

# Wetland birds of Hainan Island, China: results from winter waterbird surveys 2003–2007

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Four simultaneous winter waterbird surveys were conducted island-wide on Hainan island, China, between 2003 and 2007, during which a total of 83 species of wetland-associated birds were recorded at 57 coastal and freshwater wetlands. The most abundant species were egrets and herons, followed by shorebirds, gulls and terns, and ducks. A new wintering site for the globally Endangered Black-faced Spoonbill *Platalea minor* was discovered, and the largest known populations in China of Lesser Whistling-duck *Dendrocygna javanica* and Silky Starling *Sturnus sericeus* were found. Twelve taxa were new records for Hainan: Mandarin Duck *Aix galericulata*, Mallard *Anas platyrhynchos*, Northern Shoveler *A. clypeata*, Northern Pintail *A. acuta*, Tufted Duck *Aythya fuligula*, Pied Avocet *Recurvirostra avosetta*, Eastern Curlew *Numenius madagascariensis*, Long-billed/Short-billed Dowitcher *Limnodromus scolopaceus/griseus*, Ruff *Philomachus pugnax*, Black-tailed Gull *Larus crassirostris*, Heuglin's Gull *Larus heuglini*, and Eurasian Spoonbill *Platalea leucorodia*. In addition, three species were 'rediscovered' for the island: Great Crested Tern *Sterna bergii*, White-bellied Sea Eagle *Haliaeetus leucogaster*, and the globally Near Threatened Lesser Fish Eagle *Ichthyophaga humilis*. Five sites of high conservation value were identified: Dongzhaigang, Qinglanggang, Sigeng, Yangpugang and Guyue Villa. Hainan occupies a strategic position along the East Asian–Australasian Flyway and so the diverse and extensive wetland habitats on the island are of great importance for Asian waterbird conservation. However, many sites with high conservation value are not yet protected, and the survey results indicate general declines in both species diversity and abundance. Better management and enforcement at protected sites, greater survey efforts in little-known areas, and establishment of protected areas at sites of conservation significance are crucial for the conservation of Hainan's wetlands.

## INTRODUCTION

Hainan island lies within the tropics at 18°09'–20°11'N 108°36'–111°04'E and has a land area of c.33,600 km<sup>2</sup>. Hainan is separated from continental China by the Qiongzhou Straits, and is bordered on the west and north-west by the Gulf of Tonkin (Beibu Gulf) and on other sides by the South China Sea. The nearest landmass, the Leizhou Peninsula in south-western Guangdong province, lies only 20 km to the north, while the Red River Delta of Vietnam is c.200 km to the west. Hainan has extensive wetland habitats. There are c.2,500 km<sup>2</sup> of inland waters (including rivers and natural/artificial standing waters), while the coastline measures 1,618 km with 68 natural bays and c.1,800 km<sup>2</sup> of mudflats (Hainan Survey and Mapping Bureau 1996). The 54 km<sup>2</sup> Dongzhaigang (*gang* = port) National Nature Reserve (NNR), in north-eastern Hainan, has the best remaining mature mangroves in China, and has been designated as a Ramsar Site (Ramsar Convention on Wetlands) since 1992. The coastline of Hainan is also part of a 'key wetland region for threatened birds in Asia' defined by BirdLife International (2003).

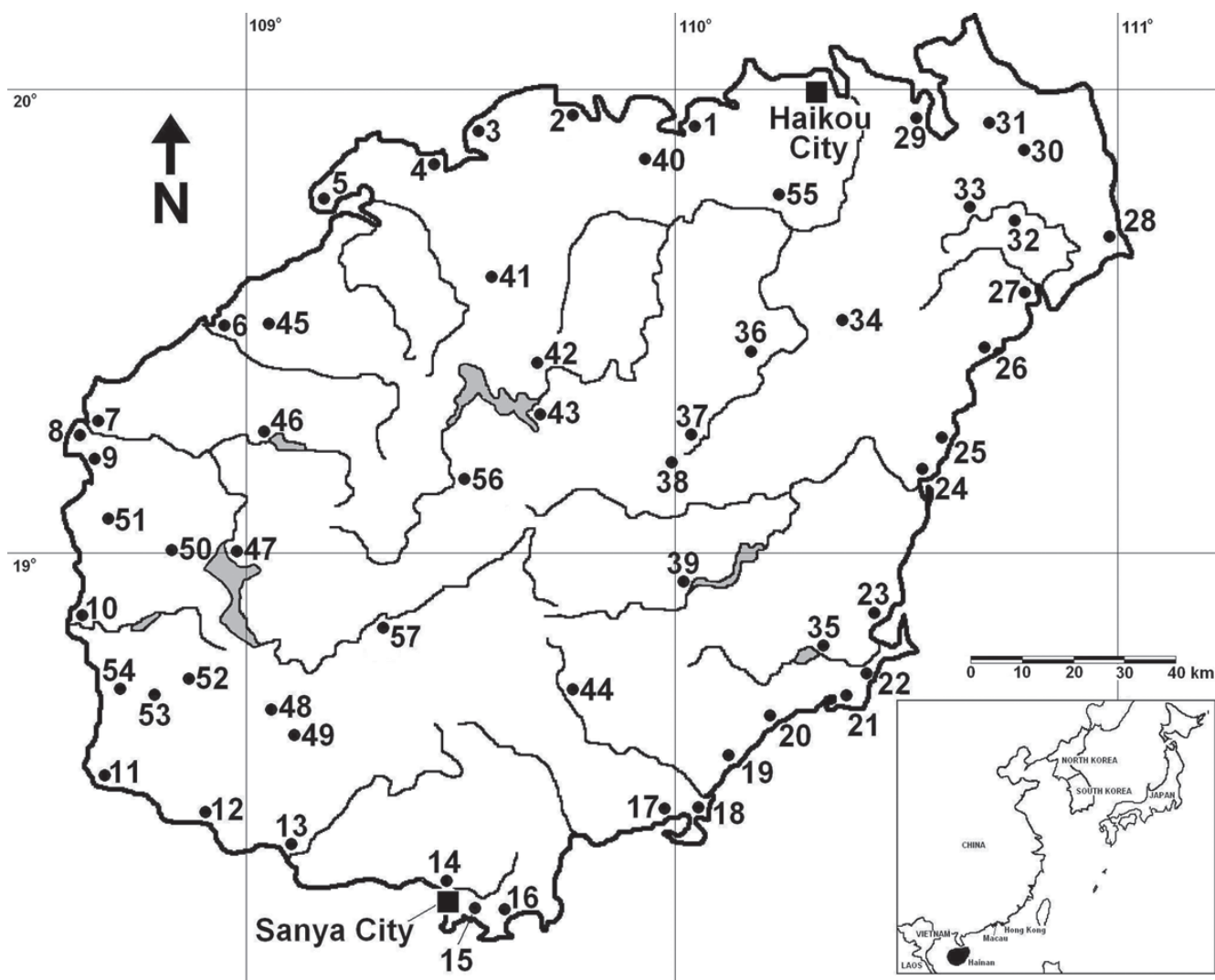
Robert Swinhoe's pioneering visit in 1868 (Swinhoe 1870) first demonstrated Hainan's rich waterbird diversity. Swinhoe recorded 47 waterbird species, including such present-day rarities as Common Crane *Grus grus* and Lesser Adjutant *Leptoptilos javanicus*. Waterbirds were again prominent among specimens collected during 1891–1906 by Tetsu, John Whitehead and Zensaku Katsumata, notable species being White-eared Night Heron *Gorsachius magnificus*, Painted Stork *Mycteria leucocephala* and Great Thick-knee *Esacus recurvirostris* (Hartlaub 1892, Styan 1893, 1894, Ogilvie-Grant 1900, Hartert 1910). Further additions to the island's waterbirds were listed by Shaw Tsen-hwang and Hsu Wei-shu (1966), Guangdong Institute of Entomology and Zhongshan University (1983), King and Liao Weiping (1989) and Gao Yuren (1991). In recent years, nesting ardeids were surveyed one summer (Wong and Wong 2004), and preliminary studies were made at

