugar cane 400ha.	Western central area along Laos border
Year 21 (2028)	Block 7 of Zone III: 2,500ha, including rubber 200ha, acacia 750ha, Teak 650ha, Jatropha 500ha and sugar cane 400ha.	Eastern central area closest to Siem Pang town
Year 22 (2029)	Block 1 of Zone IV: 2,500ha, including rubber 200ha, acacia 750ha, Teak 650ha, Jatropha 500ha and sugar cane 400ha.	North of Viel Kriel in central area of the zone of overlap
Year 23 (2030)	Block 2 of Zone IV: 2,500ha, including rubber 200ha, acacia 750ha, Teak 650ha, Jatropha 500ha and sugar cane 400ha.	North of Viel Kriel in central area of the zone of overlap
Year 24 (2031)	Block 3 of Zone IV: 2,500ha, including rubber 200ha, acacia 750ha, Teak 650ha, Jatropha 500ha and sugar cane 400ha.	Bordering Sekong in northern area area of the zone of overlap
Year 25 (2032)	Block 4 of Zone IV: 2,500ha, including rubber 200ha, acacia 750ha, Teak 650ha, Jatropha 500ha and sugar cane 400ha.	Central northern area area of the zone of overlap
Year 26 (2033)	Block 5 of Zone IV: 2,500ha, including rubber 200ha, acacia 750ha, Teak 650ha, Jatropha 500ha and sugar cane 400ha.	Central northern area area of the zone of overlap
Year 27 (2034)	Block 6 of Zone IV: 2,500ha, including rubber 200ha, acacia 750ha, Teak 650ha, Jatropha 500ha and sugar cane 400ha.	Central northern area of the zone of overlap
Year 28 (2035)	Block 7 of Zone IV: 2,500ha, including rubber 200ha, acacia 750ha, Teak 650ha, Jatropha 500ha and sugar cane 400ha.	Far northwestern area of the zone of overlap, bordering Laos

See also Map A1.

Annex 2. Plant species

Crinum sp. (Amaryllidaceae)
Photo: Jonathan C Eames

Annex 2. Provisional list of some plant species reported from Western Siem Pang

This list is based largely on the tentatively identifications made during carbon stock assessment (Berry *et al.* 2009), a few additional species mentioned by Timmins *et al.* (2003a) and Wright (2008) are also included. During the study of Berry *et al.* (2009) identifications were made by comparing Khmer names obtained from local villagers with those published in Dy Phon (2000). No voucher specimens were collected and no systematic photographic documentation was made. Some, possibly many, identifications may have been incorrect, however since the list is based on a list of plants 'known' to occur in Cambodia the majority will appear plausible. The list should therefore not be used as an indication of the species composition of Western Siem Pang. It is also clear that this list is but a fraction of the plants present in Western Siem Pang, presumably many hundreds of species remain to be found. For instance this list includes only three palms, but observations in 2011 recorded at least 14 species of palm including at least eight species of rattan (R J Timmins pers. comm.).

#	Family	Species	Notes on growth form, habitat, taxonomy
1	Anacardiaceae	*Buchanania siamensis*	Bush or small tree 5-10m tall. In secondary forests.
2	Anacardiaceae	*Bouea oppositifolia*	8-10m tall tree from dense coastal forests - ? Planted by local people for its fruits
3	Anacardiaceae	*Dalbergia cochinchinensis*	8-30m tree of SEF *(Dalbergia* formerly in Leguminosae)
4	Anacardiaceae	*Dalbergia nigrescens*	10-20m tall tree of disturbed forests
5	Anacardiaceae	*Dalbergia oliveri*	15-30m tall tree of SEF
6	Anacardiaceae	*Mangifera duperreana*	30-40m tree of EF: a mango, but fruits not edible
7	Anarcardiaceae	*Semecarpus cochinchinense*	8-15m tall tree of dense secondary forest
8	Anarcardiaceae	*Spondias malayana*	10-15m tall tree of secondary forests
9	Annonaceae	*Cananga latifolia*	8-15m tall tree of DDF and SEF
10	Annonaceae	*Polyalthia cerasoides*	6-10m tall tree of dense EF and disturbed areas
11	Apocynaceae	*Alstonia scholaris*	2-8m tall shrub of open forests
12	Apocynaceae	*Willughbeia edulis*	Ligneous liana climbing tall trees in EF

#	Family	Species	Notes on growth form, habitat, taxonomy
13	Araliaceae	*Tupidanthus calyptratus*	2-4m tall shrub of gallery and riverine forest
14	Arecaceae	*Calamus acanthophyllus*	Timmins *et al.* (2003a) reported this rattan; identification based on Evans *et al.* (2001)
15	Arecaceae	*Calamus viminalis*	Timmins *et al.* (2003a) reported this rattan which occurs in EF (see Evans *et al.* 2001)
16	Arecaceae	*Phoenix (humilis)*	Timmins *et al.* (2003a) reported this genus of palm - most likely species is *P. humilis*.
17	Asteraceae	*Elephantopus scaber*	Hard 20-40cm tall herb (formerly in Compositae)
18	Calophyllaceae	*Calophyllum pulcherrimum*	15-20m tall tree of dense humid forest
19	Chrysobalanaceae	*Parinari annamensis*	6-15m tall tree of forest clearings
20	Clusiaceae	*Cratoxylum cochinchinense*	1-4m tall shrub of DDF on sandy soil
21	Combretaceae	*Terminalia alata*	8-20m tall tree of DDF
22	Combretaceae	*Terminalia chebuta*	15-20m tall tree of SEF
23	Combretaceae	*Combretum quadrangulare*	2-10m tall shrub in secondary forests and along rivers
24	Cycadaceae	*Cycas sp.*	Timmins *et al.* (2003a) reported Cycads–most likely to be *C. siamensis*, in DDF
25	Dilleniaceae	*Dillenia ovata*	6-10m tall tree of DDF
26	Dilleniaceae	*Dillenia pentagyna*	6-7m tall tree of DDF
27	Dipterocarpaceae	*Dipterocarpus intricatus*	15-30m tall tree of SEF and DDF
28	Dipterocarpaceae	*Dipterocarpus obtusifolius*	10-15m tall tree of DDF
29	Dipterocarpaceae	*Dipterocarpus tuberculatus*	15-25m tall tree of DDF. var *grandifolius*
30	Dipterocarpaceae	*Dipterocarpus alatus*	25-40m tall tree of SEF and EF, usually gowing above 300m altitude

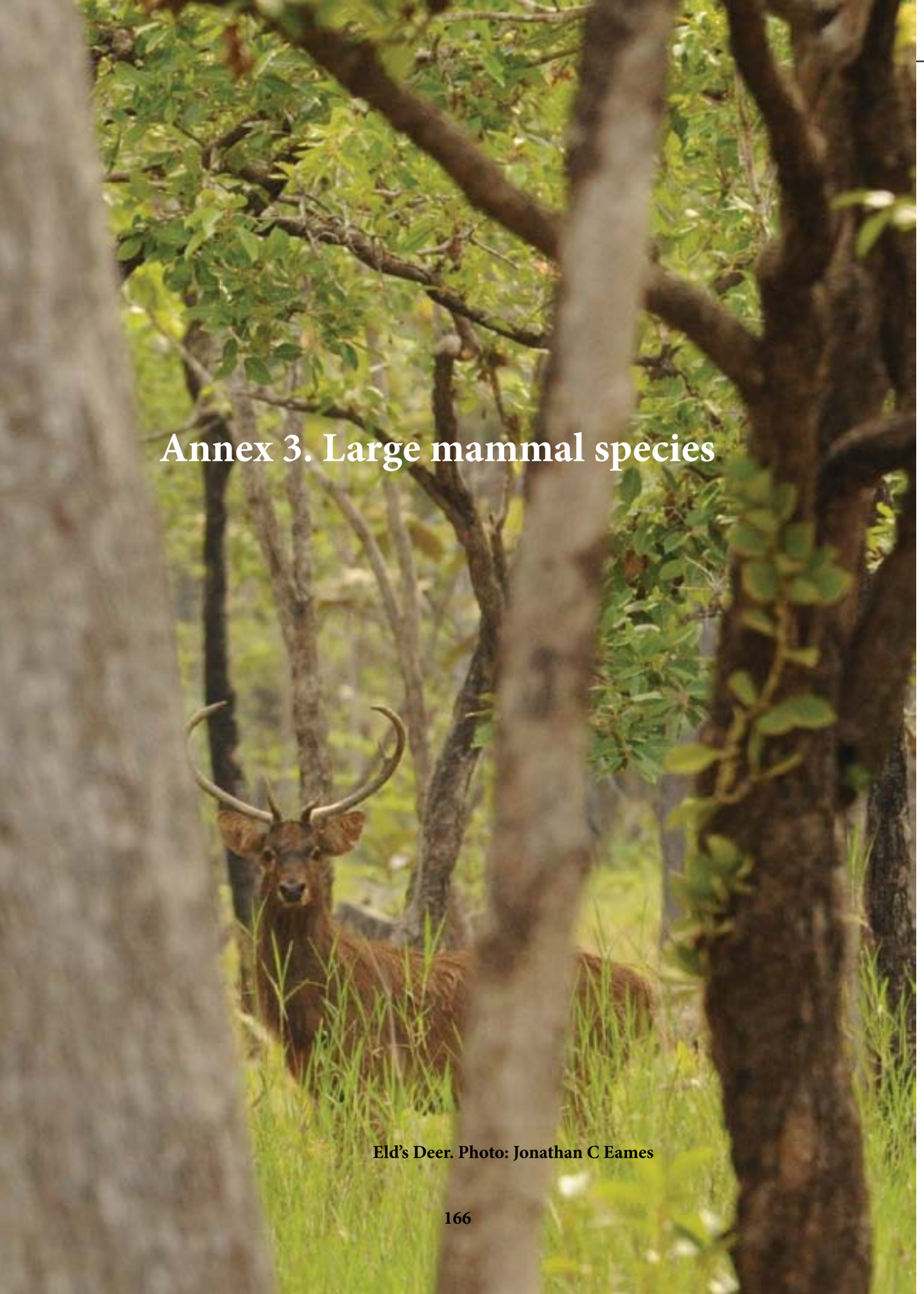
#	Family	Species	Notes on growth form, habitat, taxonomy
31	Dipterocarpaceae	*Hopea odorata*	20-35m tall tree of dense forests
32	Dipterocarpaceae	*Hopea recopei*	30-35m tall tree of dense forests
33	Dipterocarpaceae	*Hopea-helferi*	3-25m tall tree of DDF (and probably SEF)
34	Dipterocarpaceae	*Shorea guiso*	20-40m tall tee of SEF
35	Dipterocarpaceae	*Shorea obtusa*	10-30m tall tree of DDF above 150m altitude
36	Dipterocarpaceae	*Shorea siamensis*	20-25m tall tree of DDF
37	Dipterocarpaceae	*Vatica odorata*	20-25m tall tree of wet EF
38	Dipterocarpaceae	*Vatica philastreana*	15-30m tall tree of riverine habitat (and coastal regions)
39	Droseraceae	*Drosera*	"Sundew" - Small insectivorous herb of wet, sandy, open places.
40	Ebenaceae	*Diospyros castanea*	8-15m tall tree of DDF and SEF
41	Ebenaceae	*Diospyros crumenata*	8-35m tall tree of SEF and EF
42	Ebenaceae	*Diospyros ehretioides*	8-15m tall tree of DDF and secondary formations. Cambodian Endemic
43	Ebenaceae	*Diospyros hasseltii*	15-30m tall tree of dense or secondary forest
44	Ebenaceae	*Diospytos syvatica*	10-20m tall tree of disturbed forests
45	Elaeocarpaceea	*Elaeocarpus hygrophilus*	10-25m tall tree of flooded or dense forest, endemic to Indochina
46	Ericaceae	*Vaccinium bracteatum*	3-4m tall shrub of dense forests
47	Euphorbiacea	*Mallotus paniculatus*	4-20m tall shrub or tree of dense forests
48	Fabaceae	*Acacia caesia*	Small tree or liana in secondary forest along rivers. Listed as *A. intsia* - a synonymn
49	Fabacea	*Butea monosperma*	8-10m tall tree of secondary habitats

