The Hong Kong Bird Watching Society Ltd.
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Technical Report No. 2
September 2004

Ardeid nesting colony survey in Hainan, China 2004

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Published by

The Hong Kong Bird Watching Society Limited

(*Approved Charitable Institution of a Public Character*)

BirdLife International Affiliate

Available from

The Hong Kong Bird Watching Society Limited

Project Office: Room 1612, Beverley Commercial Building, 87-105 Chatham Road

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Recommended citation

Wong, C. L. C., W. Liang and J. Y. B. Wong. 2004. Ardeid nesting colony survey in Hainan, China 2004. Hong Kong Bird Watching Society Technical Report Series No. 2, Hong Kong.

Cover photo: Rice farming at Zizai Village, Basha County, western Hainan

(Photo by: W. Liang)

Abstract.- In Hainan Province, China, a survey of ardeid nesting colonies between May and August 2004 recorded a total of 5,287 nests of four species, i.e. the Little Egret, Cattle Egret, Chinese Pond Heron and Black-crowned Night Heron in 18 inland colonies in the northern area. The Chinese Pond Heron was the dominant nesting species (62% of the total nests), while Black-crowned Night Heron was the least abundant (4%). The dominant status of Chinese Pond Heron in Hainan is probably related to the presence of sizable ricefields in this area. The observed nest number in the present survey was nine times lower than the expected nest number, probably due to a higher hunting pressure or the site-specific nature of the nest density estimation. Based on the available information in South China, the number of nesting Cattle Egrets and Chinese Pond Herons in Hainan (75% of total nests of each species in South China), Black-crowned Night Herons in Guangdong and Guangxi, and Great Egrets in Hong Kong (80%) are of regional importance. Using media to invite readers to report nesting colonies is recommended for similar surveys in a large area as it provides a cost effective approach to minimize sampling effort.

INTRODUCTION

Ardeid nesting colony distribution and abundance in South China has been continuously studied over the past ten years. In the early 1990s, Young and Cha (1995) conducted the first survey on nesting ardeids in the Pearl River Delta, Guangdong Province. A total of 910 nesting pairs in five colonies were found, of which 94% were Black-crowned Night Herons (*Nycticorax nycticorax*) and the rest were Chinese Pond Herons (*Ardeola bacchus*), Little Egrets (*Egretta garzetta*) and Cattle Egrets (*Bubulcus ibis*). Around 2000, possible nesting locations of the endangered White-eared Night Herons (*Gorsachius magnificus*) in Guangdong and Guangxi was investigated by Fellowes *et al*. (2001), confirming that there are two to three breeding sites in these two provinces in China.

In 2001, a questionnaire survey on ardeid nesting colony distribution and nest numbers in Guangdong, Guangxi and Hainan, South China was conducted by Kadoorie Farm and Botanic Garden (Wong *et al.* 2004). Academics, forestry officials and nature reserve staff in this region were invited to contribute information on known colonies. A total of 44 colonies were reported and one third were found in the Pearl River Delta, the most important ardeid nesting area in South China. With data missing from over half of the known colonies, 2,300 nests of seven species were reported in Guangdong. In Guangxi, there were 2,365 nests of at least seven species, but little information was available for Hainan.

An understanding of regional populations is important to assess the conservation status of ardeids (Kushlan 2000). In order to provide up-to-date baseline information of the colony distribution and nest abundance of tree nesting ardeids, a survey of colonies in Hainan was conducted by the Hong Kong Bird Watching Society and Hainan Normal University between May and August 2004.

STUDY AREA AND METHODS

Study Area

Hainan Province (34,000 km^2), is the second largest island in China and is located in the southern part of China (Figure 1 and 2). In Hainan, lowland farmlands are distributed in the northern areas, while mountainous terrain in the central part takes up one third of the whole island (Anon 1996). Hainan has a tropical marine monsoon with mean annual temperature ranges from 23 - 25 °C. According to the latest statistics from the Hainan Provincial Government website, the dominant type of agriculture are rice farming, which is covering an area of 4,247,300 *mu*, i.e. 2,828.5 km^2 (8.3% of total surface area of Hainan), and rubber plantation, orchard, pasture and grassland. The freshwater area, which is potentially feeding habitats of

ardeids, covering an area of 137,000 ha, i.e. 1,370 km^2 (4.0% of total surface area of Hainan).

Field methods

Known nesting colonies in northern part of Hainan were jointly surveyed by the Hong Kong Bird Watching Society and Hainan Normal University between 26 and 29 May 2004 (Appendix 1, Figure 3). Surveys of new colonies, which were reported by villagers after the press release of the first survey on the 1 June 'Hainan Daily' newspaper, was conducted by the Hainan Normal University on 5 and 6 June, and 8 and 15 August 2004 (Appendix 1). Identification of nesting colonies was also made during other ecological field surveys in early May and July. A detailed itinerary of the survey in May is shown on Appendix 2. New colonies were located by (1) whilst travelling between colonies, (2) reports from villagers, and (3) newspaper reports. Active nests were determined by (1) direct count: the presence of incubating adults or chicks by the walk-and-count method underneath a colony, and (2) extrapolation: estimating the density of nests of each species and multiplying by the total area of a colony when accessing the colony was not possible due to the overgrown understory vegetation. The nest number of a species was taken to be the sum of the nest number of that species in each colony. Expected nest numbers of ardeids recorded in this study were based on the nest density in a ricefield dominated landscape in Central China by Fasola *et al*. (2004). In addition, the nesting substratum, which is broadly classified as *feng shui* wood, bamboo forest and vegetated island, was recorded. A *feng shui* wood is defined as a lowland woodland behind villages preserved for Chinese geomancy reasons (Corlett *et al*. 2000).