Qinglangang Nature Reserve (NR) and a small number of other wetland sites (Zou Fasheng *et al.* 2000, Zou Fasheng 2005). A list of the island's birds, including 98 wetland-associated species, was provided by Shi Haitao (2001). Despite these studies, no systematic winter waterbird surveys had been conducted prior to those described in this paper.

At the invitation of the Hainan Wildlife Conservation Centre of the Hainan Provincial Forestry Department (HWCC), ornithologists from several organisations conducted synchronised winter waterbird surveys island-wide. The first, in 2003/04, aimed to collect preliminary data to better understand the current status of Hainan's waterbirds and wetlands. The second survey, based on results collected in 2003/4, was more specific, aiming to study the distribution and status of the globally Endangered Black-faced Spoonbill *Platalea minor*, and also to coincide with the annual Asian Waterbird Census (AWC) organised by Wetlands International. The third and fourth surveys, in 2006 and 2007, focussed on sites of high conservation importance identified during the earlier surveys, and to confirm the continued occurrence of species of conservation concern.

## STUDY SITES AND METHODS

A total of 57 wetlands were visited during the four surveys (Fig. 1, Table 1); habitats visited ranged from rivers, paddy fields and freshwater marshes to reservoirs, and from brackish-water ponds and mangroves to intertidal mudflats. Over 20 personnel were involved in each survey, led by HWCC with participation from the Hong Kong-based environmental charity Kadoorie Farm and Botanic Garden (KFBG), members of the Hong Kong Bird Watching Society, the University of Hong Kong, the National Bird Banding Centre of China (Beijing) and Hainan Normal University. In the first survey, from 29 December 2003 to 5 January 2004, the group separated into three teams to survey wetlands along the coast, as



**Figure 1.** Map showing wetland sites visited during the Hainan winter waterbird surveys, 2003–2007. Site numbers correspond to those in Table 1.

well as freshwater habitats in the island's interior. Selection of study sites was based mainly on the size of the wetlands: larger wetlands with less human disturbance, which thus had a higher chance of harbouring concentrations of waterbirds, were selected. Other sites (such as Guyue Villa) known to support significant waterbird populations were also surveyed. In the second survey of 20–23 January 2005, two teams surveyed along the coastline concentrating on shorebirds. The third survey, conducted in January 2006, consisted of a Black-faced Spoonbill survey during 6–8 January and a synchronised island-wide survey by three teams during 19–22 January. The fourth survey, conducted during 18–22 and 28 January 2007, had two teams surveying along the coastline and inland freshwater habitats simultaneously. A total of eight, three, four and six field days were spent in 2003/4, 2005, 2006 and 2007, respectively. During the surveys, visual searching was the main method used. In most cases, cars were used to conduct road transects, and telescopes were used to scan for birds in open areas. Once flocks were identified, the teams approached the birds on foot or by boat, to enable identification and counting.

## RESULTS

A total of 83 wetland-associated birds were recorded during the surveys, including 74 species of waterbird. The annual totals were as follows: 72 species in 2003/4; 55 in 2005; 58 in 2006; and 50 in 2007. See the Appendix for the full species list.

### Composition of the waterbird fauna

Of the 83 species recorded, 24 are residents (28.9% of the total) and 59 are winter visitors (71.1%). The most numerous were egrets and herons, followed by shorebirds, gulls and terns, and ducks. The most widespread and abundant species, in both coastal and freshwater wetlands, was Little Egret *Egretta garzetta*, followed by Chinese Pond Heron *Ardeola bacchus*. The sites with the highest number of individuals were Dongzhaigang NNR, Qinglangang NR and Yangpugang; these, together with Sigeng NR, Houshui Bay and Sanya River NR, were among the most species-rich sites for waterbirds in Hainan. Table 2 summarises the key findings of the surveys.

**Table 1.** Wetland sites visited during the Hainan winter waterbird surveys, 2003–2007. NNR = National Nature Reserve, NR = Nature Reserve.

