

CONSERVATION UPDATE

Surveys in 2018 along the Mekong River, northern Kratie province, Cambodia, indicate a decade of declines in populations of threatened bird species

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Introduction

Cambodia is a significant stronghold for several populations of threatened bird species in South-East Asia. Although approaching 20% of Cambodia is protected, important populations of many species of conservation concern remain outside protected areas (Wright *et al.* 2012, Goes 2013). The riverine channels and adjacent terrestrial habitats of the Mekong River, between the towns of Kratie and Stung Treng, are of particular importance for large waterbirds and sandbar-nesting species, and have been designated part of an Important Bird Area (IBA) extending from Kratie north to the Lao PDR border (BirdLife International 2019a). Despite their importance, these habitats have yet to receive any formal protection.

Here we report the results of a recent bird survey in this area which was carried out in the context of a rapid biodiversity assessment of two proposed protected areas for the Critically Endangered Indochinese subspecies of the Hog Deer *Axis porcinus annamiticus*. The area consists of a mixture of dry dipterocarp forest, lowland semi-evergreen forest and wet grasslands, all in varying stages of fragmentation and degradation. The proximity of the Mekong River also makes the area of interest for bird conservation because large waterbirds, such as the Critically Endangered White-shouldered Ibis *Pseudibis davisoni*, may use them for breeding and foraging.

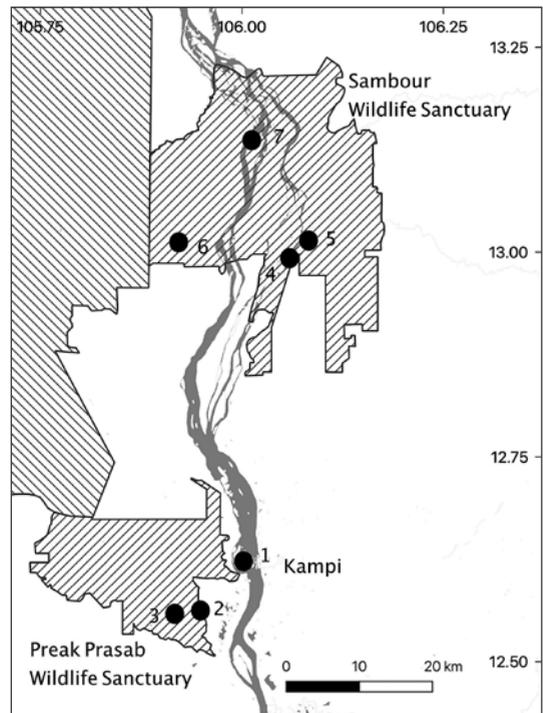
Timmins (2008) carried out three bird surveys from 10 November–2 December 2006, 11 March–7 April 2007 and 29 July–23 August 2007, which focused primarily on riverine and floodplain habitats in the 130 km stretch of the Mekong River between Kratie and Stung Treng. In 2018 we revisited this area, carrying out bird surveys around four base camps between 28 April and 17 May. Our efforts focused primarily on terrestrial habitats in the proposed Hog Deer conservation areas, but two of our camps were located on river islands and on five days we surveyed riverine habitats by boat. Our findings from terrestrial

habitats away from the river supplement the earlier survey work, whilst our observations in riverine areas provide a comparison to the prior surveys.

Study area and methods

Cambodia has a distinct dry season from November to April and a wet season from May to October which influence the distribution of many species because of the changes in water levels between seasons, particularly along the Mekong River and Tonle Sap floodplains. Our survey would normally have corresponded with the start of the wet

Figure 1. Locations visited along the central Mekong River, northern Kratie province, Cambodia, between 28 April and 17 May 2018. Numbers represent the following locations: (1) Kampi river islands; (2) O Spean camp and wet grassland; (3) Chroy Banteay Forestry Triage; (4) Koh Khlab island; (5) O Kak village; (6) Angkor En Community Forest; (7) Khang Lok Krou.



season; however, in May 2018 the rains were late and, although evening thunderstorms were frequent, rainfall was light, with heavy rain on only five nights, and water levels were generally low throughout our survey.

The four base camps and the main survey sites are shown and described in Table 1 and Figure 1. Examples of the habitats we surveyed are shown in Plates 1–4.

The surveys, carried out by JCM and EMS, aimed to cover as much terrain and as many habitats as possible, and began daily shortly after dawn for 4–5 hours, resuming for a further 3–4 hours in the afternoon and evening, weather permitting. When possible, nocturnal surveys were also made. Birds were photographed and sound-recordings made; archives are available at xeno-canto (www.xeno-canto.org) and the Macaulay Library (www.ebird.org). Six mist-nets were set up on 16 May at the O Chorm stream to supplement the audio-visual survey. Birds caught were photographed, measured, checked for moult and

breeding condition, and released. The research team also included herpetologists, mammalogists and entomologists, many of whom observed birds opportunistically during their surveys.

Results

We recorded 219 bird species, including three Endangered, two Vulnerable and 11 Near Threatened species (Appendix 1). Nine species (18 individuals) were captured during mist-netting, all of which were also detected during audio-visual surveys. In addition to accounts of specific species of interest, we report on breeding activity, migration and human interference.

Breeding activity

Active nests of seven species were found: River Tern *Sterna aurantia* incubating at Khang Lok Krou, 7 and 10 May; Little Pratincole *Glareola lactea* incubating, Kampi river islands, 28 and 30 May; Blue-tailed Bee-eater *Merops philippinus* brooding, Kampi river islands, 29 April; Oriental Magpie Robin

Table 1. Locations surveyed along the Mekong River, northern Kratie province, Cambodia, 28 April to 17 May 2018.

The four base camps were at: (A) Koh Prum Moch Rei, a small river island just north of the Kampi deep pool; (B) O Spean stream, about 5 km west of the Mekong near Toul Prich village; (C) Koh Khlab, a large river island in the eastern Mekong channels near O Kak village; and (D) O Chorm stream, about 4.5 km west of the Mekong in the Angkor En Community Forest, near Boeng Char village. Numbers in brackets in the first column refer to locations marked on Figure 1.