RESULTS

Colony distribution and nest abundance

During the surveys between May and August, a total of 5,287 nests of four ardeids, i.e. Little Egrets, Cattle Egrets, Chinese Pond Herons and Black-crowned Night Herons in 18 colonies in the northern Hainan were found (Table 1, Figure 3, Appendix 1-3). Another 39 villages and farms were also surveyed but no colonies were found (Table 1, Figure 3, Appendix 1). In the Luoji village colony (No. 2), a total of seven nests were undetermined but were suspected to be either Chinese Pond Herons or Cattle Egrets, as only adults of these two species were present around these nests. Of the 18 colonies, nine colonies were found in the May survey, while six and three were found in the June and August surveys respectively.

The Chinese Pond Heron was the dominant breeding ardeid (61.7% of the total nests) and the Black-crowned Night Heron was the least abundant (3.7%) (Table 1). Chinese Pond Herons bred in all colonies, while there was only three each for the Little Egret and Black-crowned Night

Heron. Little Egrets, Intermediate Egrets and Black-crowned Night Herons were recorded in four additional colonies but no breeding was noted.

Table 1. Nest abundance of 18 colonies in the northern Hainan between May and August 2004 (+ = present, % = relative abundance, and ? = unidentified nest).

	Great Egret	Little Egret	Cattle Egret	Chinese Pond Heron	Black-crowned Night Heron	?	Total	%
1. Daitian National Nature Reserve				5	190		195	3.7
2. Luoji Village		33	345	131		7	516	9.8
3. Chongwei Village			458	394			852	16.1
4. Guyue Resort		+	145	200	+		345	6.5
5. Nanwei Village			52	48			100	1.9
6. Hungdoubo Village				106			106	2.0
7. Nan Lai Lake Resort			105	156			261	4.9
8. Xianlailiang Village			10	115			125	2.4
9. Mingren Village				186			186	3.5
10. Xinleyuan				120			120	2.3
11. Shentianpo Village		+	260	170			430	8.1
12. Xinying Village		234	34	426	3		697	13.2
13. Shatian Village			129	441	2		572	10.8
14. Songmei Village		16		110			126	2.4
15. Chengmai No. 1 Elementary School				56			56	1.1
16. Linchang Village#				60			60	1.1
17. Tielu Village				380			380	7.2
18. Dalu Eden Garden				160			160	3.0
Total (%)		**283**	**1,538**	**3,264**	**195**	**7**	**5,287**	
		(5.4)	**(29.1)**	**(61.7)**	**(3.7)**	**(0.2)**	**(100)**	

Remark

#: Intermediate Egrets were recorded in the colony but no breeding was noted.

Numerically, the largest colony was found at Chongwei Village (No. 3) (16.1% of total nests, Figure 4), while the smallest was at Chengmai No. 1 Elementary School (No. 15) (1.1% of total nests). The Chongwei Village colony also contained the largest number of Cattle Egret nests (30% of total nests of this species). The Shatian Village colony contained the largest number of Chinese Pond Heron nests (13.5% of total nests of this species), while the Xinying Village

colony (No. 12) contained the largest number of Little Egret nests (83% of total nests of this species). The Daitian Nature Reserve Colony (No. 1) contained the largest number of Black-crowned Night Heron nests (97% of total nests of this species).

Nesting habitats

Of the vegetation type, over half of the colonies were situated in *feng shui* woods but submerged vegetation, vegetated islands and bamboo forest were also recorded (Table 2). Within these vegetation types, nests were built on native trees and shrubs, bamboo, economic crops and exotic trees including *Acacia confusa* and *Eucalyptus* spp. Nests at *feng shui* wood colonies were built on trees of about 15-20 m high, while those at bamboo were usually about two meters high.

Table 2. Vegtation types and plants used by ardeids as nesting habitats in 18 colonies in Hainan recorded between May and August 2004.

	Vegetation type	Types of plants			
		Bamboo	Native trees / shrubs	Economic crops	Exotic trees
1. Daitian National Nature Reserve	Bamboo forest	+			
2. Luoji Village	*Feng shui* wood	+	+	+ Rubber Tree, *Hevea brasiliensis*)	
3. Chongwei Village	*Feng shui* wood	+			+
4. Guyue Resort	Submerged vegetation		+		
5. Nanwei Village	*Feng shui* wood		+	+ Lychee	
6. Hongdoupo Village	*Feng shui* wood		+		+
7. Nanli Lake Resort	Vegetated island		+		+
8. Xianshanliang Village	*Feng shui* wood		+		
9. Mingren Village	*Feng shui* wood		+		
10. Xinleyuan Park	Bamboo forest	+			
11. Shentianpo Village	*Feng shui* wood	+	+	+ (Lychee)	
12. Xinying Village	*Feng shui* wood	+	+	+ (Lychee)	
13. Shatian Village	*Feng shui* wood	+	+	+ (Lychee)	
14. Songmei Village	*Feng shui* wood and shrub		+		
15. Chengmai No. 1 Elementary School	Garden		+		
16. Linchang Village	*Feng shui* wood	+	+	+ (Lychee)	
17. Tielu Village	*Feng shui* wood	+	+	+ (Lychee)	
18. Dalu Eden Garden	Garden	+			