No. and Site	Size (ha)	Coordinates	Date(s) visited	Wetland type(s)
1 Chengmai Bay	3,730	19°54'44"–19°56'42"N 109°57'41"–110°01'11"E	31 Dec 2003	Mudflat, mangrove
2 Bopu Bay	25	19°59'12"–29"N 109°43'56"–109°44'13"E	31 Dec 2003, 21 Jan 2005, 22 Jan 2007	Mudflat, mangrove, fishponds
3 Huanglonggang	84	19°54'51"–19°55'21"N 109°31'32"–109°32'03"E	31 Dec 2003, 19–20 Jan 2006	Mudflat
4 Houshui Bay	83	19°53'08"–50"N 109°31'00"–22"E	21 Jan 2005	Mudflat, mangrove
5 Yangpugang	164	19°43'51"–19°44'09"N 109°10'26"–109°12'07"E	1 Jan 2004, 20 Jan 2006, 22 Jan 2007	Mudflat
6 Haitougang	62	19°30'28"–49"N 108°55'51"–108°56'24"E	1 Jan 2004	Mudflat, mangrove, estuary
7 Changhuagang	760	19°18'20"–19°21'02"N 108°41'00"–108°44'52"E	22 Jan 2005, 22 Jan 2006	Mudflat, mangrove, estuary
8 Yingchaogang	720	19°14'11"–19°17'10"N 108°37'16"–108°40'58"E	22 Jan 2005	Mudflat, mangrove, estuary
9 Sigeng NR	1,429	19°11'33"–19°13'20"N 108°37'24"–108°40'15"E	5 Jan 2004, 22 Jan 2005, 22–23 Jan 2006, 21 Jan 2007	Mudflat, mangrove, fishponds
10 Ganchenggang	50	18°51'33"–18°52'05"N 108°37'51"–108°38'24"E	4 Jan 2004	Mudflat, mangrove, estuary
11 Yinggehai	19,235	18°29'52"–18°34'25"N 108°41'56"–108°46'01"E	4 Jan 2004, 23 Jan 2005, 22 Jan 2006, 21 Jan 2007	Saltpan
12 Wanglougang	759	18°25'56"–18°26'21"N 108°51'18"–55"E	4 Jan 2004	Mudflat
13 Yazhou Bay	1,938	18°19'59"–18°22'08"N 109°05'57"–109°08'44"E	4 Jan 2004	Mudflat, mangrove, estuary
14 Sanya River NR	662	18°13'51"–18°17'22"N 109°28'27"–109°30'25"E	23 Jan 2005, 21–22 Jan 2006, 20–21 Jan 2007	Mudflat, mangrove, estuary, fishponds, saltpan
15 Yulin Bay	609	18°12'11"–18°14'07"N 109°31'57"–109°32'13"E	3 Jan 2004, 23 Jan 2005, 22 Jan 2006	Saltpan, mangrove, freshwater marsh
16 Yalong Bay	151	18°12'52"–18°13'40"N 109°36'38"–109°37'13"E	3 Jan 2004, 22 Jan 2005, 21 Jan 2006, 20 Jan 2007	Mudflat, mangrove, estuary
17 Lingshui Bay, Changcheng Saltpan	146	18°26'00"–27"N 109°59'00"–110°00'00"E	3 Jan 2004, 22 Jan 2005, 22 Jan 2006	Mudflat, mangrove, saltpan
18 Li'angang	904	18°25'23"–18°26'51"N 110°02'08"–110°03'46"E	3 Jan 2004, 20 Jan 2007	Mudflat, mangrove, estuary
19 Niuling Resort	131	18°35'11"–42"N 110°10'21"–110°11'08"E	2 Jan 2004, 22 Jan 2005	Mudflat, fishponds
20 Shimei Bay	591	18°37'54"–18°39'51"N 110°13'24"–110°16'41"E	2 Jan 2004	Mudflat
21 Dong'ao Bay	725	18°41'02"–18°42'01"N 110°23'37"–110°25'00"E	2 Jan 2004	Mudflat, mangrove
22 Taiyang River	579	18°45'35"–18°46'33"N 110°13'19"–110°15'03"E	2 Jan 2004, 22 Jan 2005, 21 Jan 2006	Mudflat, mangrove, estuary
23 Xiaohai	5,025	18°47'33"–18°53'11"N 110°25'56"–110°30'53"E	2 Jan 2004, 22 Jan 2005, 21 Jan 2006	Mudflat, mangrove, estuary
24 Bo'aogang	918	19°05'22"–19°09'33"N 110°33'09"–110°35'11"E	1 Jan 2004, 22 Jan 2006	Mudflat, mangrove, estuary
25 Tanmengang	87	19°13'57"–19°14'20"N 110°36'27"–110°37'09"E	1 Jan 2004, 21 Jan 2005	Mudflat
26 Fengjia Bay	193	19°24'37"–55"N 110°41'53"–110°43'52"E	1 Jan 2004, 20 Jan 2006	Mudflat, mangrove
27 Qinglangang NR	2,800	19°15'00"–20°09'00"N 110°47'00"–110°54'00"E	31 Dec 2003, 21 Jan 2005, 20 Jan 2006, 19 Jan 2007	Mudflat, mangrove, estuary
28 Tongguling	949	19°38'09"–19°39'51"N 111°01'43"–111°02'36"E	31 Dec 2003	Mudflat
29 Dongzhaigang NNR	5,400	19°51'00"–20°01'00"N 110°32'00"–110°37'00"E	29–30 Dec 2003, 20 Jan 2005, 19–20 Jan 2006, 28 Jan 2007	Mudflat, mangrove, fishponds
30 Ai'mei Reservoir	171	19°52'53"–19°54'19"N 110°48'36"–110°49'57"E	31 Dec 2003	Reservoir
31 Hushan Reservoir	665	19°55'59"–19°58'11"N 110°41'02"–110°44'12"E	31 Dec 2003	Reservoir
32 Baofang Reservoir	385	19°41'42"–19°43'41"N 110°46'54"–110°49'10"E	31 Dec 2003	Reservoir
33 Mingrenshan	735	18°31'–18°35'N 108°26'–109°36'E	31 Dec 2003, 20 Jan 2006	Freshwater marsh and ponds
34 Nanli Lake	1,375	19°27'51"–19°31'05"N 110°19'54"–110°22'38"E	31 Dec 2003, 22 Jan 2006	Reservoir

