

## FIRST RECORDS OF WHITE-BROWED CRAKE (*PORZANA CINEREA*) FOR LAOS AND ITS CURRENT RANGE IN SOUTHEAST ASIA

J. W. DUCKWORTH<sup>1,3</sup> AND T. D. EVANS<sup>2</sup>

**ABSTRACT.**—All historical records of White-browed Crake (*Porzana cinerea*) in mainland Southeast Asia were south of the Isthmus of Kra, suggesting a Sundaic distribution. The first records from continental Thailand, Cambodia, Vietnam, and Laos revise the known resident distribution north almost to China. Information is inadequate to assess whether the species was historically overlooked across this huge area, or has genuinely expanded its range. Several factors suggest the latter, a pattern shown by no other bird species, and surprising given the pressing threats faced by wetlands and rallids in Southeast Asia. Received 16 November 2005. Accepted 3 September 2006.

The White-browed Crake (*Porzana cinerea*) inhabits well-vegetated lowland non-flowing wetlands from Southeast Asia east through New Guinea and Australia to Polynesia (Taylor 1996, 1998). Historical records in mainland Southeast Asia are from Malaysia, Singapore, and Thailand south of 8° N (Robinson and Chasen 1936) or “south of the Isthmus of Kra [~10° 30' N]” (Deignan 1963). On 5, 8, and 11 March 2000, TDE (Robson 2000) discovered this crake (up to three birds) in Laos, at Nong Pen, Vientiane Municipality. JWD conducted 12 monthly boat-based surveys in this area in a 20-month period: December 2003; February, April through June, and August through November 2004; and January, March, and July 2005, and found the White-browed Crake to be resident. The species is distinctive and observations were often close, prolonged, and in good light. The diagnostic white supercilium was conspicuous even on birds seen only in flight, allowing many flushed birds to be identified. The objective of this paper is to describe observations at Nong Pen, Laos and discuss recent distributional records of the White-browed Crake in Southeast Asia.

### OBSERVATIONS

Nong Pen (Fig. 1) expands greatly in area and depth during the wet season (May–Oct)

from its dry-season area of ~500 ha. Its water surface is mostly vegetated with lotus (*Nelumbo nucifera*). Smaller-stemmed and -leaved species, commonly including the aquatic fern *Salvinia cucullata* and the dicotyledon *Ludwigia adscendens* (both native to Laos: Carlsson et al. 2004b) form thick floating mats. Two invasive exotics, water-hyacinth (*Eichhornia crassipes*) and water-lettuce (*Pistia stratiotes*), are not yet present; the former abounds in some Vientiane sites, the latter less so. In the shallower parts of Nong Pen are many beds of emergent grasses and sedges. Non-native giant mimosa (*Mimosa pigra*) infests much of the margin. Plant growth is rapid from May onwards, giving much of the lake a dense swampy nature, which lasts well into the dry season. In December, vegetation starts to die back, and heavy human collection of plant and animal material (for food), much from wooden canoe, destroys much of the macrophyte growth. By February 2004 there was little cover and in April 2004 and March 2005, there was none on the lake itself. The floating mats were thin and compacted, with no projecting stalks; the out-of-water lotus persisted only as many dead, leafless, stalks, and marginal vegetation was trampled and grazed by water buffaloes (*Bubalus bubalis*).

Each morning visit during 2003–2005 involved 2 hrs in a wooden canoe, specifically searching for skulking marsh birds such as rails. White-browed Crakes were seen in all months except April (3 Jan 2005, five birds; 16 Feb 2004, nine; 6 Mar 2005, one; 5 Apr 2004, zero; 14 May 2004, three; 7 Jun 2004, three; 8 Jul 2005, eight; 26 Aug 2004, five;

<sup>1</sup> J. W. Duckworth, East Redham Farm, Pilning, Bristol BS35 4JG, United Kingdom.

<sup>2</sup> T. D. Evans, Cambodia Program, Wildlife Conservation Society, P. O. Box 1620, Phnom Penh, Cambodia.

