



## Issue No. 7 August 2004

### Feature Article

## Bats of Hong Kong: An Introduction of Hong Kong Bats, with an Illustrative Identification Key

### 香港的蝙蝠：簡介及分類索引

Chung-tong SHEK, Mammal Working Group

漁農自然護理署正進行一項本港蝙蝠物種的生態調查，本文為哺乳類工作小組首篇有關「香港蝙蝠」的文章，旨在介紹本港曾經記錄過的22種蝙蝠、其分類索引及本署正在使用的調查方法。

#### Introduction

Bats are amongst the most beneficial animals in the ecosystem, as they play important roles in the overall ecology. Some species of bats are the major predator in controlling the populations of night-flying insects. Other bats perform important functions as pollen or seed dispersers. And, since bats have specialized feeding behavior and habitat requirements, they are valuable indicators of environmental changes in the ecosystem.

The first annotated checklist of Hong Kong bats was published by Romer (1974). His checklist includes 18 species, including 2 fruit bats and 16 insectivorous bats. In the following 30 years, four additional species, i.e. Greater Bent-winged Bat (Maeda, 1982), Daubenton's Bat (Ades, 1990), Black-bearded Tomb Bat (Ades, 1993), and Lesser Bamboo Bat (Ades, 1996) have been added to the Hong Kong list.



Figure 1. Aggregations of Rickett's Big-footed Bat, Chinese Myotis, and Greater Bent-winged Bat inside a water tunnel in Sai Kung.

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A total of 22 bat species have now been recorded in Hong Kong (Table 1), which accounts for about half of the terrestrial mammalian diversity. Of these, two belong to the suborder Megachiroptera. These are fruit bats, which mainly feed on fruits and nectar. The remaining 20 belong to the suborder Microchiroptera. These are carnivorous bats that mainly feed on insects, but one of them is also piscivore feeding on fish. In Hong Kong, all bat species are protected under the Wild Animals Protection Ordinance (Cap 170).

## Key to Hong Kong Bat Species

Local bat species are classified into six different families, which can be distinguished on the basis of ear shape, muzzle shape, presence or absence of noseleaf, and tail morphology. To facilitate field identification of all known bat species in Hong Kong, an up-dated identification key has been developed.

Members of the genus *Miniopterus* all look very similar, and difficult to distinguish. Forearm length and weight separate most specimens, but since there is some overlap, skull measurements are sometimes necessary for confirmation (Maeda 1982). The three local *Miniopterus* spp. overlap with the ranges of forearm length of *M. magnater* and *M. schreibersii*. However, some *M. schreibersii* can be distinguished from *M. magnater* with forearm lengths ranging from 46mm to 48mm. Further studies, such as mtDNA and skull measurements, will be carried out on the classification of *Miniopterus* species in Hong Kong.

1. A. Large conspicuous eyes with dull red eye shine, simple ears without tragus<sup>i</sup> and second finger with claw (2)
- B. Small eyes without dull red eye shine, complex ears and second finger without claw (3)
2. A. Short muzzle, tawny brown pelage<sup>ii</sup>, ear and wing bone are edged in white (3) *Cynopterus sphinx*
- B. Long muzzle, grayish brown pelage, ear and wing bone are not edged in white (4) *Rousettus leschenaulti*



*Cynopterus sphinx*  
Short-nosed Fruit Bat (短吻果蝠)  
Forearm: 64 - 79mm



*Rousettus leschenaulti*  
Leschenault's Rousette (棕果蝠)  
Forearm: 75 - 86mm

3. A. Presence of noseleaf<sup>iii</sup> (4)
- B. Absence of noseleaf (8)
4. A. Posterior noseleaf<sup>iv</sup> elevated and pointed, with lancet<sup>v</sup> (Photo 1) (5)
- B. Posterior noseleaf low and rounded, without lancet (Photo 2) (7)



Photo 1



Photo 2

5. A. Lancet narrowly pointed (Photo 3) *Rhinolophus affinus*
- B. Lancet triangular in shape with a well developed tip and concave margin (Photo 4) (6)
6. A. Connecting Process<sup>vi</sup> broadly rounded, originating from below tip of sella<sup>vii</sup> (Photo 5) *Rhinolophus rouxi*
- B. Connecting Process triangular and slightly pointed (Photo 6) *Rhinolophus pusillus*

- i. Tragus - a cutaneous and cartilaginous projection found at the opening of the external ear in some bats.
- ii. Pelage - hair color.
- iii. Noseleaf - structures, developed from the skin around the nostrils in some bats, often of a complex nature.
- iv. Posterior noseleaf - the posterior or upper projection of the noseleaf.
- v. Lancet - an erect, subtriangular, posterior part of the noseleaf of bats of the Genus *Rhinolophus*.
- vi. Connecting process - the upper margin of the forwardly projecting sella of *Rhinolophid* bats.
- vii. Sella - an over-hanging anterior projection of the noseleaf of *Rhinolophid* bats.



Photo 3



Photo 4

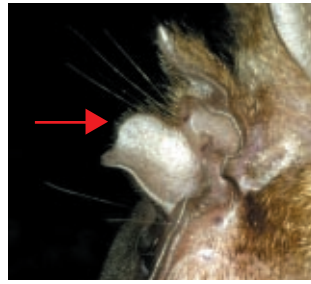


Photo 5



Photo 6



*Rhinolophus affinus*  
Intermedite Horseshoe Bat (中菊頭蝠)  
Forearm: 49 - 55mm



*Rhinolophus rouxi*  
Rufous Horseshoe Bat (魯氏菊頭蝠)  
Forearm: 41 - 52mm



*Rhinolophus pusillus*  
Least Horseshoe Bat (小菊頭蝠)  
Forearm: 35 - 40mm

- 7. A. Large body size, head-to-body length exceeds 100mm ..... *Hipposideros armiger*
- B. Small body size, head-to-body length 50mm or less ..... *Hipposideros pomona*