No. and Site	Size (ha)	Coordinates	Date(s) visited	Wetland type(s)
35 Wanning Reservoir	1,223	18°46'00"–18°48'21"N 110°15'02"–110°19'32"E	2 Jan 2004, 21 Jan 2005, 21 Jan 2006	Reservoir
36 Datong Egretty	317	19°25'12"–19°26'01"N 110°06'11"–110°07'23"E	31 Dec 2003, 18 Jan 2007	Freshwater ponds
37 Muse Reservoir	761	19°12'00"–19°13'33"N 109°57'06"–109°58'37"E	31 Dec 2003, 20 Jan 2007	Reservoir
38 Guyue Villa	35	19°10'45"–19°11'11"N 109°56'30–45"E	31 Dec 2003, 20 Jan 2007	Freshwater lake, freshwater marsh
39 Niululing Reservoir	1,442	18°57'15"–19°00'55"N 110°08'49"–110°11'51"E	1 Jan 2004	Reservoir
40 Fushan Reservoir	590	19°48'01"–19°49'57"N 109°55'38"–109°57'21"E	31 Dec 2003	Reservoir
41 Luoji Egretty	15	19°37'51"N 109°32'30"E	31 Dec 2003	Freshwater ponds
42 Yunyue Lake	1,068	19°28'29"–19°30'18"N 109°29'31"–109°31'20"E	1 Jan 2004	Reservoir
43 Songtao Reservoir	8,625	19°10'00"–19°25'00"N 109°28'00"–109°41'00"E	1 Jan 2004	Reservoir
44 Xiaomei Reservoir	241	19°10'00"–19°25'00"N 109°28'00"–109°41'00"E	5 Jan 2004	Reservoir
45 Hongyang Reservoir	26	19°59'12–29"N 109°43'56"–109°44'13"E	1 Jan 2004	Reservoir
46 Shilu Reservoir	1,017	19°13'45"–19°15'48"N 109°04'55"–109°09'23"E	5 Jan 2004	Reservoir
47 Daguangba Reservoir	6,900	18°58'00"–19°01'28"N 108°58'32"–109°01'13"E	3 Jan 2004, 21 Jan 2007	Reservoir
48 Changmao Reservoir	1,160	18°37'48"–18°40'40"N 109°04'23"–109°07'27"E	4 Jan 2004	Reservoir
49 Da'an Reservoir	442	18°36'17"–18°38'05"N 109°08'51"–109°10'57"E	4 Jan 2004	Reservoir
50 Tian'an Reservoir	286	18°58'00"–19°00'00"N 108°51'30"–108°52'50"E	3 Jan 2004	Reservoir
51 Gaopoling Reservoir	849	19°03'37"–19°05'49"N 108°43'27"–108°45'11"E	5 Jan 2004, 22 Jan 2005 21 Jan 2007	Reservoir
52 Tianchi Lake (within Jianfengling NNR)	43	18°44'32"N 108°51'27"E	5 Jan 2004	Reservoir
53 Jianfengling Reservoir	213	18°39'53"–18°40'16"N 108°45'00–24"E	4 Jan 2004, 22 Jan 2006	Reservoir
54 Sangao Reservoir	271	18°32'51"–18°34'15"N 108°46'56"–108°47'20"E	4 Jan 2004, 22–23 Jan 2005, 22 Jan 2006, 21 Jan 2007	Reservoir
55 Dongshanhu	200	19°46'45"N 110°14'13"E	18 Jan 2007	Reservoir
56 Nandu River	—	19°07'15"N 109°25'30"E	19 Jan 2007	River
57 Changhua River	—	18°53'40"N 109°25'34"E	20 Jan 2007	River

**Table 2.** Key findings of Hainan winter waterbird surveys, 2003–2007 (excluding wetland-associated species).

	Year			
	2003/4	2005	2006	2007
Total species	65	49	51	50
Total individuals	20,553	8,320	8,577	4,581
Sites with the highest waterbird abundances (count)	Yangpugang (1,837) Qinglangang (1,780) Dongzhaigang (1,569)	Dongzhaigang (985) Yangpugang (886) Changhuagang (740)	Qinglangang (1,033) Dongzhaigang (913) Yangpugang (691)	Sanya River (887) Qinglangang (846) Sigeng (690)
Sites with the highest species richness (no. species)	Dongzhaigang (49) Qinglangang (33) Sigeng (29)	Dongzhaigang (33) Houshui Bay (19) Sigeng (16)	Qinglangang (26) Dongzhaigang (18) Yangpugang (17)	Dongzhaigang (26) Sigeng (19) Sanya River (18)
Most abundant species (count)	Little Egret (3,966) Kentish Plover (1,475) Chinese Pond Heron (1,421)	Kentish Plover (1,784) Grey Heron (1,009) Whiskered Tern (756)	Little Egret (1,776) Common Greenshank (824) Kentish Plover (725)	Little Egret (927) Black-headed Gull (500) Common Greenshank (384)
Most widespread species in coastal wetlands (no. sites)	Little Egret (22) Common Sandpiper (19) Kentish Plover (17)	Little Egret (14) Common Greenshank (13) Chinese Pond Heron (11)	Little Egret (16) Common Greenshank (14) Chinese Pond Heron (10)	Little Egret (7) Common Greenshank (7) Common Sandpiper (6)
Most widespread species in freshwater wetlands (no. sites)	Little Egret (24) Chinese Pond Heron (15) Grey Heron (10)	Little Egret (4) Great Egret, Chinese Pond Heron and Little Ringed Plover (3)	Little Egret (8) Chinese Pond Heron (7) Common Sandpiper (5)	Little Egret (9) Chinese Pond Heron (8) Great Egret (7)
Composition of waterbirds recorded	Egrets and herons 8,461 (41%) Shorebirds 7,467 (36%) Gulls and terns 2,619 (13%) Ducks 1,955 (10%)	Egrets and herons 2,110 (25%) Shorebirds 5,158 (62%) Gulls and terns 928 (11%) Ducks 120 (1%)	Egrets and herons 3,389 (40%) Shorebirds 3,996 (47%) Gulls and terns 531 (6%) Ducks 624 (7%)	Egrets and herons 1,565 (34%) Shorebirds 1,965 (43%) Gulls and terns 838 (18%) Ducks 160 (3%)

### Species accounts

The following species accounts cover species that are either listed as globally Threatened or Near Threatened by IUCN (2006) or new to Hainan island, or for which otherwise noteworthy records were made.

#### LESSER WHISTLING-DUCK *Dendrocygna javanica*

A total of 1,180 were recorded (1,100 at Guyue Villa and 80 at a nearby fishpond) in Qiongzong county on 31 December 2003. About 600 were recorded at Guyue Villa on 19 January 2006. During the 2007 survey, no ducks were seen at this site because the pond was temporarily drained at the time. The ducks apparently dispersed to surrounding waterbodies following this disturbance, with 120 counted at Dongshanhu Reservoir, about 80 km north-east of Guyue Villa, and c.600 recorded at Muse Reservoir, about 5 km to the north-east. Although stated as fairly common locally and distributed in southern Guangdong, Guangxi, Yunnan and Hainan in China (Cheng Tso-hsin 1987), there has been no record of this species in Yunnan and Guangxi in recent decades, and only solitary individuals (of doubtful origin) were seen in Guangdong and Hong Kong in recent years. The only Hainan records prior to the sightings presented here concern a series of specimens collected at Dinggan and 'Riudon' (untraced locality in the interior) in April and May between 1902 and 1906 (Hartert 1910) and in Qionghai and Dinggan counties between March and July, 1960 to 1964 (Guangdong Institute of Entomology and Zhongshan University 1983), which suggests that this was then, as now, a highly localised species restricted to the north-eastern part of the island. A local population of 1,180 birds is thus of high national conservation significance and is apparently the largest congregation of this species



**Plate 1.** Female Mandarin Duck *Aix galericulata* at Guyue Villa (#38), Qiongzong county, 31 December 2003. Photo by Lee Kwok Shing.