<sup>3</sup> Corresponding author; e-mail: boonhom@ocellata.com and wcswill@myanmar.com.mm



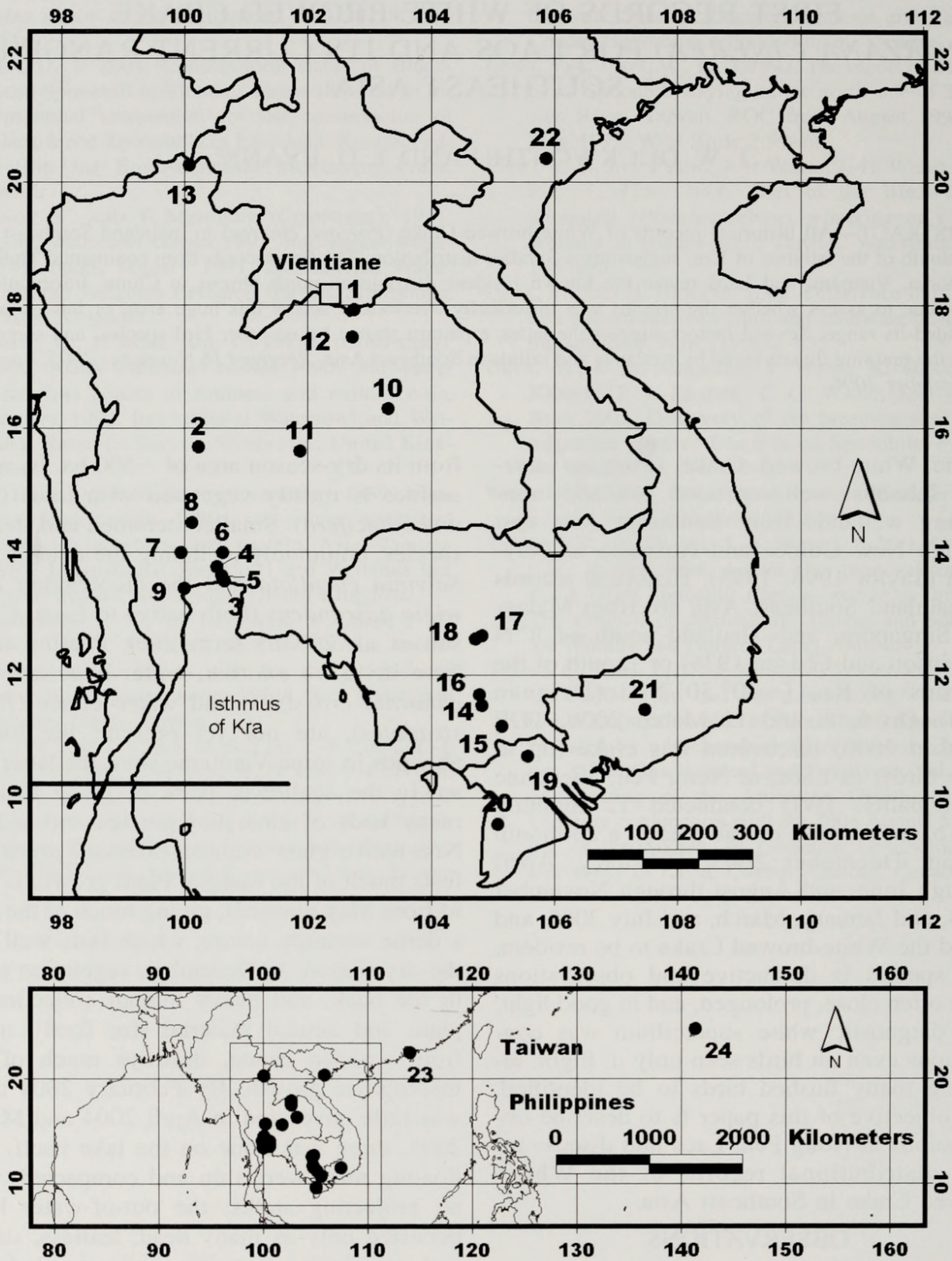


FIG. 1. Locality records of White-browed Crake from non-Sundaic mainland Asia. 1. Nong Pen (17° 55–56′ N, 102° 45′ E). 2. Bung Buraphet (15° 42′ N, 100° 14′ E). 3. Bang Pu (13° 31′ N, 100° 39′ E). 4. Nong Khaem (13° 45′ N, 100° 31′ E). 5. Khlong Bang Kaew (13° 22′ N, 100° 22′ E). 6. Rangsit (13° 59′ N, 100° 37′ E). 7. Kamphaengsaen (13° 59′ N, 99° 57′ E). 8. Suphanburi (14° 28′ N, 100° 07′ E). 9. Samut Songkram (13° 24′ N, 100° 00′ E). 10. Bung Nong Bua (Maha Sarakham Province, 16° 19′ N, 103° 18′ E). 11. Nong Lahan (Chaiyaphum Province, 15° 38′ N, 101° 53′ E). 12. Nong Samrong (Udon Thani Province, 17° 28′ N, 102° 43′ E). 13. Nong Bong Khai (near Chiang Saen, 20° 16′ N, 100° 05′ E). 14. Unnamed site north of Phnom Penh (11° 30′ N, 104° 50′ E). 15. Bassac Marsh (11° 10′ N, 105° 09′ E). 16. Basset Marsh (also known as Lac Samroung; 11° 41′ N, 104° 47′ E). 17. Kruos Kraom (12° 38′ N, 104° 49′ E). 18. Veal Srangai (12° 35′ N, 104° 43′ E). 19. Tram Chim National Park (10° 41′ N, 105° 34′ E). 20. U Minh Thuong National Park (9° 35′ N, 105° 05′ E). 21. Cat Tien National Park (11° 26′ N, 107° 28′ E). 22. Van Long Nature Reserve (20° 23′ N, 105° 52′ E). 23. Mai Po (22° 30′ N, 114° 3′ E). 24. Volcano Islands (24° 47′ N, 141° 20′ E).



14 Sep 2004, two; 8 Oct 2004, one; 7 Dec 2003, three), although the sole bird seen in November (17 Nov 2004) could not be 100% certainly identified as this species. Most birds were foraging on floating *Salvinia* mats, close to concentrations of stems of *Nelumbo* and/or *Ludwigia*, presumably to allow easy access to cover. During the wet season, some birds were found clambering, apparently foraging, in the beds of monocotyledons and, at peak water-level, in flooded *Mimosa* stands. We made few observations from the shore, except for a static watch on 28 March 2005 to check for evening, especially vocal, activity by marsh skulkers; a White-browed Crake was seen to fly at dusk from the young rice in a wet paddy, to forage on an open floating mat. Paddies provided almost the only dense cover around the lake at that season; daytime retreat into them undoubtedly explains the low March and zero April counts from the boat. The low counts in September–November may reflect the large volume of habitat coupled with a post-breeding evasiveness typical in many birds. This hypothesis, however, needs to be confirmed by more rigorous quantitative survey (involving trapping to check for molt status).