Location	Coordinates	Survey dates	Habitat description
Base camp A area			
Kampi river islands (1)	12.618°N 106.001°E	28–30 April	Sandy riverine islands; vegetation ranging from tall trees on the western islands to sandy dunes with tall grasses and shrubs on the eastern islands.
Base camp B area			
O Spean (2)	12.565°N 105.950°E	1–3 May	Abandoned and active ricefields, thickets along a small stream and patches of degraded dry dipterocarp forest. Of particular interest is Tam Nub Thea Reas, an area of wet grassland just south of the camp (12.555°N 105.948°E).
Chroy Banteay Forestry Triage (3)	12.557°N 105.918°E	2–5 May	Disturbed dry dipterocarp forest with a canopy of 8–12 m and evidence of old logging, areas opened for agricultural use and removal of trees for charcoal.
Base camp C area			
Koh Khlab island (4)	13.010°N 106.065°E	6–10 May	Semi-evergreen forest on a river island, with some selective logging, areas opened up for livestock and patches of degraded understory burnt for hunting.
O Kak (5)	13.025°N 106.076°E	7 May	Relatively undisturbed dry dipterocarp forest on eastern bank of the Mekong, with a canopy of 10–12 m.
Khsach Leav village	13.112°N 106.054°E	6 & 11 May	Small riverside village on the east bank that served as our access point for Koh Khlab island; surrounding habitat included disturbed dry dipterocarp forest and agricultural fields.
Base camp D area			
Angkor En Community Forest (6)	13.020°N 105.926°E	11–17 May	Semi-evergreen forest with some evidence of small-scale selective logging on the west bank of the river; just west of our camp was a large active logging concession.
Visited from base camp D			
Khang Lok Krou (7)	13.335°N 105.937°E	7 & 10 May	Sandy riverine island; areas of open sand and dense tall grasses. A River Tern breeding site actively monitored by WWF and WCS.

Copsychus saularis brooding, Kampi river islands, 29 April; White-crested Laughingthrush *Garrulax leucolophus* nest-building, Koh Khlab Island, 9 May; Stripe-throated Bulbul *Pycnonotus finlaysoni* brooding, Angkor En Community Forest, 16 May; and Oriental Paradise Flycatcher *Terpsiphone affinis* incubating, Angkor En Community Forest, 16 May. In addition, on 15 May a female Heart-spotted Woodpecker *Hemicircus canente* was near a nest-hole in the canopy of degraded semi-evergreen forest, Angkor En Community Forest.

During mist-netting, seven species showed extensive brood patches and significant cloacal protuberances: Banded Kingfisher *Lacedo pulchella*, Blue-winged Pitta *Pitta moluccensis*, Streak-eared Bulbul *Pycnonotus blandfordi*, Puff-throated Bulbul *Alphoixus pallidus*, White-crested Laughingthrush, Tickell's Blue Flycatcher *Cyornis tickelliae* and White-rumped Shama *Kittacincla malabarica*.

Migratory passerines

Our survey coincided with the departure of several wintering passerine species from Cambodia, and some of our records slightly extend departure dates published by Goes (2013): Black-naped Oriole *Oriolus chinensis*, one on 10 May, previous latest record 5 May; Red-rumped Swallow *Cecropis daurica*, five on 4 May, previous latest record 17 April; Dusky Warbler *Phylloscopus fuscatus*, 29 April; Oriental Reed Warbler *Acrocephalus orientalis*, 4 May; Thick-billed Warbler *Arundinax aedon*, 3 May; Black-browed Reed Warbler *Acrocephalus bistrigiceps*, 1 May; Bluethroat *Cyanecula svecica*, 3 May; Asian Brown Flycatcher *Muscicapa dauurica*, 30 April, previous latest record 21 April; Red-throated Flycatcher *Ficedula albicilla*, 30 April.

Human interference

The most obvious human impact throughout the area was habitat modification and degradation. Near O Spean, trees in remaining areas of dry dipterocarp forest were being cut down for charcoal production. On Koh Khlab, large areas of understory had been burnt (Plate 3) to clear areas for hunting terrestrial mammals such as deer; patches of forest on the north of the island had been cleared for agriculture and the forest had been selectively logged throughout. Near Angkor En, a logging company was actively building roads and extracting timber (Plate 5). Probably the most obvious direct impact was the collection of birds' eggs and chicks—on Koh Prum Mocha Rei people were digging out Blue-tailed Bee-eater nests to obtain eggs and newly-hatched chicks (Plate 6) and killing adult birds with slingshots. Chick and egg collection on this scale is clearly unsustainable and thus a serious threat, particularly for colonially nesting species on small riverine islands. However, in general, birds seemed to be less directly impacted than other species such as mammals and turtles.

Selected species accounts

Green Peafowl *Pavo muticus* EN

The Green Peafowl has been widely extirpated by habitat conversion and hunting and is now designated Endangered (BirdLife International 2019b). Cambodia remains important for the species, despite dramatic population declines in the last 50 years (Goes 2013). Timmins (2008) found it common in riverine habitats and we recorded it frequently on Koh Khlab, with at least nine individuals present here and on the neighbouring

Plate 1. A small river island north of Kampi deep pool, 29 April 2018.





Plate 2. Dry dipterocarp forest near O Kak village, 6 May 2018.



Plate 3. Tall forest with burned understory on Koh Khlab island, 10 May 2018.



Plate 4. Semi-evergreen forest in Angkor En Community Forest, 13 May 2018.



Plate 5. Logging in a concession near Angkor En Community Forest, 15 May 2018.

island. The species was also seen once in the logging area near Angkor En. Our observations support previous findings that Green Peafowl is relatively common here, but very vulnerable to increasing hunting pressure—cessation of hunting should be a priority for conservation efforts in the area.

Storks Ciconiidae

Cambodia holds important populations of four species of globally threatened stork: the

Plate 6. Harvesting of nests of colony-nesting species, in this case chicks taken from Blue-tailed Bee-eater *Merops philippinus* nests on Koh Prum Mocha Rei island, 29 April 2018.



Endangered Greater Adjutant *Leptoptilos dubius*, Vulnerable Lesser Adjutant *L. javanicus* and Asian Woollyneck *Ciconia episcopus*, and Near Threatened Painted Stork *Mycteria leucocephala*. Timmins (2008) observed all these species, finding Asian Woollyneck ‘frequent to common’ and recording Lesser Adjutant on all his surveys, concluding that there was a sizeable local breeding population which was a significant part of the north and east Cambodian population.