**Plate 2.** First winter Black-tailed Gull *Larus crassirostris* at Qinglangang NR (#27), Wenchang county, on 19 January 2006. Photo by Lu Gang.

ever recorded in China (Han Lianxian verbally 2005). Considered a summer breeder in Hainan by Meyer de Schauensee (1984) and MacKinnon and Phillipps (2000), and a migrant by Cheng Tso-hsin (1987), the winter survey results presented in this paper, our repeated observation records in spring, summer and autumn outside the scope of this study since 2001 till today, as well as assurance of its breeding (and collecting of their eggs) by local villagers of the site, suggest the species is a resident, as suggested by Guangdong Institute of Entomology and Zhongshan University (1983).

#### MANDARIN DUCK *Aix galericulata*

One female was seen at Guyue Villa with the flock of Lesser Whistling-ducks on 31 December 2003 (Plate 1). This is a new record for Hainan.

#### MALLARD *Anas platyrhynchos*

One was seen at Houshui Bay on 31 Dec 2003. This is a new record for Hainan.

#### NORTHERN SHOVELER *Anas clypeata*

Sixteen were recorded at Dongzhaigang NNR and two at Sangao Reservoir in 2003/04. Ten were recorded at Sangao Reservoir in 2005 and ten at Dongzhaigang NNR in 2007. These are new records for Hainan.

#### NORTHERN PINTAIL *Anas acuta*

A total of 421 birds were recorded at three sites (400 at Sangao Reservoir, 20 at Houshui Bay and one at Sigeng NR) in 2003/4. In 2005, ten were recorded at Sangao Reservoir. Eleven were recorded at Dongzhaigang NNR in 2007. These are new records for Hainan.

#### TUFTED DUCK *Aythya fuligula*

Four were recorded at Dongzhaigang NNR and four were recorded at Sangao Reservoir in 2003/4. Two were recorded at Sangao Reservoir in 2006. These are new records for Hainan. In Hong Kong, a marked increase in this species has been observed, with peak winter counts rising more than 12-fold, from 132 prior to the winter of 1995/96 to 1,600 in 2005/6 (Yu Yat Tung verbally 2006).

#### PIED AVOCET *Recurvirostra avosetta*

One was seen at Sigeng NR on 21 January 2007. This is a new record for Hainan.

#### EASTERN CURLEW *Numenius madagascariensis*

One was seen at Dongzhaigang NNR on 29 December 2003. This is a new record for Hainan.

#### LONG-BILLED/SHORT-BILLED DOWITCHER *Limnodromus scolopaceus/griseus*

A dowitcher, either Long-billed or Short-billed *Limnodromus scolopaceus* or *L. griseus*, was seen at Fengjia Bay, Wenchang county, on 20 January 2006. Experience in Hong Kong shows that winter-plumaged Long-billed and Short-billed Dowitchers cannot be identified to species under field condition unless the diagnostic call is heard (R. Lewthwaite verbally 2006); unfortunately the individual seen was too far from the observers and no call was heard. Although Short-billed Dowitcher is very rare in East Asia and much less likely to occur in Hainan than Long-billed Dowitcher, no assumptions can be made. The genus *Limnodromus* has never been reported from

Hainan, thus the sighting represents a new record for the island.

**RUFF** *Philomachus pugnax*

One male was seen at Dongzhaigang NNR on 29 December 2003, and a male and a female were seen at Sigeng NR on 22 January 2005. These are new records for Hainan.

**BLACK-TAILED GULL** *Larus crassirostris*

Seven were recorded (one at Qinglangang NR, one at Houshui Bay and five at Yangpugang) on 19 and 20 January 2006 (Plate 2). These are new records for Hainan.

**HEUGLIN'S GULL** *Larus heuglini*

A total of 171 (nine at Houshui Bay, 87 at Fengjia Bay, 60 at Yangpugang and 15 at Sigeng NR) were recorded during 19–22 January 2006, and a total of 34 (30 at Qinglangang NR, two at Yangpugang and two at Houshui Bay) were found on 19 and 22 January 2007. These are the first records of this species for Hainan following its split from the Herring Gull complex.

**GREAT CRESTED TERN** *Sterna bergii*

Three were recorded at Yangpugang on 22 January 2007. This is the first record for the island for many years; the last Hainan Island records were from Lingshui county, on the south-eastern coast, in the months of July and September (year not stated: Guangdong Institute of Entomology and Zhongshan University 1983), and all other records in China during 2004 were from the period April–August (China Ornithological Society 2005). The record presented here, in January, from the northern side of the island, is thus of interest.

**BLACK KITE** *Milvus migrans*

A total of 62 (five sites), 7 (two sites), 7 (three sites) and 5 (two sites) individuals were recorded during winter waterbird surveys in 2003/4, 2005, 2006 and 2007 respectively. This species was described by Swinhoe (1870) as 'abundant everywhere in Hainan'. Although individuals can still be observed in low-lying areas throughout the island, our results indicate the species has undergone a dramatic decline on Hainan Island, as has been observed elsewhere throughout the species's range. See Inskipp *et al.* (1996) for changes in its nomenclature.

**LESSER FISH EAGLE** *Ichthyophaga humilis*

One was seen at Songtao Reservoir, Danzhou county, on 1 January 2004. The bird was observed for three minutes while foraging over the reservoir. This species appears to be naturally rare on the island; the only previous original Hainan records seem to be based on specimens collected at Liuwowan (= Lumuwan, the south-eastern side of Songtao Reservoir) on 15 December 1891 (Styan 1893) and Wuzhishan (four) in November during 1902–1906 (Hartert 1910). All sightings were made in winter. Songtao is the largest reservoir on the island, and the catchment area is protected by Panjia (including part of Lumuwan) NR, with extensive secondary lowland rainforest. The species is listed as globally Near Threatened (IUCN 2006).

**WHITE-BELLIED SEA EAGLE** *Haliaeetus leucogaster*

One juvenile was seen at Daguangba Reservoir, Dongfang county, on 21 January 2006. The bird was photographed

perching on a tree. Daguangba is the second largest reservoir on the island, and the catchment area is protected by Houmiling NR and the proposed E'xianling limestone forest nature reserve, with extensive rainforest cover. The species had not been reported from the island for several decades prior to this sighting.

**EURASIAN SPOONBILL** *Platalea leucorodia*

One was seen together with Black-faced Spoonbills at Sigeng NR on 5 January 2004 and 21 January 2006. Besides this, one was photographed at Houshui Bay in April 2004 (by LG, not as part of the surveys reported). These are new records for Hainan.