## DISCUSSION

The White-browed Crake has not been found in six other wetlands with dense semi-natural aquatic macrophytes around Vientiane city, which we visited during the same months as Nong Pen. Observations at these six sites were land-based, but the lengthy periods scanning superficially suitable vegetation, and this crake's general conspicuousness (Kennerley 1992; Taylor 1996; Wells 1999; JWD, pers. obs.), suggest it was effectively absent from those sites.

Nong Pen is ~800 km north of any historical mainland record. Laos's avifauna was poorly researched before 1990; surveys conducted during 1992–99 recorded 67 species new to the country (Duckworth 2006). The White-browed Crake may be one of the many species overlooked in Laos up to 1950, but our records are part of a pattern of massive expansion since 1980 of its known Southeast Asia range (Fig. 1). The White-browed Crake was found for the first time in central Laos on 3 March 2007 when at least four birds were observed in a lotus-dominated part of Nam

Souy Lake, Savannakhet Province (16° 31'N, 105° 12'E (Dirk Van Gansberghe and Mathieu Baehrel, pers. comm.)).

P. D. Round (pers. comm.) observed White-browed Crake in February 1983 at Bung Buraphet, Thailand, ~400–500 km north of where the species had been recorded previously in Thailand and only a few months after the first reports from Bung Buraphet. It occurs there year-round, many nests have been found, and it has since been found at many other Thai water bodies between Bung Buraphet and the Isthmus of Kra, including Bang Pu, around Bangkok (Nong Khaem), Khlong Bang Kaew, Rangsit, Kamphaengsaen, Suphanburi, and Samut Songkram (Ogle 1986, Round and Jukmongkol 2006b; Round and Gardner 2007). Its known range has recently been extended into northeast Thailand, at Bung Nong Bua, with two birds on 25 January 2004, in May 2004, and on 3 January 2005 (Nittaya Lawrence and R. A. Parks, pers. comm.; photographed), and one on 26 December 2004 (John Williamson, pers. comm.); at Nong Lahan on 20 February 2005 (Mark Mallalieu in Round and Jukmongkol 2005) and at Nong Samrong, where nine adults and three chicks were seen on 20 January 2006 (Round and Jukmongkol 2006c). This species has also been observed in north Thailand, with 7 birds at Nong Bong Khai over 19–23 December 2005, and 15 on 2 January 2006 (Round and Jukmongkol 2006a, 2006b).