Our results give cause for concern: neither Greater nor Lesser Adjutant were seen, and Asian Woollyneck only three times—one soaring on 5 May at Chhroy Banteay, two on 11 May north of Khsach Leav village, and 12 over the Mekong on 11 May near Koh Khlab. Our only other sighting was of seven Painted Storks on 2 May in the O Spean wet meadows. Storks are usually conspicuous and, although the different methodology and times of year compared with Timmins (2008) could explain the discrepancies, the absence of Lesser Adjutant is worrying: the species breeds colonially and is susceptible to human disturbance at nesting sites, causing very low breeding success, hence disturbance around nesting colonies may have led to a significant decline (BirdLife International 2019c).

White-shouldered Ibis *Pseudibis davisoni* CR

The global population of this Critically Endangered species is estimated to be about 1,000 individuals, with 87–95% in Cambodia (Birdlife International 2019d). Timmins (2008) found the species to be ‘locally common’, with an estimated 78–125 birds between Kratie and Stung Treng. Similarly, Wright *et al.* (2012) estimated that 124 individuals roosted in the same section of the river. We found the species on four occasions—seven flying to roost in trees on a small river island at Kampi on 30 April; three flying over Koh Prum Mocha Rei on 1 May; two feeding in a ricefield east of Angkor En on 14 May; and a guarded nest (Sok *et al.* 2012) with two chicks near Khsach Leav village on 6 and 11 May.

Fish Eagles

Timmins (2008) recorded both Lesser Fish Eagle *Icthyophaga humilis* and Grey-headed Fish Eagle *I. ichthyaetus* on the Mekong, the latter predominating with around 150 sightings between Kratie and Stung Treng. We found Grey-headed Fish Eagle only once, a single bird near Koh Khlab, and did not see a Lesser Fish Eagle. Even allowing for the differences in methodology of the surveys noted previously, this discrepancy is surprising and worrying. Goes (2013) noted that Grey-headed Fish Eagle had declined away from Prek Toal, and BirdLife International (2019e) describe the species as ‘scarce and declining’ in Cambodia. A focused survey of this area is needed to assess the species’s status.

Vultures

The three Cambodian resident vulture species, Red-headed Vulture *Sarcogyps calvus*, White-rumped Vulture *Gyps bengalensis* and Slender-billed Vulture *G. tenuirostris*, are all designated Critically Endangered. Timmins (2008) observed them all in small numbers: Red-headed Vulture, five birds, White-rumped Vulture, three birds, and Slender-billed Vulture, one bird. Despite looking specifically for vultures, none were seen during our survey. A dead cow left out near O Kak village in the first week of May did not attract any vultures, nor had any visited a feeding station set up the previous month.

Great Thick-knee *Esacus recurvirostris* NT

A study in 2010–2012 estimated a Mekong population of about 100 individuals (Goes 2013). We observed only small numbers on the Kampi river islands (Plate 7), up to three on Koh Prum Mocha Rei between 28 April–1 May, one on Khang Lok Krou, 7 and 10 May, and one on 14 May at Sre Chrey village on the western Mekong channel. Given the pressure that we observed on birds nesting in

riverine habitats, we concur with Goes (2013) that this species is probably threatened in this region.

River Lapwing *Vanellus duvaucelii* NT

Timmins (2008) found this species common in the dry season but did not record it in the July–August 2007 wet season. We found notably fewer than Timmins (2008), only three near Koh Khlab and three or four on Khang Lok Krau, 7 and 10 May. The difference may have been because our survey was near the end of the dry season; neither Timmins nor our group found this species around the Kampi river islands.

Spotted Greenshank *Tringa guttifer* EN

The Endangered Spotted Greenshank winters on coastal mudflats in South-East Asia and breeds in eastern Siberia, but its movements between wintering and breeding grounds are poorly understood. We observed a single bird in winter plumage in company with a Common Greenshank *T. nebularia* on a sandbank at Khang Lok Krau on 7 May; its identity was confirmed by S. Mahood (images available on eBird.org). This observation provides further evidence that the Mekong may be a north–south corridor for migratory species and that the riverine habitats may provide important stop-over points for migratory shorebirds (Schwillk & Claassen 2012).

River Tern *Sterna aurantia* NT

River Tern is designated globally Near Threatened (BirdLife International 2019f), with South-East Asia’s population, including Cambodia’s, declining sharply—Timmins (2008) reported that north-east Cambodia supported the last breeding population in the Mekong basin; he estimated that 100 birds

Plate 7. Great Thick-knee *Esacus recurvirostris* on Koh Prum Mocha Rei island, 30 April 2018.



were present on the Mekong between Kratie and Stung Treng but found that many left the area in the wet season, moving south of Kratie town at this time. We only observed River Tern at Khang Lok Krau (Plate 8), where two nests were seen on 7 May, reduced to one by 10 May due to rat predation in the intervening period. A wire mesh enclosure around the nest-site to exclude rats and other terrestrial predators had been erected by a 'tern guardian', a local man hired to live on the island and monitor the nests during the breeding season (Plates 9 & 10). Predation is clearly an issue and the enclosure was not effective; the ongoing effective protection of nests (Sok *et al.* 2012) and nesting islands is vital to the survival of this species in the region.



Plate 8. Adult River Tern *Sterna aurantia* on Khang Lok Krau island, 7 May 2018.

Plate 9. Nesting River Tern showing the ineffective protective fencing, 7 May 2018.



Plate 10. River Tern eggs are especially susceptible to poaching or trampling by humans, 7 May 2018.



Great Hornbill *Buceros bicornis* NT

This species is globally Near Threatened and under threat in Cambodia, where populations outside protected areas are probably fragmented and badly impacted by hunting and loss of nesting trees. Timmins (2008) found the species only on one occasion, two birds near Koh Veng Thom on 19 August 2007, and concluded that it might only be a seasonal or occasional visitor to the area. Similarly, we only observed the species once—a pair in the active logging concession near Angkor En Community Forest on 14 May.