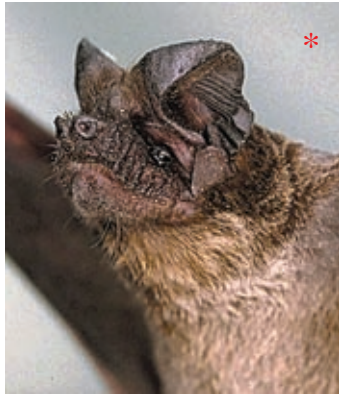


*Hipposideros armiger*  
Himalayan Roundleaf Bat (大蹄蝠)  
Forearm: 86 - 96mm



*Hipposideros pomona*  
Pomona Roundleaf Bat (小蹄蝠)  
Forearm: 38 - 45mm

- 8. A. At least half of tail free from tail membrane ..... (9)
- B. Tail enclosed by tail membrane ..... (10)
- 9. A. Lips wrinkle & ear joined over head ..... *Chaerephon plicata*
- B. Lips without wrinkle & ears not joined, male with "beard" ..... *Taphozous melanopogon*



*Chaerephon plicata*  
Wrinkle-lipped Free-tiled Bat (皺唇犬吻蝠)  
Forearm: 40 - 51mm



*Taphozous melanopogon*  
Black-bearded Tomb Bat (黑鬚墓蝠)  
Forearm: 55 - 68mm

- 10. A. Forearm length 37mm or less ..... (11)
- B. Forearm length exceeds 39mm ..... (13)
- 11. A. Thumb and feet with pads (Photos 7 & 8) ..... *Tylonycteris pachypus*
- B. Thumb and feet without pads ..... (12)



Photo 7



Photo 8



*Tylonycteris pachypus*  
Lesser Bamboo Bat (扁顛蝠)  
Forearm: 24 - 28mm

- 12. A. Brownish pelage, long baculum<sup>viii</sup> exceeds 10mm (Photo 9) for male ..... *Pipistrellus abramus*
- B. Blackish brown pelage without long baculum for male ..... *Pipistrellus pulveratus*



Photo 9



*Pipistrellus abramus*  
Japanese Pipistrelle (東亞家蝠)  
Forearm: 31 - 35mm



*Pipistrellus pulveratus*  
Chinese Pipistrelle (灰伏翼)  
Forearm: 35 - 36mm

viii. Baculum - the supporting bone of the penis.

\* ~ Photographs reproduced with the permission of Dr. James Bates and the Harrison Institute (Bates and Harrison, 1997).

- 13. A. Wings bent at rest, the 2<sup>nd</sup> bone of 3<sup>rd</sup> finger 3 times longer than the 1<sup>st</sup> bone of 3<sup>rd</sup> finger (Photo 10) . . . . (14)
- B. Wings not bent at rest, the 2<sup>nd</sup> bone of 3<sup>rd</sup> finger not 3 times longer than 1<sup>st</sup> bone of 3<sup>rd</sup> finger . . . . . (16)
- 14. A. Forearm length 43mm or less . . . . . *Miniopterus pusillus*
- B. Forearm length exceeds 43mm . . . . . (15)
- 15. A. Forearm length 48mm or less . . . . . *Miniopterus schreibersii*
- B. Forearm length exceeds 48mm . . . . . *Miniopterus magnater*



Photo 10



*Miniopterus pusillus*  
Lesser Bent-winged Bat (南摺翅蝠)  
Forearm: 39 - 43mm



*Miniopterus schreibersii*  
Common Bent-winged Bat (長翼蝠)  
Forearm: 44 - 49mm



*Miniopterus magnater*  
Greater Bent-winged Bat (摺翅蝠)  
Forearm: 48 - 53mm

- 16. A. Tragus long and pointed (Photo 11) . . . . . (17)
- B. Tragus blunt and rounded (Photo12) . . . . . (21)

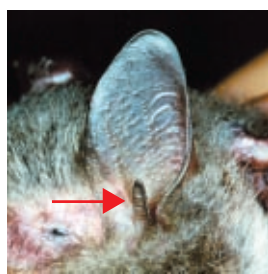


Photo 11



Photo 12

- 17. A. Forearm length exceeds 55mm . . . . . (18)
- B. Forearm length 55mm or less . . . . . (19)
- 18. A. Forearm length 60mm or less, feet greatly enlarged (Photo 13), about 80% of the tibia length . . *Myotis ricketti*
- B. Forearm length exceeds 64mm, feet about half length of tibia . . . . . *Myotis chinensis*



Photo 13



*Myotis ricketti*  
Ricket's Big-footed Bat (大足鼠耳蝠)  
Forearm: 53 - 56mm



*Myotis chinensis*  
Chinese Myotis (中華鼠耳蝠)  
Forearm: 65 - 71mm

19. A. Wing attached to hind foot (Photo 14) ..... (20)  
 B. Wing attached to ankle ..... *Myotis fimbriatus*



Photo 14



*Myotis fimbriatus*  
Hairy-legged Myotis (毛腿鼠耳蝠)  
Forearm: 35 - 38mm

20. A. Canines reduced, lower canine equal to or less than the third lower premolar in height . *Myotis daubentonii*  
 B. Canines not reduced (Photo 15), lower canine greatly exceeds the third lower premolar in height .....  
 ..... *Myotis horsfieldii*



Photo 15



*Myotis daubentonii*  
Daubenton's Bat (水鼠耳蝠)  
Forearm: 34 - 37mm



*Myotis horsfieldii*  
Horsfield's Bat (霍氏鼠耳蝠)  
Forearm: 34 - 38mm

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21. A. Tragus narrow and long (Photo 16), brown pelage with yellowish brown underpart ..... *Scotophilus kuhlii*  
 B. Tragus mushroom-shaped (Photo 17), rusty brown pelage ..... *Nyctalus noctula*