The first records for Cambodia were in 1994, when Mundkur et al. (1995) recorded single crakes on 16 and 17 April at Bassac Marsh and an unnamed site north of Phnom Penh, respectively; on 1 May they photographed three of these crakes for sale at a Phnom Penh market. A single crake was seen on 26 January 1997 at Basset Marsh (Duckworth and Hedges 1998; JWD, pers. obs.). The White-browed Crake is now found regularly at both Basset and Bassac marshes, with counts peaking at 15 birds at the latter site (Goes and Poole 2002). Single birds were recorded from two other sites in Cambodia, both in the floodplain of the Great Lake of Tonle Sap in Kompong Thom Province: at Kruos Kraom daily during 18–21 January 2002 on a large lotus pond within deep-water rice-field and scrub mosaic, and at Veal Srangai on 6 April 2002 on a mud-fringed small pool with-



in *Oryza* (wild rice) grassland (Peter Davidson, unpubl. data).

Buckton and Safford (2004) referred to the first record of the White-browed Crake from Vietnam: two separate incidents of single birds in photographs (by Nguyen Van Hung) of many crakes caught for food [mainly Baiton's Crakes (*P. pusilla*) and a few Ruddy-breasted Crakes (*P. fusca*)] taken near Tram Chim National Park during 1996–99 (S. T. Buckton, pers. comm.). Nguyen Phuc Bao Hoa (2004) listed the species from U Minh Thuong National Park as “rare” based on observations during April 1999 to March 2001. Nguyen Tran Vy et al. (2002) found 85 birds at Ta Lai and Da Bo around Cat Tien National Park in January–February 2002 (some birds were photographed), and Nguyen Tran Vy et al. (2003) found 162 birds at the same sites in January–February 2003. The birds were in floating-grass mats, moving into wet rice paddies to find food. The previous status in these parts of Cat Tien is difficult to assess because, before 2002, the floating-grass mats were not checked and the rise in counted numbers by 2003 may merely reflect that playback of tape-recorded calls specifically for the species was used in that year. Playback at many other sites in the Park in 2003 did not find the species (Nguyen Tran Vy, pers. comm.). However, single White-browed Crakes were found at Crocodile Lake (within Cat Tien National Park) in January 2004 (S. C. P. Doppagne, pers. comm.) and on 22 March 2004 (P. W. Logtmeijer, pers. comm.), and two were found there on 11 February 2005 (S. C. P. Doppagne, pers. comm.). Crocodile Lake was frequented by birdwatchers in the 1990s, but the species was apparently not seen in that interval (Gert Polet, pers. comm.).

Van Long Nature Reserve recently provided an “amazing range extension” (Robson 2004) into northern Vietnam. S. C. P. Doppagne (pers. comm.) saw 1 bird at this site on 13 December 2003, 2 on 22 February and 5 December 2004, at least 14 on 16 January 2005, 3 or 4 on 17 July 2005, and 1 adult with 3 newly-hatched chicks on 6 August 2005. A. W. Tordoff (pers. comm.) also found an adult and at least two juveniles on 13 August 2005. The species is clearly resident at Van Long, as it is at Nong Pen.

A single White-browed Crake occurred dur-

ing 20–28 April 1991 in Hong Kong at Mai Po (Kennerley 1992, Carey et al. 2001). However, we have traced no records from mainland China.

The White-browed Crake is widespread in the Philippines (Dickinson et al. 1991) and has occurred on islands farther north, with six records from Taiwan between April and November (Wang et al. 1991; “Bird Database of Wild Bird Federation Taiwan” provided by Woei-Horng Fang, pers. comm.). This crake inhabited the Volcano Islands of extreme southern Japan until the early twentieth century (Ornithological Society of Japan 2000).

