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Feature Article

Mist Net Survey of Bats with Three New Bat Species Records for Hong Kong

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Mammal Working Group

漁農自然護理署哺乳動物工作小組在2003-05年之間進行了一項蝙蝠霧網調查，目的為了解香港的非穴棲性蝙蝠的相對數目和分布，並評估其現有狀況和其生態價值。評估的結果是，在十個非穴棲性蝙蝠品種之中，灰伏翼、褐扁顱蝠、喜山鼠耳蝠和一隻尚未確認的伏翼蝠被列為可優先考慮加強保育的稀有及分布狹窄的蝙蝠品種。

Introduction

Bats comprise an important part of Hong Kong's mammal fauna, making up over 50% of all local mammal species. They are important components of our biodiversity and their small size, mobility and longevity combine to make them suitable indicator species of general environmental conditions (Fenton, 1999). Bats roost in special environments like caves and trees, and most of them are capable of echolocation. Different species may differ in their susceptibility to the available survey or capture techniques, and it is necessary to use several sampling methods to generate as complete a species list as possible.

Three different kinds of survey methods are being used by the Mammal Working Group of Agriculture, Fisheries and Conservation Department (AFCD) for studying bats in Hong Kong: direct roost censuses at their roost sites, capture study using mist netting (Fig. 1) and harp trapping, and detection of echolocation calls.

Fig 1. A researcher removing a Japanese Pipistrelle (*Pipistrellus abramus* 東亞家蝠) from a mist net.

Contents

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Direct roost censuses are the best way to study the cave-dwelling species, and based on the results, Horsfield's Bat (*Myotis horsfieldi* 霍氏鼠耳蝠) was ranked as a species of conservation concern in Hong Kong (Shek and Chan, 2005). However, only 14 species of the Hong Kong bat species are known to roost in caves and the remaining roost in other habitats, such as buildings, trees or rock crevices. Such non-cave-dwelling species need other survey methods to study their distribution and status in Hong Kong.

This survey employed mist nets to study non-cave-dwelling species. The mist net is the most effective way to capture flying bats and is the best way to study these species, which are not found during roosting cave censuses.

Methods

Bats were caught by standard mist net methods (Kunz and Kurta, 1988), using 6, 12 or 18 meter nylon mist nets (Avinet CH series mist nets). All nets were of 2.6 m in height, and nets may be used in double or triple high level by stacking two or three nets together at the sub-canopy level. Nets were set over streams and pools, along forest edges, in clearings, forest paths and other sites where bats were observed or that could otherwise serve as potential flight paths. The abundance of individuals captured were presented as individuals captured per meter of mist net employed per night.

Site selection was aimed at covering all major countryside areas throughout Hong Kong, including Country Parks, Special Areas, and other countryside areas (Fig. 2). The distribution of bat species was analyzed by using the Hong Kong 1800 grid system, in which species found in the same grid were pooled together for distribution analysis.

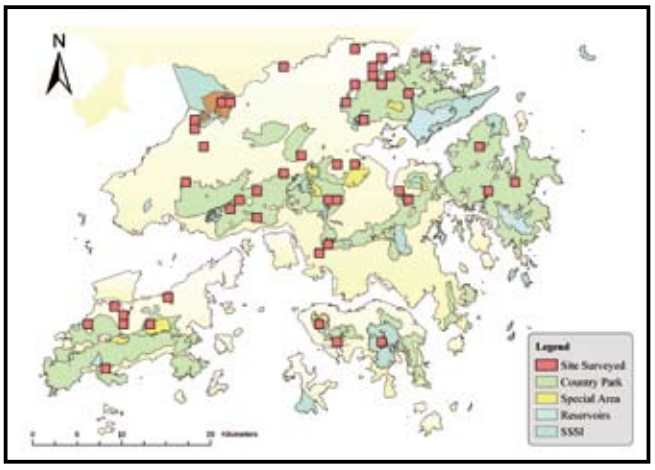

Fig 2. Sites of mist net survey by AFCD in 2003-05.

Captured bats were held individually in cloth bags and identified following Shek (2004 & 2005). Voucher specimens were taken to confirm the identification of new or uncertain records, most of which were deposited with the collection of the Biodiversity Conservation Division of the AFCD.

For this analysis, all species found during the roosting cave censuses were excluded from the study. The status of each species was classified following Shek and Chan (2005).

Results

At least 18 species of 300 individuals were caught in 1,593 Net Meter Nights during the survey of 2003-05. The status of ten non-cave-dwelling species is shown in Table 1. Among these, the Short-nosed Fruit Bat (*Cynopterus sphinx* 短吻果蝠) and the Japanese Pipistrelle (*Pipistrellus abramus* 東亞家蝠) were the most abundant and widely distributed species respectively. In addition to the Greater Bamboo Bat (*Tylonycteris robustula* 褐扁顱蝠) reported in the last issue (Shek and Chan, 2005), the identification of three more new bat species found in Hong Kong has been confirmed. They are the Least Pipistrelle (*Pipistrellus tenius* 小伏翼), the Whiskered Myotis (*Myotis muricola* 喜山鼠耳蝠) and an unidentified *Pipistrelle* sp.. These discoveries raised the total number of bat species in Hong Kong to 26. After comparing the relative abundance and distribution in Hong Kong, the Chinese Pipistrelle (*Hypsugo pulveratus* 灰伏翼), the Whiskered Myotis, the Greater Bamboo Bat and the unidentified *Pipistrelle* sp. were ranked as rare or species of conservation concern.

Discussion

The mist net survey provides baseline information on the abundance and distribution of ten species of non-cave-dwelling bats in Hong Kong. Four of them are ranked either very common or common in this study, including the Lesser Bamboo Bat, which was thought to be rare in Hong Kong (Ades, 1999).

Among these non-cave-dwelling species, five species were reported to roost in buildings or man-made structures, and some, e.g. the Japanese Pipistrelle, were found to roost in various types of man-made structures, such as under bridges, attics of houses, crevices in walls, or even air-conditioners. Such species are expected to be more widely distributed than other non-cave-dwelling species. Although some species roost in tree or bamboo, the Short-nosed Fruit Bat is widely found and commonly distributed at lower elevations in the urban areas, including parks and gardens, where human disturbance is omnipresent. It roosts under the modified fronds of the Chinese Fan-palm and Petticoat Palm in urban areas (Chan and Shek, 2006). Whereas the Lesser Bamboo Bat, which lives inside the hollow cavities of fresh bamboos such as the Tender Shoot Bamboo and Chinese Thorny Bamboo and can always be trapped near bushes of these bamboo species, is very common, the Greater Bamboo Bat is rare and highly restricted in Hong Kong. Its rarity and restrictedness may be explained by its low frequency echolocation calls, which are not effective in the cluttered space of bamboo bushes.

Mist nets are the most common device for capture flying bats, but many species, such as rhinolophid and hipposiderid bats, are highly maneuverable in flight and capable of echolocations; as a consequence, they are adept at avoiding mist nets. Furthermore, some species forage above the canopy level, and it is impossible to catch them by mist nets. It is recommended that mist net surveys are combined with acoustic monitoring by special bat detectors.

The list of bat species recorded in Hong Kong is now 26 (Shek and Chan, 2005b). Four species new to Hong Kong were discovered during this study and it is anticipated that more species are awaiting our discovery.

Species Account

Japanese Pipistrelle 東亞家蝠 – Very common

Pipistrellus abramus **(Temminck, 1840) (Fig. 3)**

The Japanese Pipistrelle is considered the most common bat species found in both the countryside and urban areas of Hong Kong. It roosts in various types of buildings and other man-made structures, such as the attics of older buildings or even in fans or air-conditioners. It is also found to be the most abundant species in wetland areas, such as Mai Po Nature Reserve and the Hong Kong Wetland Park in Tin Shui Wai (Fig. 4).

Fig 3. Japanese Pipistrelle (*Pipistrellus abramus* 東亞家蝠)

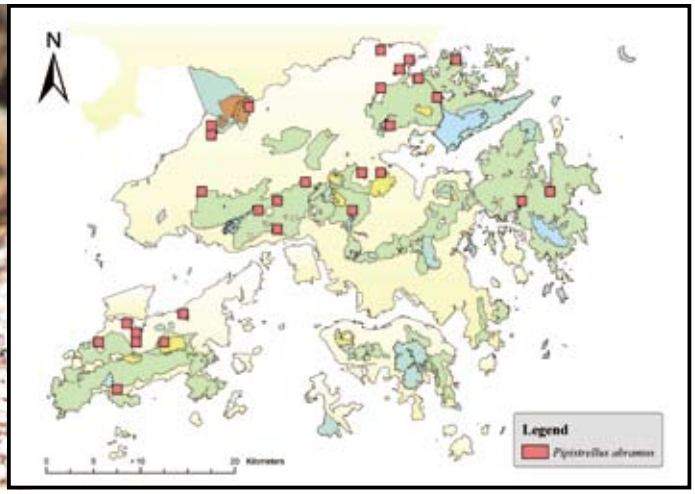

Fig 4. Records of the Japanese Pipistrelle in Hong Kong (2003-05).