#	Family	Species	Notes on growth form, habitat, taxonomy
50	Fabaceae	*Bauhinia variegata*	"Orchid Tree" - 4-15m tall tree shrub or tree in DDF, naturally only above 500m asl
51	Fabaceae	*Milletia erythrocalyx*	6-8m tall shrub of secondary habitats (often cultivated)
52	Fabaceae	*Peltophorum dasyrrhachis*	10-30m tall tree of dense and secondary forests
53	Fabaceae	*Sesbania* sp.	Genus mentioned by Timmins *et al.* (2003a) - may be *S. javanica*, a 2-3m tall wetland schrub.
54	Fabaceae	*Albizia lebbeck*	8-15mm tall tree of SEF and dense DDF
55	Fabaceae	*Pterocarpus macrocarpus*	15-25m tall tree of DDF and SEF
56	Fabaceae	*Sindora siamensis*	6-10m tall tree of DDF and SEF. Var *siamensis*
57	Fabaceae	*Xylia xylocarpa*	20-25m tall tree of denser SEF
58	Irvingiaceae	*Irvingia malayana*	15-20m tall tree of DDF (formerly placed in Simaroubaceae)
59	Lecythidaceae	*Barringtonia acutangula*	4-10m tall tree found in moist places along rivers
60	Lecythidaceae	*Barringtonia* sp.	Supposedly *B. asiatica* but this is a littoral species or in limestone hills near the sea
61	Lecythidaceae	*Careya arborea*	7-10m tall tree of DDF and SEF
62	Loganiaceae	*Strychnos nux-blanda*	4-12m tall shrub of DDF
63	Loganiaceae	*Strychnos nux-vomica*	5-20m tall tree of DDF and SEF or riversides on clay or sandy-clay soil
64	Lycopodiaceae	*Lycopodiella cernua*	"Staghorn clubmoss" 20-60m tall herb of wet places; often in DDF/SEF
65	Lythraceae	*Lagerstroemia calyculata*	20-35m tall tree of dense forests
66	Lythraceae	*Lagerstroemia floribunda*	8-40m tall tree of SEF and EF
67	Lythraceae	*Lagerstroemia macrocarpa*	10-15m tall tree (with girth up to 3m) of DDF and SEF
68	Malvaceae	*Grewia asiatica*	4-8m tall shrub of dry and secondary dense forests

#	Family	Species	Notes on growth form, habitat, taxonomy
69	Malvaceae	*Bombax ceiba*	"Silk cotton tree". 10-20m tall tree of NDF
70	Marantaceae	*Schumannianthus dichotomus*	1-3m tall ginger of wet dense forest and flooded forests
71	Meliaceae	*Azadirachta indica*	2-6m tall tree of secondary forest
72	Meliaceae	*Sandoricum keotjape*	20-30m tall tree of dense forests
73	Meliaceae	*Walsura elata*	10-25m tall tree of dense forests
74	Moraceae	*Artocarpus rigidus*	6-15m tall tree of dense and SEF
75	Moraceae	*Ficus hirta*	1-2m tall shrub (a fig) of dense or secondary forests
76	Moraceae	*Ficus hispida*	8-15m tall fig of dense or secondary forests
77	Moraceae	*Streblus asper*	2-8m tall shrub of open places and undergrowth
78	Myristicaceae	*Knema corticosa*	2-8m tall shrub of dense and secondary forests
79	Myrsinaceae	*Ardisia sp.*	Listed as *A. helferiana* which is a 1-3m tall shrub of littoral forests
80	Myrtaceae	*Syzygium baviense*	10-20m tall tree of dense forests
81	Myrtaceae	*Syzygium longiflorum*	10-20m tall tree of dense forests (Listed as *S. lineatum* which is a synonym)
82	Myrtaceae	*Syzygium zeylanicum*	7-10m tall tree, usually in clearings in coastal areas
83	Ochnaceae	*Ochna integerrima*	4-8m tall shrub of secondary forest and understory
84	Phyllanthaceae	*Antidesma ghaesembilla*	2-8m tall shrub in DDF or SEF
85	Phyllanthaceae	*Aporusa filicifolia*	2-8m tall shrub in DDF and pine forest
86	Phyllanthaceae	*Aporusa planchoniana*	2-4m tall shrub of DDF
87	Phyllanthaceae	*Baccaurea ramiflora*	10-20m tall tree of dense forest
88	Poaceae	*Oxytenanthera*	A deciduous bamboo in open forests. (The genus appears to have changed)

#	Family	Species	Notes on growth form, habitat, taxonomy
89	Poaceae	*Arundinaria falcata*	0.5-1m tal bamboo in DDF understory. (The genus appears to have changed)
90	Rhamnaceae	*Zizyphus cambodiana*	2-6m tall shrub of secondary undergrowth
91	Rubiaceae	*Cephalanthus angustifolius*	3-4m tall shrub of open habitats along rivers
92	Rubiaceae	*Lasianthus kamputensis*	1-4m tall shrub of dense forest understory above 300m asl
93	Rubiaceae	*Morinda tomentosa*	4-12m tall tree or shrub in DDF
94	Rusaceae	*Dracaena cambodiana*	1-8m tall shrub of dense forests, mostly in higher regions. (Formerly in Agavaceae)
95	Salicaceae	*Casearia graveolens*	7-10m tall tree of dense or open forests (formerly in Flacourtiaceae)
96	Santalaceae	*Scleropyrum wallichianum*	8-20m tall tree of dense forests
97	Sapindaceae	*Schleicheria oleosa*	hard 20-40cm tall herb (formerly in Compositae)
98	Sapotaceae	*Madhuca bejaudi*	8-15m tall tree or shrub of secondary forests
99	Sapotaceae	*Madhuca elliptica*	8-15m tall tree of SEF
100	Simaroubaceae	*Eurycoma longifolia*	2-5m tall shrub of understory in dense forest
101	Sphenocleaceae	*Sphenoclea zeylanica*	20-60cm tall herb of marshy ground - NOT NATIVE introduced from Africa
102	Sterculiaceae	*Pterospermum semisagttatum*	20-25m tall tree of dense and secondary forest
103	Theaceae	*Ternstroemia penagiana*	6-12m tall tree of dense and secondary forests
104	Tiliaceae	*Schoutenia ovata*	15-25m tall tree of secondary habitats (also listed as *S. hypoleuca* which is a synonym)
105	Verbenaceae	*Congea tomentosa*	Ligneous liana climbing tall trees at edge of dense forest (often cultivated near villages)
106	Verbenaceae	*Vitex glabrata*	10-12m tall tree of dense forest
107	Verbenaceae	*Vitex pinnata*	15-25m tall tree of DDF

#	Family	Species	Notes on growth form, habitat, taxonomy
108	Vitaceae	*Cayratia trifolia*	Liana usually found near houses
109	Zingiberaceae	*Curcuma domestica*	Ginger with rhizomes. NOT NATIVE - introduced from India



Annex 3. Large mammal species

Eld's Deer. Photo: Jonathan C Eames

Annex 3. Large mammal species confirmed from Western Siem Pang

There has never been an attempt to systematically document the large mammals of Western Siem Pang, l*et al.*one the small mammals and bats. As such the list presented below is not indicative of the mammals present in Western Siem Pang. Many widespread species that clearly must occur in Western Siem Pang, have yet to be confirmed and are thus missing from the list (e.g. Small Asian Mongoose *Herpestes javanicus*) and in fact this list probably only represents half of the large mammals still present within Western Siem Pang.

This list only includes those species confirmed from the wild in Western Siem Pang. It may thus seem strange that for instance Banteng *Bos javanicus* is not on the list, as Banteng certainly occurred, and they are widely reported by local people as present, at least in the past. But, confirmed records, as used here, are specifically those records of a species that are both well documented (i.e. based on a written record, with locations, dates and other details) and attributable to a suitably qualified observer. Thus while it may seem strange that Banteng is not on the list, for many readers the absence of Small Indian Civet *Viverricula indica* will probably not be questioned, however it likewise certainly occurred and is much more likely than Banteng to be still present. However, even though many local people undoubtedly 'know' the species it is presumably rarely included in interviews, and if it were included it would be somewhat more difficult than Banteng to be certain whether a report from a local person was actually of this species rather than one of the several other similar civets (or even small cats). This illustrates the fact that there is a considerable gray area as to what evidence should be used to create a species list such as this; in this case the concept of 'confirmed records' provides a relatively clear and convenient criterion for acceptance. In a situation such as that in Western Siem Pang, where there has never been an attempt to document the large mammal community and only approximately 50% of the species present have actually been confirmed, a predictive approach using regionally available data, provides a better basis for speculation on mammal status; this was done for Threatened species in the main section of the report (Table 3.1.).

