



曲紋黛眼蝶
Angled Red Forester
(*Lethe chandica*)



香港物種探索 Hong Kong Biodiversity

Agriculture, Fisheries and Conservation Department Newsletter

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From the Editor

Welcome to this newsletter issue, filled with stories about the fascinating yet lesser-known wildlife neighbours, as well as initiatives led by the AFCD to conserve our local fauna and flora. Join us as we explore migrating butterflies that grace our countryside, ghost crabs that scuttle and vanish out of sight, tiny bamboo bats that weigh a few grams, and the uninvited guests of pangolin burrows, among many others. Each of these creatures reminds us of the rich tapestry of life that surrounds us every day.

Last year, we were excited to announce the launch of the Biodiversity Geographical Information System, a new facility within the Hong Kong Biodiversity Information Hub (bih.gov.hk). This remarkable tool hosts over a million occurrence records of local species, compiled from the AFCD, local institutions, partner organisations, and likely contributions from you, our city's many citizen scientists. These collaborative efforts are important for conserving Hong Kong's biodiversity and fostering a greater appreciation of our natural environment. We also updated the Hong Kong Biodiversity Strategy and Action Plan, setting targets for the next decade and calling on everyone in the community to come together as we advance our city's conservation. Whether you love nature or are just curious about it, we hope this edition encourages you to connect with and appreciate the nature around us. Happy reading!

Flora MOK

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Chief Editor : Flora S.Y. Mok
(flora_sy_mok@afcd.gov.hk)

Article Editor : Jason W.C. Wong
(jason_wc_wong@afcd.gov.hk)

Editorial team : Elvis W.H. Wong, Cody H.Y. Lee, Pan C.P. Tong

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Feature Article

An Updated Checklist of Butterflies of Hong Kong

*Cody H.Y. Lee, Angela C.H. Chan, Andrew C.M. Chan, Sandra W.S. Chow, Joyce H.W. Mak, Charlie P.H. Shue, Nelson C.F. So and Azaria K.Y. Wong
Butterfly Working Group*

漁農自然護理署蝴蝶工作小組根據 2011 至 2023 年期間進行的蝴蝶生態調查數據，更新香港蝴蝶名錄總數至 249 種，包括 8 個新列入名錄的物種。而根據本港蝴蝶的最新分布情況，共有 45 個十分稀有的物種。名錄中約 99% 的物種均曾在本港的保護區內被記錄。

Introduction

The Agriculture, Fisheries and Conservation Department (AFCD) published its first checklist of butterflies of Hong Kong in 2011, which detailed the local restrictedness of butterflies of Hong Kong and their presence in protected areas¹ (Chan et al. 2011). Since then, sightings of butterfly species new to Hong Kong have been reported from time to time. The butterfly checklist was later reviewed, and a checklist containing 245 species was published in 2021 on AFCD’s departmental homepage and the Hong Kong Biodiversity Information Hub.

This article presents an updated checklist (“the Checklist”) and local restrictedness of butterflies of Hong Kong based on the data collected by the AFCD Butterfly Working Group during the territory-wide butterfly survey programme from 2011 to 2023. The Checklist comprises 249 species, with the addition of 8 new species and the removal of 4 species considered as vagrants or historical records. Among these 249 species, 45 species were reviewed as “Very Rare” in Hong Kong.

Methodology

The Checklist was updated based on the previous checklist published in 2021, regular survey records and occasional sightings collected by the AFCD Butterfly Working Group from 2011 to 2023. The Checklist excluded irregular vagrants, accidental introductions which do not or only irregularly reproduce, historical records, doubtful records or cryptic species which require further investigation, and species believed to be mis-labelled or mis-identified.

The local restrictedness of butterflies was reviewed using the methodology established by Walthew (1997). The land area of Hong Kong, including all reservoirs and islands, is divided into 1,595 1-km² grids. The local restrictedness of each species was reviewed based on their occurrence in the surveyed grids, using a five-category scale: “Very Rare”, “Rare”, “Uncommon”, “Common” and “Very Common” (Table 1).