Photo 16



Photo 17



*Scotophilus kuhlii*  
 Lesser Yellow Bat (中黃蝠)  
 Forearm: 44 - 56mm



*Nyctalus noctula*  
 Brown Noctule (褐山蝠)  
 Forearm: 47 - 55mm

Table 1. List of Hong Kong Bats

Order	Suborder	Family	Common Name	中文名	Scientific Name	IUCN <sup>1</sup>	China Red Data Book	AFCD Record <sup>2</sup>	Conservation Status <sup>3</sup>	
Chiroptera (翼手目)	Megachiroptera (大翼手亞目)	Pteropodidae (狐蝠科)	Leschenault's Roussette	棕果蝠	<i>Rousettus leschenaultia</i>			Yes	Common	
			Short-nosed Fruit Bat	短吻果蝠	<i>Cynopterus sphinx</i>		Indeterminate	Yes	Common	
		Emballonuridae (鞘尾蝠科)	Black-bearded Tomb Bat	黑鬚墓蝠	<i>Taphozous melanopogon</i>			No	???	
		Rhinolophidae (菊頭蝠科)	Rufous Horseshoe Bat	魯氏菊頭蝠	<i>Rhinolophus rouxi</i>			Yes	Common	
	Intermediate Horseshoe Bat		中菊頭蝠	<i>Rhinolophus affinus</i>			Yes	Common		
	Least Horseshoe Bat		小菊頭蝠	<i>Rhinolophus pusillus</i>			Yes	Common		
		Hipposideridae (蹄蝠科)	Pomona Roundleaf Bat	小蹄蝠	<i>Hipposideros pomona</i>			Yes	Common	
	Himalayan Roundleaf Bat		大蹄蝠	<i>Hipposideros armiger</i>			Yes	Common		
		Microchiroptera (小翼手亞目)	Myotis	Chinese Myotis	中華鼠耳蝠	<i>Myotis chinensis</i>		Vulnerable	Yes	Uncommon
	Rickett's Big-footed Bat			大足鼠耳蝠	<i>Myotis ricketti</i>	LR/nt		Yes	Uncommon	
	Hairy-legged Myotis			毛腿鼠耳蝠	<i>Myotis fimbriatus</i>	LR/nt		No	???	
			Horsfield's Bat	霍氏鼠耳蝠	<i>Myotis horsfieldii</i>			Yes	Rare	
			Daubenton's Bat	水鼠耳蝠	<i>Myotis daubentonii</i>			Yes	Rare	
			Vespertilionidae (蝙蝠科)	Brown Noctule	褐山蝠	<i>Nyctalus noctula</i>			Yes	Rare
	Japanese Pipistrelle			東亞家蝠	<i>Pipistrellus abramus</i>			Yes	Common	
	Chinese Pipistrelle			灰伏翼	<i>Pipistrellus pulveratus</i>			Yes	Rare	
	Lesser Bamboo Bat			扁鼻蝠	<i>Tylonycteris pachypus</i>			Rare	Yes	Uncommon
			Lesser Yellow Bat	中黃蝠	<i>Scotophilus kuhlii</i>			Yes	Rare	
		Greater Bent-winged Bat	大長翼蝠	<i>Miniopterus magnater</i>			Yes	Common		
		Common Bent-winged Bat	長翼蝠	<i>Miniopterus schreibersii</i>	En	En	Yes	Rare		
	Lesser Bent-winged Bat	南長翼蝠	<i>Miniopterus pusillus</i>			Yes	Common			
	Molossidae (犬吻蝠科)	Wrinkle-lipped Free-tailed Bat	皺唇犬吻蝠	<i>Chaerephon plicata</i>			No	???		

1. LR/nt: Lower risk / near threatened; En: Endangered 2. Species which have been recorded by AFCD since 2003 (as at May 2004)  
 3. Rare - species found at 1-3 sites; Uncommon - species recorded at 4-8 sites; Common - species recorded at 9 or more sites; ??? - data deficient.

## Survey Methodologies

AFCD began surveying Hong Kong bats in 2003. The objectives were then, and remain: 1) to establish the baseline information on Hong Kong's bat biodiversity; 2) to assess the conservation status of bats; 3) to form conservation plans for the bats. Specimens have also been collected where appropriate for authentication and reference. As different species differ in their susceptibility to the survey methodologies, a combination of survey techniques has been used, including direct counting, harp-trapping and mist-netting.

For direct counting, the number of bats is counted at least twice a year in their major roosting sites, such as winter roosting sites, summer roosting sites, foraging sites, and maternity roosting sites. The number of settled individuals, usually in aggregations, is counted or estimated by determining the cluster densities at selected areas and extrapolating these by the total area of the colony covered by the settled bats. In some cases, the estimated number is further verified by counting the number of individuals in the photos taken from the site (Figure 2).

For flying individuals, the number of individuals passing through a reference point is counted, and they are identified to species level with the aids of video recording. In some cases, the nightly emergence count is made by counting the number of individuals departing from their day roosts, and is suitable for some inaccessible sites or roosting sites with a single species. This method can be used to verify the data obtained by other counting methods.

Both harp traps and mist nets are effective for capturing bats at different heights, such as at subcanopy level. Harp traps consist of a large rectangular frame crossed by a series of vertical wires (Figure 3). It is usually used at the exit or entrance of bats' roosting caves for capturing emerging bats, but can also be positioned in the travel lane of bats across trails or small streams for capturing passing individuals. Mist nets are made from microfilament or nylon. Most successful capture sites are near roosts, along or across trails, or over streams. Both devices are setup at dusk and checked every 20 minutes to remove captured bats. Data on sex, age, body measurement, and weight of each captured bat are recorded.



Figure 3. Harp trap survey in Shek Kong.