The Sundaic (Thai-Malay Peninsula, Borneo, Java, Sumatra, and associated islands) avifauna is distinct from that further north in southeastern Asia; many Sundaic species' northern range limits lie on the peninsula around the Isthmus of Kra (Round et al. 2003). The White-browed Crake's known mainland range since 1980 has expanded from a purely Sundaic distribution north almost to China. It is not clear whether this ‘expansion’ is the result of genuine range change, recent detections of the species where historically it was overlooked, or both. Previous coverage of the “new” sites was too minimal for the lack of historical records to be interpreted as confirming the crake's absence at any one of them. P. D. Round (pers. comm.) considers it could have been previously overlooked even at well-covered Chiang Saen, Thailand. The species' history at Cat Tien is consistent with recent colonization, but might simply reflect site-specific habitat succession. Thus, the evident trend cannot be extrapolated to the wider region.

The lack of a single historical record north of the Isthmus of Kra, the broad distribution of recent records, the multiple records from small and degraded sites close to large cities, and the species' rather conspicuous behavior all indicate genuine range expansion. As a group, if small marsh birds had been under-surveyed historically in non-Sundaic Southeast Asia, other resident species should surely also have been found in areas far from their previously known range. No other bird species has extended its known distribution from the Isthmus of Kra almost to China, at least not in the last half-century. However, without good data on wetland characteristics through



time, it is not possible to identify causes behind changes in range. Wells (1999) considered the White-browed Crake on the Thai-Malay peninsula “mostly dependant” on transient, man-made habitats. The wetlands with the recent new records are also artificial or heavily modified. Other regional changes, either known or inferred, that may or may not be affecting the crake’s distribution include major shifts in plant, fish, and aquatic invertebrate communities with introductions and range expansions of non-native species, eutrophication, expansion of wet rice cultivation in the dry-season and, conceivably, shifts in climate.

### CONSERVATION IMPLICATIONS

Despite the suggested expansion of the White-browed Crake’s range, Indochinese wetlands face severe threats. They continue to be lost through conversion to paddies and dry land habitats (e.g., Claridge 1996; Round and Gardner 2007). Wetland birds are hunted assiduously, especially in Laos. During our surveys, hunting methods observed included snares set amid dense vegetation and at the water’s edge, shooting, catapulting, aerial lines of hooks, and mist-netting. Duckworth et al. (1999) listed most marshland bird species that were bigger than *Ixobrychus* bitterns as “At Risk in Laos” or “Potentially At Risk in Laos”; our survey fully supports those listings. Other than the White-browed Crake, the Common Moorhen (*Gallinula chloropus*) was the only rallid regularly found at Nong Pen. The moorhen and White-breasted Waterhen (*Amaurornis phoenicurus*) are the only rallids recently recorded both frequently and widely in Laos (Duckworth et al. 1999). That the White-browed Crake might greatly have expanded its geographic range is not a positive indication of overall marsh bird status in Indochina.

A new threat to the White-browed Crake is the South American golden apple snail (*Pomacea canaliculata*). This snail at high densities can almost eradicate aquatic macrophytes, resulting in their replacement by planktonic algae (Carlsson et al. 2004a, Carlsson and Lacoursière 2005). Villagers reported to Carlsson et al. (2004b) that both *Salvinia cucullata* and *Ludwigia adscendens* (plants used extensively by foraging crakes, and,

largely, forming the floating mat substrate) “disappeared from the Vientiane wetlands since the snail was introduced”. *Pomacea* has already colonized Nong Pen, but it is unclear whether the snail and aquatic macrophytes successfully coexist there, or whether the snail is simply a new colonist; it arrived in Laos as recently as 1991 (Duangboupha et al. 2002). Nong Pen is not well-connected to other wetlands (as demonstrated by the lack of waterhyacinth there), and our subjective assessment indicated much lower densities of snail-egg masses at Nong Pen than at some other surveyed wetlands of Vientiane.

### ACKNOWLEDGMENTS

D. N. S. Allen, S. T. Buckton, N. O. L. Carlsson, Peter Davidson, S. C. P. Doppagne, Woei-Horng Fang, Nittaya Lawrence, P. W. Logtmeijer, Mark Mallalieu, Nguyen Tran Vy, R. A. Parks, Gert Polet, C. R. Robson, P. D. Round, R. J. Safford, A. W. Tordoff, and John Williamson provided information about records outside Laos or about snails, S. P. Johnson and R. J. Olley forwarded references, and Sisay Chounnavanh translated the paper by Duangboupha et al. (2002).