Woodpeckers *Picidae*

Over 20 species have been recorded in the country, but relatively little is known of the precise habitat preferences of so many ecologically similar species. We recorded 13 species of woodpecker, with their habitats noted as follows: Heart-spotted Woodpecker, seen once near a nest-hole in Angkor En (see Breeding Activity); Rufous-bellied Woodpecker *Dendrocopos hyperythrus*, a pair in good dry dipterocarp woodland at O Kak, 7 May; Grey-capped Woodpecker *Picoides canicapillus*, fairly common at Chhroy Banteay, up to seven recorded daily in the canopy of degraded dry dipterocarp forest, and uncommon at Angkor En, one to two recorded on two days, although probably under-detected in the canopy of semi-evergreen forest; Yellow-crowned Woodpecker *Leiopicus mahrattensis*, a pair in good dry dipterocarp forest at O Kak, 7 May; Greater Yellownape *Chrysophlegma flavinucha* and Lesser Yellownape *Picus chlorolophus*, both uncommon in the middle and upper levels of semi-evergreen forest at Angkor En; Laced Woodpecker *P. vittatus*, surprisingly rare, seen once in scattered trees near the O Spean grasslands, 3 May; Streak-throated Woodpecker *P. xanthopygaeus*, seen once in good dry dipterocarp forest at O Kak, 7 May; Black-headed Woodpecker *P. erythropygius*, fairly common in the mid-story and sub-canopy of varied habitats, including degraded and good dry dipterocarp forest, semi-evergreen forest and riverine forest; Black-naped Woodpecker *P. guerini*, uncommon in degraded dry dipterocarp forest and fairly common in riverine forest and semi-evergreen forest, where it was seen from near ground level to the sub-canopy; Common Flameback *Dinopium javanense*, fairly common in open habitat, including degraded and good dipterocarp forest and in widely spaced trees on small river islands, but uncommon in open semi-evergreen forest; Greater Flameback *Chrysocolaptes guttacristatus*, fairly common in the middle and upper levels of riverine forest and upper areas of semi-evergreen forest; Rufous Woodpecker

Micropternus brachyurus, seen twice in open degraded dry dipterocarp forest at Chhroy Banteay, 4 and 5 May. These observations highlight the importance of dry dipterocarp forest as found around O Kak village for several of the more uncommon woodpecker species, such as Rufous-bellied and Yellow-crowned Woodpeckers. Neither of the two largest Cambodian woodpecker species, Great Slaty *Mulleripicus pulverulentus* and White-bellied *Dryocopus javensis* Woodpeckers, were seen during our surveys.

Parakeets *Psittacidae*

Blossom-headed *Psittacula roseata*, Red-breasted *P. alexandri* and Alexandrine *P. eupatria* Parakeets are all designated globally Near Threatened. We found Blossom-headed Parakeet to be common around O Kak village and also saw single birds on Kampi river islands and Chhroy Banteay Forestry Triage, while Red-breasted Parakeet was common at all sites. Alexandrine Parakeet was not recorded during our survey, thus supporting the statement in Goes (2013) that it is the most threatened lowland parakeet in Cambodia.

White-browed Reed Warbler *Acrocephalus tangorum* VU

This species is designated Vulnerable, with loss of preferred wintering habitat in Indochina being one of the reasons for its decline (BirdLife International 2019g). Cambodia is an important wintering ground for the species. We observed up to four White-browed Reed Warbler in the O Spean waist-high wet grassland (Plate 11) on 2–3 May—apparently the first records for Kratie province (Goes 2013).

Green-backed Flycatcher *Ficedula elisae*

The species is a rare vagrant in Cambodia, with three previous autumn records. On 30 April we observed a single female Green-backed Flycatcher foraging in the sub-canopy of a small forested island in the Kampi rivers (12.618°N 105.992°E)—the first spring record and the second record of a female for Cambodia (Goes 2013).

Red Avadavat *Amandava amandava*

The Red Avadavat is dependent on wet grasslands and is of conservation concern in Cambodia, where this habitat has been converted to agriculture. Goes (2013) summarised previous records from Kratie marsh on the Mekong's east bank. On 2 and 3 May we saw up to 16 Red Avadavat foraging in the wet grasslands near O Spean, apparently a new site for this species—a further reason for the protection of this and other small patches of wet grassland.



Plate 11. White-browed Reed Warbler *Acrocephalus tangorum* in wet grassland, 3 May 2018.

Mekong Wagtail *Motacilla samveasnae* NT

Timmins (2008) found Mekong Wagtail ‘relatively abundant’ in this area, a stronghold of the species. Similarly, we encountered up to six daily in the appropriate habitat around the Kampi river islands and observed two birds on trips between Koh Khlab and Khang Lok Krou on 7 May.

Species not recorded

In addition to comments above about species recorded by Timmins (2008) but not seen during the 2018 survey, there have been very occasional records of the Critically Endangered Giant Ibis *Pseudibis gigantea* from the dry forest habitats in the area (Sok Ko pers. comm.) but there were no reports of this species during our survey. Likewise, the Endangered Masked Finfoot *Heliopais personatus* was observed once, in March 2007 (Timmins 2008), but was not seen by our team. Streaked Weaver *Ploceus manyar* and the Near Threatened Asian Golden Weaver *P. hypoxanthus*, both under threat in Cambodia, could potentially occur in habitats found in this region but were not found in either the 2006–2007 or 2018 surveys—although Timmins (2008) found both species at a single location which we did not visit.

Discussion

Our results highlight the apparent decline of several threatened species since the surveys of Timmins (2008). The very low numbers of Grey-headed Fish Eagle and the absence of vultures and Lesser Adjutant are notable and suggest the need for a more thorough evaluation.