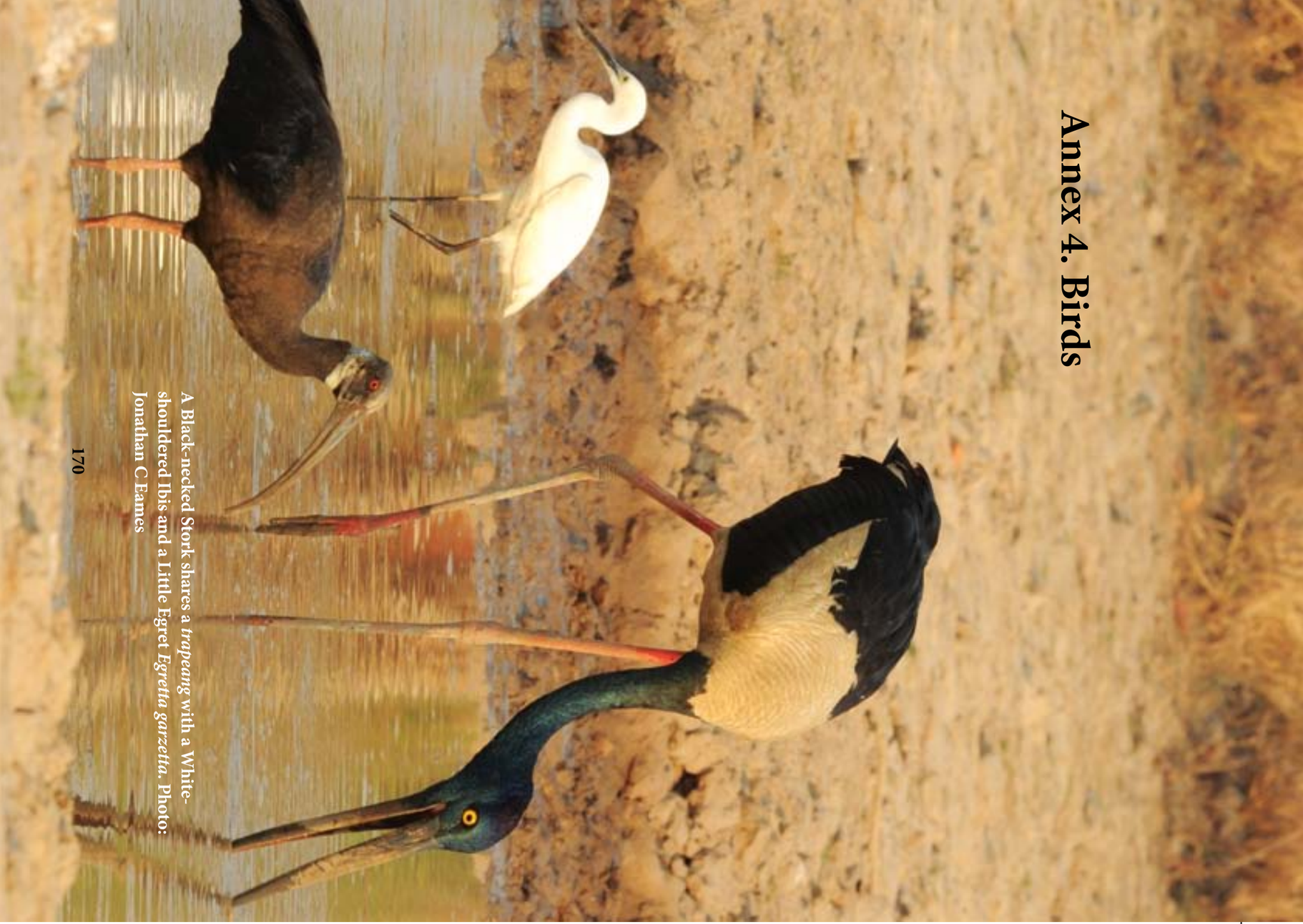
Family and English Name	Scientific Name	Species recorded by RJTimmins
Tupaiidae Tree Shrews		
Northern Treeshrew	*Tupaia belangeri*	*x*
Northern Slender-tailed Treeshrew**	*Dendrogale murina*	
Cercopithecidae Old-world Monkeys		
Northern Pig-tailed Macaque	*Macaca leonina*	*x*
Long-tailed Macaque	*Macaca fascicularis*	*x*
Indochinese Silvered Leaf Monkey	*Trachypithecus germaini*	*x*
Hylobatidae Gibbons		

Family and English Name	Scientific Name	Species recorded by RJTimmins
Yellow-cheeked Crested Gibbon	*Nomascus gabriellae*	*x*
Caniidae Wild Dogs		
Dhole	*Cuon alpines*	*x*
Viverridae Civets		
Large Indian Civet	*Viverra zibetha*	
Common Palm Civet	*Paradoxurus hermaphrodites*	
Ursidae Bears		
bear species	*Ursus /Helarctos*	*x*
Mustelidae Weasels, Otters etc.		
large otter species	*Lutra/Lutrogale*	*x*
Elephantidae Elephants		
(Asian Elephant)	*(Elephas maximus)*	
Suidae Pigs		
pig species	*Sus*	*x*
Tragulidae Chevrotains		
Lesser Oriental Chevrotain*	*Tragulus javanicus*	*x*
Cervidae Deer		
Sambar	*Rusa unicolor*	*x*
Eld's Deer	*Rucervus eldii*	*x*
Red Muntjac	*Muntiacus vaginalis*	*x*
Bovidae Cattle, Antelopes		
Gaur	*Bos gaurus*	*x*
Sciuridae Squirrels		
Black Giant Squirrel	*Ratufa bicolor*	*x*
Variable Squirrel	*Callosciurus finlaysoni williamsoni***	*x*
Cambodian Striped Squirrel	*Tamiops rodolphei*	*x*
Red-cheeked Squirrel	*Dremomys rufigenis*	*x*
Berdmore's Squirrel	*Menetes berdmorei*	*x*
Indian Giant Flying-squirrel*	*Petaurista philippensis*	*x*
Hystricidae Old-world Porcupines		

Family and English Name	Scientific Name	Species recorded by RJTimmins
East Asian Porcupine	*Hystrix brachyura*	
Leporidae Rabbits and Hares		
Siamese Hare	*Lepus peguensis*	*x*

The presence of species in parenthesis ( ) has not been confirmed post 2006.
* Identified as this species solely on the basis of range
** The records of this species are particularly noteworth and extend the species ecological distribution considerably, into low monsoonal elevations of the dry forests (see Timmins *et al.* 2003b). The species has been observed on several occasions by H. L. Wright, most recently in the 2011 dry season. The species was observed at locations along the *O Kul* (south of the *O Khampha*) in bamboo, a microhabitat with much similarity to other bamboo formations in which the species has been found (Timmins *et al.* 2003b).
*** Interestingly this is the only sub-species of *Callosciurus finlaysoni* observed both east and west of the Sekong.

Annex 4. Birds



A Black-necked Stork shares a *trapeang* with a White-shouldered Ibis and a Little Egret *Egretta garzetta*. Photo: Jonathan C Eames

Annex 4. Bird species recorded in WSP and surrounding areas

The list presented below is modified from Goes, F. and Wright, H. L. (ongoing) 'Western Siem Pang IBA, Stung Treng, Bird List', both by a reappraisal of some species reported from the area and by a slightly different application of species' habitat associations (R J Timmins pers. comm.). The list includes certain species that have not been recorded from the proposed Western Siem Pang Protected Forest. This is largely because the source on which this list is based, encompassed the IBA rather than the proposed protected forest area, itself reflecting the fact that the majority of surveys have recorded species from a greater area than the proposed protected forest. Principally the species not yet recorded from Western Siem Pang are riverine birds recorded from the Sekong below Siem Pang town. This list is by no means a complete list of the species present, there are many species that clearly occur that have yet to be documented; a fact that reflects the focused work that has taken place to date, rather than broad inventory surveys.

English name	Scientific name	DDF	SEF	Agri/dstrb	Water	Source of first record	Date of first record
Phasianidae							
Chinese Francolin	*Francolinus pintadeanus*	x		x		A Tordoff *et al.*	19-24.5.02
Scaly-breasted Partridge	*Arborophila chloropus*		x			R Timmins *et al.*	3-15.11.03
Red Junglefowl	*Gallus gallus*	x	x	x		Seng KH *et al.*	23-27.1.03
Siamese Fireback	*Lophura diardi*		x			D Buckingham	25.10-3.12.06
Green Peafowl	*Pavo muticus*	x	x			Seng KH *et al.*	23-27.1.03
Anatidae							
White-winged Duck	*Asarcornis scutulata*		x		r	D Buckingham	25.10-3.12.06
Lesser Whistling-duck	*Dendrocygna javanica*	x			r/t	R Timmins *et al.*	3-15.11.03
Northern Shoveler	*Anas clypeata*	x			t	D Buckingham	25.10-3.12.06
Northern Pintail	*Anas acuta*	x			t	D Buckingham	25.10-3.12.06
Garganey	*Anas querquedula*	x			t	D Buckingham	25.10-3.12.06

English name	Scientific name	DDF	SEF	Agri/dstrb	Water	Source of first record	Date of first record
Ciconiidae							
Asian Openbill	*Anastomus oscitans*	x		x	t	R Timmins *et al.*	3-15.11.03
Woolly-necked Stork	*Ciconia episcopus*	x	x	x	t/r	A Tordoff *et al.*	19-24.5.02
Black-necked Stork	*Ephippiorhynchus asiaticus*	x			t/r	Seng KH *et al.*	23-27.1.03
Lesser Adjutant	*Leptoptilos javanicus*	x	x		t/r	A Tordoff *et al.*	19-24.5.02
Greater Adjutant	*Leptoptilos dubius*	x			t	J C Eames	4.11.09
Threskiornithidae							
White-shouldered Ibis	*Pseudibis davisoni*	x		x	t	A Tordoff *et al.*	19-24.5.02
Giant Ibis	*Thaumatibis gigantea*	x			t/r	A Tordoff *et al.*	19-24.5.02
Phalacrocoracidae							
Little Cormorant	*Phalacrocorax niger*				r	H Wright	15.5.08
Anhingidae							
Oriental Darter	*Anhinga melanogaster*				r	H Wright	29.3.08
Ardeidae							
Von Schrenck's Bittern	*Ixobrychus eurhythmus*		x		r	R J Timmins	8 12 11
Cinnamon Bittern	*Ixobrychus cinnamomeus*	x			t	D Buckingham	25.10-3.12.06
Malaysian Night-heron	*Gorsachius melanophus*		x		t/r	D Buckingham	25.10-3.12.06
Black-crowned Night-heron	*Nycticorax nycticorax*	x			t	H Wright	5.12.09
Little Heron	*Butorides striata*	x			t/r	Seng KH *et al.*	23-27.1.03
Grey Heron	*Ardea cinerea*	x			t/r	A Tordoff *et al.*	19-24.5.02

English name	Scientific name	DDF	SEF	Agri/dstrb	Water	Source of first record	Date of first record
Purple Heron	*Ardea purpurea*	x			t/r	H Wright	3.4.08
Chinese Pond-heron	*Ardeola bacchus*	x	x	x	t/r	A Tordoff *et al.*	19-24.5.02
Little Egret	*Egretta garzetta*	x		x	t/r	A Tordoff *et al.*	19-24.5.02
Eastern Cattle Egret	*Bubulcus coromandus*	x		x	t/r	A Tordoff *et al.*	19-24.5.02
Great Egret	*Ardea alba*	x			t/r	D Buckingham	25.10-3.12.06
Falconidae							
White-rumped Pygmy-falcon	*Polihierax insignis*	x				Seng KH *et al.*	23-27.1.03
Collared Falconet	*Microhierax caerulescens*	x		x		Seng KH *et al.*	23-27.1.03
Oriental Hobby	*Falco severus*		x			R J Timmins	18 12 11
Peregrine Falcon	*Falco peregrinus*	x		x		Seng KH *et al.*	23-27.1.03
Accipidridae							
Jerdon's Baza[1]	*Aviceda jerdoni*		x			H Wright	20.1.10
Black Baza	*Aviceda leuphotes*	x				Seng KH *et al.*	23-27.1.03
Brahminy Kite	*Haliastur indus*	x		x	t/r	Seng KH *et al.*	23-27.1.03
Crested Serpent-eagle	*Spilornis cheela*	x	x	x		A Tordoff *et al.*	19-24.5.02
Osprey	*Pandion haliaetus*				r	Seng KH *et al.*	23-27.1.03
White-bellied Sea-eagle	*Haliaeetus leucogaster*				r	Seng KH *et al.*	23-27.1.03
Lesser Fish-eagle	*Ichthyophaga humilis*				r	Seng KH *et al.*	23-27.1.03
Grey-headed Fish-eagle	*Ichthyophaga ichthyaetus*	x	x		t/r	A Tordoff *et al.*	19-24.5.02
White-rumped Vulture	*Gyps bengalensis*	x		x		Seng KH *et al.*	23-27.1.03