Short-nosed Fruit Bat 短吻果蝠 – Very common

Cynopterus sphinx **(Vahl, 1797) (Fig. 5)**

The Short-nosed Fruit Bat lives in a wide variety of habitats, ranging from woodlands to lowlands and hills, and it is also recorded in urban areas (Fig. 6). It roosts in trees with dense clumps of leaves, under palm fronds or occasionally under the roof of a house. It is the only bat species in Hong Kong that constructs its own roosts by chewing the veins of the large fan-shaped leaves of the Chinese Fan-palm and Petticoat Palm. The colony size ranges from one to 30 individuals, and apparently a harem-type arrangement exists (Chan and Shek, 2006).

Fig 5. Short-nosed Fruit Bat (*Cynopterus sphinx* 短吻果蝠)

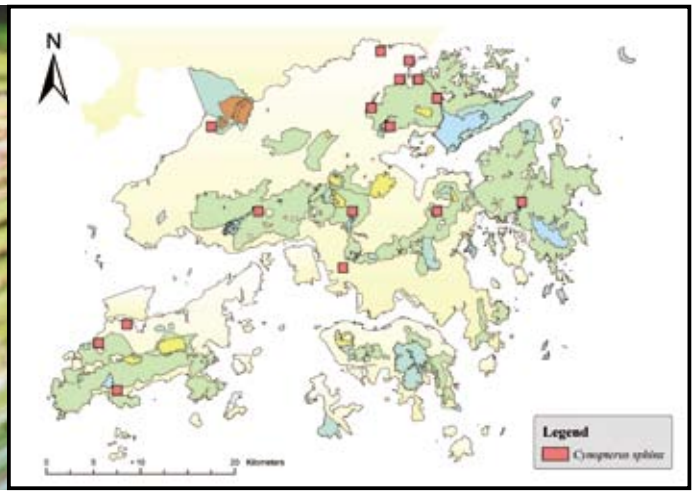

Fig 6. Records of the Short-nosed Fruit Bat in Hong Kong (2003-05).

Lesser Bamboo Bat 扁顱蝠 – Very common
***Tylonycteris pachypus* (Temminck, 1840) (Fig. 7)**

The Lesser Bamboo Bat is remarkably adept at gaining access to and roosting in the internodes or hollow joints of thick and fresh bamboo stems, such as the Tender Shoot Bamboo and Chinese Thorny Bamboo in Hong Kong (Fig. 8). The colony size ranges from one to 24 individuals, and apparently a harem-type relation exists.

Fig 7. Lesser Bamboo Bat (*Tylonycteris pachypus* 扁顱蝠)

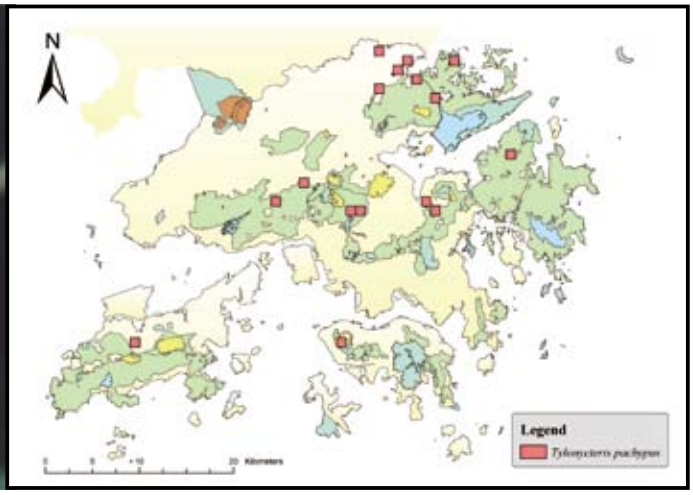

Fig 8. Records of the Lesser Bamboo Bat in Hong Kong (2003-05).

Brown Noctule 褐山蝠 - Common
***Nyctalus noctula* (Schreber, 1774) (Fig. 9)**

The Brown Noctule is a fast flying medium-sized bat, and it has a distinctive mushroom-shaped tragi. It prefers mature trees as its summer roost, but in winter, although it usually roosts in trees or in rock crevices, it is also known to roosts in human habitation. The colony size ranges from a few to 50 individuals. It is usually caught by mist nets at the edge of or across a stream, such as Wu Kau Tang and Tan Shan River (Fig. 10).

Fig 9. Brown Noctule (*Nyctalus noctula* 褐山蝠)

Fig 10. Records of the Brown Noctule in Hong Kong (2003-05).

Lesser Yellow Bat 中黃蝠 - Uncommon
***Scotophilus kuhlii* Leach, 1821 (Fig. 11)**

The Yellow House Bat often roosts in the attics of houses, but it also roosts under the modified fronds of palm trees next to the Short-nosed Fruit Bat, holes in walls or even in an abandoned bird nest (Lin *et al*, 2005) (Fig. 12). It prefers roosts that have an extremely high temperature. The colony size varies from a few to hundreds of individuals.

Fig 11. Lesser Yellow Bat (*Scotophilus kuhlii* 中黃蝠)

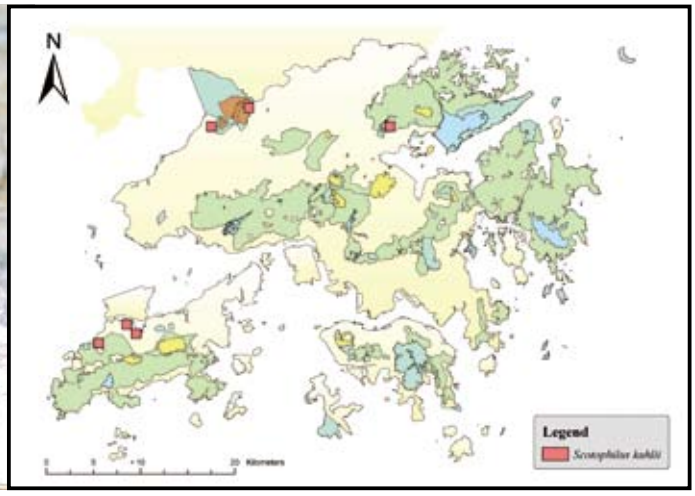

Fig 12. Records of the Lesser Yellow Bat in Hong Kong (2003-05).

Least Pipistrelle 小伏翼 – Uncommon (New species for HK)
Pipistrellus tenius **(Temminck, 1840) (Fig. 13)**

The Least Pipistrelle is a small pipistrelle with a forearm length ranging from 28 to 31 mm (Bates *et al*, 1997). The pelage is a uniform dark clove brown on the dorsal side, and the hairs on the ventral side have paler brown tips and dark roots. The ears are small and moderately long and the tragi are small with a concave anterior border and a convex posterior one. The penis is of moderate size and the baculum has a thin shaft of moderate length (~3.7 mm) and a distinctly bifid tip. This species favors the woodland region, but it is also common in villages. It roosts in a wide range of habitats, such as the attics of houses, holes and crevices in walls, hollow branches and the dead leaves of trees. The colony size ranges from a few to 20 individuals. Two males were caught in So Lo Pun and Shek Pik respectively and a few females were caught in Shing Mun, Kai Kuk Shue Ha and Sheung Wo Hang (Fig. 14). This species is similar to the Japanese Pipistrelle (*Pipistrellus abramus* 東亞家蝠), but it is smaller in size and with a short penis in males.

Fig 13. Least Pipistrelle (*Pipistrellus tenius* 小伏翼)

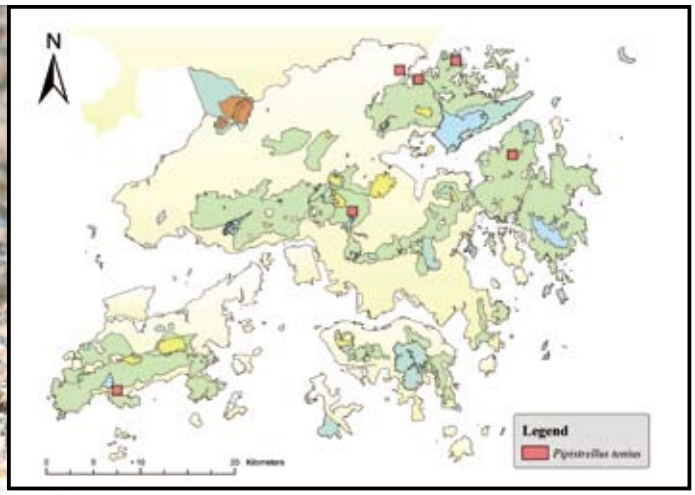

Fig 14. Records of the Least Pipistrelle in Hong Kong (2003-05).