Protection status

Only the colony at Daitian National Nature Reserve is officially protected as it falls within the boundary of the Reserve, the remaining colonies are spontaneously protected by the local villagers and landowners. The charging of an entrance fee at the privately owned Guyue Resort, Nanli Lake Resort, Dalu Eden Garden and Xinleyuan Park could help to restrict the access of these colonies to the public. At Xianshanliang Village, less intense human disturbance is expected due to the de-population of the village.

Comparison between expected and observed nest numbers

The expected nest number estimation revealed that the Black-crowned Night Heron is expected to be the dominant species, while the Chinese Pond Heron should be the least one (Table 3). In contrast, the present study showed the reverse. The expected nest numbers of all recorded ardeids, in particular Little Egrets and Black-crowned Night Herons, were greater than the observed one. In addition, the total expected nest number was approximately nine times greater than that the observed one.

Table 3. The expected and observed nest number in Hainan in 2004. The estimation of expected nest number is based on the nest density in Fasola *et al*. (2004). The observed nest number is the result of present study.

	Nest density in landscape (nest / km^2)	Expected no. of nests	Observed no. of nests
Little Egret	1.766	4,995	283
Cattle Egret	1.381	3,906	1,538
Chinese Pond Heron	1.357	3,838	3,264
Black-crowned Night Heron	11.956	33,818	195
Undetermined nests	-	-	7
Total	-	46,557	5,287

DISCUSSION

Our survey revealed that nesting colonies were only found in the northern part of Hainan. According to a land use map published in 1996, lowland flatlands dominated by ricefields, pasture, grasslands, rubber plantation and orchards are found in this area (Anon 1996). Ricefield and pasture are identified as feeding habitats of ardeids in Europe (Farinha and Leitao 1996, Fasola and Ruiz 1997) and Japan (Lane and Fujioka 1998). Thus, these colonies are

established adjacent to these feeding habitats. The absence of colonies in the southern part of Hainan could relate to the dominance of rubber plantation, which was seldom used by feeding ardeids (Wong, L. C pers. obs.). In addition, all colonies are situated in the inland areas, probably due to low food availability of coastal wetlands in Hainan. The current colony distribution may also be influenced by cultural difference among villages. Interviews with villagers revealed that some villages set up regular patrols to protect the nests from collection, while collecting birds for food is still a strong habit in some villages, indicating that the attitude to conservation in rural area may affect the distribution of nesting colonies.

Based on the findings of the present study and other available information in South China (Young and Cha 1995, Wong *et al*. 2004), a preliminarily assessment of the regionally important breeding areas could be made (Appendix 4). However, caution should be taken as the nest count in Guangdong is incomplete and some of the nest surveys were conducted ten years ago. The nesting Cattle Egrets and Chinese Pond Herons in Hainan are of regional importance. They account for approximately 75% of known nests of each species in this region. The nesting Black-crowned Night Herons in the Pearl River Delta in Guangdong, and Guangxi are of potential regional importance as they contained about 90% of nest numbers. In Hong Kong, the nesting Great Egrets is of regional importance as over 80% of nest numbers.

The composition of wet feeding habitats plays an important role on determining species composition and abundance of ardeids in Europe (Fasola 1994, Farinha and Leitao 1996). Freshwater habitats are known to determine the ardeid nest abundance in the Mediterranean region (Hafner and Fasola 1992). No such study has been conducted in South China but the findings in the present study may allow a preliminarily assessment. The dominant status of Cattle Egrets and Chinese Pond Herons in Hainan is suspected to be associated with rice farming as this habitat were found adjacent to most colonies of these two species. The breeding of Black-crowned Night Herons is suspected to be associated with freshwater ponds, which were one of the main feeding habitats of this species in Hong Kong during breeding seasons (Wong *et al*. 1999). In Hainan, the dominant wetlands adjacent to the only Black-crowned Night Herons colony at Daitian National Nature Reserve are small open freshwater reservoirs intended to be wildlife drinking pools. Similarly, the dominant status of Black-crowned Night Herons in the Pearl River Delta in Guangdong is apparently associated with fishponds and dyke ponds, which are dominant habitats there (Anon 2004). Nevertheless, an assessment of the relationship between the land use pattern and nest abundance should be conducted to verify our assumption.

The present survey recorded far fewer nests than the expected one, in particular the Little Egret and Black-crowned Night Herons, suggesting the nest density estimated by Fasola *et al.* (2004)

could be site specific. Therefore, more rigorous field studies are needed to support the expectation of five million ardeid nests in China suggested by Fasola *et al*. (2004). A contributing factor in the difference between the expected and observed nest numbers in Hainan could be the altitude towards wildlife conservation of people between Central and South China. Harvesting wildlife for food is still common in South China, causing lower nest numbers in the present study area.