## Preliminary findings

These AFCD surveys have recorded 19 species, with distributions shown in Figure 4. Table 1 shows a preliminary assessment of species rarity, which is based on the number of site localities each species is recorded from in Hong Kong, making reference to AFCD's existing data and records made in the past 10 years (i.e. Lau, 2004; Dahmer, 2002; Lin, 2001; Ades, 1999). "Rare" species are restricted to one to three localities only. "Uncommon" species are found at four to eight localities. "Common" species are recorded from nine sites or more. The distribution map and the rarity of each species will be updated in view of future findings.



Figure 2. Direct counting of bats (Rufous Horseshoe Bat) inside an abandoned mine on Ma On Shan.





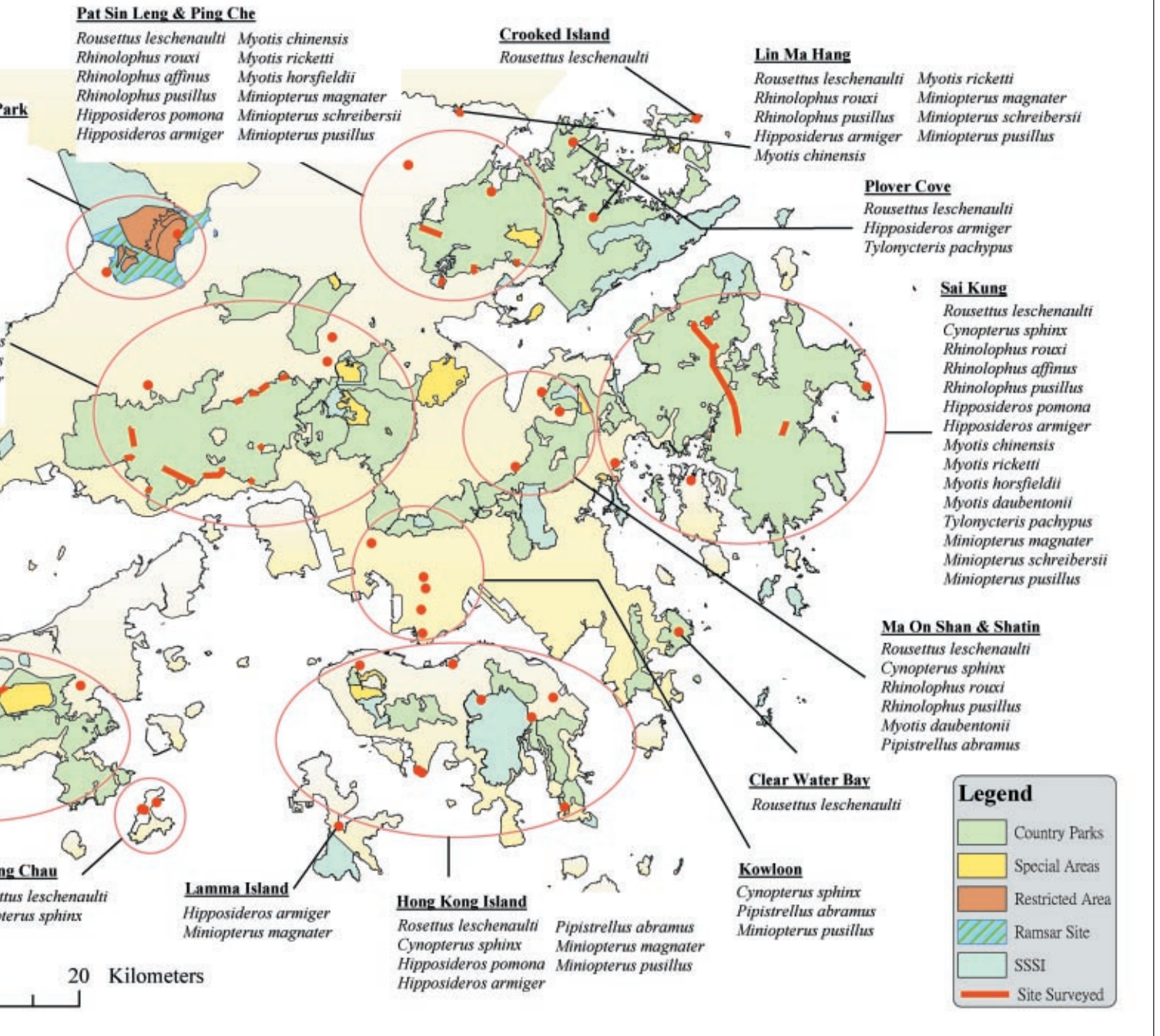


Figure 4. The distribution of bats in Hong Kong (2004).

**Acknowledgement**

The Mammal Working Group cordially thanks Dr. Gary Ades and Mr. Paul Crow for their participation, training and information. We also wish to express our thanks to Dr. James Bates and the Harrison Institute for their technical advice and permission to reproduce the photographs marked with an "\*" in the identification key.

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## Working Group Column

## Age Structure of Wintering Black-faced Spoonbills in Hong Kong 1998/99 - 2003/04\*

### 在香港渡冬黑臉琵鷺的年齡結構 1998/99 - 2003/04

Wai-hung LEE and Eric K.Y. LIU  
Bird Working Group

漁農自然護理署於1998/99至2003/04年，在黑臉琵鷺於香港渡冬期間，利用照相或攝錄方式記錄黑臉琵鷺成鳥與未成鳥的比例。過去六年在香港渡冬的黑臉琵鷺中約有六成為成鳥，而與此同時其全球數目亦穩定上升。在香港渡冬的黑臉琵鷺約佔全球總數的四分之一，將來在其他主要渡冬地或繁殖地進行類似研究將有助更準確推算其全球族群趨勢。

#### Abstract

AFCD has been monitoring the ratio of adult to non-adult Black-faced Spoonbills in Hong Kong from 1998/1999 to 2003/2004 using photo or video records. Non-adults were distinguished by their black wing tips when they were in flight. Results showed that the adult population in Hong Kong maintained at about 60% in the last six years. At the same period of time, there has been a steady increase in the global population of Black-faced Spoonbills, indicating a positive breeding success of the species. As the wintering population in Hong Kong only accounts for about 25% of the global population, similar studies in major breeding sites or other non-breeding sites may contribute to more accurate prediction of the global population trend of the species.