Whiskered Myotis 喜山鼠耳蝠 – Rare (New species for Hong Kong)
Myotis muricola **(Gray, 1846) (Fig. 15)**

The Whiskered Myotis is a small-footed myotis (Subgenus: *Selysius*) with a forearm length of 35.4 to 35.8 mm. The pelage is dark brown on the dorsal side and the hairs on the ventral side have pale grey tips and dark roots. The ears are large with a distinctive border and the tragi are long and sharp at the end. The hind foot is less than 50 % of the tibia. The wings are attached 1 mm above the base of the toes. Little is known about this species. It is reported to roost in the central curled leaves of banana plants, but is occasionally found in caves in Thailand (Lekagul and McNeely, 1988). Also, it is noted that this species is problematic in taxonomy, which further separates it from several other species. Three individuals (1 ♂ and 2 ♀) were caught in Kai Kuk Shue Ha, Ho Pui and San Tau (Fig. 16). This species is different from all recorded myotis species (big-footed myotis) in Hong Kong due to the small hind feet and distinctive ear shape.

Fig 15. Whiskered Myotis (*Myotis muricola* 喜山鼠耳蝠)

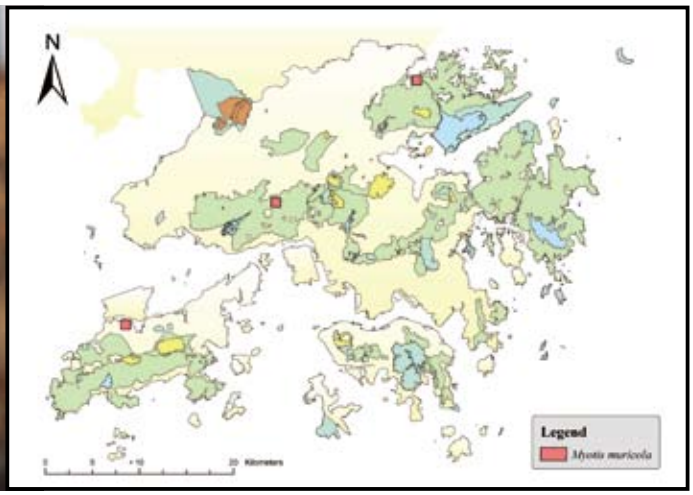

Fig 16. Records of the Whiskered Myotis in Hong Kong (2003-05).

Chinese Pipistrelle 灰伏翼 - Rare

***Hypsugo pulveratus* (Peters, 1871) (Fig. 17)**

Little is known about the Chinese Pipistrelle. It roosts alone or in a small group of several individuals in the crevices of caves and human habitation. Two individuals (1 ♂ and 1 ♀) were caught in Ting Kau at the end of Route 3 and Ma On Shan by a mist net stretched across a stream or at the edge of a reservoir (Fig. 18).

Fig 17. Chinese Pipistrelle (*Hypsugo pulveratus* 灰伏翼)

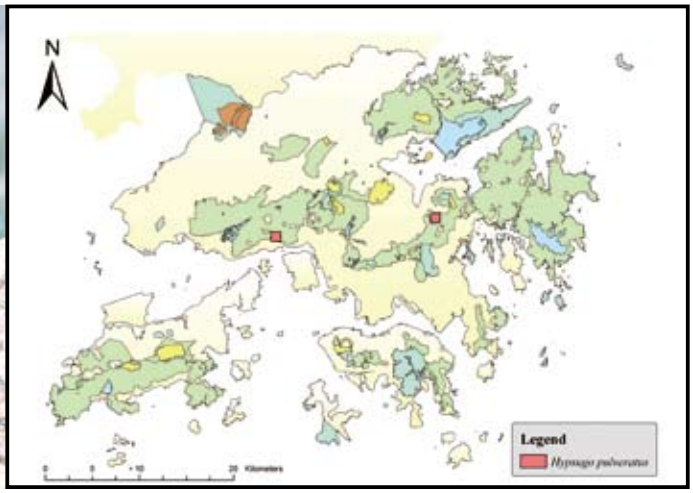

Fig 18. Records of the Chinese Pipistrelle in Hong Kong (2003-05).

Greater Bamboo Bat 褐扁顱蝠 – Rare (New species for Hong Kong)

***Tylonycteris robustula Thomas*, 1915 (Fig. 19)**

The roosting habits of the Greater Bamboo Bat are similar to the Lesser Bamboo Bat, but the colony size only ranges from one to 13 individuals. A single specimen was collected at So Lo Pun near the bushes of the Chinese Thorny Bamboo (Fig. 20).

Fig 19. Greater Bamboo Bat (*Tylonycteris robustula* 褐扁顱蝠)

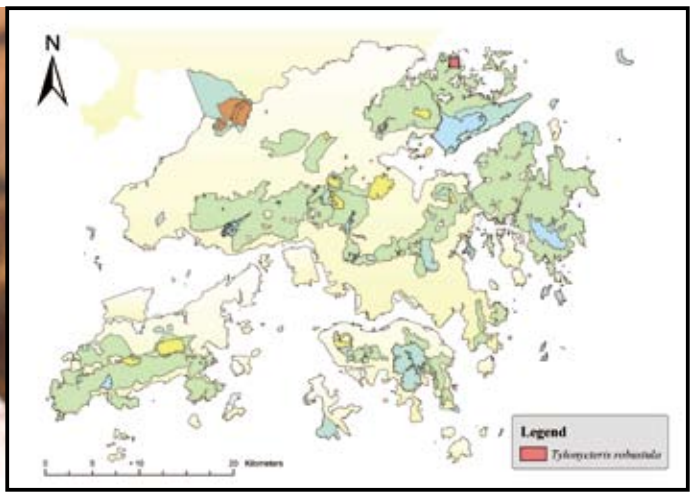

Fig 20. Record of the Greater Bamboo Bat in Hong Kong (2003-05).

Unidentified Pipistrelle – Rare (New species for Hong Kong)
***Pipistrellus* sp. (Fig. 21)**

The unidentified pipistrelle is a large pipistrelle with a forearm length of 38 mm. The pelage is brown on the ventral side with golden brown collars, and paler on the dorsal side. The ears are triangular with blunt and curved tragi. The penis is long (~10 mm). Only a single male individual was caught in Wu Kau Tang by a mist net across a stream (Fig. 22).

Fig 21. Unidentified Pipistrelle (*Pipistrellus* sp.)

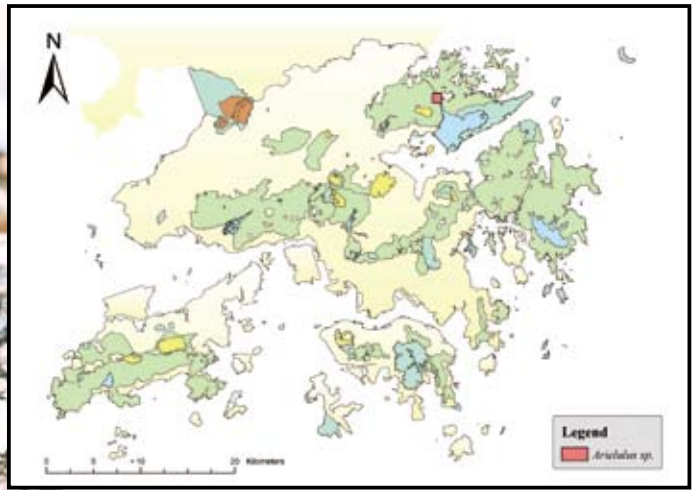

Fig 22. Record of the *Pipistrellus* sp. in Hong Kong (2003-05).

Table 1. Non-cave-dwelling bat species recorded in this study.

Species	Site (% site)*	RA (% RA)**	Status
Japanese Pipistrelle (*Pipistrellus abramus* 東亞家蝠)	28 (75.7 %)	1.51 (22.2 %)	Very common
Short-nosed Fruit Bat (*Cynopterus sphinx* 短吻果蝠)	19 (51.4 %)	1.56 (23.0 %)	Very common
Lesser Bamboo Bat (*Tylonycteris pachypus* 扁顱蝠)	14 (37.8 %)	1.21 (17.9 %)	Very common
Brown Noctule (*Nyctalus noctula* 褐山蝠)	9 (24.3 %)	0.54 (8.0 %)	Common
Lesser Yellow Bat (*Scotophilus kuhlii* 中黃蝠)	6 (16.2 %)	0.29 (4.3 %)	Uncommon
Least Pipistrelle (*Pipistrellus tenius* 小伏翼)	5 (13.5 %)	0.18 (2.6 %)	Uncommon
Whiskered Myotis (*Myotis muricola* 喜山鼠耳蝠)	3 (8.1 %)	0.07 (1.0 %)	Rare
Chinese Pipistrelle (*Hypsugo pulveratus* 灰伏翼)	2 (5.4 %)	0.03 (0.5 %)	Rare
Greater Bamboo Bat (*Tylonycteris robustula* 褐扁顱蝠)	1 (2.7 %)	0.02 (0.3 %)	Rare
Unidentified Pipistrelle (*Pipistrellus* sp.)	1 (2.7 %)	0.02 (0.3 %)	Rare

* Site = the number of sites with record; % site = the percentage of sites at which the species were recorded

** Relative abundance = the numbers of individuals captured per meter of mist net employed per night (unit: per net meter per night); % RA =the percentage of relative abundance of species out of the grand total of relative abundance of all bat species

Acknowledgement

Special thanks to Dr. Gabor Csorba of the Hungarian Natural History Museum for species reconfirmation / identification.