Developing an inventory of ardeid populations in less developed areas is difficult due to the large survey area and lack of resources (Kushlan 2000). This information, in turn, could allow identification of Important Heron Areas, assess the risks they faced and the regional or territorial conservation status (Kushlan 2000). Aerial surveys identifying colony locations is an effective but expensive option. The use of media for inviting reports of nesting colonies from the readers could provide another cost effective option. In the present study, new colonies were reported by keen villagers following a press release of the first survey the Hainan Daily. These reports greatly reduced our sampling effort and expense on identifying the location of nesting colonies. However, detailed description of nesting sites should be avoided in the media as it may attract more hunters to visit these sites. In conclusion, the success of this option is restricted by the literacy and environmental awareness of the local people.

Protection of main colonies including those at Luoji, Chongwei, Shatian and Xinying villages, which contained about 50% of total nests in Hainan, should be given. Securing the safety of these colonies by stationing of authorized persons who could prosecute hunters is encouraged. Priority should also be given to protect the largest colony of Little Egrets in Xinying as it is one of the uncommon breeding ardeids in Hainan. As the largest breeding site of Black-crowned Night Herons has been protected, preservation of the small open reservoirs is vital for providing adequate feeding habitats for this uncommon breeding ardeid.

Promoting environmental education should also be encouraged. In fact, local county governments have put much effort on environmental education in recent years. Notice boards showing the conservation and appreciation of ardeids were installed in front of colonies. They also organized seminars to educate the villagers about the importance of conservation. Moreover, conservation and environmental news often appear on the local newspapers. This could help to increase people’s awareness on the conservation and appreciation of wildlife. At last, designating all egrets and herons as protected species, of which no hunting is allowed, is one of the measures to ensure a sustainable breeding population in Hainan.

ACKNOWLEDGMENTS

We are grateful to the members of Egret Research Group for commenting the report. We would like to express our gratitude to Carrie Ma of the Hong Kong Bird Watching Society for the administration of this study and Dr Lew Young for commenting of the earlier drafts. Gratitude was also expressed to Wang Jichao of Hainan Normal University and He Fenqi of Institute of Zoology, The Chinese Academy of Sciences, for their part of field survey. The expense for this study in Hainan was kindly funded by Hainan Province Key Discipline in Ecology, Hainan Normal University and WWF-China.

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Figure 1. The location of Hainan in China (shaded area).

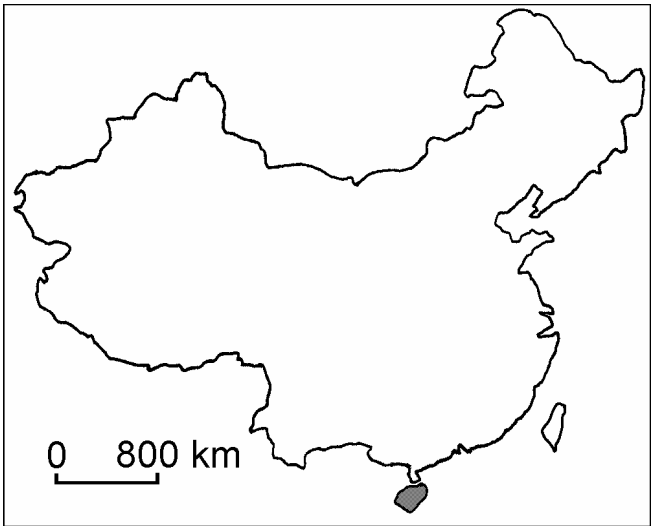

Figure 2. The location of Guangdong, Guangxi, Hainan, Hong Kong and Macau in South China.