Timmins (2008) hypothesised that the habitats further from the Mekong would be of relatively low conservation significance for birds, both because they were similar to those found over large areas of north and east Cambodia and because the region is already home to a relatively high human population, making it unlikely to hold species that are sensitive to human persecution. Our results overall support this, all the forest species we encountered are widespread in northern Cambodia, and species most sensitive to human disturbance were either absent, e.g. Giant Ibis and Sarus Crane *Antigone antigone*, or only present in low numbers, e.g. Great Hornbill. An exception was the wet grassland (Plate 12) south of O Spean (12.555°N 105.948°E), important for the remaining populations of Hog Deer and where we found the Vulnerable White-browed Reed Warbler and Red Avadavat. Habitat loss (Plate 13) is a major driver of the declines of both species in Cambodia, further highlighting the importance of protecting patches of wet grassland, which may also be wintering habitat for the Critically Endangered Yellow-breasted Bunting *Emberiza aureola*. Protecting wet grassland from conversion to agriculture should be a top conservation priority in the proposed Preak Prasab Wildlife Sanctuary.

Our findings also confirm the importance of conserving good quality dry dipterocarp forest for White-shouldered Ibis and other species. We found that the area around O Kak contained the highest quality dry dipterocarp forest that we encountered during our surveys and it certainly merits protection (Plate 2).

A 2009 assessment by BirdLife International concluded that the areas covered by this survey, particularly those contiguous with the river, are under serious threat, in poor condition, and that little action has been taken to remedy these problems (BirdLife International 2019a). Our observations support this assessment. Specific threats to birds encountered during the survey were: habitat degradation through the rapid expansion of selective logging for charcoal production and hardwood harvesting; habitat destruction and fragmentation caused by agricultural expansion, e.g. rubber and cashew plantations; and poaching, including nest harvesting and hunting of adults of riverine island and colonial-nesting species. Finally, the proposed dams on the Mekong, if approved, would destroy important riverine habitat and dramatically change the water regimes downriver (International Rivers 2014).

Cagebird trade

Elsewhere in South-East Asia, trapping for the cagebird trade has decimated Common Hill Myna



Plate 12. Wet grasslands near O Spean creek, 3 May 2018.



Plate 13. Ploughed wet grassland for conversion to agricultural fields near O Spean, 2 May 2018.

Gracula religiosa and White-rumped Shama populations, leading to local extinctions. Although both species were being kept as pets in Kratie, trapping pressure is apparently low in this region as White-rumped Shama was common or fairly common in all locations with suitable habitat, including O Spean creek, where it was common despite the proximity of a fairly large town with significant levels of human activity. Likewise, Common Hill Myna was common and conspicuous in semi-evergreen forest at Angkor En.

Ecotourism potential

The Kampi river islands are already known to birdwatchers looking for Mekong Wagtail. Highlighting the fact that White-shouldered Ibis occurs in the area, and that White-browed Reed Warbler may be seen in winter on a day trip

from Kratie, would potentially help to expand bird ecotourism at this site. A visit to the dry dipterocarp forest near O Kak village provides an excellent opportunity to look for woodpeckers, while the Green Peafowl present on Koh Khlab make this site interesting as well.

Conservation recommendations

We have four recommendations for avian conservation in the area: 1) protect areas of critically important wetland habitat—riverine areas and wet grasslands; 2) continue targeted nest protection for White-shouldered Ibis, River Tern and other species; 3) a more thorough re-survey of Timmins's 2006–2007 study to reassess populations of large waterbirds; and 4) prevent hunting of species such as Green Peafowl and the trapping of birds for the pet trade.

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Appendix 1

Species observed during surveys along the Mekong River, northern Kratie province, Cambodia, 28 April–17 May 2018.

Key: numbered columns are the following locations: 1) Kampi river islands; 2) O Spean camp and the wet grasslands; 3) Chroy Banteay Forestry Triage; 4) Koh Khlab island; 5) dry dipterocarp forest around O Kak and Khsach Leav villages; 6) Angkor En Community Forest; 7) Khang Lok Krou. Relative abundance codes: c = common, > 10 individuals per day; f = fairly common, 4–10 individuals per day; u = uncommon, 1–3 per day; and r = rare, < 1 per day.

For globally threatened species, Red List status are shown: NT = Near Threatened, VU = Vulnerable, EN = Endangered, CR = Critically Endangered.