### LITERATURE CITED

- BUCKTON, S. T. AND R. J. SAFFORD. 2004. The avifauna of the Vietnamese Mekong Delta. *Bird Conservation International* 14:279–322.
- CAREY, G. J., M. L. CHALMERS, D. A. DISKIN, P. R. KENNERLEY, P. J. LEADER, M. R. LEVEN, R. W. LEWTHWAITE, D. S. MELVILLE, M. TURNBULL, AND L. YOUNG. 2001. The avifauna of Hong Kong. Hong Kong Birdwatching Society, Hong Kong, China.
- CARLSSON, N. AND J. O. LACOURSIÈRE. 2005. Herbivory on aquatic vascular plants by the introduced golden apple snail (*Pomacea canaliculata*) in Lao PDR. *Biological Invasions* 7:233–241.
- CARLSSON, N. O. L., C. BRÖNMARK, AND L.-A. HANSSON. 2004a. Invading herbivory: the golden apple snail alters ecosystem functioning in Asian wetlands. *Ecology* 85:1575–1580.
- CARLSSON, N., Å. KESTRUP, M. MÅRTENSSON, AND P. NYSTRÖM. 2004b. Lethal and non-lethal effects of multiple indigenous predators on the invasive golden apple snail (*Pomacea canaliculata*). *Freshwater Biology* 49:1269–1279.
- CLARIDGE, G. F. 1996. An inventory of wetlands of the Lao P.D.R. IUCN-the World Conservation Union, Bangkok, Thailand.
- DEIGNAN, H. G. 1963. Checklist of the birds of Thailand. U.S. National Museum Bulletin 226:1–263.
- DICKINSON, E. C., R. S. KENNEDY, AND K. C. PARKES. 1991. The birds of the Philippines: an annotated checklist. British Ornithologists’ Union, Tring, United Kingdom.