References

Ades, G.W.J. 1999. The species composition, distribution, and population size of Hong Kong bats. *Memoirs of the Hong Kong Natural History Society* 22: 183-209.

Bates, P.J.J., Harrison, D.L., Jenkins, P.D. and Walston, J.L. 1997. Three rare species of *Pipistrellus* (Chiroptera: Vespertilionidae) new to Vietnam. *Acta Zoologica Academiae Scientiarum Hungaricae* 43(4): 359-374.

Chan, C.S.M. and Shek, C.T. 2006. Survey on the Short-nosed Fruit Bat (*Cynopterus sphinx* 短吻果蝠) in the urban areas of Hong Kong. Hong Kong Biodiversity 11:8-10.

Fenton, M.B. 1999. Science and the conservation of bats. *Journal of Mammalology*, 78(1): 1-14.

Kunz, T.H. and Kurta, A. 1988. Capture methods and holding devices. In T. H. Kunz (ed.) *Ecological and Behavioral Methods for the Study of Bats*. Smithsonian Institution Press, Washington, D.C. 1-30.

Lekagul, B. and McNeely, J. A. 1988. *Mammals of Thailand*. Darnsutha Press, Bangkok.

Lin, L.K., Lee, L.L.and Cheng, H.C. 2005. *Bats of Taiwan (second edition)*. National Museum of Natural Science, Taichung, Taiwan.

Shek, C.T. 2004. Bats of Hong Kong: An introduction of Hong Kong bats with an illustrative identification key. *Hong Kong Biodiversity* 7: 1-9.

Shek, C.T. and Chan, C.S.M. 2005. New bat species for Hong Kong – Greater Bamboo Bat (*Tylonycteris robustula* 褐扁顱蝠). *Hong Kong Biodiversity* 8:1-9.

Shek, C.T. and Chan, C.S.M. 2005. Roost Censuses of Cave-dwelling Bats of Hong Kong. *Hong Kong Biodiversity* 10:1-8.

Working Group Column

Survey on the Short-nosed Fruit Bat (*Cynopterus sphinx* 短吻果蝠) in the Urban Areas of Hong Kong

Cynthia S.M.CHAN and Chung-tong SHEK
Mammal Working Group

漁農自然護理署的哺乳類工作小組就短吻果蝠於本港市區內的現況進行研究，調查結果顯示，此蝙蝠品種廣泛分佈於本港市區。

Introduction

The Short-nosed Fruit Bat (*Cynopterus sphinx* 短吻果蝠) is a relatively small fruit bat with forearm length ranging from 63-74 mm (n=43). It has large eyes, a short muzzle and is easily distinguished from other local bat species by the pale borders around the ears and wing bones (Fig. 23).

The geographic range of the Short-nosed Fruit Bat is from Pakistan, India, Sri Lanka to southern China, Malaysia, Java, Borneo, Sulawesi and Timor (Storz and Kunz, 1999). This species is considered as common and widespread throughout Hong Kong (Shek, 2004) and is protected under the Wild Animals Protection Ordinance (Cap. 170). No person shall therefore take, remove, injure, destroy or willfully disturb the bat or its roosts.

Of all the 26 local bat species, Short-nosed Fruit Bat is the only species that constructs its own roosts by its "tent-making" behavior. It is reported to roost on several tree species by modifying different parts of the plants, such as aerial roots, tree branches, fruit clusters, and fronds (Storz and Kunz, 1999). In Hong Kong, it is known to roost under the modified fronds of Chinese Fan-palm (*Livistona chinensis* 蒲葵) and banana plants (Ades, 1999).

Fig 23. Short-nosed Fruit Bat (*Cynopterus sphinx* 短吻果蝠)

The objective of this study is to survey the Short-nosed Fruit Bat living under the modified fronds of Chinese Fan-palm which is a common ornamental plant in parks and playgrounds in the urban areas of Hong Kong.

Fig 24. Chinese Fan-palm (*Livistona chinensis* 蒲葵) in parks with modified fronds indicated with the red arrow.

Methodology

We surveyed the Chinese Fan-palm higher than 2 m in the urban areas of Hong Kong between April 2004 and July 2005. If bite marks or individuals of Short-nosed Fruit Bat were found, roost census were done with the aid of binoculars. The bite marks were characterized by the collapsing fronds, with circular bite marks along major veins (Fig. 24 & 25).

During each roost census, the roost characteristics, such as colony size, maturity of individuals and sex of adults were recorded. The males were identified by their larger size and orange tinted collar. The females are smaller with yellowish brown collar. The immature individuals are often in paler grey, without any orange-tinted nor yellowish-brown collar.

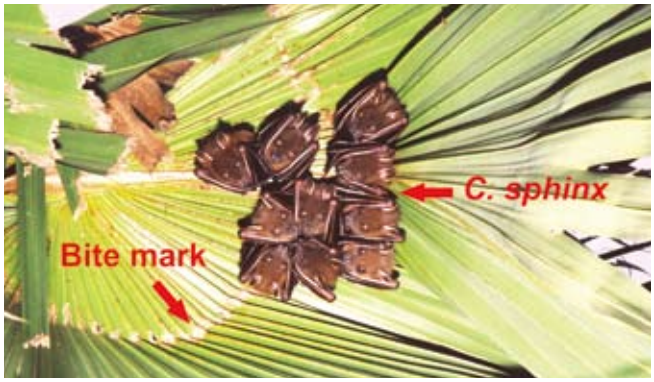

Fig 25. Roost of the Short-nosed Fruit Bat (*Cynopterus sphinx* 短吻果蝠) with bite marks on the fronds of Chinese Fan-palm (*Livistona chinensis* 蒲葵).

Roosts of Short-nosed Fruit Bat generally contain a single dominant male typically roosts alone or in a harem associated with one to 24 reproductive females and their dependent young (Fig. 26). This is known as the harem mode of social organization (Storz and Kunz, 1999). In the daytime, a harem male can be distinguished from the females as it is relatively more alert and active, with eyes opened and wings partially spread (Balasingh *et al*, 1995). The height of trees, bite marks and roosting 'tents' were also estimated. The result of the distribution analysis was presented in a 1 km² grid system, and roosts within the same grid were grouped as a single surveyed grid.

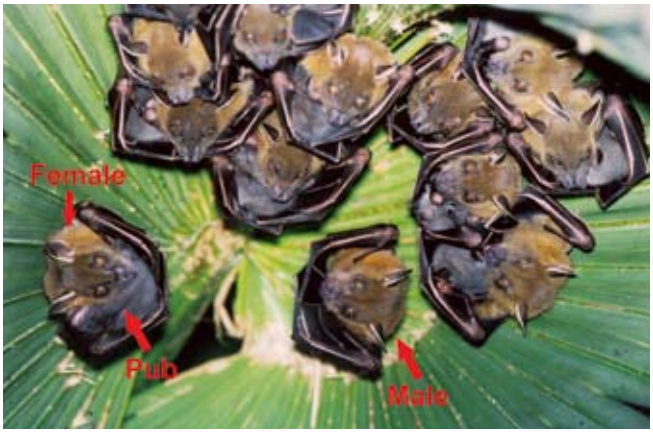

Fig 26. Roost of Short-nosed Fruit Bat (*Cynopterus sphinx* 短吻果蝠) with the dominant male, reproductive females and their dependent young (pub).

Results

Height of Chinese Fan-palm

Over 3,000 nos. of the Chinese Fan-palm were recorded in the urban areas of Hong Kong, with the height ranging from 2 m to 20 m (average height: 6.3 ± 2.8 m). About 15.6% were over 10 m (Fig. 27). Among the Chinese Fan-palm surveyed, 11.2% were found with bite marks and 6.1% with colonies of the Short-nosed Fruit Bat. Bite marks were found from trees of 3 m to 16 m high (average height: 8.3 ± 2.7 m) while colonies of Short-nosed Fruit Bat were found from trees of 3.5 m to 16 m high (average height: 6.0 ± 1.8 m). About 86.8% of the colonies of Short-nosed Fruit Bat were at a height between 5 m and 10 m (Fig. 28).