English name	Scientific name	DDF	SEF	Agri/dstrb	Water	Source of first record	Date of first record
Slender-billed Vulture	*Gyps tenuirostris*	x		x		D Buckingham	25.10-3.12.06
Himalayan Griffon	*Gyps himalayensis*	x				Lourn Bun Paeng	8.3.10
Red-headed Vulture	*Aegypius calvus*	x		x		A Tordoff *et al.*	19-24.5.02
Rufous-winged Buzzard	*Butastur liventer*	x		x		A Tordoff *et al.*	19-24.5.02
Grey-faced Buzzard	*Butastur indicus*	x				H Wright	25.3.10
Crested Goshawk	*Accipiter trivirgatus*		x			Seng KH *et al.*	23-27.1.03
Shikra	*Accipiter badius*	x	x	x		Seng KH *et al.*	23-27.1.03
Indian Spotted Eagle	*Aquila hastata*	x				D Buckingham	25.10-3.12.06
Greater Spotted Eagle	*Aquila clanga*	x				H Wright	11.2.10
Short-toed Snake-eagle	*Circaetus gallicus*	x				H Wright	13.1.10
Rufous-bellied Eagle	*Lophotriorchis kienerii*	x				D Buckingham	25.10-3.12.06
Oriental Honey-buzzard	*Pernis ptilorhynchus*	x	x	x		Seng KH *et al.*	23-27.1.03
Mountain Hawk-eagle	*Nisaetus nipalensis*		x			F Goes	20.1.10
Changeable Hawk-eagle	*Nisaetus limnaeetus*	x		x		Seng KH *et al.*	23-27.1.03
Gruidae							
Sarus Crane	*Grus antigone*	x			t	R Timmins *et al.*	3-15.11.03
Rallidae							
Slaty-breasted Rail	*Gallirallus striatus*	x			t/r	R Timmins *et al.*	3-15.11.03
White-breasted Waterhen	*Amaurornis phoenicurus*	x		x	t/r	A Tordoff *et al.*	19-24.5.02
Common Moorhen	*Gallinula chloropus*	x			t/r	N Collar	29.1.09

English name	Scientific name	DDF	SEF	Agri/dstrb	Water	Source of first record	Date of first record
Turnicidae							
Barred Buttonquail	*Turnix suscitator*	x		x		Seng KH *et al.*	23-27.1.03
Burhinidae							
Indian Thick-knee	*Burhinus indicus*			x	r	Morris & Goes	8-23.3.03
Great Thick-knee	*Esacus recurvirostris*				r	A Tordoff *et al.*	19-24.5.02
Charadriidae							
Grey-headed Lapwing	*Vanellus cinereus*	x			t/r	Cambodia B News	?.3.04
River Lapwing	*Vanellus duvaucelii*				r	A Tordoff *et al.*	19-24.5.02
Red-wattled Lapwing	*Vanellus indicus*	x		x	t/r	A Tordoff *et al.*	19-24.5.02
Little Ringed Plover	*Charadrius dubius*	x			t/r	Seng KH *et al.*	23-27.1.03
Kentish Plover	*Charadrius alexandrinus*				r	R Timmins *et al.*	3-15.11.03
Jacanidae							
Pheasant-tailed Jacana	*Hydrophasianus chirurgus*			x	t/r	R Timmins *et al.*	3-15.11.03
Scolopacidae							
Pintail Snipe**	*Gallinago stenura*	x		x		Seng KH *et al.*	23-27.1.03
Common Snipe	*Gallinago gallinago*	x		x		D Buckingham	25.10-3.12.06
Common Sandpiper	*Actitis hypoleucos*				r	Seng KH *et al.*	23-27.1.03
Green Sandpiper	*Tringa ochropus*	x			t/r	Seng KH *et al.*	23-27.1.03
Wood Sandpiper	*Tringa glareola*	x			t/r	Seng KH *et al.*	23-27.1.03
Common Greenshank	*Tringa nebularia*	x			t/r	Seng KH *et al.*	23-27.1.03

English name	Scientific name	DDF	SEF	Agri/dstrb	Water	Source of first record	Date of first record
Spotted Redshank	*Tringa erythropus*	x			t/r	H. Wright	21.1.12
Glareolidae							
Oriental Pratincole	*Glareola maldivarum*	x			t	H Wright	8.5.08
Small Pratincole	*Glareola lacteal*				r	A Tordoff *et al.*	19-24.5.02
Laridae							
River Tern	*Sterna aurantia*				r	A Tordoff *et al.*	19-24.5.02
Black-bellied Tern	*Sterna acuticauda*				r	Claassen	
Columbidae							
Green Imperial Pigeon	*Ducula aenea*	x	x			A Tordoff *et al.*	19-24.5.02
Mountain Imperial Pigeon	*Ducula badiax*		x			D Buckingham	25.10-3.12.06
Red Collared-dove	*Streptopelia tranquebarica*	x		x		A Tordoff *et al.*	19-24.5.02
Spotted Dove	*Streptopelia chinensis*	x	x	x		A Tordoff *et al.*	19-24.5.02
Zebra Dove	*Geopelia striatax*	x		x		D Buckingham	25.10-3.12.06
Orange-breasted Green-pigeon	*Treron bicincta*	x	x			H Wright	8.4.08
Thick-billed Green-pigeon	*Treron curvirostra*	x	x			Seng KH *et al.*	23-27.1.03
Yellow-footed Green-pigeon	*Treron phoenicopterus*	x		x		Seng KH *et al.*	23-27.1.03
Psittacidae							
Vernal Hanging Parrot	*Loriculus vernalis*	x	x	x		Seng KH *et al.*	23-27.1.03
Alexandrine Parakeet	*Psittacula eupatria*	x		x		A Tordoff *et al.*	19-24.5.02
Blossom-headed Parakeet	*Psittacula roseate*	x		x		FE Rheindt	17-20.2.04

English name	Scientific name	DDF	SEF	Agri/dstrb	Water	Source of first record	Date of first record
Red-breasted Parakeet	*Psittacula alexandri*	x		x		A Tordoff *et al.*	19-24.5.02
Cuculidae							
Indian Cuckoo	*Cuculus micropterus*	x	x			A Tordoff *et al.*	19-24.5.02
Chesnut-winged Cuckoo	*Clamator coromandus*	x	x			H Wright	17.3.09
Banded Bay Cuckoo	*Cacomantis sonneratii*	x	x	x		Seng KH *et al.*	23-27.1.03
Plaintive Cuckoo	*Cacomantis merulinus*	x		x		Seng KH *et al.*	23-27.1.03
Violet Cuckoo	*Chrysococcyx xanthorhynchus*	x	x			H Wright	5.1.09
Drongo Cuckoo	*Surniculus lugubris*		x			Seng KH *et al.*	23-27.1.03
Asian Koel	*Eudynamys scolopaceus*	x	x	x		A Tordoff *et al.*	19-24.5.02
Coral-billed Ground-cuckoo	*Carpococcyx renauldi*		x			F Goes	1.1.10
Green-billed Malkoha	*Rhopodytes tristis*		x	x		Seng KH *et al.*	23-27.1.03
Greater Coucal	*Centropus sinensis*	x		x		A Tordoff *et al.*	19-24.5.02
Tytonidae							
Common Barn-owl	*Tyto alba*			x		E Urquhart, H Wright	18.3.08
Strigidae							
Collared Scops-owl	*Otus lettia*		x	x		A Tordoff *et al.*	19-24.5.02
Oriental Scops-owl	*Otus sunia*	x				Seng KH *et al.*	23-27.1.03
Collared Owlet	*Glaucidium brodiei*		x			R Timmins *et al.*	3-15.11.03
Asian Barred Owlet	*Glaucidium cuculoides*	x	x	x		A Tordoff *et al.*	19-24.5.02
Spotted Owlet	*Athene brama*	x		x		FE Rheindt	17-20.2.04

English name	Scientific name	DDF	SEF	Agri/dstrb	Water	Source of first record	Date of first record
Brown Boobook	*Ninox scutulata*		x			A Tordoff *et al.*	19-24.5.02
Spot-bellied Eagle-owl	*Bubo nipalensis*		x			D Buckingham	25.10-3.12.06
Brown Fish-owl	*Ketupa zeylonensis*	x			t	D Buckingham	25.10-3.12.06
Buffy Fish-owl	*Ketupa ketupu*	x			t	D Buckingham	25.10-3.12.06
Spotted Wood-owl	*Strix leptogrammica*	x				H Wright	15.3.09
Podardidae							
Blyth's Frogmouth	*Batrachosotmus affinis*		x			J Pilgrim, H Wright	27.11.09
Caprimulgidae							
Great Eared-nightjar	*Eurostopodus macrotis*		x			A Tordoff *et al.*	19-24.5.02
Large-tailed Nightjar	*Caprimulgus macrurus*	x	x	x		Seng KH *et al.*	23-27.1.03
Indian Nightjar	*Caprimulgus asiaticus*	x		x		Seng KH *et al.*	23-27.1.03
Savanna Nightjar	*Caprimulgus affinis*	x		x		D Buckingham	25.10-3.12.06
Germain's Swiftlet**	*Aerodramus germani*	x	x			H Wright	4.4.09
Apodidae							
Silver-backed Needletail	*Hirundapus cochinchinensis*	x	x			A Tordoff *et al.*	19-24.5.02
Brown-backed Needletail	*Hirundapus giganteus*	x	x			D Buckingham	25.10-3.12.06
Asian Palm-swift	*Cypsiurus balasiensis*	x		x		A Tordoff *et al.*	19-24.5.02
Fork-tailed Swift	*Apus pacificus*	x	x			D Buckingham	25.10-3.12.06
House Swift	*Apus affinus*					Birdquest *et al.*	8-23.3.03
Hemiprocnidae							

English name	Scientific name	DDF	SEF	Agri/dstrb	Water	Source of first record	Date of first record
Crested Treeswift	*Hemiprocne coronata*	x		x		A Tordoff *et al.*	19-24.5.02
Trogonidae							
Orange-breasted Trogon	*Harpactes oreskios*		x			R Timmins *et al.*	3-15.11.03
Coraciidae							
Indian Roller	*Coracias benghalensis*	x		x		A Tordoff *et al.*	19-24.5.02
Dollarbird	*Eurystomus orientalis*		x			Morris & Goes	8-23.3.03
Alcedinidae							
Banded Kingfisher	*Lacedo pulchella*		x			R J Timmins	3-18 12 11
Stork-billed Kingfisher	*Pelargopsis capensis*		x		r	A Tordoff *et al.*	19-24.5.02
White-throated Kingfisher	*Halcyon smyrnensis*	x			t/r	A Tordoff *et al.*	19-24.5.02
Black-capped Kingfisher	*Halcyon pileata*	x			t/r	Seng KH *et al.*	23-27.1.03
Blue-eared Kingfisher	*Alcedo meninting*		x		r	R J Timmins	3-18 12 11
Common Kingfisher	*Alcedo atthis*	x			t/r	Seng KH *et al.*	23-27.1.03
Pied Kingfisher	*Ceryle rudis*				r	Seng KH *et al.*	23-27.1.03
Meropidae							
Blue-bearded Bee-eater	*Nyctyornis athertoni*		x		x	Seng KH *et al.*	23-27.1.03
Little Green Bee-eater	*Merops orientalis*	x		x		A Tordoff *et al.*	19-24.5.02
Blue-throated Bee-eater	*Merops viridis*					E Urquhart	9.2-20.3.09
Blue-tailed Bee-eater	*Merops philippinus*	x		x		D Buckingham	25.10-3.12.06
Chestnut-headed Bee-eater	*Merops leschenaulti*	x	x			Seng KH *et al.*	23-27.1.03