#### Introduction

Black-faced Spoonbill (*Platalea minor*, BFS) is a migratory waterbird in East Asia. It is a globally endangered species with a population of just over 1,200 in the winter of 2003/2004 (Yu *pers. comm.*). The known breeding sites of this species are on uninhabited islands along the eastern and northern coasts of the Yellow Sea in the Korean Peninsula and northeast China (BirdLife International, 2001). In winter, BFS mainly migrate to the

Tsengwen estuary (曾文溪口) in Taiwan, the Mai Po and Inner Deep Bay in Hong Kong, and the Red River Delta in Vietnam. Small numbers are also wintering in the coastal areas in Japan, South Korea and southeast of China (including Macau).

The world population of BFS has nearly doubled from at least 586 in 1998/1999 (Wetlands International, 2002) to at least 1,206 in 2003/2004 (Yu, 2003 and *pers. comm.*). The peak wintering population of BFS in Hong Kong has also increased from 152 in 1998/1999 to 262 in 2003/2004 (Table 2).

As one of the recommended measures in the conservation plan for BFS in Hong Kong (Anon, 2001a), AFCD has been monitoring the ratio of adult to non-adult BFS from 1998/1999 to 2003/2004. A summary of the major findings are given in this paper.

#### Age determination

The age structure of BFS was monitored at the Mai Po Inner Deep Bay Ramsar site and the adjacent fishpond areas (Anon, 2001b, 2002, 2003a and 2004). These areas



Figure 5. Adult BFS (left) have black bill and ridges on the upper mandible, and will have golden-yellow breeding plumage in spring and summer; non-adults (right) have brownish-pink bill and smooth upper mandible, and do not show breeding plumage.

are known as the second largest wintering site for this species, regularly supporting some 20 - 30% of the world population of BFS in the last six years (Table 2).

BFS could be classified into adults or non-adults by the number of ridges on the upper mandible, color of the bill and iris, the presence or absence of yellow eye-

Table 2. Peak counts of wintering BFS and percentage of global population in Hong Kong.

Year	Peak count <sup>1</sup>	Global Census in January <sup>2</sup>	% Global Population
1998-1999	152 (Dec 1998)	586	25.9%
1999-2000	164 (Nov 1999)	660	24.8%
2000-2001	252 (Nov 2000)	828	30.4%
2001-2002	192 (Nov 2001)	969	19.8%
2002-2003	258 (Dec 2002)	1,069 <sup>3</sup>	24.1%
2003-2004	262 (Dec 2003)	1,206	21.7%
Average =			24.5%

1, Anon, 1999, 2001a; Y. T. Yu *pers. comm.* in 2000/2001 and 2001/2002.; P.J. Leader *pers. comm.* in 2002/2003 and 2003/2004

2, Yu, 2003; Y. T. Yu *pers. comm.* in 2003/2004

3, excluding 73 BFS killed by Avian Botulism in Taiwan.

\* This paper has also been presented in the 2004 International Symposium for the Conservation of Black-faced Spoonbill in East Asia.