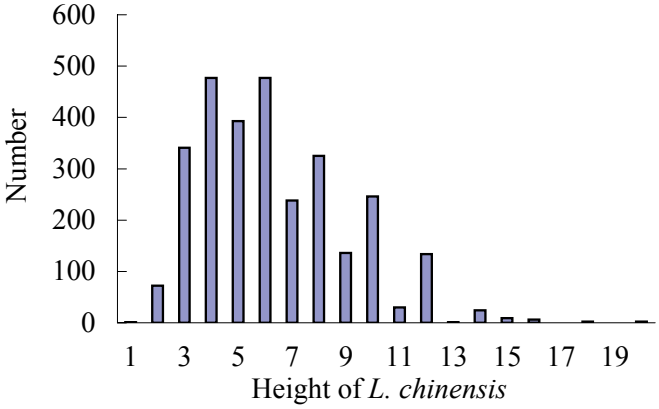

Fig 27. Distribution of heights of the Chinese Fan-palm (*Livistona chinensis* 蒲葵) surveyed.

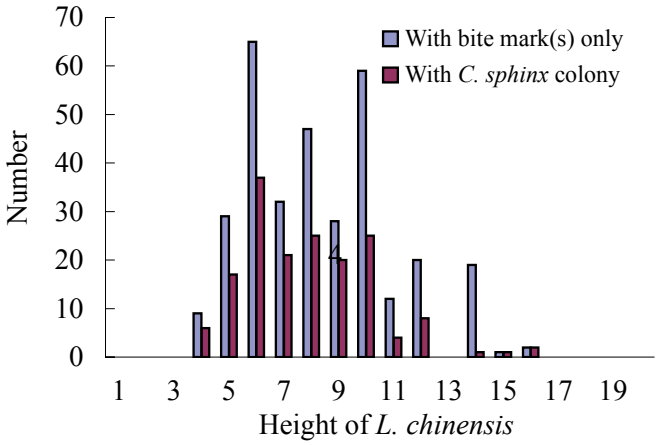

Fig 28. Distribution of heights of bite marks and roosts of Short-nosed Fruit Bat (*Cynopterus sphinx* 短吻果蝠).

Colony Size of Short-nosed Fruit Bat

A total of 819 individuals of the Short-nosed Fruit Bat in 177 roosts were recorded. The colony sizes ranged from one to 28 individuals (Fig. 29), of which 16.9% of roosts had a single male roosting alone. 83.1% of them roost in harems, with the male roosting with one to 24 reproductive females and their dependent young. The two largest colonies, with 27 and 28 individuals of the species, were recorded at the playgrounds in Mongkok and Tung Tze respectively.

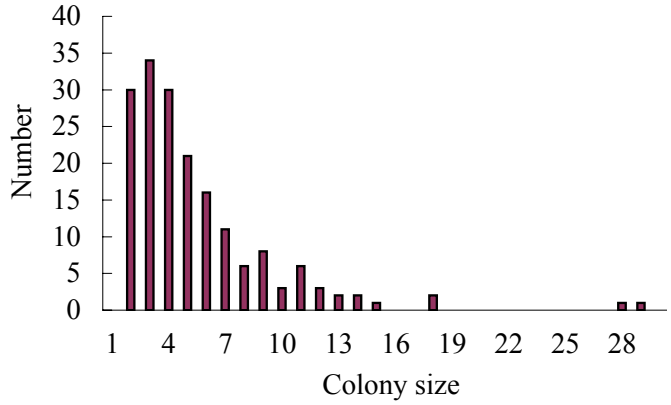

Fig 29. Distribution of the colony sizes of the Short-nosed Fruit Bat (*Cynopterus sphinx* 短吻果蝠).

Distribution of Chinese Fan-palm with Short-nosed Fruit Bat

A total of 168 x 1 km² grids with Chinese Fan-palm were surveyed. Short-nosed Fruit Bats were recorded to roost in 77 out of 168 × 1 km² grids with Chinese Fan-palm (Fig. 30).

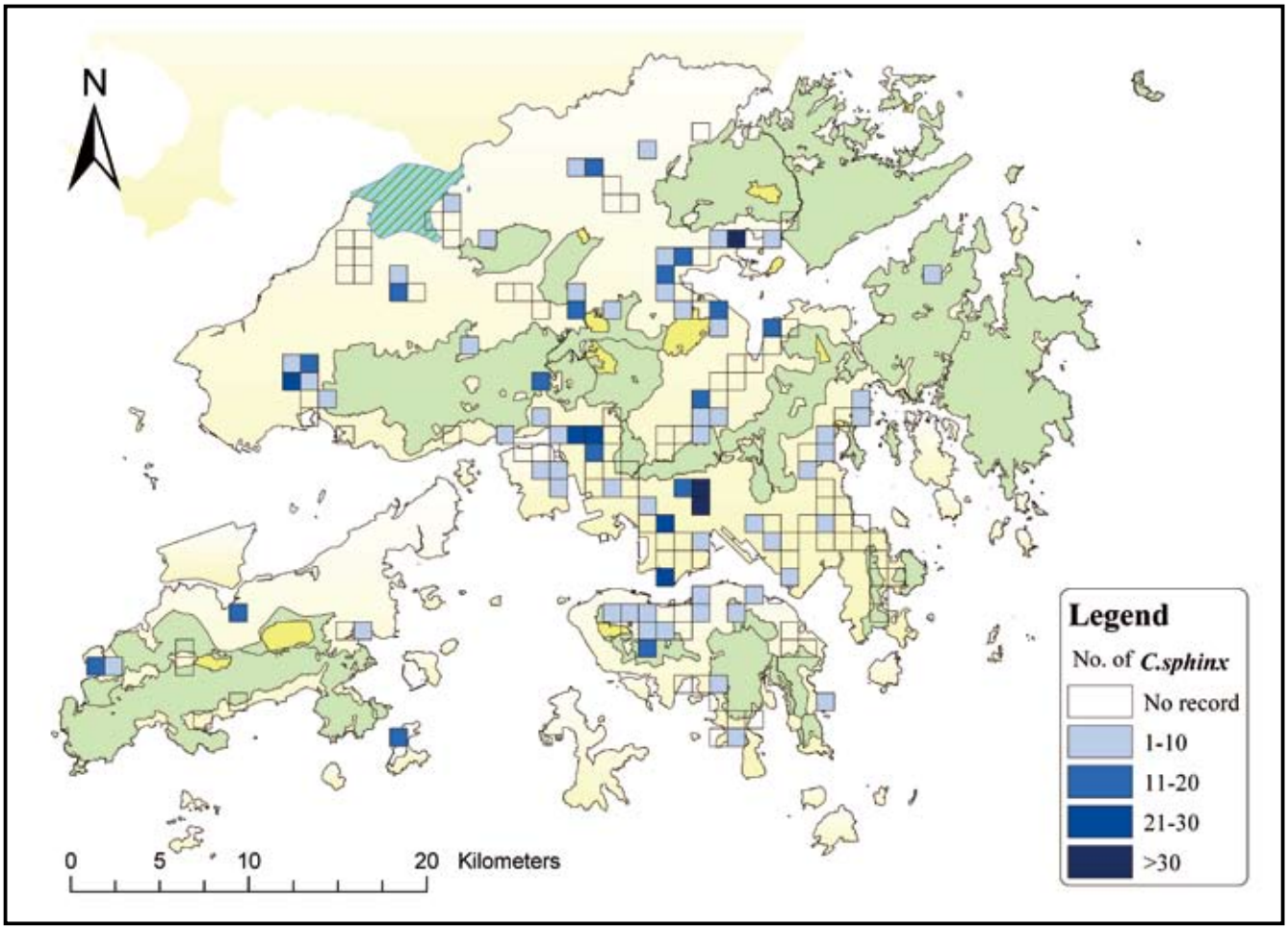

Fig 30. Locations of sites surveyed in 1 km^2 grids. Color of grids indicate the number of Short-nosed Fruit Bat (*Cynopterus sphinx* 短吻果蝠) recorded.

Discussion

The Short-nosed Fruit Bat is commonly found and widely distributed at lower elevations in the urban areas of Hong Kong, including parks and gardens, where human disturbance is omnipresent. This suggests that the species can tolerate humans in the vicinity of their roosts. Many roosts on the relatively young Chinese Fan-palm (with tree height less than 10 m) that is common and widespread throughout the urban areas. During the surveys, roosts of Short-nosed Fruit Bat were also seen under the fronds of Petticoat Palm (*Washingtonia robusta* 大絲葵), but this tree species is less common in the urban area than Chinese Fan-palm.

This fruit bat is also shown to be very common in the rural areas in AFCD's mist net surveys (Shek and Chan, 2006). However, as this species may roost on many different tree species which have dense foliage cover, it is hard to discover such roosts. Further studies on the species' roosting behaviour in the countryside are thus needed.