Species	1	2	3	4	5	6	7	Species	1	2	3	4	5	6	7
Lesser Whistling Duck <i>Dendrocygna javanica</i>	f	f		u				sparrowhawk <i>Accipiter</i> sp.			u	u		u	
Indian Spot-billed Duck <i>Anas poecilorhyncha</i>	f	f				c		Brahminy Kite <i>Haliastur indus</i>				r			u
Green-legged Partridge <i>Arborophila chloropus</i>						u		Grey-headed Fish Eagle <i>Icthyophaga ichthyaetus</i> NT							
Green Peafowl <i>Pavo muticus</i> EN				f		r		White-breasted Waterhen <i>Amaurornis phoenicurus</i>	u	f				r	
Chinese Francolin <i>Francolinus pintadeanus</i>		f	f	f				Watercock <i>Gallicrex cinerea</i>		u					
Red Junglefowl <i>Gallus gallus</i>				f		u		Purple Swampphen <i>Porphyrio porphyrio indicus</i> (Note 2)			r				
Siamese Fireback <i>Lophura diardi</i>					r			Great Thick-knee <i>Esacus recurvirostris</i>	u				r	u	
Asian Openbill <i>Anastomus oscitans</i>		u						Pacific Golden Plover <i>Pluvialis fulva</i>						r	
Asian Woollyneck <i>Ciconia episcopus</i> VU		r	u	u				River Lapwing <i>Vanellus duvaucelii</i> NT							f
Painted Stork <i>Mycteria leucocephala</i> NT		u						Red-wattled Lapwing <i>Vanellus indicus</i>			f	f	f	u	
Little Cormorant <i>Microcarbo niger</i>	c	c				c		Little Ringed Plover <i>Charadrius dubius</i>		f		u		c	
Indian Cormorant <i>Phalacrocorax fuscicollis</i>	f							Red-necked Stint <i>Calidris ruficollis</i> NT (Note 3)							r
Oriental Darter <i>Anhinga melanogaster</i> NT	c	c				c		snipe <i>Gallinago</i> sp. (Note 4)			r				
Spot-billed Pelican <i>Pelecanus philippensis</i> NT	r							Common Sandpiper <i>Actitis hypoleucos</i>	u						
Yellow Bittern <i>Ixobrychus sinensis</i>	u	r						Common Greenshank <i>Tringa nebularia</i>							r
Cinnamon Bittern <i>Ixobrychus cinnamomeus</i>	r	u						Spotted Greenshank <i>Tringa guttifer</i> EN							r
Black Bittern <i>Ixobrychus flavicollis</i>	u	f						Barred Buttonquail <i>Turnix suscitator</i>		f	f	f	r		
Grey Heron <i>Ardea cinerea</i>	u					c		Oriental Pratincole <i>Glareola maldivarum</i>		f					
Purple Heron <i>Ardea purpurea</i>	u	f				u		Little Pratincole <i>Glareola lactea</i>	c						c
Great Egret <i>Ardea alba</i>		f				u		Caspian Tern <i>Hydroprogne caspia</i>							u
Intermediate Egret <i>Ardea intermedia</i>	u	r						Whiskered Tern <i>Chlidonias hybrida</i>							u
Little Egret <i>Egretta garzetta</i>	u		r	u				River Tern <i>Sterna aurantia</i> NT							c
Cattle Egret <i>Bubulcus ibis</i>	c		c					Red Turtle Dove <i>Streptopelia tranquebarica</i>	f	c	c				
Chinese Pond Heron <i>Ardeola bacchus</i>	r							Eastern Spotted Dove <i>Streptopelia chinensis</i>	f	c	c	u	f		
Javan Pond Heron <i>Ardeola speciosa</i>	r							Grey-capped Emerald Dove <i>Chalcophaps indica</i>				r	f		
pond heron <i>Ardeola</i> sp. (Note 1)	c	c						Zebra Dove <i>Geopelia striata</i>	u	f	c		f		
Green-backed Heron <i>Butorides striata</i>	c					u		Orange-breasted Green Pigeon <i>Treron binctus</i>		r					
Black-crowned Night Heron <i>Nycticorax nycticorax</i>	u		u					Thick-billed Green Pigeon <i>Treron curvirostra</i>				f	f		
White-shouldered Ibis <i>Pseudibis davisoni</i> CR	f		r	r				Yellow-footed Green Pigeon <i>Treron phoenicopterus</i>			u	c	r		
Osprey <i>Pandion haliaetus</i>	u					u		Green Imperial Pigeon <i>Ducula aenea</i>				f	r	f	u
Black-winged Kite <i>Elanus caeruleus</i>		f	u					Greater Coucal <i>Centropus sinensis</i>	f	f	c	u	f		
Crested Honey Buzzard <i>Pernis ptilorhynchus</i>				u	u			Lesser Coucal <i>Centropus bengalensis</i>	u	c	c				
Black Baza <i>Aviceda leuphotes</i>				u	u			Green-billed Malkoha <i>Phaenicophaeus tristis</i>	r	u	u	u			
Crested Serpent Eagle <i>Spilornis cheela</i>		u	f	f				Western Koel <i>Eudynamis scolopaceus</i>	u	u	f	u	u		
Rufous-winged Buzzard <i>Butastur liventer</i>	r		r	u				Banded Bay Cuckoo <i>Cacomantis sonneratii</i>				r			
Shikra <i>Accipiter badius</i>	u		u	u				Plaintive Cuckoo <i>Cacomantis merulinus</i>	r	u	u				
								Square-tailed Drongo Cuckoo <i>Sumiculus lugubris</i>							u
								Indian Cuckoo <i>Cuculus micropterus</i>					u		
								Himalayan Cuckoo <i>Cuculus saturatus</i> (Note 5)				r	u		
								Common Barn Owl <i>Tyto alba</i>		r					
								Oriental Bay Owl <i>Phodilus badius</i>				r			
								Collared Scops Owl <i>Otus lettia</i>	r						u