Table 1. Categories of local restrictedness of butterflies of Hong Kong in this review.

Local restrictedness	Percentage cover of surveyed grids	No. of surveyed 1-km ² grids (total: 467)
Very Rare	<1%	4 or below
Rare	1-3%	5-14
Uncommon	4-10%	15-46
Common	11-33%	47-154
Very Common	>33%	155-467

¹ Including Country Parks, Special Areas and Sites of Special Scientific Interest (SSSI).

Results and Discussion

From 2011 to 2023, the AFCD Butterfly Working Group conducted a total of 1,293 butterfly surveys, along with 291 occasional records outside regular surveys. These efforts covered 467 accessible 1-km² grids (Figure 1), accounting for 29% of the grids covering Hong Kong.

Over this period, a total of 26 butterfly species from five families were reported as new to Hong Kong (Table 2). The majority of these were Nymphalidae (蛺蝶科) (38%), followed by Lycaenidae (灰蝶科) (23%), with the remaining being Hesperidae (弄蝶科) (15%), Papilionidae (鳳蝶科) (12%) and Pieridae (粉蝶科) (12%).

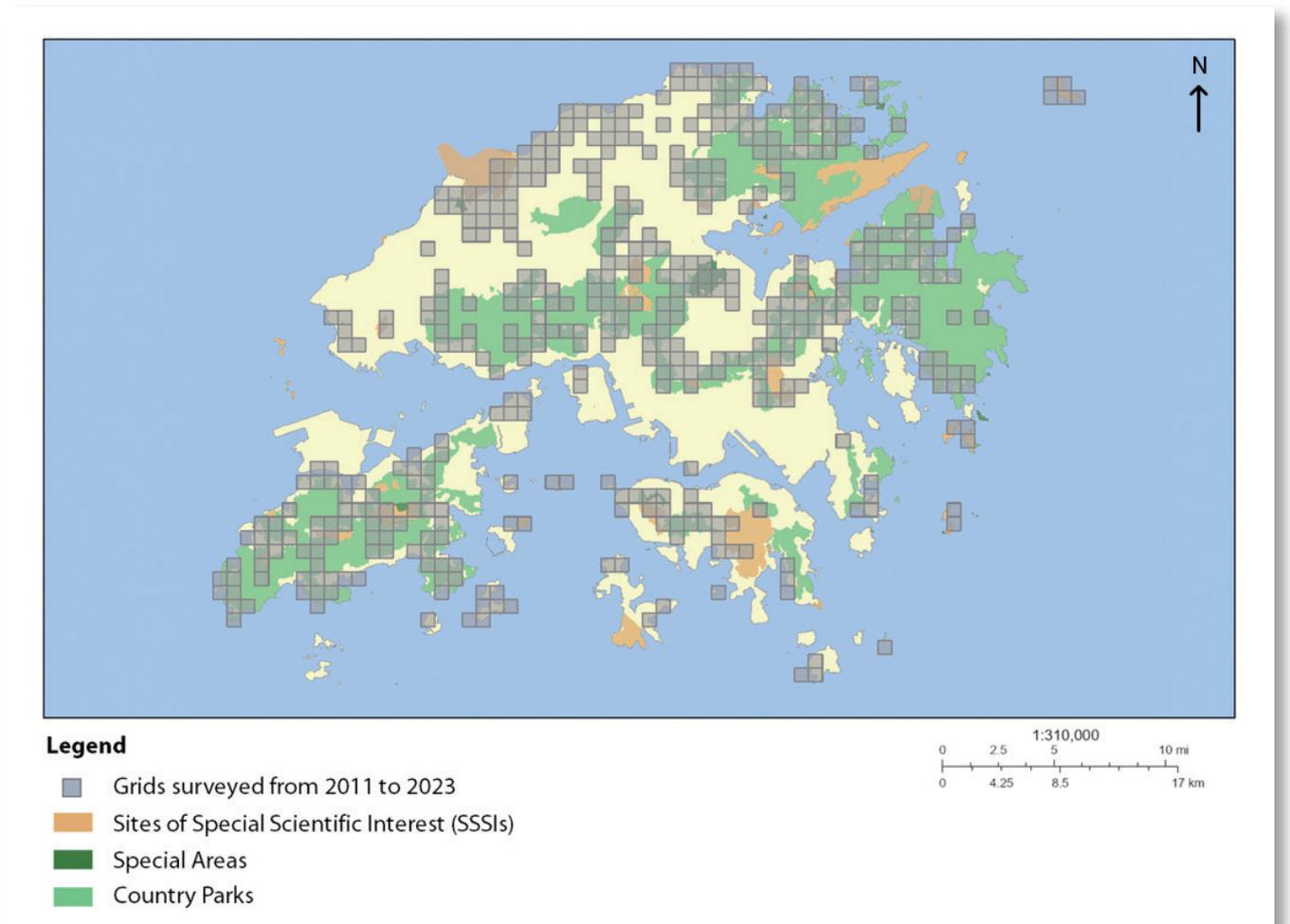


Figure 1. Grid coverage of the AFCD butterfly survey programme from 2011 to 2023.

Table 2. New butterfly records in Hong Kong during 2011 to 2023 (species added to the Checklist in 2021 and 2023 are shaded in pink and blue respectively).