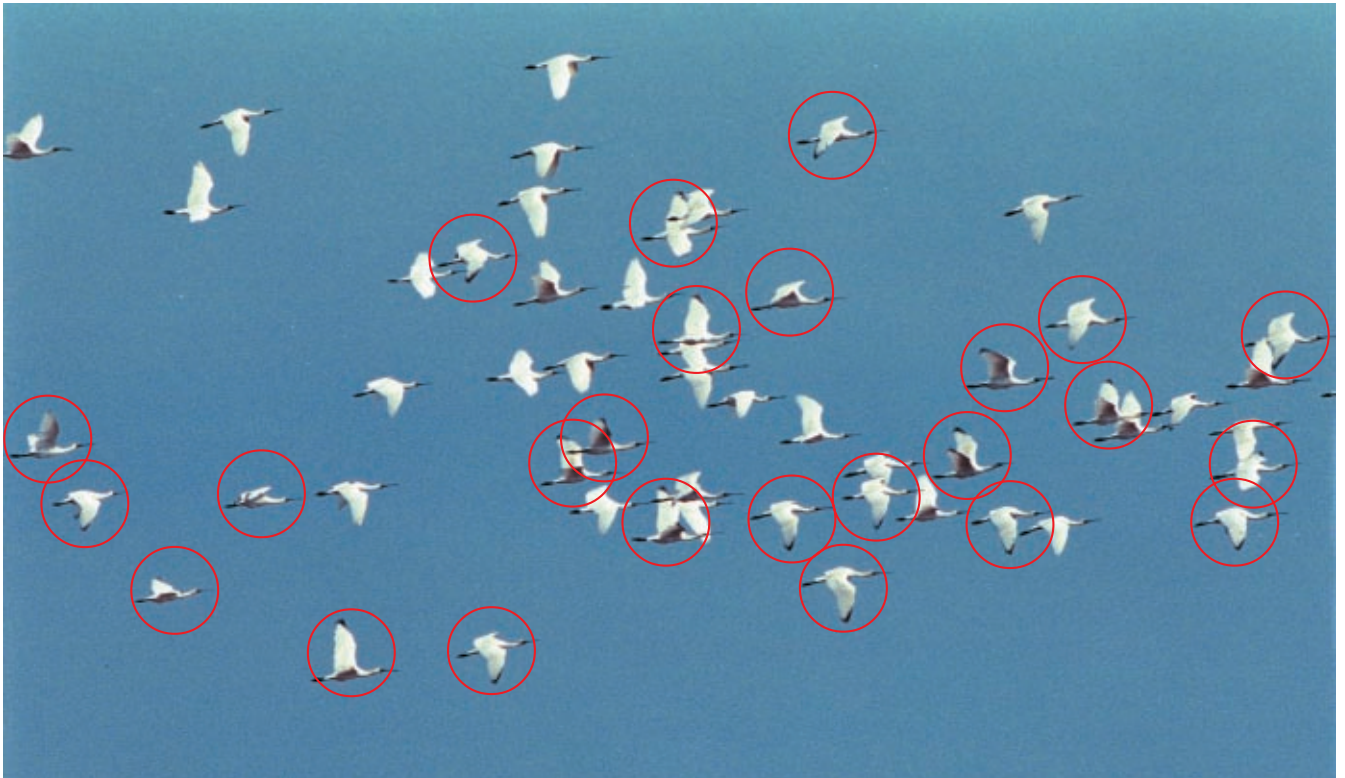


Figure 6. A flock of flying BFS. The number of non-adults could be determined by counting the number of birds with black wing tip (in red circle).

patches and the color of wing tips (Hancock *et al.*, 1992; Figure 5). Among these, the color of wing tips is the most easily observable character to distinguish adults and non-adults in the field when a flock of BFS is in flight (Anon, 2003a, Figure 6). By taking photographs or videos of BFSs in flight, the number of adults and non-adults can be recorded and their percentage determined.

The photographs were mainly taken in winter of each year from late October to April of the next year for 20 observation periods (there are three 10-day observation periods in each month). At least 30 BFSs were recorded for each month during the survey period.

### Age structure of BFS in Hong Kong

The past six years' monitoring results revealed that about 25% of the world population of BFS, including adults and non-adults, would regularly visit Hong Kong every year (except 2001-2002 winter) (Table 2). Also, the percentage of adults' wintering BFS population ranged

from 49% to 69% at the same period of time (Table 3). In addition, Table 3 shows that the percentage of adult BFS in April is much lower than the previous months. This suggests that adults and non-adults may behave differently during their southward and northward migrations. It is likely that both adults and non-adults depart their breeding sites and/or summer visiting sites during their southward migration together, arriving Hong Kong at the same time, thus the percentages of adult population is similar in winter months with increasing winter population (i.e. November to January). In spring, however, adults seem to depart Hong Kong earlier than non-adults during their northward migration to breeding sites in March and April (Table 3), resulting in significantly lower adult ratio in April.

### Discussion

The percentage of adult population of BFS maintained at  $59\% \pm 7\%$  from 1998/1999 to 2003/2004 in Hong Kong. However, as the wintering population in Hong Kong only

Table 3. Percentage of adults of the wintering population in different months in Hong Kong, 1998/1999 - 2003/2004 (Anon, 1999, 2001a, 2001b, 2002, 2003a and 2004).

Months	% adults in wintering population in Hong Kong						Average
	1998/99	1999/2000	2000/01	2001/02	2002/03	2003/04	
November	N/A	60 ± 12	62 ± 12	75 ± 13	54 ± 10	42 ± 11	59
December	N/A	60 ± 4	68 ± 9	65 ± 11	64 ± 10	60 ± 7	63
January	N/A	60 ± 8	57 ± 7	69 ± 15	63 ± 26	59 ± 22	62
February	63 ± 6	50 ± 9	53 ± 15	62 ± 15	71 ± 9	83 <sup>1</sup>	60 <sup>2</sup>
March	51 ± 11	N/A	N/A	73 ± 15	62 ± 9	34 ± 3	55
April	27 ± 10	N/A	N/A	0 ± 0	30 ± 25	8 ± 8	16
<b>Average in peak spoonbill period (i.e. Nov - Mar)</b>	57	58	60	69	63	49 <sup>2</sup>	

Note: "N/A" represents no data

1 Only one survey was carried out in February 2004 due to the temporary closure of the Mai Po Marshes Nature Reserve.

2 Excluding the figure in February 2004.

accounts for about 25% of the global population, the age structure of the local wintering population may not be accurately used for global population trend analysis. Nonetheless, the results of the BFS's age structure monitoring in Mai Po Inner Deep area are similar to that of the annual International BFS Census (Anon, 2003a). In order to more accurately predict the global population trend of BFS, more information, such as the age structure of the BFS in major breeding sites and other major non-breeding sites, should be obtained with higher observation frequency and larger sample size.

Having said that, there has been a steady increase in global population of BFS in the past six years (Table 2), indicating a positive breeding success of BFS. Assuming no significant adverse environmental changes (e.g. Avian Botulism in Taiwan in 2003 or significant habitat loss), the world population of BFS is predicted to continue to increase. As the long term monitoring of the age structure of BFS could provide important information, such as population trend and breeding success of the species, to site managers and conservationists in the formulation and implementation of conservation measures for this species, AFCD will continue such assessment as one of the BFS conservation measures.

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## Brown Shrike Feeding a Juvenile Long-tailed Shrike

### 紅尾伯勞餵飼棕背伯勞的幼鳥

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本署職員於2004年5月於馬草壟記錄到一隻紅尾伯勞的繁殖行為，後來與香港觀鳥會討論後確定為紅尾伯勞餵飼棕背伯勞的幼鳥。

At eleven in the morning of 18<sup>th</sup> May, 2004, together with another field officer Leo Liu, we observed the following. We had just finished a baseline bird survey in Ma Tso Lung, when we heard a harsh chatting call from some mixed short shrubs. Following the direction of the call, we found an adult Brown Shrike *Lanius cristatus lucionensis* feeding a fledging juvenile. The adult Brown Shrike then flew away while the juvenile kept giving loud, persistent begging calls. We managed to shoot a few photos of the juvenile by digitiscoping (Figure 7). Without closer examination, we thought the juvenile was a Brown

Shrike - making this sighting the first breeding record of Brown Shrike in Hong Kong.