Species	1	2	3	4	5	6	7	Species	1	2	3	4	5	6	7
Brown Fish Owl <i>Ketupa zeylonensis</i>	u					r		Freckle-breasted Woodpecker	f	u	u				
Spotted Owlet <i>Athene brama</i>						r		<i>Dendrocopos analis</i>							
Asian Barred Owlet <i>Glaucidium cuculoides</i>						f	u	Collared Falconet <i>Microhierax caerulescens</i>			r		r		
Collared Owlet <i>Glaucidium brodiei</i>							r	Blossom-headed Parakeet	r	r		c			
Horsfield's Frogmouth							r	<i>Psittacula roseata</i> NT							
<i>Batrachostomus javensis</i>								Red-breasted Parakeet	c	c	c	c	c	c	f
Great Eared Nightjar <i>Lyncornis macrotis</i>						r	u	<i>Psittacula alexandri</i> NT							
Large-tailed Nightjar <i>Caprimulgus macrurus</i>	u	u	u				u	Vernal Hanging Parrot <i>Loriculus vernalis</i>	r		r		u		
Brown-backed Needletail							c	Banded Broadbill <i>Eurylaimus harterti</i>						u	
<i>Hirundapus giganteus</i>								Blue-winged Pitta <i>Pitta moluccensis</i>		u	u		f		
large swift <i>Hirundapus</i> sp.						u	u	Golden-bellied Gerygone <i>Gerygone sulphurea</i>	f						
dark swiftlet <i>Aerodramus</i> sp. (Note 6)	c	c	c	f		f		Common Woodshrike			u		f		
Asian Palm Swift <i>Cypsiurus balasiensis</i>	f	c	c	f		r	r	<i>Tephrodornis pondicerianus</i>							
Crested Treeswift <i>Hemiprocne coronata</i>				c	u	c	r	Bar-winged Flycatcher-shrike				u	u		
Common Hoopoe <i>Upupa epops</i>	u	u	f	r	f			<i>Hemipus picatus</i>							
Great Hornbill <i>Buceros bicornis</i> NT							r	Common Iora <i>Aegithina tiphia</i>	u	c	c	u	f	u	
Oriental Pied Hornbill	u			c		f	u	Small Minivet <i>Pericrocotus cinnamomeus</i>		u	f		c		
<i>Anthracoceros albirostris</i>								Scarlet Minivet <i>Pericrocotus flammeus</i>			r				
Banded Kingfisher <i>Lacedo pulchella</i>							r	Large Cuckooshrike <i>Coracina javensis</i>					f	u	
Stork-billed Kingfisher <i>Pelargopsis capensis</i>	u			u			u	Indochinese Cuckooshrike <i>Lalage polioptera</i>		u					
White-throated Kingfisher	u	r	r				r	Brown Shrike <i>Lanius cristatus</i>		u					
<i>Halcyon smyrnensis</i>								Burmese Shrike <i>Lanius colluriooides</i>			c		f		
Pied Kingfisher <i>Ceryle rudis</i> (Note 7)	f						f	White-bellied Erpornis <i>Erpornis zantholeuca</i>				u	r		
Blue-bearded Bee-eater <i>Nyctornis athertoni</i>							r	Black-naped Oriole <i>Oriolus chinensis</i>				r			
Asian Green Bee-eater <i>Merops orientalis</i>				c	f		f	Black-hooded Oriole <i>Oriolus xanthornus</i>				f	f	u	
Blue-tailed Bee-eater <i>Merops philippinus</i>	c	r					c	Black Drongo <i>Dicrurus macrocercus</i>	u	u	u				
Chestnut-headed Bee-eater	f			f	r	u	c	Ashy Drongo <i>Dicrurus leucophaeus</i>			f		u		
<i>Merops leschenaulti</i>								Bronzed Drongo <i>Dicrurus aeneus</i>				u	u		
Indian Roller <i>Coracias benghalensis</i>				u	c		c	Hair-crested Drongo <i>Dicrurus hottentottus</i>						f	f
Oriental Dollarbird <i>Eurystomus orientalis</i>							r	Greater Racquet-tailed Drongo			r	c	u	c	
Coppersmith Barbet	f						u	<i>Dicrurus paradiseus</i>							
<i>Psilopogon haemacephalus</i>								Sunda Pied Fantail <i>Rhipidura javanica</i>	c	f					
Blue-eared Barbet <i>Psilopogon cyanotis</i>						f	u	White-browed Fantail <i>Rhipidura aureola</i>			f		f		
Green-eared Barbet <i>Psilopogon faiostrictus</i>							u	Black-naped Monarch <i>Hypothymis azurea</i>				c	c		
Lineated Barbet <i>Psilopogon lineatus</i>						f	f	Oriental Paradise Flycatcher						u	
Heart-spotted Woodpecker							r	<i>Terpsiphone affinis</i>							
<i>Hemicircus canente</i>								Eurasian Jay <i>Garrulus glandarius</i>					r		
Greater Flameback						u	u	Red-billed Blue Magpie			u	u	u		
<i>Chrysocolaptes guttacristatus</i>								<i>Urocissa erythrorhyncha</i>							
Common Flameback <i>Dinopium javanense</i>	u	u	u			u	r	Rufous Treepie <i>Dendrocitta vagabunda</i>						u	
Rufous Woodpecker <i>Micropternus brachyurus</i>						u		Racquet-tailed Treepie <i>Crypsirina temia</i>	f	f	f		u	r	
Greater Yellownape							u	Large-billed Crow <i>Corvus macrorhynchos</i>	u		u		u		
<i>Chrysophlegma flavinucha</i>								Horsfield's Bushlark <i>Mirafra javanica</i> (Note 8)		c					
Lesser Yellownape <i>Picus chlorolophus</i>							u	Indochinese Bushlark <i>Mirafra erythrocephala</i>	u	c		f			
Streak-throated Woodpecker							r	Asian Plain Martin <i>Riparia chinensis</i> (Note 9)	c						
<i>Picus xanthopygaeus</i>								Barn Swallow <i>Hirundo rustica</i>	c	u	u				
Laced Woodpecker <i>Picus vittatus</i>						r		Wire-tailed Swallow <i>Hirundo smithii</i> (Note 10)							u
Black-naped Woodpecker <i>Picus guerini</i>						u	u	Red-rumped Swallow <i>Cecropis daurica</i>				u			
Black-headed Woodpecker						r	f	Burmese Nuthatch <i>Sitta neglecta</i>			u		f		
<i>Picus erythrogygius</i>								Black-headed Bulbul <i>Brachypodius atriceps</i>			r		f		
Grey-capped Woodpecker						f	u	Black-crested Bulbul <i>Pycnonotus flaviventris</i>				f	c		
<i>Picoides canicapillus</i>								Sooty-headed Bulbul <i>Pycnonotus aurigaster</i>	c	c		c			
Yellow-crowned Woodpecker							u	Stripe-throated Bulbul <i>Pycnonotus finlaysoni</i>		u	f		c		
<i>Leiopicus mahrattensis</i>								Yellow-vented Bulbul <i>Pycnonotus goiavier</i>	c	c	u				
Rufous-bellied Woodpecker							u	Streak-eared Bulbul <i>Pycnonotus blandfordi</i>	c	f	f	f	f		
<i>Dendrocopos hyperythrus</i>								Puff-throated Bulbul <i>Alophoixus pallidus</i>						u	