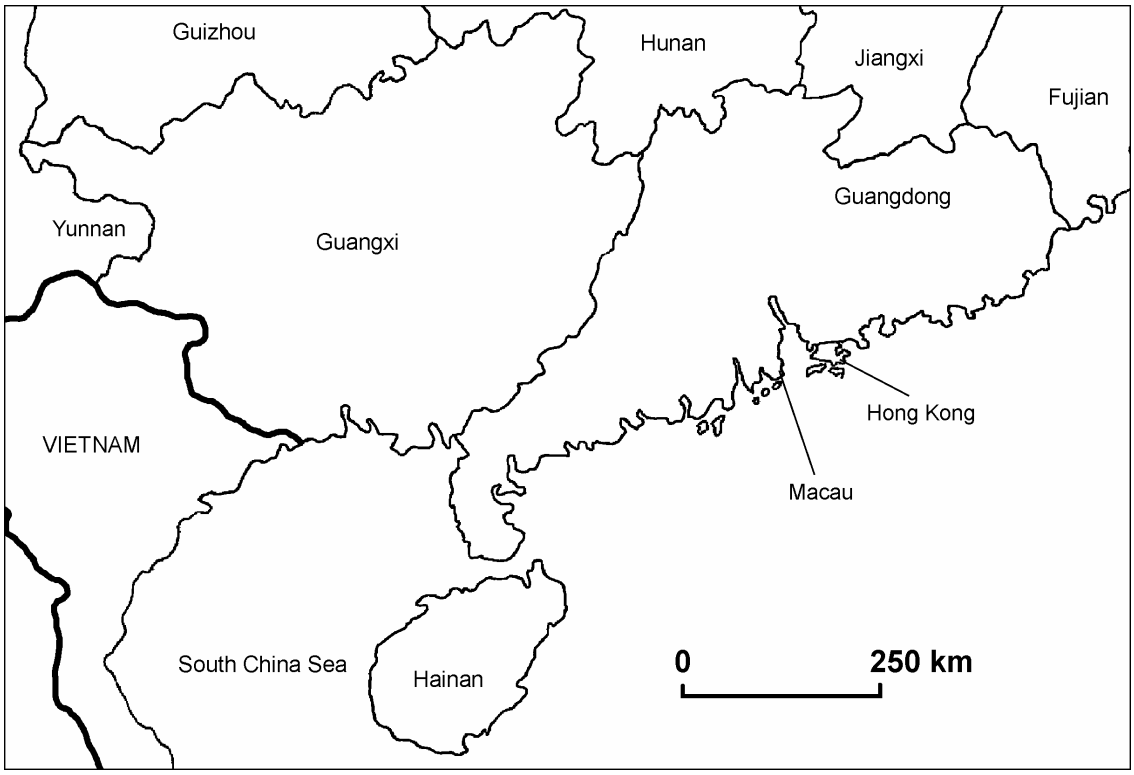

Figure 3. The locations of nesting colonies (black dots) in Hainan (1-18). An additional 39 sites (empty dots 19-57) were surveyed but no colonies were found

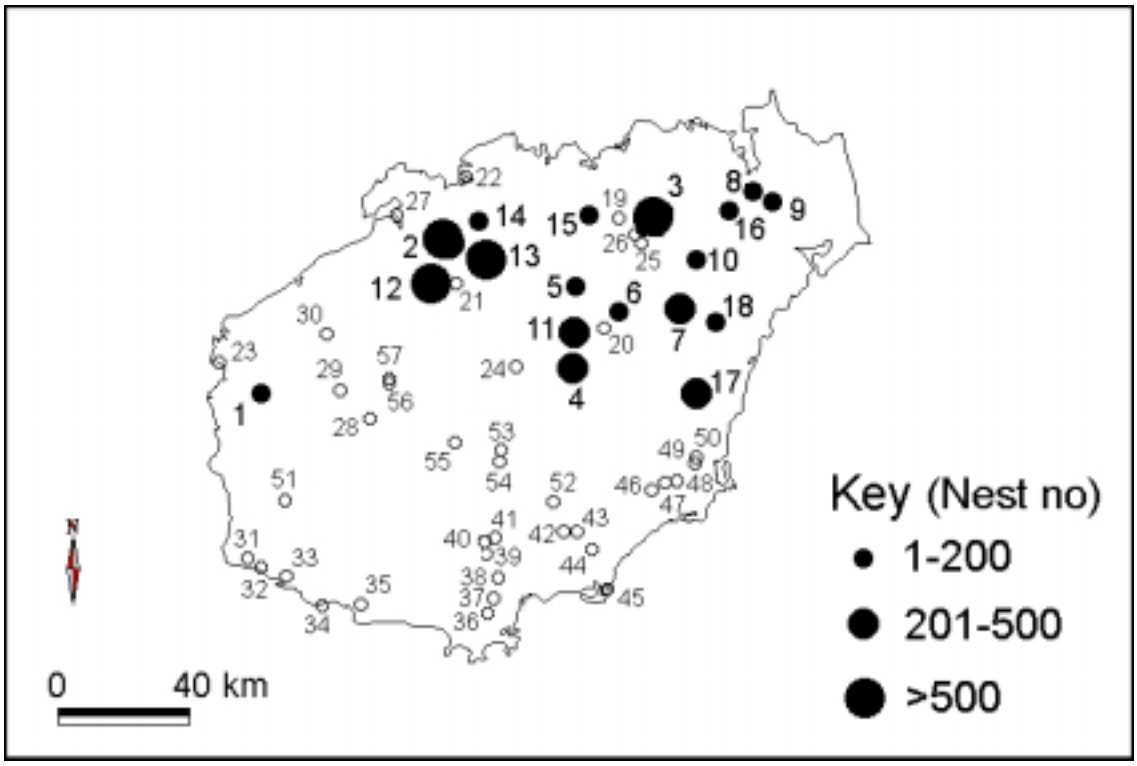

Figure 4. The Daitian National Nature Reserve (No.1). The largest nest number of Black-crowned Night Heron (*Nycticorax nycticoxax*) was found in this bamboo colony (Credit: Captain Wong).

Figure 5. The Chongwei colony (No. 3). The largest colony recorded in the present survey. Regular patrols were made by the villagers to protect it from collection. (Credit: Prof. Liang Wei)

Figure 6. Nesting Cattle Egrets (*Bubulcus ibis*) and Chinese Pond Herons (*Ardeola bacchus*) at the Guyue Resort colony (No.4). Nest count was made underneath the colony due to the overgrown of the submerged vegetation. (Credit: Prof Liang Wei)

Figure 7. A warning signpost at the Nanli Lake colony (No. 7) erected by the Nanli Lake Police Authority in 2003. It warns that collection of any bird species is prohibited (Credit: Captain Wong).