English name	Scientific name	DDF	SEF	Agri/dstrb	Water	Source of first record	Date of first record
Upupidae							
Common Hoopoe	*Upupa epops*	x				A Tordoff *et al.*	19-24.5.02
Bucerotidae							
Oriental Pied Hornbill	*Anthracoceros albirostris*	x	x			A Tordoff *et al.*	19-24.5.02
Great Hornbill[2]	*Buceros bicornis*		x			Lourn Bun Paeng	?.3.09
Ramphastidae							
Lineated Barbet	*Megalaima lineata*	x				A Tordoff *et al.*	19-24.5.02
Green-eared Barbet	*Megalaima faiostricta*		x			A Tordoff *et al.*	19-24.5.02
Blue-eared Barbet	*Megalaima australis*		x			R Timmins *et al.*	3-15.11.03
Coppersmith Barbet	*Megalaima haemacephala*	x		x		A Tordoff *et al.*	19-24.5.02
Picidae							
White-browed Piculet	*Sasia ochracea*		x			D Buckingham	25.10-3.12.06
Rufous-bellied Woodpecker	*Hypopicus hyperythrus*	x				R Timmins *et al.*	3-15.11.03
Grey-capped Pygmy Woodpecker	*Dendrocopos canicapillus*	x		x		Seng KH *et al.*	23-27.1.03
Spot-breasted Woodpecker	*Dendrocopus analis*	x				D Buckingham	25.10-3.12.06
Yellow-crowned Woodpecker	*Dendrocopos mahrattensis*	x				A Tordoff *et al.*	19-24.5.02
White-bellied Woodpecker	*Dryocopus javensis*	x			r	Seng KH *et al.*	23-27.1.03
Greater Yellownape	*Picus flavinucha*		x			D Buckingham	25.10-3.12.06
Lesser Yellownape	*Picus chlorolophus*	x	x			A Tordoff *et al.*	19-24.5.02
Laced Woodpecker	*Picus vittatus*		x		r	D Buckingham	25.10-3.12.06

English name	Scientific name	DDF	SEF	Agri/dstrb	Water	Source of first record	Date of first record
Streak-throated Woodpecker	*Picus xanthopygaeus*	x		x		FE Rheindt	17-20.2.04
Red-collared Woodpecker	*Picus rabieri*		x			D Buckingham	25.10-3.12.06
Black-headed Woodpecker	*Picus erythropygius*	x		x		A Tordoff *et al.*	19-24.5.02
Grey-headed Woodpecker	*Picus canus*		x			Seng KH *et al.*	23-27.1.03
Great Slaty Woodpecker	*Mulleripicus pulverulentus*	x	x			A Tordoff *et al.*	19-24.5.02
Rufous Woodpecker	*Micropternus brachyurus*	x	x	x		A Tordoff *et al.*	19-24.5.02
Common Flameback	*Dinopium javanense*	x	x	x		A Tordoff *et al.*	19-24.5.02
Greater Flameback	*Chrysophlegma flavinucha*	x	x			FE Rheindt	17-20.2.04
Pale-headed Woodpecker	*Gecinulus grantia*		x			D Buckingham	25.10-3.12.06
Bay Woodpecker	*Blythipicus rubiginosus*		x			R J Timmins	3-18 12 11
Heart-spotted Woodpecker	*Hemicircus canente*	x	x	x		D Buckingham	25.10-3.12.06
Eurylaimidae							
Dusky Broadbill	*Corydon sumatranus*		x			D Buckingham	25.10-3.12.06
Banded Broadbill	*Eurylaimus javanicus*		x			H Wright	18.3.09
Pittidae							
Blue-winged Pitta	*Pitta moluccensis*		x			A Tordoff *et al.*	19-24.5.02
Blue-rumped Pitta	*Pitta soror*		x			R J Timmins	3-18 12 11
Bar-bellied Pitta	*Pitta elliotii*		x			Seng KH *et al.*	23-27.1.03
Eared Pitta	*Athocinda phayrei*		x			D Buckingham	25.10-3.12.06
Artamidae							

English name	Scientific name	DDF	SEF	Agri/dstrb	Water	Source of first record	Date of first record
Ashy Woodswallow	*Artamus fuscus*			x		H Wright	18.11.09
Genera Incertae Cedis							
Large Woodshrike	*Tephrodornis gularis*	x	x			A Tordoff *et al.*	19-24.5.02
Common Woodshrike	*T. pondicerianus*	x				A Tordoff *et al.*	19-24.5.02
Bar-winged Flycatcher-shrike	*Hemipus picatus*		x			Seng KH *et al.*	23-27.1.03
Aegithinidae							
Common Iora	*Aegithina tiphia*	x				A Tordoff *et al.*	19-24.5.02
Great Iora	*Aegithina lafresnayei*		x			D Buckingham	25.10-3.12.06
Vireonidae							
White-bellied Erponis	*Erponis zantholeuca*		x			D Buckingham	25.10-3.12.06
Coracinidae							
Large Cuckooshrike	*Coracina macei*	x	x	x		A Tordoff *et al.*	19-24.5.02
Indochinese Cuckooshrike	*Coracina polioptera*	x				A Tordoff *et al.*	19-24.5.02
Rosy Minivet	*Pericrocotus roseus*	x				Seng KH *et al.*	23-27.1.03
Swinhoe's Minivet	*Pericrocotus cantonensis*		x			D Buckingham	25.10-3.12.06
Ashy Minivet	*Pericrocotus divaricatus*	x	x			Seng KH *et al.*	23-27.1.03
Small Minivet	*Pericrocotus cinnamomeus*	x				A Tordoff *et al.*	19-24.5.02
Scarlet Minivet	*Pericrocotus speciosus*	x	x			R Timmins *et al.*	3-15.11.03
Laniidae							
Brown Shrike	*Lanius cristatus*	x		x		D Buckingham	25.10-3.12.06

English name	Scientific name	DDF	SEF	Agri/dstrb	Water	Source of first record	Date of first record
Burmese Shrike	*Lanius collurioides*	x				A Tordoff *et al.*	19-24.5.02
Long-tailed Shrike[3]	*Lanius schach*	x				D Buckingham	25.10-3.12.06
Oriolidae							
Black-naped Oriole	*Oriolus chinensis*		x	x		Seng KH *et al.*	23-27.1.03
Black-hooded Oriole	*Oriolus xanthornus*	x	x			A Tordoff *et al.*	19-24.5.02
Dicruridae							
Black Drongo	*Dicrurus macrocercus*	x		x		A Tordoff *et al.*	19-24.5.02
Ashy Drongo	*Dicrurus leucophaeus*	x	x	x		A Tordoff *et al.*	19-24.5.02
Crow-billed Drongo	*Dicrurus annectans*					Morris & Goes	8-23.3.03
Bronzed Drongo	*Dicrurus aeneus*		x			Seng KH *et al.*	23-27.1.03
Greater Racket-tailed Drongo	*Dicrurus paradiseus*		x	x		A Tordoff *et al.*	19-24.5.02
Hair-crested Drongo	*Dicrurus hottentottus*	x	x			A Tordoff *et al.*	19-24.5.02
Rhipiduridae							
White-browed Fantail	*Rhipidura aureola*	x		x		A Tordoff *et al.*	19-24.5.02
Monarchidae							
Black-naped Monarch	*Hypothymis azurea*		x			Seng KH *et al.*	23-27.1.03
Asian Paradise-flycatcher	*Terspiphone atrocaudata*		x			D Buckingham	25.10-3.12.06
Corvidae							
Southern Jungle Crow	*Corvus macrorhynchos*	x		x	r/t	A Tordoff *et al.*	19-24.5.02
Eurasian Jay	*Garrulus glandarius*	x				H Wright	5.5.08

English name	Scientific name	DDF	SEF	Agri/dstrb	Water	Source of first record	Date of first record
Indochinese Green Magpie	*Cissa hypoleuca*		x			R Timmins *et al.*	3-15.11.03
Red-billed Blue Magpie	*Urocissa erythrorhyncha*	x		x		Seng KH *et al.*	23-27.1.03
Rufous Treepie	*Dendrocitta vagabunda*	x		x		A Tordoff *et al.*	19-24.5.02
Racket-tailed Treepie	*Crypsirina temia*		x	x	r	Seng KH *et al.*	23-27.1.03
Paridae							
Grey Tit	*Parus cinereus*	x				R Timmins *et al.*	3-15.11.03
Hirundidae							
Asian House Martin	*Delichon dasypus*					H Wright	18.11.09
Common Sand-martin	*Riparia riparia*					Seng KH *et al.*	23-27.1.03
Grey-throated Sand-martin	*Riparia chinensis*				r	A Tordoff *et al.*	19-24.5.02
Barn Swallow	*Hirundo rustica*					Seng KH *et al.*	23-27.1.03
Wire-tailed Swallow	*Hirundo smithii*				r	Seng KH *et al.*	23-27.1.03
Red-rumped Swallow	*Cecropis daurica*					Birdquest *et al.*	8-23.3.03
Alaudidae							
Indochinese Bushlark	*Mirafra eryrthrocephala*	x				A Tordoff *et al.*	19-24.5.02
Cisticolidae							
Zitting Cisticola	*Cisticola juncidis*	x				H Wright	30.3.10
Rufescent Prinia	*Prinia rufescens*	x		x		R Timmins *et al.*	3-15.11.03
Yellow-bellied Prinia	*Prinia flaviventris*				r	Seng KH *et al.*	23-27.1.03

English name	Scientific name	DDF	SEF	Agri/dstrb	Water	Source of first record	Date of first record
Plain Prinia	*Prinia inornata*	x				H Wright	14.3.08
Brown Prinia	*Prinia polychroa*	x				A Tordoff *et al.*	19-24.5.02
Dark-necked Tailorbird	*Orthotomus atrogularis*	x	x			R Timmins *et al.*	3-15.11.03
Common Tailorbird	*Orthotomus sutorius*	x		x		Seng KH *et al.*	23-27.1.03
Pycnonotidea							
Red-whiskered Bulbul	*Pycnonotus jocosus*			x		Birdquest *et al.*	4-30.1.09
Sooty-headed Bulbul	*Pycnonotus aurigaster*	x		x		A Tordoff *et al.*	19-24.5.02
Himalayan Black Bulbul	*Hypsipetes leucocephalus*	x	x			Seng KH *et al.*	23-27.1.03
Black-headed Bulbul	*Pycnonotus atriceps*		x			D Buckingham	25.10-3.12.06
Black-crested Bulbul	*Pycnonotus flaviventris*		x			R Timmins *et al.*	3-15.11.03
Stripe-throated Bulbul	*Pycnonotus finlaysoni*		x			D Buckingham	25.10-3.12.06
Yellow-vented Bulbul	*Pycnonotus goiavier*			x		H Wright	4-30.1.09
Streak-eared Bulbul	*Pycnonotus blanfordi*			x	r	A Tordoff *et al.*	19-24.5.02
Grey-eyed Bulbul	*Iole propinqua*		x			R J Timmins	3-18 12 11
Puff-throated Bulbul	*Alophoixus pallidus*		x			R Timmins *et al.*	3-15.11.03
Silviidae							
Rusty-rumped Warbler	*Locustella certiola*	x			t	D Buckingham	25.10-3.12.06
Lanceolated Warbler	*Locustella lanceolata*	x				R Timmins *et al.*	3-15.11.03
Black-browed Reed-warbler	*Acrocephalus bistrigiceps*	x			t	H Wright	17.2.09