Species	1	2	3	4	5	6	7	Species	1	2	3	4	5	6	7
Grey-eyed Bulbul <i>Iole propinqua</i>						u		White-rumped Shama <i>Kittacincla malabaricus</i>	f	r	f				c
Dusky Warbler <i>Phylloscopus fuscatus</i>	r							Tickell's Blue Flycatcher <i>Cyornis tickelliae</i>		f	f	f			
Thick-billed Warbler <i>Arundinax aedon</i>		r						Bluethroat <i>Cyanecula svecica</i>		u					
Black-browed Reed Warbler <i>Acrocephalus bistrigiceps</i>	f							Green-backed Flycatcher <i>Ficedula elisae</i>	r						
White-browed Reed Warbler <i>Acrocephalus tangorum</i> VU		u						Red-throated Flycatcher <i>Ficedula albicilla</i>	r						
Oriental Reed Warbler <i>Acrocephalus orientalis</i>	f	f	u					Pied Bushchat <i>Saxicola caprata</i>		c	c		u		
Pallas's Grasshopper Warbler <i>Locustella certhiola</i>		r						Common Hill Myna <i>Gracula religiosa</i>							f
Zitting Cisticola <i>Cisticola juncidis</i>		u						Black-collared Starling <i>Gracupica nigricollis</i>			r		r		
Golden-headed Cisticola <i>Cisticola exilis</i>		c	f					Chestnut-tailed Starling <i>Sturnia malabarica</i>	c	u	f				
Common Tailorbird <i>Orthotomus sutorius</i>			u	r		u		Common Myna <i>Acridotheres tristis</i>		u				u	
Dark-necked Tailorbird <i>Orthotomus atrogularis</i>	c	f		c		c		Burmese Myna <i>Acridotheres burmannicus</i>						u	
Brown Prinia <i>Prinia polychroa</i>			c		c			Great Myna <i>Acridotheres grandis</i>		c	f	c		u	
Rufescent Prinia <i>Prinia rufescens</i>						f		Blue-winged Leafbird <i>Chloropsis moluccensis</i>				r			
Grey-breasted Prinia <i>Prinia hodgsonii</i>		f	f		f			Golden-fronted Leafbird <i>Chloropsis aurifrons</i>				u	u	f	
Yellow-bellied Prinia <i>Prinia flaviventris</i>	c	f	r					Thick-billed Flowerpecker <i>Dicaeum agile</i>						u	
Plain Prinia <i>Prinia inornata</i>		f	r					Scarlet-backed Flowerpecker <i>Dicaeum cruentatum</i>		f					u
Chestnut-capped Babbler <i>Timalia pileata</i>		u						Ruby-cheeked Sunbird <i>Chalcoparia singalensis</i>		r	u			u	
Pin-striped Tit Babbler <i>Mixornis gularis</i>		c		c		c		Purple Sunbird <i>Cinnyris asiaticus</i>			u	f	r	f	f
Puff-throated Babbler <i>Pellorneum ruficeps</i>						f		Olive-backed Sunbird <i>Cinnyris jugularis</i>		u	u	u	r	u	f
Abbott's Babbler <i>Malacocincla abbotti</i>				u				Crimson Sunbird <i>Aethopyga siparaja</i>							f
White-crested Laughingthrush <i>Garrulax leucolophus</i>			f		c			Eastern Yellow Wagtail <i>Motacilla tschutschensis</i>							u
Asian Fairy Bluebird <i>Irena puella</i>						u		Mekong Wagtail <i>Motacilla samveasnae</i> NT	f						f
Dark-sided Flycatcher <i>Muscicapa sibirica</i>	u							Paddyfield Pipit <i>Anthus rufulus</i>			c	u			u
Asian Brown Flycatcher <i>Muscicapa dauurica</i>	u							Plain-backed Sparrow <i>Passer flaveolus</i>	f	u	f				
Oriental Magpie Robin <i>Copsychus saularis</i>	c	u	f			u	u	Baya Weaver <i>Ploceus philippinus</i>		f	c	u			
								Red Avadavat <i>Amandava amandava</i>			f				
								White-rumped Munia <i>Lonchura striata</i>	f	u	u				
								Scaly-breasted Munia <i>Lonchura punctulata</i>	c	c					c

Notes

- Both Chinese Pond Heron *Ardeola bacchus* and Javan Pond Heron *A. speciosa* occur in the area. We saw pond heron spp. in non-breeding plumage on the Kampi river islands and O Spean wet grasslands. Chinese and Javan Pond Heron in breeding plumage were seen in O Spean grasslands on 2 May.
- Taxonomy of the Purple Swamphen *Porphyrio porphyrio* complex is under debate. Several taxa are thought by some to be separate species based on plumage, but evidence is conflicting; further research is needed (Eaton *et al.* 2016).
- The Red-necked Stint *Calidris ruficollis* is a widespread winter visitor and passage migrant in Cambodia, but with few previous records from Kratie province (Goes 2013). We observed a single individual on Khang Lok Krau on 7 May.
- On 4 May we flushed a single snipe *Gallinago* sp. from a wet pasture near O Spean. Recordings of the flight call suggested that it was probably a Pintail Snipe *G. stenura*. Snipe are regular winter visitors to Cambodia, but this record is later than the previous latest spring date for Pintail Snipe (25 April) and Common Snipe *G. gallinago* (16 April).
- The taxonomy of migratory Asian cuckoos *Cuculus* spp. remains debated, with some recognising Himalayan Cuckoo *C. saturatus* and Oriental Cuckoo *C. optatus* as separate species, whilst others consider them as races of *C. saturatus*. Identification of non-vocal birds in the field may be impossible (Lindholm & Linden 2007), but the taxa apparently differ in their wintering distribution, with *saturatus* more likely to occur in Cambodia. Individuals were seen once in the dry dipterocarp forest at O Kak village and once feeding on Koh Khlab. Here we follow Goes (2013) in identifying them as *saturatus* on the basis of distribution.
- The identification of dark plumage swiftlets *Aerodramus* spp. in Cambodia has been complicated by the import of White-nest Swiftlets *A. fuciphagus* for swiftlet nest farming (Poole 2010). This species is often indistinguishable from the native Germain's Swiftlet *A. germani* in the field (Goes 2013). We frequently observed dark swiftlets *Aerodramus* spp. at our camp locations and follow Goes (2013) in not assigning them to species.
- The Mekong channels are one of two population strongholds for Pied Kingfisher *Ceryle rudis* in Cambodia (Goes 2013). Timmins (2008) found it to be relatively common and we also found it fairly common around the Kampi river islands, with up to 12 seen daily. However, further north, on the channels between Koh Khlab and Khang Lok Krau, it was uncommon, with only one or two birds seen during 45 km of river travel.
- The widespread Horsfield's Bushlark *Mirafra javanica* is known in Cambodia only from a few locations in Kratie province. We found it fairly common in wet grasslands near O Spean, apparently a new location (Goes 2013).
- Timmins (2008) saw Asian Plain Martin *Riparia chinensis* nesting colonies on the Kampi river islands and in the Koh Preal area—the only known breeding sites in Cambodia. We also found up to 50 individuals near a potential nest site on the Kampi river islands on 28 April; small flocks of 6–12 were seen daily on Koh Prum Mocha Rei.
- Wire-tailed Swallow *Hirundo smithii* is local in Cambodia, with the rocky channels between Kratie and Stung Treng being an important nesting area, although Timmins (2008) estimated less than 100 individuals there. We only observed one to two Wire-tailed Swallows on three occasions during two river trips between Koh Khlab and Khang Lok Krau on 7 and 10 May.