Family	Scientific name ^a	Chinese name ^a	Year of first record ^b
Hesperiidae	<i>Matapa cresta</i>	珂瑪弄蝶	2011
Nymphalidae	<i>Cynitia whiteheadi</i>	綠裙蛺蝶	2011
Nymphalidae	<i>Lethe chandica</i>	曲紋黛眼蝶	2011
Nymphalidae	<i>Libythea myrrha</i>	棒紋喙蝶	2011
Lycaenidae	<i>Allotinus drumila</i>	德銼灰蝶	2012
Hesperiidae	<i>Burara jaina</i>	橙翅傘弄蝶	2013
Hesperiidae	<i>Notocrypta paralyos</i>	窄紋袖弄蝶	2014
Lycaenidae	<i>Prosotas nora</i>	波灰蝶	2015
Nymphalidae	<i>Libythea lepita</i>	朴喙蝶	2015
Papilionidae	<i>Graphium chironides</i>	碎斑青鳳蝶	2016
Lycaenidae	<i>Deudorix smilis</i>	斯米玳灰蝶	2017
Nymphalidae	<i>Aglais urticae</i>	蕁麻蛺蝶	2017
Hesperiidae	<i>Tagiades cohaerens</i>	滾邊裙弄蝶	2018
Nymphalidae	<i>Neptis nata</i>	娜環蛺蝶	2018
Nymphalidae	<i>Polyura narcaea</i>	二尾蛺蝶	2018
Papilionidae	<i>Pazala eurous</i>	升天劍鳳蝶	2018
Pieridae	<i>Eurema mandarina</i>	北黃粉蝶	2018
Nymphalidae	<i>Lethe hyrania</i>	深山黛眼蝶	2019
Nymphalidae	<i>Neptis cartica</i>	卡環蛺蝶	2019
Lycaenidae	<i>Ancema blanka</i>	白襯安灰蝶	2021
Lycaenidae	<i>Lycaena phlaeas</i>	紅灰蝶	2021
Lycaenidae	<i>Zeltus amasa</i>	珍灰蝶	2021
Nymphalidae	<i>Polyura eudamippus</i>	大二尾蛺蝶	2021
Papilionidae	<i>Graphium agetes</i>	斜紋綠鳳蝶	2021
Pieridae	<i>Cepora nadina</i>	青園粉蝶	2021
Pieridae	<i>Pieris melete</i>	黑紋粉蝶	2021

^a Scientific name and Chinese name mainly follow Wu and Hsu (2017) and other publications.