English name	Scientific name	DDF	SEF	Agri/dstrb	Water	Source of first record	Date of first record
Oriental Reed-warbler	*Acrocephalus orientalis*	x			t	H Wright	5.5.10
Thick-billed Warbler	*Acrocephalus aedon*	x				E Urquhart	18.3.08
Blyth's Leaf-Warbler	*Phylloscopus reguloides*		x			R J Timmins	3-18 12 11
Pale-legged Leaf-warbler	*Phylloscopus tenellipes*	x	x			D Buckingham	25.10-3.12.06
Greenish Warbler	*Phylloscopus trochiloides*	x				Seng KH *et al.*	23-27.1.03
Two-barred Warbler	*Phylloscopus plumbeitarsus*	x	x			FE Rheindt	17-20.2.04
Yellow-browed Warbler	*Phylloscopus inornatus*	x	x			Seng KH *et al.*	23-27.1.03
Radde's Warbler	*Phylloscopus schwarzi*	x				FE Rheindt	17-20.2.04
Dusky Warbler	*Phylloscopus fuscatus*	x	x	x	t/r	Seng KH *et al.*	23-27.1.03
Timaliidae							
Black-browed Fulvetta	*Alcippe grotei*		x			D Buckingham	25.10-3.12.06
White-crested Laughingthrush	*Garrulax leucolophus*		x			A Tordoff *et al.*	19-24.5.02
Lesser Necklaced Laughingthrush	*Garrulax monileger*		x			F Goes	18-21.1.10
Chestnut-capped Babbler	*Timalia pileata*	x		x		H Wright	5.4.08
Pin-striped Tit-babbler	*Macronus gularis*		x			A Tordoff *et al.*	19-24.5.02
Grey-faced Tit-babbler	*Macronus kelleyi*		x			R Timmins *et al.*	3-15.11.03
Puff-throated Babbler	*Pellorneum ruficeps*		x			Seng KH *et al.*	23-27.1.03
Scaly-crowned Babbler	*Malacopteron cinereum*		x			R J Timmins	3-18 12 11
Abbott's Babbler	*Malacocincla abbotti*		x			D Buckingham	25.10-3.12.06

English name	Scientific name	DDF	SEF	Agri/dstrb	Water	Source of first record	Date of first record
Large Scimitar-Babbler	*Pomatorhinus hypoleucos*		x			R J Timmins	3-18 12 11
White-browed Scimitar-babbler	*Pomatorhinus schisticeps*		x			D Buckingham	25.10-3.12.06
Irenidae							
Asian Fairy-bluebird	*Irena puella*		x			Seng KH *et al.*	23-27.1.03
Sittidae							
Velvet-fronted Nuthatch	*Sitta frontalis*	x	x			A Tordoff *et al.*	19-24.5.02
Neglected Nuthatch	*Sitta neglecta*	x				A Tordoff *et al.*	19-24.5.02
Sturnidae							
White-vented Myna	*Acridotheres grandis*	x		x	t/r	A Tordoff *et al.*	19-24.5.02
Common Myna	*Acridotheres tristis*			x		A Tordoff *et al.*	19-24.5.02
Common Hill-myna	*Gracula religiosa*	x	x			A Tordoff *et al.*	19-24.5.02
Chestnut-tailed Starling	*Sturnus malabaricus*	x				D Buckingham	25.10-3.12.06
Vinous-breasted Starling	*Acridotheres burmannicus*	x		x		A Tordoff *et al.*	19-24.5.02
Black-collared Starling	*Gracupica nigricollis*	x		x		A Tordoff *et al.*	19-24.5.02
Turdidae							
Chinese Blackbird	*Turdus mandarinus*					T Evans	?.?.94
Blue Rock-thrush	*Monticola solitarius*			x	r	R Timmins *et al.*	3-15.11.03
Muscicapidae							
Oriental Magpie Robin	*Copsychus saularis*	x		x		A Tordoff *et al.*	19-24.5.02

English name	Scientific name	DDF	SEF	Agri/dstrb	Water	Source of first record	Date of first record
White-rumped Shama	*Copsychus malabaricus*		x	x		Seng KH *et al.*	23-27.1.03
Bluethroat	*Luscinia svecica*	x				H. Wright	21.1.12
Siberian Blue Robin	*Luscinia cyane*	x	x			D Buckingham	25.10-3.12.06
Eastern Stonechat	*Saxicola maurus*	x		x		Seng KH *et al.*	23-27.1.03
Pied Bushchat	*Saxicola caprata*	x		x		A Tordoff *et al.*	19-24.5.02
Hainan Blue Flycatcher	*Cyornis hainanus*		x			D Buckingham	25.10-3.12.06
Tickell's Blue Flycatcher	*Cyornis tickelliae*		x			Seng KH *et al.*	23-27.1.03
Blue-and-white Flycatcher	*Cyanoptila cyanomelana*	x				E Urquhart	18.3.08
Narcissus Flycatcher	*Ficedula narcissina*	x				H Wright	24.4.08
Taiga Flycatcher	*Ficedula albicilla*	x		x	r	Seng KH *et al.*	23-27.1.03
Grey-headed Canary-flycatcher	*Culicicapa ceylonensis*		x	x		D Buckingham	25.10-3.12.06
Verditer Flycatcher	*Eumyias thalassinus*	x		x		Seng KH *et al.*	23-27.1.03
Asian Brown Flycatcher	*Muscicapa dauurica*	x		x		FE Rheindt	17-20.2.04
Chloropsidae							
Blue-winged Leafbird	*Chloropsis cochinchinensis*		x			Seng KH *et al.*	23-27.1.03
Golden-fronted Leafbird	*Chloropsis aurifrons*	x		x		A Tordoff *et al.*	19-24.5.02
Dicaeidae							
Thick-billed Flowerpecker	*Dicaeum agile*		x			D Buckingham	25.10-3.12.06
Yellow-vented Flowerpecker	*Dicaeum chrysorrbeum*		x	x		FE Rheindt	17-20.2.04

English name	Scientific name	DDF	SEF	Agri/dstrb	Water	Source of first record	Date of first record
Scarlet-backed Flowerpecker	*Dicaeum cruentatum*	x		x		FE Rheindt	17-20.2.04
Nectariniidae							
Crimson Sunbird	*Aethopyga siparaja*		x			D Buckingham	25.10-3.12.06
Purple-naped Sunbird	*Hypogramma hypogrammicum*		x			D Buckingham	25.10-3.12.06
Brown-throated Sunbird	*Anthreptes malacensis*		x	x	r	D Buckingham	25.10-3.12.06
Van Hasselt's Sunbird	*Leptocoma brasiliana*		x		r	D Buckingham	25.10-3.12.06
Purple Sunbird	*Cinnyris asiaticus*	x				A Tordoff *et al.*	19-24.5.02
Olive-backed Sunbird	*Cinnyris jugularis*		x	x		FE Rheindt	17-20.2.04
Ruby-cheeked Sunbird	*Chalcoparia singalensis*		x	x		D Buckingham	25.10-3.12.06
Little Spiderhunter	*Arachnothera longirostra*	x	x			D Buckingham	25.10-3.12.06
Passeridae							
House Sparrow	*Passer domesticus*			x		E Urquhart	9.2-20.3.09
Plain-backed Sparrow	*Passer flaveolus*	x		x		FE Rheindt	17-20.2.04
Eurasian Tree Sparrow	*Passer montanus*			x		Seng KH *et al.*	23-27.1.03
Ploceidae							
Streaked Weaver	*Ploceus manyar*	x			t	R Timmins *et al.*	3-15.11.03
Baya Weaver	*Ploceus philippinus*	x		x	t	R Timmins *et al.*	3-15.11.03
Asian Golden Weaver	*Ploceus hypoxanthus*	x			t	A Tordoff *et al.*	19-24.5.02
Estrildidae							

English name	Scientific name	DDF	SEF	Agri/dstrb	Water	Source of first record	Date of first record
White-rumped Munia	*Lonchura striata*			x	t	Seng KH *et al.*	23-27.1.03
Scaly-breasted Munia	*Lonchura punctulata*	x			t	A Tordoff *et al.*	19-24.5.02
Motacilidae							
White Wagtail	*Motacilla alba*	x			r	Seng KH *et al.*	23-27.1.03
Mekong Wagtail	*Motacilla samveasnae*				r	A Tordoff *et al.*	19-24.5.02
Grey Wagtail	*Motacilla cinerea*	x			r	D Buckingham	25.10-3.12.06
yellow wagtail	*Motacilla flava/tschutschensis*	x			t/r	D Buckingham	25.10-3.12.06
Olive-backed Pipit	*Anthus hodgsoni*	x	x			Seng KH *et al.*	23-27.1.03
Richard's Pipit	*Anthus richardi*	x		x		FE Rheindt	17-20.2.04
Paddyfield Pipit	*Anthus rufulus*			x		Seng KH *et al.*	23-27.1.03
Emberizidae							
Yellow-breasted Bunting	*Emberiza aureola*	x			T	R Timmins *et al.*	3-15.11.03

**Identified as this species on the basis of range

[1] Also recorded in December 2011 (R J Timmins pers. comm.)

[2] Only a single record

[3]Two separate individuals recorded by D. Buckingham are the only certain records. Both were in mosaic forest, around deep/lush grass on the interface between forest patches (mixed evergreen?) and more open grassland/Deciduous Dipterocarp Forest

Habitat associations: habitat associations of the species in Western Siem Pang are given. Note that species may occasionally occur in other habitats. DDF: Deciduous Dipterocarp Forest; SEF: Semi-evergreen Forest; agri/dstrb: agricultural and heavily modified forest habitats; water: water features of the landscape, principally trapeang (t) and streams and rivers (r); only species strongly associated with water features are listed in this column. Some only occasionally recorded species have no clear association with habitat.

Sources: A Tordoff *et al.* : Tordoff *et al.* (2002); Birdquest *et al.*: visiting birdwatchers (pers. comm. to H. L. Wright); Claassen: Claassen (2004); D Buckingham: records during the survey of Buckingham and Prach Pich Phirun (2006); E Urquhart: visiting birdwatcher (pers. comm. to F. Goes); F. E. Rheindt: visiting birdwatcher (pers. comm. to H. L. Wright); F Goes: visiting birdwatcher; H Wright: records during the fieldwork of H. L. Wright; JC Eames: visiting birdwatcher (pers. comm. to H. L. Wright); J Pilgrim: visiting birdwatcher (pers. comm. to H. L. Wright); Lourn Bun Paeng: SSG member (pers. comm. to H. L. Wright); Morris and Goes: visiting birdwatchers; N Collar: visiting birdwatcher (pers. comm. to H. L. Wright); R. J. Timmins: records from December 2011; R Timmins *et al.*: Timmins *et al.* (2003a); Seng KH *et al.*: Seng Kim Hout *et al.* (2003a); T Evans: T. D. Evans from the Laos bank of the Sekong in 2004 (pers. comm. to F. Goes).