Figure 8. A *feng shui* wood colony behind Mingren Village (No. 9). Most nests were found near the canopy (Credit: Josephine Wong).

Figure 9. The Songmei colony (No 14). This colony is dominated by the Chinese Pond Heron (*Ardeola bacchus*) (Credit: Prof Liang Wei).

Appendix 1. Survey dates and methods in Hainan between May and August 2004. No 1-18 were active nesting colonies while the others were surveyed but no colonies were seen.

No.	Locations	Survey date	Survey methods	
			Direct Count	Extrapolation
1	Datian National Nature Reserve, Dongfang County 東方大田保護區	26 May	+	+
2	Luoji Village, Danzhou County 儋州洛基	27 May	+	
3	Chongwei Village,Chengmai County 澄邁沖尾村	27 May	+	
4	Wanling Guyue Resort,Qiongzhong County 瓊中灣嶺古月山莊	28 May	+	+
5	Nanwei Village,Tunchang County 屯昌南味村	28 May		+
6	Hongdoupo Village, Tunchang County 屯昌洪鬥坡村	28 May	+	
7	Nanli Lake, Ding'an County 定安南麗湖	28 May	+	
8	Xianshanliang Village, Haikou 海口鹹山良村	28 May	+	+
9	Mingren Village, Wenchang County 文昌名人村	29 May	+	
10	Xinleyuan Park, Ding'an County 定安欣樂園	5 June	+	
11	Shentianpo Village, Tunchang County 屯昌深田坡村	5 June	+	+
12	Xinying Village, Danzhou County 儋州新營村	6 June	+	+
13	Shatian Village, Danzhou County 儋州沙田村	6 June	+	+
14	Songmei Village, Lingao County 臨高松梅村	6 June	+	
15	No. 1 Elementary School, Chengmai County 澄邁一小	6 June	+	
16	Linchang Village, Haikou 海口林昌村	8 Aug	+	
17	Tielu Village, Qionghai County 瓊海鐵爐村	8 Aug	+	
18	Dalu Eden Garden, Qionghai County 瓊海伊甸園山莊	15 Aug	+	+
19	Jialian Village, Chengmai County 澄邁加璉村	27 May		
20	Cunxin Village, Tunchang 屯昌村心村	5 June		
21	Yunyue Lake, Danzhou County 儋州雲月湖	6 June		
22	Hegui Village, Lingao County 臨高和貴村	28 July		
23	Sibi Village, Dongfang County 東方四必村	2 August		
24	Limushan NR, Qiongzhong County 瓊中黎母山保護區	5 June		
25	Zhuangpo Village, Ding'an County 定安莊坡村	9 June		
26	Jiajing Village,Ding'an County 定安加京村	10 June		
27	Nanan Village, Danzhou County 儋州南岸村	22 August		
28	Dayan Village, Changjiang County 昌江大炎村	22 August		
29	Bawangling NR, Changjiang County 昌江霸王嶺保護區	23 August		
30	Taipo Village, Changjiang County 昌江太坡村	23 August		
31	Yinggehai Salt Field, Ledong County 樂東鸚歌海鹽場	23 August		
32	Huangliu Village, Ledong County 樂東黃流村	23 August		
33	Chongpo Village, Ledong County 樂東沖坡村	23 August		

34	Meishan Village, Sanya County 三亞梅山村	23 August
35	Yacheng Village, Sanya County 三亞崖城村	23 August
36	Damao Village, Sanya County 三亞大茅村	9 June
37	Ganshiling NR, Sanya County 三亞甘什嶺保護區	9 June
38	Sandao Village, Baoting County 保亭三道村	23 August
39	Shigu Village, Baoting County 保亭什穀村	23 August
40	Jinjiang Farm, Baoting County 保亭金江農場	23 August
41	Shiluo Village, Baoting County 保亭什羅村	23 August
42	Dapo Village, Baoting County 保亭大坡村	24 August
43	Zhongyang Village, Lingshui County 陵水中央村	24 August
44	Timeng Village, Lingshui County 陵水提蒙村	24 August
45	Li'an Village, Lingshui County 陵水黎安村	24 August
46	Xinzhong Farm, Wanning County 萬寧新中農場	24 August
47	Shentian Village, Wanning County 萬甯深田村	24 August
48	Changfeng Village, Wanning County 萬甯長豐村	24 August
49	Longwei Village, Wanning County 萬甯龍尾村	24 August
50	Lelai Village, Wanning County 萬甯樂來村	24 August
51	Jianfengling NR, Ledong County 樂東尖峰嶺保護區	10 July
52	Diaoluoshan NR, Lingshui County 陵水吊羅山保護區	2 May
53	Wuzhishan NR, Wuzhishan County 五指山保護區	3 May
54	Shuiman Village, Wuzhishan County 五指山水滿村	3 May
55	Maoyang Village, Wuzhishan County 五指山毛陽村	4 May
56	Zizai Village, Baisha County 白沙子宰村	28 July
57	Yitiao Village, Baisha County 白沙益條村	28 July

Appendix 2. The itinerary of the first survey between 26 and 29 May 2004.