^b It refers to the first photographic record or specimen collected as evidence to substantiate the record.

Among these new species, four of them, *Cynitia whiteheadi* (綠裙蛺蝶), *Lethe chandica* (曲紋黛眼蝶), *Burara jaina* (橙翅傘弄蝶) and *Notocrypta paralysos* (窄紋袖弄蝶), had already been included in the 2021 checklist. Under this review, another eight species were added to the Checklist, including *Ancema blanka* (白襯安灰蝶), *Deudorix smilis* (斯米玳灰蝶), *Prosotas nora* (波灰蝶), *Zeltus amasa* (珍灰蝶), *Neptis cartica* (卡環蛺蝶), *Neptis nata* (娜環蛺蝶), *Polyura eudamippus* (大二尾蛺蝶), and *Cepora nadina* (青園粉蝶) (Table 3; Figures 2-9). These species were recorded for consecutive years or from time to time during surveys, with observations and records of their breeding activity or different life stages. Their host plants are also present in Hong Kong. All of the eight species had been recorded in the protected areas, indicating the importance of the protected area system in supporting these newly recorded species in Hong Kong.

The first specimen of *Neptis nata* (娜環蛺蝶) was collected by Walthew (1996), but no photographic record or voucher specimen was collected since then. Similarly, a sighting of *Polyura eudamippus* (大二尾蛺蝶) was reported by Kendrick (2002), but no photograph or specimen were available at that time. The two species were rediscovered in 2018 and 2021, respectively, and found in scattered locations over consecutive years. As a result, they were added to the Checklist.

Table 3. Butterfly species added to the Checklist and their known host plants.

Family	Scientific name	Common name	Chinese name	Known host plant(s)
Lycaenidae	<i>Ancema blanka</i>	Silver Royal	白襯安灰蝶	<i>Viscum ovalifolium</i> (瘤果槲寄生)
Lycaenidae	<i>Deudorix smilis</i>	Princess Flash	斯米玳灰蝶	<i>Strychnos</i> spp. (馬錢屬)
Lycaenidae	<i>Prosotas nora</i>	Common Line Blue	波灰蝶	<i>Adenanthera microsperma</i> (海紅豆), <i>Bauhinia championii</i> (缺葉藤)
Lycaenidae	<i>Zeltus amasa</i>	Fluffy Tit	珍灰蝶	<i>Clerodendrum cyrtophyllum</i> (大青)
Nymphalidae	<i>Neptis cartica</i>	Plain Sailer	卡環蛺蝶	<i>Castanopsis fissa</i> (鰲菊錐)
Nymphalidae	<i>Neptis nata</i>	Burmese Sailer	娜環蛺蝶	<i>Bauhinia championii</i> (缺葉藤), <i>Pongamia pinnata</i> (水黃皮), <i>Quisqualis indica</i> (使君子), <i>Trema tomentosa</i> (山黃麻)
Nymphalidae	<i>Polyura eudamippus</i>	Great Nawab	大二尾蛺蝶	<i>Prunus phaeosticta</i> (腺葉桂櫻), <i>Ventilago leiocarpa</i> (翼核果)
Pieridae	<i>Cepora nadina</i>	Lesser Gull	青園粉蝶	<i>Capparis acutifolia</i> (獨行千里)



Figure 2. *Ancema blanka* (Silver Royal, 白襯安灰蝶).

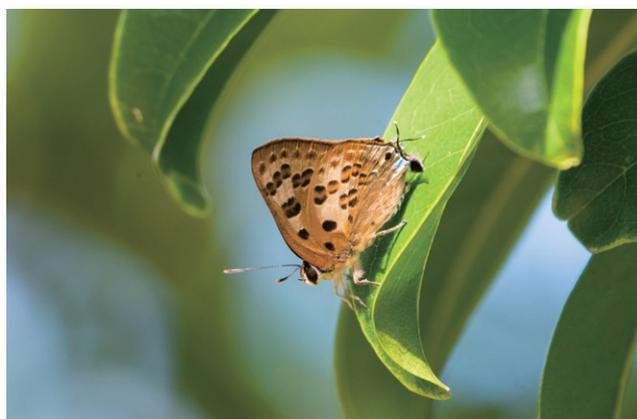


Figure 3. *Deudorix smilis* (Princess Flash, 斯米玳灰蝶).