This is an ongoing survey aiming at covering all the urban areas in Hong Kong. If you encounter any Chinese Fan-palm with bite marks or roosts of the Short-nosed Fruit Bat in your neighborhood, please inform us by sending an e-mail to ct_shek@afcd.gov.hk.

The more specific and detailed of your observations, the more useful the information will be. For each sighting, please provide us with the locality, estimated height of the roosting tree, number of bite marks or Short-nosed Fruit Bat, date and time of the sighting.

References

Ades, G.W.J. 1999. The species composition, distribution and population size of Hong Kong Bats. *Memoirs of the Hong Kong Natural History Society* 22: 183-209.

Balasingh, J., Koilraj, J. and Kunz, T.H. 1995. Tent construction by the short-nosed fruit bat *Cynopterus sphinx* (Chiroptera: Pteropodidae) in southern India. *Ethology* 100: 210-229.

Shek, C.T. 2004. Bats of Hong Kong: An introduction of Hong Kong bats with an illustrative identification key. *Hong Kong Biodiversity* 7: 1-9.

Shek, C.T. and Chan, C. S. M. 2006. Mist net surveys of bats with three new bat species for Hong Kong. *Hong Kong Biodiversity* 11: 1-9.

Storz, J.F. and Kunz, T.H., 1999. *Cynopterus sphinx*. *Mammalian Species* 613:1-8.

Wrinkle-lipped Free-tailed Bat (*Chaerephon plicata* 皺唇犬吻蝠) in Hong Kong

Chung-tong Shek
Mammal Working Group

Although direct roost censuses and mist net surveys are commonly used in bat surveys, such methods do miss certain species; in particular, those without known roosts and/or those which fly high above the tree canopy. An example is the Wrinkle-lipped Free-tailed Bat (*Chaerephon plicata* 皺唇犬吻蝠) (Fig. 31).

Fig 31. Wrinkle-lipped Free-tailed Bat (*Chaerephon plicata* 皺唇犬吻蝠)

The species derives its name from the distinctive features of heavily wrinkled upper lips and a tail protruding from the tail membrane. It was first reported by Romer (1960) in Hong Kong and was considered "probably more widespread" by Marshall (1967). All local records to date were individuals that have accidentally entered houses, especially in winter.

Chaerephon was a subgenus of *Tardaria*, but Freeman (1981) upgraded it to a full genus as members have ears that are joined by a band of skin (Fig. 32a & b), usually a more elevated mandibular condyle and broader wing tips.

The Wrinkle-lipped Free-tailed Bat is highly gregarious in its day roost, and is often found in groups of over 200,000 in some overseas countries such as Thailand. It prefers large caves with a high ceiling and often aggregates in sea caves on small islands. To date, no roost of this species has been found in Hong Kong.

The wings of this species are exceptionally narrow and produce a high aspect ratio of heavy wing loading, both of which contribute to a fast, low maneuverability flight style (Freeman, 1981). It forages above the forest canopy and is more susceptible to straying into human houses on higher floors. So far, all local records concern individuals found entering houses or buildings in Ma On Shan, Jordan (information provided by the Kadoorie Farm and Botanic Garden) and Tung Chung. Ades (1999) suggests that they may have either foraged or strayed into Hong Kong. As many records were made in early winter, it is likely that Hong Kong lies on their migration route or near their hibernation site.

Fig 32a. Head of Wrinkle-lipped Free-tailed Bat, showing ears joined by a band of skin (red arrow).

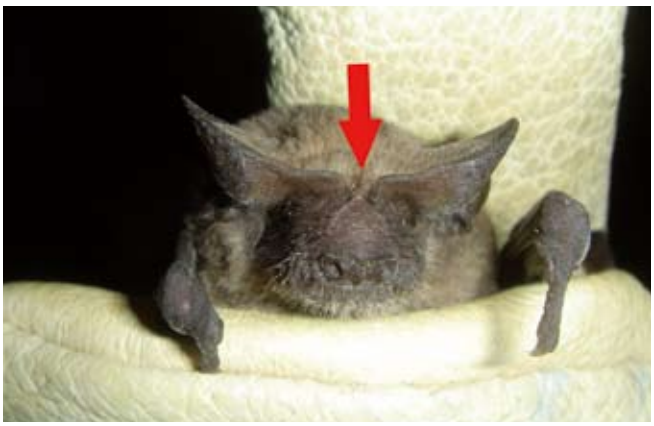

Fig 32b. Head of Brazilian Free-tailed Bat (*Tadaria brasilensis*), showing ears not joined (red arrow).

If a bat strays into your home, you should simply open the windows and it will leave of its own accord. In case the bat does not leave, you can wait until it lands, wear a pair of gloves, approach it slowly and slip a small flask or box over it. Slide a piece of cardboard under the container to trap the bat inside. The bat can then be released outdoors. If you find a suspected Wrinkle-lipped Free-tailed Bat straying into your house, please inform us by sending an e-mail to ct_shek@afcd.gov.hk.

References

Ades, G.W.J. 1999. The species composition, distribution, and population size of Hong Kong bats. *Memoirs of the Hong Kong Natural History Society* 22: 183-209.

Freeman, P.W. 1981. A multivariate study of the family Molossidae (Mammalia, Chiroptera): morphology, ecology, and evolution. *Fieldiana Zool*., n.s.,no.7, vii + 173 pp.

Marshall, P.M. 1967. Wild mammals of Hong Kong. *Oxford University Press*, Hong Kong.

Romer, J. D. 1960. Bats Known from Hong Kong. *Memoirs of the Hong Kong Natural History Society* 4 : 4 pp.

Rare Species Highlight: White-browed Keelback (白眉游蛇)

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Herpetofauna Working Group

About the Species

The White-browed Keelback (*Amphiesma boulengeri* 白眉游蛇) is a small to medium-sized non-venomous snake up to 65 cm in total length (Fig. 33). The body is rather dark in colour and two orange stripes run along its lateral side. The white stripe (the "white brow") that extends from the eye to the neck is unmistakable. It is an oviparous species but little is known of its breeding habits. This species is generally found near streams or agricultural fields in hills and mountains below 1000 m. Some information about the species is summarized in the table below:

Fig 33. White-browed Keelback (*Amphiesma boulengeri*) (Photo by Hui Wing-leung)

Family	Colubridae 游蛇科
Sub-family	Colubrinae 游蛇亞科
Genus	*Amphiesma* 腹鏈蛇屬 It is combined with other genera *Sinonatrix*, *Xenochrophis*, *Rhabdophis* and *Natrix* into one genus *Natrix* (游蛇屬) by Tin & Jiang (1986).
Scientific name	*Amphiesma boulengeri* (Gressitt)
Common name	White-browed Keelback, White-browed Belly-chain Snake
Chinese name	白眉游蛇 / 白眉腹鏈蛇
Diagnostic features	Body dark to black, rather slender. Two dull-coloured orange stripes running longitudinally on dorso-lateral sides of body. Dorsal scales keeled except the last rows. A thin white line behind the eye, extending backwards to neck and connecting with longitudinal stripe on body. Upper lip whitish with distinct dark sutures between scales. Whitish underside with a dark spot at each end of the ventral scales.
Distribution	Occurs in central and southern China including Yunnan, Guizhou, Jiangxi, Fujian, Guangdong, Hainan and Guangxi. Also reported to occur in Vietnam.
Status in Hong Kong	Very rare, only known to occur in the Shek Kong and Tai Mo Shan areas.

Field Notes

The White-browed Keelback is a very rare snake in Hong Kong. Only four specimens were recorded between 1985 and 1997, of which three were dead. Past records have been restricted to the Shek Kong area.

On 29 September 2005, Hui Wing-leung and Philip Lo Yik-fui of AFCD found a live White-browed Keelback prowling on the leaf litter beside a stream on Tai Mo Shan. The individual was a healthy adult about 50 cm long. It was kept for a few days for observation and photo taking prior to release into its original habitat. While in captivity, the snake was found to feed on the tadpoles of Gunther's Frog (*Rana guentheri*). It is not an offensive snake; it is very docile and does not attempt to bite when caught.

In view of the very limited number of records of this species in the wild, further surveys will be required to ascertain its distribution and status in Hong Kong.

References

ASEAN Centre for Biodiversity Conservation (http://www.arcbc.org)

Karsen, S.J., Lau, M.W.N. and Bogadek, A. 1998. *Hong Kong Amphibians and Reptiles*. 2nd Ed. Provisional Urban Council, Hong Kong 148-149.

Lau, M. 1996. Status of *Amphiesma boulengeri* and *A. sauteri* in Hong Kong. *Porcupine*! 14:8.

Reels, G.T. and Ades, G. 1995. New Hong Kong Snake. *Porcupine*! 13:5.