Date	Time (h)	Journey / Action
26 May	10.55-11.55	HK members took flight to Haikou (海口)
	13.30	Arrived at Hainan Normal University, Haikou
	13.30-14.15	Lunch at Haikou
	14.15-17.00	From Haikou to Daitian (大田) National Nature Reserve
	17.15-18.00	Surveyed at the colony at Daitian NR
	18.00-19.00	From Daitian Nature Reserve to Beili Bay (北黎灣)
	19.00-19.30	Birdwatching at Beili Bay
	19.30-20.00	From Beili Bay to Dongfang (東方) City, overnight at Dongfang City
27 May	07.45-09.20	From Dongfang City to Luoji Village, Danzhou County (澹州縣洛基村)
	09.20-12.00	Surveyed at the colony at Luoji Village
	12.00-13.00	From Luoji to the coast of Xianyin Town, Lingao County (臨高縣新盈鎮)
	13.00-13.30	Lunch
	13.30-14.10	Birdwatching at the coast
	14.10-15.45	From the coast to Jialian Village, Chengmai County (澄邁縣迦璉村)
	15.45-16.15	Surveyed at the colony at Jialian Village (abandoned)
	16.15-17.30	To county government office, and to Tunchang County (屯昌縣)
	17.30-18.30	Surveyed at the colony at Chongwei Village, Yongfa Town, Chengmai County (澄邁縣永發鎮沖尾村) (discovered occasionally)
	18.30-19.15	To Tunchang County and overnight there
28 May	07.15-08.00	From Tunchang County to Guyue Resort, Wanling Town, Qiongzhang County (瓊中縣灣嶺鎮古月山莊)
	08.00-08.45	Surveyed at Guyue Resort
	08.45-10.00	Returned to Tunchang County Town for car repairing and breakfast
	10.00-11.15	From Tunchang County to Nanwei Village(南味村)
	11.15-11.50	Surveyed at the Nanwei Village colony
	11.50-13.00	From Nanwei Village to Hongdoupo Village (洪鬥坡村), through Tunchang County
	13.00-13.25	Surveyed at the Hongdoupo Village colony
	13.25-15.30	From Hongdoupo to Nan Li Lake Resort, Ding'an County (安定縣南麗湖)
	15.30-16.50	Surveyed at the colony on an island of Nanli Lake Resort
	16.50-18.20	From Nanli Lake Resort to Daizhipo Town (大致岐鎮)
	18.20-18.45	Surveyed at the colony at Xianshanliang Village(鹹山良村)
	18.45-19.10	From Daizhipo Town to Mingren Resort (名人山莊)
	19.10-19.30	Visited Mingren Resort
	19.30-19.45	Arrived at the colony at Mingren Village
	19.45-20.15	Returned to Daizhipo Town and overnight there
29 May	06.00-06.15	From Daizhipo Town to Mingren Village
	06.15-06.45	Surveyed at the colony at Mingren Village
	06.45-07.15	From Mingren Village to Haikou airport
	07.15-10.00	HK members took flight back to Hong Kong

Appendix 3. Detailed description of nine nesting colonies in northern Hainan recorded in the first survey between 26 and 29 May 2004.

1. Daitian National Nature Reserve (19°06'41.2"N, 108°47'45.0"E)
The 13 km^2 Daitian National Nature Reserve is situated in Dongfang county, West Hainan. This Nature Reserve is aimed at protecting the endemic Eld's Deer (*Cervus eldi hainanus*) by enclosure. Small drinking reservoirs of surface area varying from 0.5 to 2 ha were created for the deers. The colony is about 0.5 ha and is dominated by bamboo. It is situated at about 2 km from the park office. Black-crowned Night Herons were first noted to breed in the reserve in 1996 and it relocated to the present location in 1999. Access to this reserve was restricted to the public.

2. Lujio Village (19°38'26.5"N, 109°31'49.2"E)
The colony is situated in a *feng shui* wood, i.e. isolated woodland near a village preserved for Chinese geomancy reasons, in Danzhou County, North West Hainan. The colony size was about 3 ha. Main vegetation types were bamboo, rubber tree (*Hevea brasiliensis*) plantation and unidentified native tree species. The colony is spontaneously protected by the villagers.

3. Chongwei Village (19°40'26.7"N, 110°11'49.8"E)
This approximate 0.5 ha colony is situated at Chengmai County, North Hainan. It is dominated by bamboo of 2.5 m high mixing with exotic tree of around 10 –15 m high. It is adjacent to a duck-cum fishpond. The colony is spontaneously protected by the villagers.

4. Guyue Resort (19°11'104.4"N, 109°56'45.2"E)
This approximate 500 m^2 colony was situated at Qiongzhang County, Central Hainan. It was found in dense submergent shrubby vegetation of 2 m high on an artificial lake of a recreational holiday resort. Entrance fee is charged for accessing the resort.

5. Nanwei Village (19°28'56.6"N, 109°57'27.2"E)
This approximate 0.25 ha colony is situated at Tunchang County, Central Hainan. It is found at a *feng shui* wood of 20 m high. Vegetation includes bamboo, and native and exotic trees. Breeding ardeids first bred at this village about 15 years ago. The colony is currently spontaneously protected by the villagers and shooting of birds and collection of chicks were claimed to be prohibited.