We returned to the site later that day, hoping to take photos to support our observation. We could not see the juvenile, but we heard its calling intermittently. Meanwhile, an adult Brown Shrike once was seen flying out from the direction of the calls.

Considering this an unusual record for Hong Kong avifauna, we submitted our observation to the Hong Kong Bird Watching Society. Mr. Geoff Carey pointed out that the juvenile in the photos was a Long-tailed Shrike (*Lanius schach*), due to the combination of body shape and colour. In addition, given the time of sighting it was unlikely to be a fledging Brown Shrike. In Hong Kong, Brown Shrike is a common passage migrant from mid-April to mid-May and rare in winter, while the Long-tailed Shrike is a common and widespread resident (Carey *et al.*, 2001).

After re-examining the photos, we agreed that the juvenile was a Long-tailed Shrike rather than a Brown Shrike. However, as the adult Brown Shrike

## A Dragonfly Species New to Science Found in Hong Kong 在香港發現新蜻蜓品種

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香港在 2004 年又增加一個蜻蜓新記錄——閩春蜓屬品種，令香港蜻蜓的品種數目增至 112 種。這品種更是全球首次發現的新品種，亦是漁農自然護理署自 2002 年開始香港蜻蜓生態基線調查而來的第 4 個蜻蜓新記錄。已出版的第二版「香港蜻蜓圖鑑」亦有描述這個新發現。

A new dragonfly species, *Fukienogomphus* sp., was recorded at the beginning of the dragonfly flying period of 2004. This species is a new species to science and is the fourth new dragonfly record found by AFCD



Figure 8. *Fukienogomphus* sp. (Hong Kong specimen) ♂

since commencement in 2002 of the ecological baseline survey on Hong Kong dragonflies. The total number of dragonfly species recorded in Hong Kong now is 112.

The species is a medium-sized gomphid and was discovered at Wu Kau Tang by Joyce K. Wong and Boris S.P. Kwan. A male was found emerging at the side of a small fast-flowing stream and the other teneral male was also found at the stream on 14 April 2004. The total length of abdomen and anal appendages of the male is 38.5mm, while the length of the male hindwing and the exuviae are 32mm and 28.5mm respectively. This species strongly resembles *Fukienogomphus prometheus* from Fujian but it is much smaller than the typical *F. prometheus* from Fujian and there are some structural and colour differences. Only two members of *Fukienogomphus* are currently described. The second species is *Fukienogomphus prominens* also known from Fujian, which is even larger than *F. prometheus*. *Fukienogomphus* sp. has stout white superior appendages and has black, widely divaricate inferior appendages.

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Figure 9. Exuviae of *Fukienogomphus* sp. (Hong Kong specimen)

was clearly seen by three observers in a good sighting condition, it was unlikely to be a misidentification. Therefore, the most likely conclusion is that what we saw in Ma Tso Lung was an adult Brown Shrike feeding a juvenile Long-tailed Shrike.

One possible explanation of this behaviour is that the persistent begging call of the juvenile Long-tailed Shrike stimulated the Brown Shrike to feed it. Brown Shrike is known to be parasitized by cuckoos in Russia and Japan (Lefranc and Worfolk, 1997). This means that it is not unusual for the species to act as a foster parent, and so feed the juveniles of another species - hence our original mistake in the identification.

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Figure 7. Photo of the juvenile Long-tailed Shrike.

## The Nationally Rare and Endangered Plant, *Aquilaria sinensis*: its status in Hong Kong

### 中國珍稀瀕危植物土沉香在香港的現況

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香樹，又稱土沉香 (*Aquilaria sinensis*)，是原產南中國的常綠喬木，在香港常見於低地(尤其鄉村的風水林)及郊野公園範圍內。其樹脂可製成香料或供藥用，香港早期曾大量種植並因出口香木而聞名，所以被稱名「香港」(即香的港口)。在中國內地因遭砍伐，成林的面積銳減，只剩下零星的分佈，因此，國務院將它列入為「國家二級重點保護植物」，予以保護。在香港，近來亦有發生非法砍伐及偷竊土沉香的案件，情況令人關注。本文闡述土沉香在香港的狀況。

#### Introduction

The English common name of *Aquilaria sinensis* is "Incense Tree", which is a direct translation of its Chinese name - "Heung" (香) tree. Incense is made from any wood that releases fragrance when it is burnt. The species was once widely planted in Hong Kong as the raw material of incense exported to the mainland, Southeast Asia and places as far away as Arabia. The Hong Kong region was well known for this, thus giving it its Chinese name - "harbour exporting incense" (Lu, 1983; Hong Kong Herbarium, 2003).

In recent field surveys of local *fung shui* woods by AFCD in 2003, *Aquilaria sinensis* was recorded at 84 sites out of a total of 111 sites surveyed. This species is locally common in lowland habitats, particularly in *fung shui* woods behind villages

where it is most commonly found. The species is considered vulnerable in mainland China due to its over exploitation there. Recently, illegal exploitation of the species has spread into Hong Kong - and so the situation of *Aquilaria sinensis* in Hong Kong calls for our attention.

#### Characteristics

*Aquilaria sinensis* belongs to the plant family Thymelaeaceae. It is an evergreen tree, 6 to 20 m tall. The smooth bark is grayish to dark grey (Figure 10), and the wood is white to yellowish - so giving it another Chinese name "Pak Muk Heung" (白木香) (White Wood

Incense). Its branchlets are sparsely covered with hairs when young. Its leaves are alternate, leathery, obovate to elliptic, generally 5 to 11 cm long and 2 to 4 cm wide, with 15 to 20 pairs of inconspicuous and nearly parallel lateral veins which is a helpful diagnostic feature in the field (Figure 11). The apex of each leaf is short acuminate and the base is broadly cuneate, with entire and smooth margins. Its flowers are yellowish green, fragrant, in a terminal or axillary umbel. The fruit is a woody obovoid capsule with an outer covering of short grey hairs (Figure 12), 2.5 to 3 cm long, opening in two flat valves when ripen. When the fruit is open, a silky thread from the base of the fruit holds the single seed (or two) in the air, very much alike a caterpillar hangs from a tree twig with its silk (Figure 13). Whether this characteristic has any biological interest is yet to be explored.