**BLACK-FACED SPOONBILL** *Platalea minor*

The species was first collected at Haikou city in February 1903 (Hartert 1910) but no individuals were subsequently seen in Hainan until small numbers were found in the nearby Dongzhaigang NNR and Houshui Bay in the 1990s. During the 2003/4 survey, a total of 62 (1 at Dongzhaigang, 10 at Houshui Bay and 51 at Sigeng NR) were recorded. In 2005, a total of 77 (9 at Houshui Bay and 68 at Sigeng NR) were recorded. In 2006, a total of 81 (1 at Dongzhaigang NNR, 5 at Houshui Bay and 75 at Sigeng NR) were recorded. In 2007, a total of 74 (66 at Sigeng NR and 8 at Houshui Bay) were recorded, including 36 individuals of the Sigeng population that visited nearby Changhuagang. During 2004–2007, the Sigeng population represented over 4% of the global population of the species (Yu Yat Tung verbally 2007). The species is listed as globally Endangered by IUCN (2006).

**SILKY STARLING** *Sturnus sericeus*

A total of 2,293, 481 and 11,160 were recorded in 2003/04, 2005 and 2006, respectively, with the vast majority concentrated around Dongzhaigang NNR. The species is described as an abundant but localised (the vast majority concentrated around the Mai Po Inner Deep Bay Ramsar Site) winter visitor to Hong Kong, with a peak count of 3,000 in December 1994 (Carey *et al.* 2001). Hong Kong was previously thought to hold the largest population in China, but the count of 11,160 in Hainan is almost four times larger. The major roosting site by Dongzhaigang NNR was not visited in 2007 due to time constraints.

## DISCUSSION

### Comparison with the Hong Kong Winter Waterbird Count

Hong Kong, c.420 km north-east of Hainan, has had annual winter waterbird counts since 1979. With similar size and habitats to Dongzhaigang NNR on Hainan, Mai Po and Inner Deep Bay Ramsar Site in Hong Kong regularly holds around 50,000 waterbirds each winter. At Dongzhaigang NNR, however, only about 350–1,500 waterbirds were recorded each winter during the study period. Even the total number of waterbirds recorded in each winter throughout Hainan, which is over 30 times the size of Hong Kong, was far less than at the Mai Po and Inner Deep Bay Ramsar Site in Hong Kong alone. Nevertheless, a number of waterbird species on the Hainan list have never been recorded in Hong Kong: White-eared Night Heron, Lesser Adjutant, Painted Stork, Lesser Fish

Eagle, Great Thick-knee and River Lapwing *Vanellus duvaucelii*. However, except for Lesser Fish Eagle, none of these was found during our surveys and it has been decades since they were last recorded.

There appear to be differences in seasonality for some migratory marsh terns and shorebirds between Hainan and Hong Kong. Whiskered Tern *Chlidonias hybridus*, White-winged Tern *C. leucopterus*, Whimbrel *Numenius phaeopus*, Terek Sandpiper *Xenus cinereus*, Ruddy Turnstone *Arenaria interpres*, Long-toed Stint *Calidris subminuta*, Curlew Sandpiper *C. ferruginea*, Lesser Sand Plover *Charadrius mongolus* and Greater Sand Plover *C. leschenaultii* were recorded in quite good numbers in the Hainan winter surveys but are absent or near-absent in winter in Hong Kong, occurring mainly as passage migrants. Also, numbers of Intermediate Egret *Mesophoyx intermedia* recorded were higher for Hainan than in Hong Kong. Four species that are numerous in Hong Kong during winter were either absent or occurred in very small numbers during the Hainan surveys: Great Cormorant *Phalacrocorax carbo* (one in four years), Great Crested Grebe *Podiceps cristatus* (none), Common Coot *Fulica atra* (none) and Black-tailed Godwit *Limosa limosa* (highest annual count of 16 in 2003/4). The numbers and diversity of ducks and gulls were also much lower on Hainan than in Hong Kong.

### Conservation

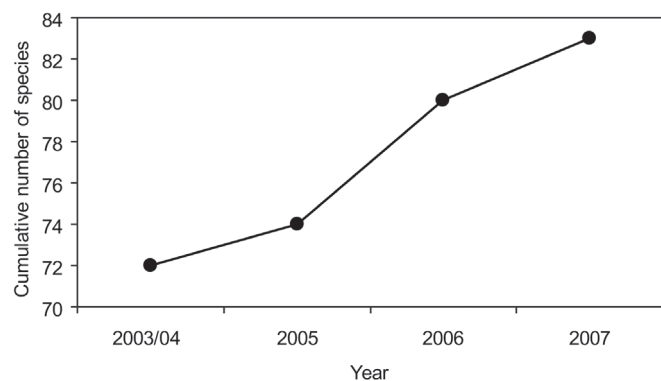
Hainan Island is situated on the East Asian-Australasian Flyway, and holds a large area of different wetland types. The occurrence of a globally significant population of Black-faced Spoonbill in Hainan, especially at Sigeng NR in the west of the island, is of particular conservation significance. However, our results indicate that numbers and species richness of waterbirds and other wetland-dependent birds have declined significantly since historical times (as inferred from references in the later 19th and first half of the 20th century). A number of wetland-dependent bird species that we expected to find, on the basis of historical records, were not recorded during the surveys, notably Bean Goose *Anser fabalis* (only recorded by Shaw Tsen-hwang and Hsu Wei-shu 1966), Cotton Pygmy-goose *Nettapus coromandelianus* (only recorded by Hartert 1910), Baikal Teal *Anas formosa*, Falcated Duck *A. falcata*, Common Crane (described by Swinhoe 1870 as 'abundant on the plains' of northern Hainan), Pheasant-tailed Jacana *Hydrophasianus chirurgus*, Greater Painted-snipe *Rostratula benghalensis*, Great Thick-knee (listed by Gao Yuren [1991] as occurring in November and December at Puqian and Wenchang), Spot-billed Pelican *Pelecanus philippensis*, Chinese Egret *Egretta eulophotes*, Purple Heron *Ardea purpurea*, Black Bittern *Dupetor flavicollis*, Great Bittern *Botaurus stellaris*, Lesser Adjutant (only recorded by Swinhoe 1870), Painted Stork and Black-headed Ibis *Threskiornis melanocephalus* (both only recorded by Hartert 1910). There appears to be a general decline in species richness and total bird number even within the four-year survey period (Table 2, although note differences in survey effort). While this probably reflects the effects of hunting and habitat degradation over the decades, and mirrors general global population declines for the large-bodied species, constraints on the surveys, in terms of weather conditions and survey effort, may also have affected the results, as very limited time was available. For example, Black Bittern, Pheasant-tailed

Jacana and Greater Painted-snipe have been recently recorded on Hainan island outside the surveys presented here; these records will be reported elsewhere.