Figure 4. *Prosotas nora* (Common Line Blue, 波灰蝶).



Figure 5. *Zeltus amasa* (Fluffy Tit, 珍灰蝶).



Figure 6. *Neptis cartica* (Plain Sailer, 卡環蛺蝶).



Figure 7. *Neptis nata* (Burmese Sailer, 娜環蛺蝶).



Figure 8. *Polyura eudamippus* (Great Nawab, 大二尾蛺蝶).



Figure 9. *Cepora nadina* (Lesser Gull, 青園粉蝶).

The remaining butterfly species first recorded during the review period were either considered as vagrants or data deficient, indicating that they require further monitoring in longer terms to confirm their local establishment (Table 2). *Castalius rosimon* (豹灰蝶) and *Hypolimnys anomala* (畸紋紫斑蛺蝶) were once considered as locally extinct in Chan et al. (2011), but were rediscovered in 2018 and 2020 respectively. Despite this, they were excluded in the Checklist due to limited records to prove their continued presence. Status of these species will be further reviewed when compatible data is available.

Four species, namely *Euploea sylvestris* (雙標紫斑蝶), *Leptosia nina* (纖粉蝶), *Papilio machaon* (金鳳蝶), and *Ypthima motschulskyi* (東亞矍眼蝶), were removed from the Checklist. These were considered as vagrants or historical records, or there was considerable doubt regarding their authenticity. Apart from these four, the Checklist also excluded (i) irregular vagrants, (ii) species suspected to be accidentally introduced with their exotic ornamental host plants and lacking local breeding records, (iii) historical records with no known observation record in Hong Kong for at least 20 years, (iv) species deemed doubtful in their continued presence locally, requiring further monitoring to verify their establishment, and (v) species believed to be mislabelled or misidentified.

In view of the above, the Checklist of Hong Kong butterflies contains 249 species from six families². Until the end of 2023, 99% of the species in the Checklist were recorded in the protected areas in Hong Kong since the commencement of butterfly survey programme (Annex 1), except for *Arhopala paramuta* (小嬌灰蝶) which was later recorded in the protected area during the AFCD butterfly survey in 2024. This indicates the conservation significance of the protected areas in supporting the majority of butterflies of Hong Kong.

In recent years, there has been an increase in the observation of tropical butterfly species in Hong Kong. *Euripus nyctelius* (芒蛺蝶) and *Lexias pardalis* (小豹律蛺蝶) of tropical origin were first recorded in Hong Kong in 2007 and 2008 respectively. They have established themselves and expanded their local distribution over the past decade. *Euripus nyctelius* has become more common and is now seen more frequently. *Lexias pardalis* has rapidly expanded its local range since 2018, spreading from just a few locations mainly on Lantau Island to a wider area, making it a more common and widely distributed species than before.

Notably, all eight additions to the Checklist in 2023 are tropical species, and their known host plants are found in Hong Kong (Table 3). Some studies suggest that the increase in occurrences of *Zeltus amasa* (珍灰蝶) and *Euripus nyctelius* (芒蛺蝶) may be related to the redistribution and range expansion of tropical species in response to a warmer climate (Au and Bonebrake 2019; Perissinotto et al. 2023). However, this hypothesis requires further investigation. Greater efforts in inventorying and monitoring would also provide valuable data for future study.

Regarding the local restrictedness of the butterflies, about 40% of the species were reviewed as “Very Rare” and “Rare”, while the remaining 60% were “Uncommon”, “Common” and “Very Common” (Table 4). Hesperidae (弄蝶科) has the highest number of “Very Rare” and “Rare” species, followed by Lycaenidae (灰蝶科) (Table 5; Figure 10).