田婉淑、江耀明 主編。 1986。 中國兩棲爬行動物鑒定手冊。 科學出版社。 116 pp。

趙爾宓、黃美華、宗愉 等 著。 1998。 中國動物志 — 爬行綱第三卷〈有 目：蛇亞目〉。 科學出版社。 522 pp。

中國野生動物保護協會 主編。 2002。 中國爬行動物圖鑑。 河南科學技術出版社。 347 pp。

Division Column

The Olive Ridley (*Lepidochelys olivacea*) – an Unusual Sea Turtle Recorded in Hong Kong

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Wetland and Fauna Conservation Division

On 1 June 2005, a sea turtle carcass weighing 32 kg was found on a rocky beach within Ocean Park, Hong Kong (Fig. 34). The relatively large head, as well as the elevated and almost round carapace immediately revealed its unusual identity. It was an Olive Ridley (*Lepidochelys olivacea* 欖蠵龜) as revealed from its asymmetrical coastal scute numbers and the presence of openings of Rathke's glands on the plastron.

Further examination revealed that this female turtle measured 60.5 cm in straight carapace length and 57 cm in straight carapace width; its almost equal length and width explained its round appearance. The body was in a relatively good overall condition although it had begun to distend and to smell. There were green algae growing on the carapace but no other epibiota. No apparent fatal wound was detected. This Olive Ridley had only one claw on each front flipper, suggesting the loss of secondary claws that has been observed in some adults.

Dr. Nimal Fernando undertook a post-mortem examination in Ocean Park's laboratory (Fig. 35). Food slurry was found along the digestive track, which included some partially digested filamentous algae in the oesophagus and stomach. This discovery was consistent with what is known about Olive Ridley's omnivorous diet in which algae are eaten as occasional snacks. A few nylon threads were recovered from the oesophagus, stomach and small intestine but no hooks were found. The autopsy could not come up with a definite cause of death for this particular Olive Ridley.

Rated as endangered under the IUCN Red List, the Olive Ridley is considered the most abundant sea turtle in the world with major distribution in the tropical waters of the Pacific, India and South Atlantic Oceans. It is also known for its nesting behaviour – "Arribada" – an extraordinary feature of certain nesting populations in India, Mexico and some Central American countries in which hundreds or even thousands of females aggregate for nesting on the same beach over a few days. Another unusual feature of the Olive Ridley is that nesting takes place both in the daytime and at night.

In Hong Kong, there are less than 10 records of the Olive Ridley. The last one was found in 1996. Since the species is not known to nest in Hong Kong or nearby regions, the Olive Ridley probably died on the way to her natal beach for mating and nesting. The current post-mortem study enriches our understanding of sea turtles found in Hong Kong.

Note: Five species of sea turtle out of a total of seven have been recorded in Hong Kong waters. They are the Green Turtle (*Chelonia mydas* 綠海龜), Hawksbill (*Eretmochelys imbricata* 玳瑁), Leatherback (*Dermochelys coriacea* 棱皮龜), Loggerhead (*Caretta caretta* 赤蠵龜), and Olive Ridley (*Lepidochelys olivacea* 欖蠵龜), among them only the Green Turtle is better known for its regular nesting at Sham Wan, Lamma Island. As for the remaining two species, i.e. Kemp's Ridley (*Lepidochelys kempii* 肯普氏龜) in the Gulf of Mexico and Flatback (*Natator depressus* 平背龜) in Australian waters, their major ranges of distribution are very far away from Hong Kong.

Acknowledgements

Our gratitude is extended to Ocean Park Hong Kong for its long-term contribution to artificial incubation, rehabilitation and necropsy for sea turtles in Hong Kong. The post-mortem dissection of the present Olive Ridley was undertaken by Dr Nimal Fernando and was assisted by Ms. Wendy Chan and Yoyo Szeto, all of Ocean Park Hong Kong.

References

Chan, S. 2004. *Green Turtles in Hong Kong*. Friends of the Country Parks.

Eckert, K.L., Bjorndal, K.A., Abreu-Grobois, F.A. and Donnelly, M. (Eds.) 1999. *Research and Management Techniques for the Conservation of Sea Turtles*. IUCN/SSC Marine Turtle Specialist Group Publication No. 4.

Lutz, P. L., and Musick, J.A. (Eds.) 1997. *The Biology of Sea Turtles*. CRC Press.

Spotila, J.R. 2004. *Sea Turtles: a Complete Guide to their Biology, Behavior, and Conservation*. The Johns Hopkins University Press.

Fig 34. The overall view of the Olive Ridley. Note the doomed carapace.

Fig 35. Post-mortem dissection in actions. The job requires patience and enthusiasm.

Wetland Restoration Trial in Lions Nature Education Centre, Tsiu Hang Special Area

Winnie P.W. Kwok, Simon K.F. Chan, Tze-wai Tam and Franco K.Y. Ng
Wetland Restoration Team

Objective

The objective of this trial is to collect supplementary information on wetland restoration in Hong Kong. The target is to increase habitat and species diversity by restoring the wetland functions of abandoned and degraded wetlands and by creating a mosaic of different wetland types including freshwater ponds, seasonal marshes and wet cultivated fields for different species of wildlife.

Site Selection Criteria

The major criteria for site selection are existing conditions and the naturalness of the site, ecological linkage to other high valued habitats and the possibility of wetland restoration. In general, a degraded wetland or artificial habitat that was a former natural wetland with a stable source of flowing water is the most suitable choice. Abandoned agricultural lands or marshes that are overgrown with vegetation are therefore our target sites for this project. From a management point of view, government lands in Country Parks or Special Areas, which allow for close supervision and monitoring, are suitable for this trial since they enable us to collect valuable information for our future wetland restoration works.

We started our programme of site searching in August 2003. After a number of preliminary visits and taking into consideration the accessibility of the potential sites to construction machines, a piece of abandoned agricultural land of about 600 m^2 that was overgrown with vegetation and that lay adjacent to the bamboo grove in the Lions Nature Education Centre (LNEC) within Tsiu Hang Special Area was chosen for the trial. The site has very good water holding capacity, which was confirmed by trial pits dug by the Irrigation Section of AFCD in early 2004. It also links ecologically with the adjacent habitats (e.g. dragonfly ponds and wooded areas), allowing for the natural colonisation of wildlife. Its location in the LNEC also gave us the opportunity to incorporate public education elements into the project in order to promote wetland conservation.

Details of the Trial

The site (Fig. 36) was originally overgrown with 15 trees and clusters of shrubs. Due consideration was given in the design to avoid and minimize disturbance. Only seven trees of common / ornamental species[1] in fair to poor condition were felled as a result of the project. Six trees in better condition (all *Machilus* sp. ranging from 3 to 8 m) were transplanted to nearby locations in LNEC.

Fig 36. The site was overgrown with shrubs.

In order to protect an old stone wall that separated the site into two terraces, we decided to build a Wet Cultivated Area (WCA) on the upper level and a Freshwater Pond (FWP) on the lower platform. An Artificial Stream was made to connect the existing drainage culvert, and water from the culvert was directed to the FWP (Fig. 37). A specially designed concrete tube sunk 2 m below the pond bottom (Fig. 38) was also installed in the FWP for fish to seek refuge during extreme cold or hot weather. The restored wetland was designed to provide diversified habitats for lowland wetland wildlife including various species of dragonflies, freshwater fish, amphibians and reptiles. A short boardwalk and interpretation boards were also provided as visitor facilities.

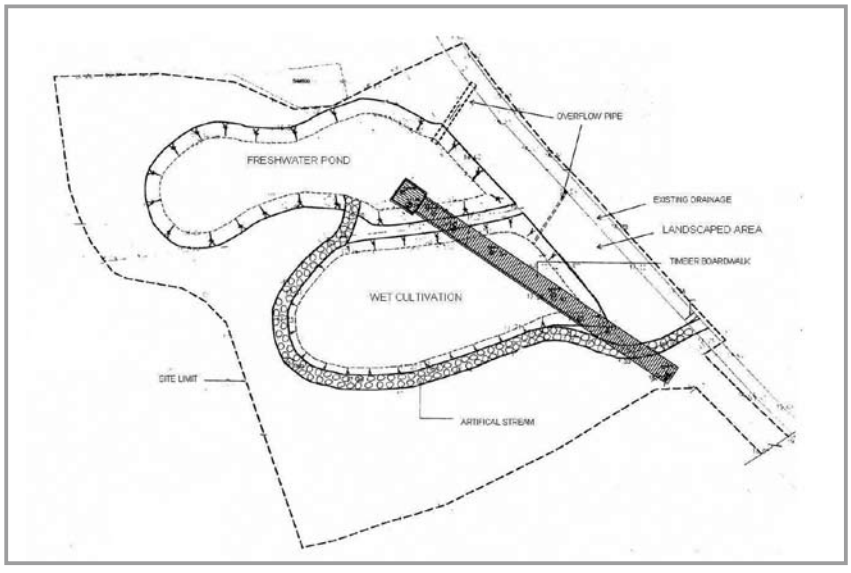

Fig 37. The site layout plan.