Large-scale habitat destruction and potentially deleterious human activities were regularly observed during the surveys. During the 2005 survey, several of the mangrove stands visited in 2003/4 had been cleared for aquaculture. Bird nets/traps, fishing nets, cages and collection of edible worms were frequently encountered on the mudflats. Guyue Villa, a privately-owned artificial lake targeting tourism, had a healthy community of freshwater wetland birds. However, a lack of tourism revenue saw the owner draining the lake and clearing lakeside vegetation (which is a breeding site for the largest population of Lesser Whistling-duck in China), in order to construct more 'attractions' in 2005, and for freshwater aquaculture in 2007. Protection of these habitats is particularly urgent, especially given habitat loss and instability elsewhere in the region (e.g. BirdLife International 2003). Human disturbance directly influences the carrying capacity of many sites; very few birds were recorded in large areas of seemingly suitable habitats, many of these could potentially hold much higher wintering bird populations if the degree of human disturbance was reduced.

### Recommendations

Although the surveys revealed the general trends of waterbirds in Hainan, the status of many species, especially species associated with freshwater habitats, remains poorly known. In particular, very few riverine habitats were visited during our survey, and freshwater wetlands were under-sampled. Thus, the status of some rare freshwater specialists known from Hainan, such as White-eared Night Heron, Crested Kingfisher *Megaceryle lugubris*, Brown Fish Owl *Ketupa zeylonensis* and River Lapwing, could not be determined. There are also extensive coastal habitats that were not covered, especially sandy/rocky shores. The fact that some species previously recorded on Hainan but unrecorded during the surveys (e.g. Cotton Pygmy-goose and Pheasant-tailed Jacana) are visitors to the island outside of the survey periods may also explain their apparent absence. There is certainly a need for further surveys, especially in the numerous freshwater habitats and along deserted stretches of shoreline. Further bird species will doubtless be added to the list with extra effort, as suggested by the species accumulation curve over the four-year study period (Fig. 2), which does not yet appear to have levelled off.



**Figure 2.** Species accumulation curve of Hainan winter waterbird surveys over the four-year survey period.

Following the discovery of the important populations of Black-faced Spoonbill at Sigeng NR and Lesser Whistling-duck at Guyue Villa, the former site has been designated a wetland nature reserve and regular monitoring of the latter site is being conducted. Such steps are very important since only four (Dongzhaigang, Qinglanggang, Sigeng and Sanya River) out of the 57 surveyed sites are formally protected. It is imperative that other sites of conservation significance (e.g. Yangpugang, Guyue Villa, Houshui Bay and Changhuagang) are protected in the near future, if Hainan's rich wetland avifauna is to be preserved and to recover. There also needs to be a conservation strategy for wetland ecosystems of Hainan as a whole, with better management plans and enforcement efforts to tackle the problems of habitat encroachment and poaching. Community work aimed at providing livelihood alternatives for local people without depleting natural resources may provide the most cost-effective and sustainable option on an island scale.

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## APPENDIX

Total number of birds recorded during the Hainan winter waterbird surveys, 2003–2007. EN = Endangered, NT = Near Threatened. Site numbers correspond to those in Table 1.

Species	2003/4	2005	2006	2007	Sites
<b>Waterbirds</b>					
LESSER WHISTLING-DUCK <i>Dendrocygna javanica</i>	1,180		600	120	38, 55
MANDARIN DUCK <i>Aix galericulata</i>	1				38
EURASIAN WIGEON <i>Anas penelope</i>	270	30			54
MALLARD <i>Anas platyrhynchos</i>	1				3



Species	2003/4	2005	2006	2007	Sites
NORTHERN SHOVELER <i>Anas clypeata</i>	18	10		10	29, 54
NORTHERN PINTAIL <i>Anas acuta</i>	421	10		11	3, 9, 29, 54
GARGANEY <i>Anas querquedula</i>	60	60		19	3, 29, 54
COMMON TEAL <i>Anas crecca</i>	4	10	22		54
TUFTED DUCK <i>Aythya fuligula</i>			2		29, 54
SLATY-BREASTED RAIL <i>Gallirallus striatus</i>	3		1		14, 23, 27, 29
WHITE-BREASTED WATERHEN <i>Amaurornis phoenicurus</i>	22	4	4	7	2, 9, 14, 23, 24, 27, 29, 34, 41, 49
RUDDY-BREASTED CRAKE <i>Porzana fusca</i>	1				29
WATERCOCK <i>Gallinula chloropus</i>	1				17
COMMON MOORHEN <i>Gallinula chloropus</i>	12	5	10		5, 14, 16, 34, 38, 41
PINTAIL SNIPE <i>Gallinago stenura</i>	15				11, 18, 27, 29
COMMON SNIPE <i>Gallinago gallinago</i>	149	15	5	212	2, 11, 14, 18, 23, 29
BLACK-TAILED GODWIT <i>Limosa limosa</i>	16	2		8	9, 11, 29
BAR-TAILED GODWIT <i>Limosa lapponica</i>	13	12	2		5, 27, 29
WHIMBREL <i>Numenius phaeopus</i>	157	72	10	20	2, 3, 5, 7, 9, 29
EURASIAN CURLEW <i>Numenius arquata</i>	197	132	42	40	3, 5, 7, 9, 18, 26, 27, 29
EASTERN CURLEW <i>Numenius madagascariensis</i>	1				29
LONG-BILLED/SHORT-BILLED DOWITCHER <i>Limnodromus scolopaceus/griseus</i>			1		27
SPOTTED REDSHANK <i>Tringa erythropus</i>	135	232	145	152	2, 3, 8, 9, 11, 14, 16, 29
COMMON REDSHANK <i>Tringa totanus</i>	267	160	44	120	2, 3, 5, 8, 9, 11, 14, 16, 23, 26, 27, 29
MARSH SANDPIPER <i>Tringa stagnatilis</i>	338	634	503	191	2, 3, 5, 8, 9, 11, 14, 16, 18, 23, 27, 29
COMMON GREENSHANK <i>Tringa nebularia</i>	370	333	824	384	2, 3, 5, 7-9, 11, 14, 16, 18, 23, 26, 27, 29, 47, 55
GREEN SANDPIPER <i>Tringa ochropus</i>	28	4	2	17	2, 9, 11, 14, 18, 29
WOOD SANDPIPER <i>Tringa glareola</i>	98	210	60	20	1-3, 5, 9, 11, 14, 18, 23, 27, 29
TEREK SANDPIPER <i>Xenus cinereus</i>	12	22	7	6	17, 26, 27, 29
COMMON SANDPIPER <i>Actitis hypoleucos</i>	144	62	66	51	1, 2, 5, 7, 9, 11, 12, 14, 16-18, 20, 21, 23, 24, 27-29, 34, 40, 42, 43, 45, 55
RUDDY TURNSTONE <i>Arenaria interpres</i>	56	82	28	10	2, 3, 6-8, 27, 29
GREAT KNOT <i>Calidris canutus</i>	9	6			7, 9, 27
RED KNOT <i>Calidris canutus</i>		14			9
SANDERLING <i>Calidris alba</i>	32				1, 9
RED-NECKED STINT <i>Calidris ruficollis</i>	669	27	7		2, 3, 7, 9, 11, 18, 23, 27
TEMMINCK'S STINT <i>Calidris temminckii</i>	122	42	8	12	2, 9, 11, 14, 18, 23, 29
LONG-TOED STINT <i>Calidris subminuta</i>	343	11		24	3, 9, 11, 14, 18, 23, 29
DUNLIN <i>Calidris alpina</i>	1,013	268	565	230	2, 3, 7-9, 11, 17, 18, 23, 26, 27, 29
CURLEW SANDPIPER <i>Calidris ferruginea</i>	8	6	103		2, 3, 27
BROAD-BILLED SANDPIPER <i>Limicola falcinellus</i>	27		7		2, 3, 27, 29
RUFF <i>Philomachus pugnax</i>	3	2			9, 29
RED-NECKED PHALAROPE <i>Phalaropus lobatus</i>	1				29
BLACK-WINGED STILT <i>Himantopus himantopus</i>	3		1	1	2, 27, 29
PIED AVOCET <i>Recurvirostra avosetta</i>				1	9
PACIFIC GOLDEN PLOVER <i>Pluvialis fulva</i>	158	140	63	27	9, 18, 27, 29
GREY PLOVER <i>Pluvialis squatarola</i>	454	190	73	20	2, 3, 5-9, 11, 17, 18, 26, 27, 29
LITTLE RINGED PLOVER <i>Charadrius dubius</i>	252	463	78	54	2, 9, 11, 13, 14, 16, 18, 23, 27-29, 38, 43
KENTISH PLOVER <i>Charadrius alexandrinus</i>	1,475	1,784	725	127	1-3, 5, 6, 9, 11, 13, 14, 16-18, 23, 26, 27, 29