D Buckingham also made the following observations which are not included in the table: what was suspected to be a *Ceyx* sp. was heard several times during the survey; Rufous-fronted Babbler *Stachyris rufifrons*: seven records of up to 3, scattered throughout the northern Semi-evergreen Forest from near the Sekong, up to c.200m, foraging in the undergrowth or understorey of dense Semi-evergreen Forest, in mixed flocks or alone. They were vocal, giving rapid, quiet, monotonous "tchi-chi-chi" calls, with all the notes on the same pitch, thin and slightly higher-pitched than a Blue Tit's contact note. Two groups were seen well and clearly showed distinct, but subtle grey areas around the eye. They were small, slim 'tit-babblers', with relatively long, slim bills, compared to Striped Tit-babbler. The upperparts were a medium-toned olive-brown with a greenish tint. The underparts were described variously as: dirty, yellowish grey; a pale yellow-washed dull, pale buff or "a not very bright buff". The underparts were not as bright as on Striped Tit-babbler. The crown was orange-brown and did not contrast strongly with the rest of the head, when viewed from the side (though it looked brighter and slightly scaled, when seen from above). The face looked very uniform. In the best views, the face was a pale-mid ash-grey on the lores and supercillium, back to just behind the eye. The throat was a paler, greyish white, compared to the richer face/underparts and looked a bit streaky at close range. The bill was darkish grey.

The following species have been reported from the area, however their presence in Western Siem Pang or adjacent areas seems unlikely.

Ochraceous Bulbul	*Alophoixus ochraceus*	Seng KH *et al.*	23-27.1.03	Forms a species complex with Puff-throated Bulbul
Australasian Bushlark	*Mirafra javanica*	Seng KH *et al.*	23-27.1.03	No other records from Western Siem Pang
Asian Pied Starling	*Gracupica contra*	FE Rheindt	17-20.2.04	No other records from Western Siem Pang or Northeastern Cambodia

Annex 5. Bird species characteristic of Deciduous Dipterocarp Forest, and their status in Western Siem Pang

Table A5. Bird species characteristic of Deciduous Dipterocarp Forest, and their status in Western Siem Pang.

English Name	Scientific Name	Global Threat Status	Laos Threat Status	Siem Pang Status
Blue-breasted Quail (E)	*Coturnix chinensis*	0	LKL / D*	Unrecorded; probably overlooked
Green Peafowl	*Pavo muticus*	GT-VU	ARL	ST: significant population
Cotton Pygmy-goose (W)	*Nettapus coromandelianus*	0	ARL	Unrecorded; probably extirpated as a breeder
Small Buttonquail (E)	*Turnix sylvatica*	0	LKL / ?	Unrecorded; probably overlooked
Fulvous-breasted Woodpecker	*Dendrocopos macei*	0	LKL / D*	Occasional
Yellow-crowned Woodpecker	*Dendrocopos mahrattensis*	0	ARL / D**	Occasional; more frequently found than last
Rufous-bellied Woodpecker	*Dendrocopos hyperythrus*	0	D**	Rare; only recorded a few times per season (H L Wright pers. comm, R J Timmins pers. comm.)
White-bellied Woodpecker	*Dryocopus javensis*	0	PARL / D	Frequent / local
Streak-throated Woodpecker	*Picus xanthopygaeus*	0	PARL / D**	Common
Great Slaty Woodpecker (E)	*Mulleripicus pulverulentus*	VU	D*	Common
Common Hoopoe (br) (E?)	*Upupa epops*	0	D*	Common
Alexandrine Parakeet	*Psittacula eupatria*	0	ARL / D*	Common/Frequent; small numbers
Grey-headed Parakeet (E)	*Psittacula finschii*	0	D*	Unconfirmed records only; probably an occasional to rare resident?
Blossom-headed Parakeet	*Psittacula roseata*	0	PARL / D*	Common
Red-breasted Parakeet (E)	*Psittacula alexandri*	0	D*	Common
Crested Treeswift (E)	*Hemiprocne coronata*	0	D*	Common
Oriental Scops Owl (E)	*Otus sunia*	0	?	Common
Spotted Owlet	*Athene brama*	0	?	Common
Grey Nightjar (br) (E)	*Caprimulgus indicus*	0	?	Unrecorded; possibly overlooked
Indian Nightjar	*Caprimulgus asiaticus*	0	?	Frequent?
Savanna Nightjar (E)	*Caprimulgus affinis*	0	D*	Frequent?
Pale-capped Pigeon (E)	*Columba punicea*	GT-VU	LKL / C	Unrecorded
Red Collared Dove (E)	*Streptopelia tranquebarica*	0	?	Common
Orange-breasted Green Pigeon	*Treron bicincta*	0	PARL / D**	Frequent
Yellow-footed Green Pigeon	*Treron phoenicoptera*	0	ARL / D*	Frequent; more frequently found than the last
Green Imperial Pigeon (E)	*Ducula aenea*	0	ARL / D*	Frequent
Sarus Crane (W)	*Grus antigone*	GT-VU	ARL	ST: significant population
Red-wattled Lapwing (E)	*Vanellus indicus*	0	D*	Common; although not all seemingly suitable habitat occupied
White-rumped Vulture (E)	*Gyps bengalensis*	GT-CR	ARL	ST: significant population

English Name	Scientific Name	Global Threat Status	Laos Threat Status	Siem Pang Status
Slender-billed Vulture (E)	*Gyps tenuirostris*	GT-CR	ARL	ST: significant population
Red-headed Vulture (E)	*Sarcogyps calvus*	GT-CR	ARL	ST: significant population
Indian Spotted Eagle (L-)	*Aquila hastata*	GT-VU	C	ST: significant population
Changeable Hawk Eagle	*Spizaetus cirrhatus*	0	C	Frequent
White-rumped Falcon	*Polihierax insignis*	GNT	PARL / D*	Frequent
Collared Falconet (E)	*Microhierax caerulescens*	0	D*	Occasional
White-shouldered Ibis	*Pseudibis davisoni*	GT-CR	ARL	ST: significant population
Giant Ibis	*Thaumatibis gigantea*	GT-CR	ARL	ST: significant population
Woolly-necked Stork (W)	*Ciconia episcopus*	0	ARL	Frequent/common; similar status to Lesser Adjutant
Black-necked Stork (W)	*Ephippiorhynchus asiaticus*	GNT	ARL	ST: rare resident
Lesser Adjutant (W)	*Leptoptilos javanicus*	GT-VU	ARL	ST: significant population
Greater Adjutant (W)	*Leptoptilos dubius*	GT-EN	ARL	ST: probably only non-breeding visitor
Burmese Shrike (E)	*Lanius collurioides*	0	D	Common
Indochinese Cuckooshrike	*Coracina polioptera*	0	D	Common
Small Minivet	*Pericrocotus cinnamomeus*	0	D	Common
White-browed Fantail	*Rhipidura aureola*	0	D*	Common
Common Woodshrike	*Tephrodornis pondicerianus*	0	D	Common

English Name	Scientific Name	Global Threat Status	Laos Threat Status	Siem Pang Status
Asian Brown / Brown-streaked Flycatcher (br) (L-)	*Muscicapa dauurica / M. williamsoni*	0	?	Uncertain breeding status
Chestnut-tailed Starling (br)	*Sturnus malabaricus*	0	?	Common
Vinous-breasted Starling	*Sturnus burmannicus*	0	D*	Common
Golden-crested Myna (E)	*Ampeliceps coronatus*	0	PARL / ?	Unrecorded; possibly a rare resident?
Chestnut-bellied Nuthatch ssp.	*Sitta castanea neglecta*	0	D	Frequent
Velvet-fronted Nuthatch (E)	*Sitta frontalis*	0	D	Occasional / local
Great Tit ssp.	*Parus major templorum*	0	D	Occasional
Black Bulbul (br) (E)	*Hypsipetes leucocephalus concolor*	0	?	Uncertain breeding status
Brown Prinia	*Prinia polychroa*	0	D*	Common
Plain Prinia (E)	*Prinia inornata*	0	?	Common
Chestnut-capped Babbler (E)	*Timalia pileata*	0	?	Present
Rufous-winged Bushlark	*Mirafra assamica*	0	D	Common
Asian Golden Weaver (W)	*Ploceus hypoxanthus*	GNT	ARL	Frequent / local
Chinese Francolin (E)	*Francolinus pintadeanus*	0	0	Common
Black-headed Woodpecker	*Picus erythropygius*	0	0	Common
Common Flameback (E)	*Dinopium javanense*	0	0	Common
Rufous-winged Buzzard	*Butastur liventer*	0	0	Common
Golden-fronted Leafbird	*Chloropsis aurifrons*	0	0	Common

English Name	Scientific Name	Global Threat Status	Laos Threat Status	Siem Pang Status
Eurasian Jay	*Garrulus glandarius*	0	0	Occasional
Rufous Treepie	*Dendrocitta vagabunda*	0	0	Frequent
Black-hooded Oriole	*Oriolus xanthornus*	0	0	Common
Common Iora (E)	*Aegithina tiphia*	0	0	Common
Sooty-headed Bulbul (E)	*Pycnonotus aurigaster*	0	0	Common
Scarlet-backed Flowerpecker (E)	*D. cruentatum*	0	0	Frequent
Purple Sunbird	*Nectarinia asiatica*	0	0	Common
Plain-backed Sparrow (E)	*Passer flaveolus*	0	0	Frequent / local

This table is taken from SUFORD (2010; modified after Timmins (2009)) and modified to reflect the status of each species in Western Siem Pang. Status in Western Siem Pang has been derived from the experience of R. J. Timmins, H. L. Wright and D. Buckingham, taking a conciliatory course where experiences differ.