#### Uses

The tree produces a valuable fragrant wood used for incense and medicine. Previously, the wood was used to make joss sticks and incense, but in Hong Kong this industry has died out.



Figure 10. Bark of *Aquilaria sinensis*.



Figure 11. Leaves and flowers of *Aquilaria sinensis*.



Figure 12. Fruits of *Aquilaria sinensis*.

The balm (resin) produced and accumulated from the wood is used as a valuable Chinese medicine called "Chen Xiang" (沉香) for clinical use. According to Chinese medicinal literature, the resin can be extracted in large quantities by natural fungal infection or by external wounding (up to 5 cm into the bark). Sustainable harvesting of the resin of one tree can be induced by opening a wound 3 to 4 cm into the bark, and with the resin collected a few years later after accumulation. A small quantity of resin can also be extracted from wood blocks by heating or burning, so that the resin liquefies and seeps from the wood blocks.

Sections of trees trunks or branches that contain patches of fragrant, resinous wood enter into the trade under the name "agarwood". The resin is probably produced by the plant as a reaction against fungal infection or external wounding. Resin impregnated fragrant wood is usually found in trees older than 20 years. Although not all trees are infected, with increasing harvest pressure, harvesters in some regions often fell trees indiscriminately in search of infected wood.

Good quality "Chen Xiang", derived mostly from a related species *Aquilaria malaccensis*, was formerly imported from the Asian tropics into China but the supply of such quality products is now depleted. The import and export of *Aquilaria malaccensis* are regulated internationally under the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) and locally under the Animals and Plants (Protection of Endangered



Figure 13. Seeds of *Aquilaria sinensis*.

Species) Ordinance (Cap. 187). The resin produced by *Aquilaria sinensis* has been used as a substitute (named as "Tu Chen Xiang" (土沉香) i.e. local Chen Xiang) to the former and thus the species is also under threats.

### Conservation status

The species is chiefly distributed in South China including Hong Kong. However, owing to the intensive use of the species, wild populations outside Hong Kong have become rare and large trees are also uncommon. The 2000 IUCN Red List of Threatened Plants published by The World Conservation Union (IUCN) listed the threat status of *Aquilaria sinensis* as vulnerable. Regarding its conservation status, the plant is considered "an important source of medicine" and is "restricted to Jinghong in Yunnan, Guangdong including Hainan Island and Guangxi" (i.e. endemic to China). It is "mainly found in semi-evergreen monsoon forest up to altitudes of 400 m". There is concern over the rates of exploitation and the damage to trees incurred during the harvesting of the medicinal balm. Habitat loss and clearance are also frequent (Oldfield *et al.*, 1998).

In mainland China, the species is listed as a category II protected plant in the "List of Wild Plants under State Protection" (1999), part of the Chinese legislation promulgated by the State Council. It is considered vulnerable in the *China Plant Red Data Book*, as it has become depleted due to severe damage of trees caused by indiscriminate collection of the balm used in Chinese medicine (China National Environmental Protection Agency & Institute of Botany, Chinese Academy of Sciences, 1992).

A recent book, *Rare and Endangered Plants in Guangdong Province* (South China Institute of Botany & Wild Animals and Plants Protection Office of Guangdong Province, 2003) reported that in Guangdong province over-exploitation and over-cutting of numerous large trees of the species have made it rare and threatened. Due to its conservation status in mainland China, the species is also considered precious in Hong Kong, and it has been included in the book *Rare and Precious Plants*

of Hong Kong (South China Institute of Botany & AFCD, 2003).

## Status in Hong Kong

As mentioned above, the species is common in lowland areas in Hong Kong, particularly in *fung shui* woods behind rural villages. The species has also been found in Country Parks. It is known that the species was



Figure 14. Cuts near the bases of tree trunks of *Aquilaria sinensis* (suspected for agarwood extraction).

once widely cultivated in South China and Hong Kong for the production of incense sticks, although no large scale plantation is known nowadays in Hong Kong. This may explain why the species is abundant around villages in modern times. Regardless of the long history of cultivation in Hong Kong, the local populations are well within its range of distribution where it regenerates in wild with vigour, and the species is therefore considered a native plant of Hong Kong (Iu, 1983).

Exploitation of this plant species for agarwood has been rare in Hong Kong, but there are recent reports that the species has been illegally exploited in our countryside. The trunks of certain large trees are being cut or felled for extraction of agarwood, to an extent that the trees may not be able to recover (Figures 14 & 15), although these individual incidents have not caused serious threat to the survival of the overall local *Aquilaria* populations. Under the Forests and Countryside Ordinance (Cap. 96), all plants within forests and plantations on Government land are under protection. The maximum penalties for contravening the Ordinance are \$25,000 fine and one year imprisonment.

## Conclusion

From the point of view of flora conservation in Hong

Kong, and because in other parts of China the species is over-exploited and depleted, the local populations of *Aquilaria sinensis* represent some of the best remaining healthy populations in China. The plant communities to which local populations of *Aquilaria sinensis* belong (lowland broadleaved forests and *fung shui* woods) have been well-preserved by both former villagers and local legislation, including the Country Parks Ordinance (Cap. 208) and Forests and Countryside Ordinance (Cap. 96). Most illegal exploitation of the species occurred recently involve unsustainable harvesting, which has caused undesirable impacts to the survival of certain large individuals of *Aquilaria sinensis*. These incidents show that the conservation of this nationally rare and endangered species deserves attention.

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Figure 15. Damage to a large individual of *Aquilaria sinensis* (suspected of agarwood extraction). Most part of the tree trunk was cut away, making the tree unlikely to survive.