6. Hongdoupo Village (19° 23' 55.0"N, 110° 06' 40.8"E)
This approximate 0.25 ha colony is situated at Tunchang County, Central Hainan. It is found at a *feng shui* wood of 20 m high. The colony is spontaneously protected by the villagers. However, as it was situated on the roadside, shooting of birds by outsiders with air guns was occasionally found.

7. Nanli Lake Resort (19°24'37.1"N, 110°20'06.6"E)
The colony is situated on an approximate one ha island at Nan Lai Lake Resort, Auding County, North Hainan. The island is dominated by native shrubs of 3 to 4 m high and exotic trees of 10 to 15 m.

8. Xianshanliang Village (19°49’00.3”N, 110°35’58.1”E)
This approximate 0.25 ha colony is situated at Xianlai Town, Haikou City , North East Hainan. It is found in a *feng shui* wood of 20 to 25 m high. This village is almost abandoned and only few residents are still living there. The colony is also spontaneously protected by the villagers.

9. Mingren Village (19°46’47.5”N, 110°39’54.8” E)
This approximate 0.5 ha colony is situated at Dalu Town, Wenchang County, East Hainan. It is found in a *feng shui* wood of 20 to 25 m high. A short interview with the villagers revealed that Little Egrets were first noted to breed in 1964 but it was abandoned later due to collection of birds for food. Chinese Pond Herons subsequently bred there annually until now. The colony is also spontaneously protected by the villagers.

10. Xinleyuan (19º34’32’’N, 110º23¹22’’E)
The colony is situated at a riverside bamboo forest, which is 100 m away from the Hainan Highway (eastern lane). The location is a recreational park and also a tourism hotspot.

11. Shentianpo Village (19º19’17”N, 109º55’52”E)
The colony is situated at bamboo and economic fruit trees. Villagers revealed they have spontaneously protected it for six years. A fixed penalty of RMB 50 per bird is imposed if hunter is caught.

12.Xinying Village (19º29’18”N, 109º27’57”E)
The colony is situated at bamboo, native trees and economic fruit trees. Nests of Little Egrets occupied over 20 m of Banyan trees (*Ficus microcarpa*). Villagers revealed that Chinese Pond Herons came to breed first when it was noted to become a nesting site ten years ago. The nesting site is spontaneously protected by villagers for about ten years.

13. Shatian Village (19º35¹12N, 109º35¹39E)
The colony is situated at bamboo, native trees and economic fruit trees. Most Cattle Egret nests (118) were found on bamboo. The village is an “ecological civilized village”. The nesting site is spontaneously protected by villagers for six years. A hunter was seen during the visit but he claimed that they just focused on birds near hillside.

14. Songmei Village (19º42’31”N, 109º35’48”E)
Unlike other colonies in the village area, this colony is not situated in close proximity to this village of indigenous people. Nests were found 1 to 4 m above the ground in the shrub, which is isolated from the village by farmlands. A marker stone showing the protection of this colony is established by the villagers.

15. Chengmai No. 1 Elementary School (19º43’51”N, 110º00’05”E)
The colony is situated on two trees near a playground of the school. The largest river of Hainan is about 10 m away from the colony. Human activities are intense but no disturbance to the nesting birds is reported.

16. Linchang Village (19º44’31”N, 110º30’25”E)
It was first noted to breed in 2002. This village is proposed to be an “ecological civilized village”.

17. Tielu Village (19º06’04”N, 110º22’48”E)
It was first noted to breed in 1995. The local government designated it as a “Chinese Pond Heron Protection Area” in 1999. The village is also an “ecological civilized village”.

18. Dalu Eden Garden (19º21’10”N, 110º27’40”E)
The colony is situated on lakeside bamboo in a private farm that is not open to the public. Thus, it receives better protection against human disturbance. Ricefields were not found in adjacent to the colony.

Appendix 4. Nest abundance and bird count in South China between the 1990s and 2004. Only nest count in the Pearl River Delta is available in Guangdong.

	Year	Source	Data type	Great Egret	Little Egret	Cattle Egret	Chinese Pond Heron	Black-crowned Night Heron	Total
Hainan	2004	Present study	Nest		283	1,538	3,264	195	5,280
Guangdong	1995	Young and Cha (1995)	Nest		14	1	40	855	910
	1990s	Wong *et al*. (2004)	Bird	1,500	10,250	3,150	3,250	23,500	42,400
Guangxi	1990s	Wong *et al*. (2004)	Nest	20	180	360	880	740	2,365
Hong Kong	2004	Wong and Wong (in prep)	Nest	85	242	71	315	160	873
Macau	2003	Wong L. C. unpublished data	Nest		164		5	18	187

The Hong Kong Bird Watching Society Ltd.
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The Hong Kong Bird Watching Society founded in 1957, is one of the oldest non-governmental organizations in Hong Kong. It is committed to research, education and conservation related to birds and their habitats. The Society organizes long-term bird monitoring schemes, conducts research and education programmes, and promotes appreciation and understanding of birds within the community. It was incorporated in 2002 as a limited company and was at the same time approved as a charitable organization of a public character. The specific objectives of the HKBWS are:

(a) To promote the study of birds to understand their biology and ecology;
(b) To promote the appreciation and understanding of birds;
(c) To promote the conservation of birds, wildlife and their habitat; and
(d) To promote awareness and observance of laws protecting birds and in particular the Wild Animals Protection Ordinance.

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