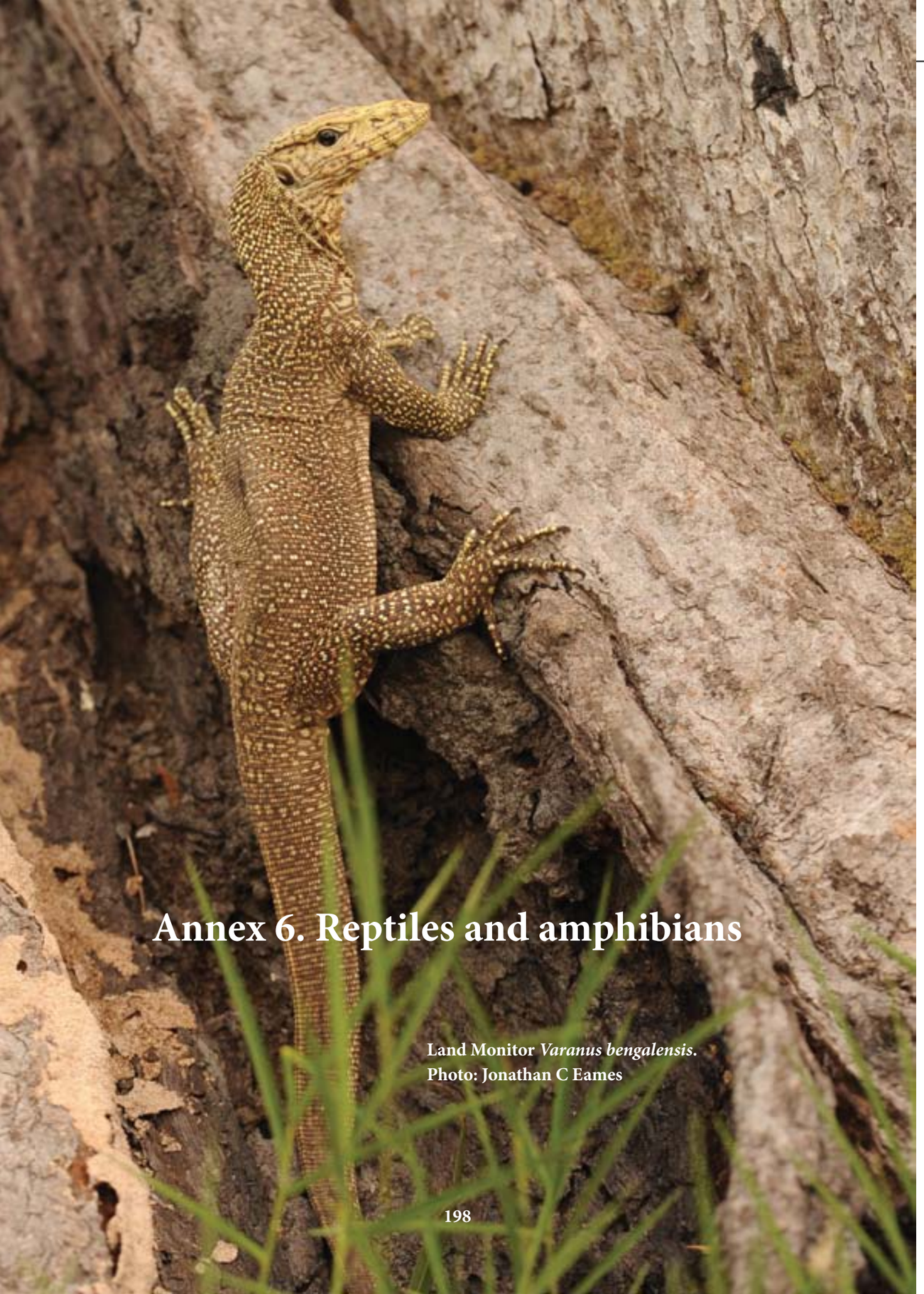
Species notes:
The list is not necessarily exhaustive; there may be other species which are potential indicators of conservation significant Deciduous Dipterocarp Forest. The list was drawn up primarily on the basis of the status of the Laos Deciduous Dipterocarp Forest bird community and many of the species are still widespread and common in Cambodian Deciduous Dipterocarp Forest landscapes.
(W) = associated with wetlands; several of these species are found widely in other habitat types.
(br) = assessment is only for the Deciduous Dipterocarp Forest breeding population; a significant non-breeding visitor population is or may be present for these taxa.
(E) = species occurs widely in other habitats, but population in Deciduous Dipterocarp Forest may be indicative of negative factors operating in that habitat.
(L-) = species has not been recorded in Lao PDR but on grounds of habitat and distribution in neighbouring countries it should occur or have occurred.

Global Threat Status: see 'conventions'.

Laos Threat Status: see 'conventions'. Additionally various reviews have highlighted declines or suspected declines, or otherwise raised concerns for a number of additional species associated with or occurring in Deciduous Dipterocarp Forest, of particular significance is the review of Duckworth (2007), who reviewed the status of the Deciduous Dipterocarp Forest bird communities in Central Laos. Such species are indicated as following: for species indicated 'D**' there are no records north of South Laos suggesting perhaps factors affecting community richness related to latitude (Duckworth *et al.* 1999, Duckworth 2007). For species indicated 'D*' there is demonstrable evidence for population decline and in many cases also range contraction, while for those indicated 'D' the evidence is less clear, although it is suspected that declines have taken place within Deciduous Dipterocarp Forest areas and are continuing (see Duckworth 2007 for Velvet-fronted Nuthatch). For species indicated '?' there is circumspect evidence that the species either has a naturally patchy distribution and or declines have occurred locally, but either way the species is probably a useful indicator of Deciduous Dipterocarp Forest bird community richness. For species indicated 'C' occurrence in Deciduous Dipterocarp Forest landscapes of Cambodia strongly suggest that the lack or paucity of records from similar landscapes in Laos is a reflection of population declines in the latter. Codes 'D*', 'D' and '?' have not incorporate consideration of status in Lao PDR north of the Nam Kading basin because surviving Deciduous Dipterocarp Forests are so converted, degraded and fragmented that even the most robust species have shown major declines. The focus of these codes is to assist in identifying species which are under decline even in the extensive Deciduous Dipterocarp Forests of lowland southern Lao PDR.

Status in Western Siem Pang: ST = for Globally Threatened species and select river and wetland associated species refer to text accounts in the report; otherwise status codes refer to an assessment of the ease with which the species can be detected within Deciduous Dipterocarp Forest of Western Siem Pang during an 'average' day of field survey using a combination of motorbike and foot travel: 'common' a species usually found daily, on most days found multiple times, even when different areas are visited each day; 'frequent' a species found on more than half of days, but not daily; 'occasional' a species found on fewer than half of days even when different areas are visited each day; and 'rare' only a few records from Western Siem Pang. 'Present' is used where status assessment is not clear largely due to methodological constraints of the various surveys that have been undertaken (e.g. nocturnal birds); 'local' indicates species whose status across Western Siem Pang varies significantly, in many cases due to ecological factors.

Taxonomy in the list is based on Inskipp *et al.* (1996) except:
Slender-billed Vulture *Gyps tenuirostris* instead of Long-billed Vulture *G. indicus*
Indian Spotted Eagle *Aquila hastata* instead of Lesser Spotted Eagle *A. pomarina*
White-shouldered Ibis *Pseudibis davisoni* instead of Black Ibis *Pseudibis papillosa*



Annex 6. Reptiles and amphibians

Land Monitor *Varanus bengalensis*.
Photo: Jonathan C Eames

Annex 6. Provisional list of reptiles and amphibians from Western Siem Pang

This list, like those for mammals and plants, should not be used for purposes of comparison with other areas or as an indication of the herpetofauna community present in Western Siem Pang. It is simply an opportunistic list of species recorded during project activities, and may contain misidentifications. Clearly a great many more species than are present in the list occur within Western Siem Pang.

#	English Name	Scientific Name
	Reptiles	
1	Tokay Gecko	*Gekko gecko*
2	Ground skink sp.	*Scincella*
3	Bengal Monitor	*Varanus bengalensis*
4	Water Monitor	*Varanus salvator*
	Snakes	
5	Spectacled Cobra	*Naja naja*
6	Malayan Pit Viper	*Calloselasma rhodostoma*
7	Brown Kukri	*Oligodon purpurascens*
8	Red-necked Keelback	*Rhabdophis subminiatus*
9	Painted Bronzeback	*Dendrelaphis pictus*
10	Paradise Tree Snake	*Chrysopelea paradisi*
11	Reticulated Python	*Python reticulatus*
	Turtles	
10	Elongated Tortoise	*Indotestudo elongata*
11	Southeast Asian Box Turtle	*Cuora amboinensis*
12	Asiatic Softshell Turtle	*Amyda cartilaginea*
13	Giant Asian Pond Turtle	*Heosemys grandis*
14	Asian Stripe-necked Leaf Turtle	*Cyclemys atripons/ pulchristriata*
	Amphibians	
1	Caecilian sp.	*Ichthyophis*
2	Long-toed Frog	*Rana macrodactyla*
3	Common Asian Bull Frog (Malaysian Narrowmouth Frog)	*Kaloula pulchra*
4	Berdmore's Narrow-mouthed Frog	*Microhyla berdmorei*

#	English Name	Scientific Name
5	Ornate Narrow-mouthed Frog	*Microhyla fissipes*
6	Beautiful Narrow-mouthed Frog (Beautiful Pygmy Frog)	*Microhyla pulchra*
7	Three-striped Glass Frog (Striped Slender Frog)	*Rana taipehensis*
8	Paddy Frog (Common Pond Frog)	*Fejevarya limnocharis*
9	Common Tree Frog (White-lipped Tree Frog)	*Polypedates leucomystax*
10	Rugulose Frog (Chinese Edible Frog)	*Hoplobatrachus rugulosus*
11	Truncate-snouted Burrowing Frog	*Glyphoglossus molossus*

Names of amphibians follow Neang Thy and Holden (2008); names used by IUCN (2010) are given in parenthesis where these differ.
Crocodiles, presumably Siamese Crocodile *Crocodylus siamensis,* were once present, but have now probably been extirpated.

Annex 7. Butterflies

Photo: Jonathan C Eames

Annex 7. Butterflies recorded within Western Siem Pang

Source: D. Buckingham

#	English Name	Scientific Name
1	Common Indian Crow	*Euploea core godartii*
2	Common Tiger	*Danaus genutia*
3	Great Orange Tip	*Hebomoia glaucippe*
4	Common Birdwing	*Troides helena*
5	Great Mormon	*Papilio memnon*
6	Orange Emigrant	*Catopsilia scylla*
7	Lime Butterfly	*Papilio demoleus*
8	Blue Pansy	*Junonia orithya ocyale*
9	White Tiger	*Danaus melanippus*
10	Plain Tiger	*Danaus chrysippus*
11	Yellow Orange Tip	*Ixias pyrene*
12	Peacock Pansy	*Junonia almana*
13	White Imperial	*Neomyrina nivea*
14	Grey Pansy	*Junonia atlites*
15	Common Palmfly	*Elymnias hypermnestra*
16	(a judy)	*Abisara abnormis*
17	White-edged Blue Baron	*Euthalia phemius*
18	Common Tit	*Hypolycaena erylus himavantus*
19	Rustic	*Cupha erythmanis*
20	(a lascar)	*Neptis sandaka*
21	Leopard Lacewing	*Cethosia cyane*
22	White Cerulean	*Jamides pura*
23	Clipper	*Parthenis sylvia*
24	Banded Swallowtail	*Papilio demolion*
25	Common Nawab	*Polyura athamas*
26	Knight	*Lebadea martha martha*
27	Great Sergeant	*Athyma larymna*
28	Archduke	*Lexias dirtea toonchai*
29	Tailed Jay	*Graphium agamemnon*
30	Common Bluebottle	*Graphium sarpedon*
31	(a cyclops)	*Erites medura rotundata*
32	Dark Evening Brown	*Melanitis phedima ganapti*
33	Scarce Catseye	*Coelites nothis nothis*
34	Lavender Count	*Tanaecia cocytus*
35	Chocolate Albatross	*Appias lyncida*
36	Common Grass Yellow	*Eurema hecabe*
37	Tawny Rajah	*Charaxes bernardus (polyxena)*
38	(an assyrian)	*Terinos atlita miletum*
39	Common Imperial	*Cheritra freja evansi*
40	Common Yeoman	*Cirrochroa tyche mithila*
41	(a glassy tiger)	*Ideopsis vulgaris*
42	Orange-tail Awl	*Bibasis sena*
43	Common Sailor	*Neptis hylas*
44	Grass Demon	*Udaspes folus*
45	Commander	*Moduza procris procris*
46	Large Snow Flat	*Tagiades gana*
47	(an oakleaf)	*Kallima knyvetti*

BirdLife International is a global conservation network of non-governmental organisations (NGOS), active in more than 100 countries. Together, BirdLife International is the leading authority on the status of birds and their habitats. Over ten million people now support the BirdLife Partnership.

BirdLife International Cambodia Programme works to promote the conservation of biodiversity in the Kingdom of Cambodia. By focusing on birds, and the sites and habitats on which they depend, BirdLife is working to improve the quality of life for birds, for biodiversity, and for people.

Cambodia Programme Office
#9, Street 29 Tonle Basac, Chamkarmon, Phnom Penh
P.O. Box 2686; Phnom Penh, Cambodia
Tel/Fax: (855) 23 993631
Email: admin@birdlifecambodia.org