² The six families are Hesperidae (弄蝶科), Lycaenidae (灰蝶科), Nymphalidae (蛺蝶科), Papilionidae (鳳蝶科), Pieridae (粉蝶科) and Riodinidae (蛺蝶科). Riodinidae is treated as a distinct family due to new evidence on phylogenetic relationship (Espeland et al. 2018; Kawahara et al. 2023).

Compared to Chan et al. (2011), the local restrictedness of some butterfly species have shifted, with 64 species becoming more common (e.g. from "Very Rare" to "Rare" or "Uncommon", and so on), 21 species becoming rarer while 147 species remaining unchanged³. Explaining the shift in local restrictedness can be complicated and challenging. While these relatively minor fluctuations may be anticipated due to differences among surveyors, some species have shifted to the more common side probably due to various factors. For example, *Catochrysops strabo* (咖灰蝶) and *Jamides alecto* (素雅灰蝶), which were once "Very Rare", expanded their range in a particular year and established viable populations. The once "Very Rare" *Nacaduba berenice* (百娜灰蝶) is almost indistinguishable from the "Common" species *Nacaduba kurava* (古樓娜灰蝶) in the field, but its local restrictedness has shifted to "Uncommon" as identification knowledge of this species has increased. The once "Very Rare" *Zizula hylax* (長腹灰蝶) has become more widely distributed as its larval foodplant, *Lantana montevidensis*, is commonly used in landscaping. As such, the changes could be related to many factors such as enhanced survey efforts at new survey sites, vegetation management efforts such as the upkeep of butterfly gardens and eco-gardens, enrichment planting in protected areas and warmer weather. Moving forward, efforts will be intensified through continued surveys and habitat conservation to support the local butterfly populations.

Table 4. Local restrictedness of butterflies of Hong Kong.

Local restrictedness	No. of butterfly species of Hong Kong (% of total)
Very Rare	45 (18.1%)
Rare	54 (21.7%)
Uncommon	68 (27.3%)
Common	61 (24.5%)
Very Common	21 (8.4%)
Total	249

Table 5. Total number of species by families.

Family	Total no. of species (no. of "Very Rare" and "Rare" species in that family)	
	Checklist (2011-2023)	Checklist (2002-2010) ^a
Hesperiidae 弄蝶科	61 (33)	59 (38)
Lycaenidae 灰蝶科	58 (26)	51 (29)
Nymphalidae 蛺蝶科	85 (26)	80 (25)
Papilionidae 鳳蝶科	21 (4)	22 (8)
Pieridae 粉蝶科	21 (9)	21 (11)
Riodinidae 蛭蝶科	3 (1)	3 (1)
Total no. of species	249 (99)	236 (112)

^a Chan et al. (2011).

³ 17 species that were not recorded or assessed by Chan et al. (2011) were not compared.

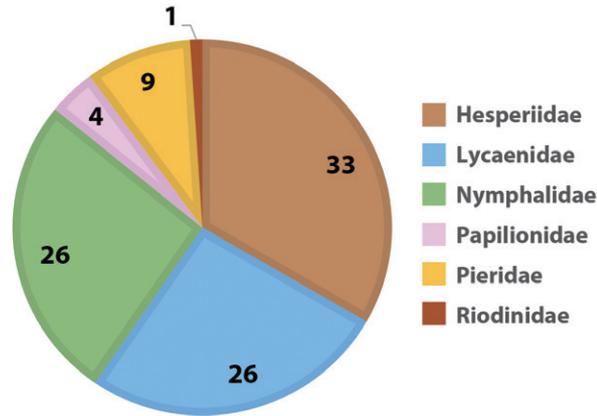


Figure 10. Number of "Very Rare" and "Rare" species by families (2011-2023).