Species	2003/4	2005	2006	2007	Sites
LESSER SAND PLOVER <i>Charadrius mongolus</i>	807	194	3	205	1–3, 5–9, 11, 14, 23, 26, 27, 29
GREATER SAND PLOVER <i>Charadrius leschenaultii</i>	56	30	609	26	2, 8, 9, 23, 27, 29
BLACK-TAILED GULL <i>Larus crassirostris</i>			7		9, 27
HEUGLIN'S GULL <i>Larus heuglini</i>	46	2	171	34	2, 3, 5, 7, 9, 27, 29
BLACK-HEADED GULL <i>Larus ridibundus</i>	635	40	163	500	2, 3, 5, 9, 25, 27, 29
CASPIAN TERN <i>Sterna caspia</i>	118	130	26	1	3, 5, 6, 9, 11, 26, 27
LITTLE TERN <i>Sterna albifrons</i>			1		27
WHISKERED TERN <i>Chlidonias hybridus</i>	403	756	163	300	26, 27, 29
WHITE-WINGED TERN <i>Chlidonias leucopterus</i>	1,417				6, 23, 27, 29
GREAT CRESTED TERN <i>Sterna bergii</i>				3	5
LITTLE GREBE <i>Tachybaptus ruficollis</i>	50	4	37	23	5, 23, 29, 33–35, 37, 40, 43, 44, 47, 50–52, 55
GREAT CORMORANT <i>Phalacrocorax carbo</i>	1				29
LITTLE EGRET <i>Egretta garzetta</i>	3,966	264	1776	927	1–5, 8, 9, 11–14, 16–18, 20, 21, 23, 25–53, 55
PACIFIC REEF EGRET <i>Egretta sacra</i>			1		16
GREY HERON <i>Ardea cinerea</i>	836	1,009	233	117	2, 3, 5, 7–9, 11, 14, 16, 18, 20, 21, 23, 27–29, 31–35, 41–43, 45, 47, 51, 53, 55
GREAT EGRET <i>Casmerodius albus</i>	1,224	505	339	28	1, 2, 3, 5, 8, 9, 11, 14, 16–18, 20, 23, 26, 27, 29, 33–35, 38, 42, 43, 45, 47, 48, 51
INTERMEDIATE EGRET <i>Mesophoyx intermedia</i>	241	9	34	67	1–3, 5, 9, 11, 14, 16–18, 23, 29, 33, 35, 48, 55
CATTLE EGRET <i>Bubulcus ibis</i>	615	19	336	4	14, 16, 29, 33, 35, 41, 47
CHINESE POND HERON <i>Ardeola bacchus</i>	1,421	204	335	143	1–3, 5, 9, 12, 14, 16, 18, 20, 21, 23, 24, 27–29, 31–39, 41–44, 47, 50, 56, 57
LITTLE HERON <i>Butorides striatus</i>			1	2	14, 47
BLACK-CROWNED NIGHT HERON <i>Nycticorax nycticorax</i>	87	21	264		5, 14, 29, 33, 41, 51
YELLOW BITTERN <i>Ixobrychus sinensis</i>	3		1	1	27, 29, 36
VON SCHRENCK'S BITTERN <i>Ixobrychus eurhythmus</i>	1				27
CINNAMON BITTERN <i>Ixobrychus cinnamomeus</i>	4	2		1	3, 17, 29, 38
EURASIAN SPOONBILL <i>Platalea leucorodia</i>	1		1		9
BLACK-FACED SPOONBILL <i>Platalea minor</i> (EN)	62	77	68	76	3, 9, 29
<b>Wetland-associated species</b>					
COMMON KINGFISHER <i>Alcedo atthis</i>	41	31	41	10	2, 11, 14, 22, 27, 29, 37, 51, 55, 56
WHITE-THROATED KINGFISHER <i>Halcyon smyrnensis</i>	33	23	27	8	2, 14, 16, 27, 29, 56, 57
BLACK-CAPPED KINGFISHER <i>Halcyon pileata</i>	21	28	21	6	14, 16, 17, 23, 27, 29, 56
PIED KINGFISHER <i>Ceryle rudis</i>	21	13	12	5	2, 14, 29, 55
OSPREY <i>Pandion haliaetus</i>	7	2	8	1	9, 27, 29, 43, 47
BLACK-EARED KITE <i>Milvus migrans lineatus</i>	62	7	7	5	27, 29, 37, 39, 43, 47, 57
WHITE-BELLIED SEA EAGLE <i>Haliaeetus leucogaster</i>			1		47
LESSER FISH EAGLE <i>Ichthyophaga humilis</i> (NT)	1				43
EASTERN MARSH HARRIER <i>Circus aeruginosus spilonotus</i>	7				5, 29
SILKY STARLING <i>Sturnus sericeus</i>	2,293	481	11,160		14, 27, 29