[1]Including *Ficus hispida* 對葉榕, *Litsea monopetala* 假柿木薑子, *Cinnamomum camphora* 樟, *Machilus* sp 楠., *Archonotophoenix alexandrae* 假檳榔

Fig 38. Concrete tube

The Country and Marine Parks Board and the Scientific Subcommittee of the Wetland Advisory Committee discussed and supported the proposed trial in May 2004. Civil works, managed by the Irrigation Section of AFCD, began in late October 2004. These included excavation of the FWP and WCA, creation of the Artificial Stream and construction of a short boardwalk (Fig. 39). Water flowing from a nearby drainage channel was diverted into the FWP through the Artificial Stream, while the WCA received water from rainfall. An overflow pipe was installed at the WCA and

Fig 39. Civil works from December 2004-February 2005.

Fig 40. Civil works completed in March 2005.

at the FWP to divert water in case of heavy rainfall. Civil works were largely completed in March 2005 (Fig. 40 & 41). Wetland plant species of known ecological value to wildlife (providing a breeding ground, refuge site or food source) were selected and planting took place in June 2005. The plant species used are listed below:

	Plant Species
Wet Cultivated Area	*Cyperus flabelliformis* 風車草 *Colocasia esculenta* 芋 *Paspalum orbiculare* 圓果雀稗 *Polygonum hydropiper* 水蓼 *Sagittaria sagittifolia* 慈姑 *Eleocharis plantagineiformis* 荸薺 *Rotala rotundifolia* 圓葉節節菜 *Equisetum debile* 筆管草(纖弱木賊) *Commenlina communis* 鴨跖草 *Juncus effuses* 燈芯草 *Oryza sativa* 水稻
Freshwater Pond	*Cyperus flabelliformis* 風車草 *Nymphaea* sp. 睡蓮
Land Area	*Hedychium coronarium*, 薑花 *Duranta erecta* 假連翹 *Salix babylonica* 垂柳

Target Animals

Target dragonflies, freshwater fish, amphibians and reptiles native to Hong Kong will be introduced / attracted to the restored wetland to enhance its ecological value. Only limited numbers of individuals from sites with abundant populations will be collected in order to avoid possible damage to the original populations.

Amphibians & Reptiles:

Baseline surveys conducted prior to the restoration works indicated that the site was home to a number of amphibians and reptiles, including the Asian Common Toad (*Bufo melanostictus* 黑眶蟾蜍), Romer's Tree Frog (*Philautus romeri* 盧氏小樹蛙) and the Changeable Lizard (*Calotes versicolor* 變色樹蜥). The Brown Tree Frog (*Polypedates megacephalus* 斑腿泛樹蛙) and Paddy Frog (*Fejervarya limnocharis* 澤蛙) were also found in the surrounding habitats and are expected to colonise the site naturally.

The wetland mosaic will offer a diverse habitat for different amphibian species, in particular those favouring lowland marshes or wet cultivated fields, as a foraging and breeding ground. The lush vegetation will act as a shelter for frogs and attract insects, on which frogs feed. Also, the water bodies of the restored wetland will serve as a breeding site for amphibians. Immediately after the completion of civil works, Günther's Frogs (*Rana guentheri* 沼蛙) and Asian Common Toads were found spawning in both the FWP and the WCA and many tadpoles were recorded in April and May 2005. A Reeve's Turtle (*Chinemys reevesii* 烏龜) was also found at the FWP. A number of Three-striped Grass Frogs (*Rana macrodactyla* 長趾蛙) were introduced to the WCA and one Reeve's Turtle was introduced to the FWP in September 2005. We will monitor the site to check if they can survive or establish themselves there.

Dragonflies

Similarly, the restored wetland will provide different habitats for dragonfly specialists. For instance, the WCA is suitable for the marsh specialist Marsh Skimmer (*Orthetrum luzonicum* 呂宋灰蜻). The Lesser Blue Skimmer (*O. triangulare triangulare* 鼎異色灰蜻) and Forest Chaser (*Lyriothemis elegantissma* 華麗寬腹蜻), which require marshy areas with a wooded

area nearby, will also find the WCA suitable. In addition, the wetland crops planted in the WCA are suitable for the Orange-tailed Midget (*Agriocnemis femina oryzae* 杯斑小蟌), while the FWP is suitable for the Common Flangetail (*Ictinogomphus pertinax* 霸王葉春蜓), which favours ponds or still water areas.

In summer 2005, a number of surveys were carried out to investigate the re-colonisation of dragonflies in the restored wetland. A target species, the Lesser Blue Skimmer, was recorded in the WCA. Other species such as Yellow Featherlegs (*Copera marginipes* 黃狹扇蟌), the Common Bluetail (*Ischnura senegalensis* 褐斑異痣蟌), the Russet Percher (*Neurothemis fulvia* 網脈蜻), the Red-faced Skimmer (*Orthetrum chrysis* 華麗灰蜻), the Common Blue Skimmer (*Orthetrum glaucum* 黑尾灰蜻) and the Ruby Darter (*Rhodothemis rufa* 紅腡蜻), were also found using the WCA. In addition, the Pied Skimmer (*Pseudothemis zonata* 玉帶蜻) was found patrolling in the FWP, while the Orange-faced Sprite (*Pseudagrion rubriceps rubriceps* 丹頂斑蟌) was observed flying around the vegetation at the pond margins.

Freshwater Fish

The FWP was originally designed for four target freshwater fish species – the Three-lines Bagrid Fish (*Pseudobagrus trilineatus* 三線擬鱨), the Rice Fish (*Oryzias curvinotus* 弓背青魚將), *Nicholsicypris normalis* (擬細鯽) and the Hong Kong Paradise Fish (*Macropodus hongkongensis* 香港鬥魚). These species are found in steams, marshes or ponds in the Sai Kung region and are recommended for enhanced conservation by the Freshwater Fish Working Group of the AFCD. However, the discovery of exotic Tilapia (*Oreochromis niloticus* 尼羅口孵非鯽) and Mosquito Fish (*Gambusia affinis* 食蚊魚) in the FWP in October 2005 changed our plans and we decided that no Rice Fish would be introduced since their eggs and young are susceptible to predation by the exotic fish.

In October 2005, 130 individuals of the Hong Kong Paradise Fish, 70 individuals of *Puntius semifasciolatus* 五線無鬚鮅 and 180 individuals of *N. normalis* 擬細鯽 were released into the FWP. Surveys in November 2005 found *P. semifasciolatus*, and *N. normalis*. Further surveys will be conducted to check whether the introduced species can establish themselves in the FWP and to continuously evaluate our species introduction plan.

Lessons Learned

Baseline ecological information

Such information is important for setting practical and realistic goals and objectives for the restoration site. Since there are ecological links with nearby habitats, natural colonisation was preferred in this trial with the exception that translocation of target species was carried out specifically for their conservation. Baseline ecological information is thus useful to determine the habitat conditions to be provided. The importance of baseline information was also demonstrated in the translocation of freshwater fish. Although we planned to introduce some species of conservation interest with limited dispersal ability like Rice Fish to the restored wetland, the presence of Mosquito Fish and Tilapia made the site unsuitable for these species.

Water sources

Water sources provide not only water but also the biological components associated with it. The availability of a natural water source is essential for the wetland to be hydrologically sustainable in the long run. On the other hand, the colonisation of the FWP by exotic species demonstrated the importance of the quality of water sources. In addition, the presence of hydric soil is important because it pre-empts the need for additional works to prevent water leakage.

Adaptive and flexible approach

An "adaptive approach" means continuous evaluation of the project in light of new information, generating ideas and making decisions on how to further refine the project; e.g. the unexpected colonisation of the site by exotic fish species changed the original translocation plan. We need to be adaptive to keep the project developing towards a positive outcome.

Lack of experienced contractors

The use of civil engineering contracts with detailed specifications may be too rigid for habitat creation and enhancement works that involve complex ecosystems. Such contracts allow only minor modifications, usually with significant cost and time implications. There is also a lack of skilled habitat creation contractors in the market. In fact, wetland restoration could be undertaken on a large scale such as this one in LNEC by contractors; however, detailed instructions and close on-site supervision are required for a successful outcome. Alternatively, small-scale works can be undertaken, like those being carried out by the skilled and experienced country parks management staff of AFCD in other country parks.

Other considerations

The issues of mosquitoes and public perception of what is required for a clean and pleasant environment should be taken into consideration if the restored wetlands are to be made accessible for public education purposes. We may need to strike a balance between what is attractive to wildlife and to human beings, allowing the public to visit with minimum disturbance to wildlife.

Fig 41. Planting work completed in summer of 2005.