This update reflects the increase in the discoveries of newly recorded species and rediscoveries of species previously considered locally extinct. This can be attributed to the growing popularity of butterfly watching and photography, the publication of more butterfly guidebooks and reference materials by local lepidopterists and green groups, and the contributions of citizen science platforms like iNaturalist. These photographic inventories and records provide valuable insights and help address data gaps in local butterfly monitoring.

Way Forward

The AFCD Butterfly Working Group will continue to carry out systematic surveys and monitor the key sites of butterflies in Hong Kong. More survey efforts will target newly established species to determine whether they can establish stable populations in Hong Kong. Greater efforts will also be necessary for cryptic species, such as *Parnara apostata* (圓突稻弄蝶)⁴, *Tagiades cohaerens* (滾邊裙弄蝶), and *Eurema mandarina* (北黃粉蝶), to confirm their local status or presence. Studies on the life histories of the "Very Rare" and "Rare" species, as well as potential species among the new discoveries (Table 2), will help fill key knowledge gaps and facilitate the implementation of effective species-specific conservation actions.

Among the new discoveries, *Ancema blanka* (白襖安灰蝶), *Deudorix smilis* (斯米玳灰蝶), and *Polyura eudamippus* (大二尾蛺蝶) are hill-topping species. Hilltops act as essential landmark for mate attraction, significantly contributing to the courtship, reproduction and dispersal of many butterfly species, forming a crucial part of their life history. Therefore, hilltop habitats possess significant conservation implication. As such, greater survey efforts will focus on hill-topping sites. We will also continue identifying potential sites for enrichment planting of native butterfly host plants and nectar plants to enhance habitat quality for butterflies, especially for larval host plant specific species. When additional data become available, the Checklist and local restrictedness of the butterflies of Hong Kong will be further reviewed.

Acknowledgements

The authors would like to thank the former and existing members of the Butterfly Working Group, in particular Mr Tam Kin Chung as well as Mr Hui Wing Leung for their assistance in data collection and contribution of personal records.

⁴ One specimen collected by AFCD staff in 2015 was suspected to be *Parnara apostata* (圓突稻弄蝶) under dissection, but genetic or molecular analysis is required to confirm its presence as it is morphologically indistinguishable with *Parnara ganga* (曲紋稻弄蝶).

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Annex 1. The Checklist of butterflies of Hong Kong.