- DUANGBOUPHA, B., M. OUDOM, AND P. INTAPANYA. 2002. Invasion of the golden apple snail. *Lao Journal of Agriculture and Forestry* 4:1–8.
- DUCKWORTH, J. W. 2006. Six species of bird new to Laos. *Forktail* 22:147–151.
- DUCKWORTH, J. W. AND S. HEDGES. 1998. Bird records from Cambodia in 1997, including records of sixteen species new for the country. *Forktail* 14:29–36.
- DUCKWORTH, J. W., P. DAVIDSON, AND R. J. TIMMINS. 1999. Birds. Pages 69–159 in *Wildlife in Lao PDR: 1999 Status Report* (J. W. Duckworth, R. E. Salter, and K. Khounbolin, Editors). IUCN-The World Conservation Union/Wildlife Conservation Society/Centre for Protected Areas and Watershed Management, Vientiane, Laos.
- GOES, F. AND C. POOLE. 2002. Wetlands of the four-arms plain. *Cambodia Bird News* 10:25–41.
- KENNERLEY, P. R. 1992. White-browed Crake at Mai Po: the first record for Hong Kong and China. *Hong Kong Bird Report* 1991:108–109.
- MUNDKUR, T., P. CARR, SUN HEAN, AND CHHIM SOMEAN. 1995. Surveys for large waterbirds in Cambodia, March–April 1994. IUCN, Gland, Switzerland, and Cambridge, United Kingdom.
- NGUYEN PHUC BAO HOA. 2004. Birds. Pages 63–75, 133–138 in *Biodiversity survey U Minh Thuong National Park* (N. Sage, S. Kutcher, Nguyen Xuan Vinh, P. Wilson, and J. Dunlop, Editors). Agriculture Publishing House, Ho Chi Minh City, Vietnam.
- NGUYEN TRAN VY, NGUYEN HOANG HAO, NGUYEN VIET SU, AND PHAN DUY THUC. 2002. Water-related birds survey in Cat Tien National Park, Vietnam, 2002. Technical Report 39. WWF Cat Tien National Park Conservation Project, Cat Tien National Park, Vietnam.
- NGUYEN TRAN VY, NGUYEN HOANG HAO, NGUYEN THI NGOC THIN, AND PHAN DUY THUC. 2003. Water-related birds survey in Cat Tien National Park, Vietnam 2003. Technical Report 45. WWF Cat Tien National Park Conservation Project, Cat Tien National Park, Vietnam.
- OGLE, D. 1986. The status and seasonality of birds in Nakhon Sawan Province, Thailand. *Natural History Bulletin of the Siam Society* 34:115–143.
- ORNITHOLOGICAL SOCIETY OF JAPAN. 2000. Check-list of Japanese birds. Sixth Edition. Ornithological Society of Japan, Tokyo.
- ROBINSON, H. C. AND F. N. CHASEN. 1936. The birds of the Malay Peninsula. Volume 3. H. F. & G. Witherby, London, United Kingdom.
- ROBSON, C. 2000. From the field: Laos. *Oriental Bird Club Bulletin* 32:70.
- ROBSON, C. 2004. From the field: Vietnam. *Birding Asia* 2:105.
- ROUND, P. D. AND D. GARDNER. 2007. Birds of the Bangkok area. White Lotus, Bangkok, Thailand.
- ROUND, P. D. AND R. JUKMONGKOL. 2005. Recent report: January–February 2005. *Bird Conservation Society of Thailand Bulletin* 22(4):16–20.
- ROUND, P. D. AND R. JUKMONGKOL. 2006a. Recent report: November–December 2005. *Bird Conservation Society of Thailand Bulletin* 23(1):14–17.
- ROUND, P. D. AND R. JUKMONGKOL. 2006b. Recent report: November 2005–January 2006. *Bird Conservation Society of Thailand Bulletin* 23(2):15–19.
- ROUND, P. D. AND R. JUKMONGKOL. 2006c. Recent report: December 2005–February 2006. *Bird Conservation Society of Thailand Bulletin* 23(3):18–19.
- ROUND, P. D., J. B. HUGHES, AND D. S. WOODRUFF. 2003. Latitudinal range limits of resident forest birds in Thailand and the Indochinese–Sundaic geographic transition. *Natural History Bulletin of the Siam Society* 51:69–96.
- TAYLOR, P. B. 1996. Family Rallidae (Rails, gallinules and coots). Pages 108–209 in *Handbook of the birds of the world. Volume 3* (J. del Hoyo, A. Elliott, and J. Sargatal, Editors). Lynx Edicions, Barcelona, Spain.
- TAYLOR, B. 1998. Rails. A guide to the rails, crakes, gallinules and coots of the world. Pica Press, Robertsbridge, United Kingdom.
- WANG, K. H., S. H. NG, K. Y. WANG, S. Y. YEUNG, C. K. CHOI, M. H. CHOI, AND H. L. SIU (EDITORS). 1991. A pictorial guide to the wild birds of Taiwan. Taiwan Society of Wild Bird Information and the Wild Bird Society of Japan, Taipei, Taiwan.
- WELLS, D. R. 1999. The birds of the Thai-Malay Peninsula. Volume 1. Academic Press, London, United Kingdom.



Duckworth, J W and Evans, Tom D. 2007. "FIRST RECORDS OF WHITE-BROWED CRAKE (PORZANA CINEREA) FOR LAOS AND ITS CURRENT RANGE IN SOUTHEAST ASIA." *The Wilson journal of ornithology* 119(2), 253–258.  
<https://doi.org/10.1676/05-143.1>.

**View This Item Online:** <https://www.biodiversitylibrary.org/item/214751>

**DOI:** <https://doi.org/10.1676/05-143.1>

**Permalink:** <https://www.biodiversitylibrary.org/partpdf/240862>

#### **Holding Institution**

Harvard University, Museum of Comparative Zoology, Ernst Mayr Library

#### **Sponsored by**

IMLS LG-70-15-0138-15

#### **Copyright & Reuse**

Copyright Status: In copyright. Digitized with the permission of the rights holder.

Rights Holder: Wilson Ornithological Society

License: <http://creativecommons.org/licenses/by-nc-sa/4.0/>

Rights: <https://biodiversitylibrary.org/permissions>

This document was created from content at the **Biodiversity Heritage Library**, the world's largest open access digital library for biodiversity literature and archives. Visit BHL at <https://www.biodiversitylibrary.org>.