No.	Family	Subfamily	Scientific Name	Common Name	Chinese Name	Local restrictedness 2011-2023 ¹	Record(s) in protected areas ²
1	Hesperiidae	Coeliadinae	<i>Badamia exclamationis</i>	Brown Awl	尖翅弄蝶	R	Y
2	Hesperiidae	Coeliadinae	<i>Burara gomata</i>	Pale Awlet	白傘弄蝶	UC	Y
3	Hesperiidae	Coeliadinae	<i>Burara jaina</i>	Orange-striped Awlet	橙翅傘弄蝶	VR	Y
4	Hesperiidae	Coeliadinae	<i>Burara oedipodea</i>	Orange Awlet	黑斑傘弄蝶	R	Y
5	Hesperiidae	Coeliadinae	<i>Choaspes benjaminii</i>	Indian Awl King	綠弄蝶	UC	Y
6	Hesperiidae	Coeliadinae	<i>Choaspes hemixanthus</i>	Orange Red Skirt	半黃綠弄蝶	VR	Y
7	Hesperiidae	Coeliadinae	<i>Hasora anura</i>	Slate Awl	無趾弄蝶	VR	Y
8	Hesperiidae	Coeliadinae	<i>Hasora badra</i>	Common Awl	三斑趾弄蝶	R	Y
9	Hesperiidae	Coeliadinae	<i>Hasora chromus</i>	Banded Awl	雙斑趾弄蝶	R	Y
10	Hesperiidae	Coeliadinae	<i>Hasora taminatus</i>	White-banded Awl	銀針趾弄蝶	VR	Y
11	Hesperiidae	Coeliadinae	<i>Hasora vitta</i>	Plain Banded Awl	緯帶趾弄蝶	VR	Y
12	Hesperiidae	Hesperiinae	<i>Aeromachus jhora</i>	Grey Scrub Hopper	寬鏢弄蝶	UC	Y
13	Hesperiidae	Hesperiinae	<i>Aeromachus pygmaeus</i>	Pigmy Scrub Hopper	侏儒鏢弄蝶	VR	Y
14	Hesperiidae	Hesperiinae	<i>Ampittia dioscorides</i>	Bush Hopper	黃斑弄蝶	C	Y
15	Hesperiidae	Hesperiinae	<i>Ampittia virgata</i>	Striped Bush Hopper	鈎形黃斑弄蝶	VR	Y
16	Hesperiidae	Hesperiinae	<i>Astictopterus jama</i>	Forest Hopper	腌翅弄蝶	C	Y
17	Hesperiidae	Hesperiinae	<i>Baoris farri</i>	Paintbrush Swift	刺脛弄蝶	R	Y
18	Hesperiidae	Hesperiinae	<i>Borbo cinnara</i>	Formosan Swift	杣弄蝶	C	Y
19	Hesperiidae	Hesperiinae	<i>Caltoris bromus</i>	Colon Swift	斑珂弄蝶	UC	Y
20	Hesperiidae	Hesperiinae	<i>Caltoris cahira</i>	Dark Swift	珂弄蝶	UC	Y
21	Hesperiidae	Hesperiinae	<i>Cephrenes acalle</i>	Plain Palm Dart	金斑弄蝶	VR	Y
22	Hesperiidae	Hesperiinae	<i>Erionota torus</i>	Banana Skipper	黃斑蕉弄蝶	R	Y
23	Hesperiidae	Hesperiinae	<i>Halpe paupera paupera</i>	Beggar's Ace	珀酣弄蝶	VR	Y
24	Hesperiidae	Hesperiinae	<i>Halpe porus</i>	Dark Brown Ace	雙子酣弄蝶	R	Y
25	Hesperiidae	Hesperiinae	<i>Hyarotis adrastus</i>	Tree Flitter	希弄蝶	UC	Y
26	Hesperiidae	Hesperiinae	<i>Iambrix salsala</i>	Chestnut Bob	雅弄蝶	C	Y
27	Hesperiidae	Hesperiinae	<i>Isoteinon lamprospilus</i>	Shiny-Spotted Bob	旖弄蝶	R	Y
28	Hesperiidae	Hesperiinae	<i>Matapa aria</i>	Common Redeye	瑪弄蝶	UC	Y
29	Hesperiidae	Hesperiinae	<i>Notocrypta curvifascia</i>	Restricted Demon	曲紋袖弄蝶	UC	Y

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30	Hesperiidae	Hesperiinae	<i>Notocrypta paralyos</i>	Banded Demon	窄紋袖弄蝶	UC	Y
31	Hesperiidae	Hesperiinae	<i>Parnara bada</i>	Oriental Straight Swift	么紋稻弄蝶	UC	Y
32	Hesperiidae	Hesperiinae	<i>Parnara ganga</i>	Rare Swift	曲紋稻弄蝶	UC	Y
33	Hesperiidae	Hesperiinae	<i>Parnara guttata</i>	Common Straight Swift	直紋稻弄蝶	UC	Y
34	Hesperiidae	Hesperiinae	<i>Pelopidas agna</i>	Little Branded Swift	南亞穀弄蝶	R	Y
35	Hesperiidae	Hesperiinae	<i>Pelopidas assamensis</i>	Great Swift	印度穀弄蝶	R	Y
36	Hesperiidae	Hesperiinae	<i>Pelopidas conjuncta</i>	Conjoined Swift	古銅穀弄蝶	UC	Y
37	Hesperiidae	Hesperiinae	<i>Pelopidas mathias</i>	Small Branded Swift	隱紋穀弄蝶	UC	Y
38	Hesperiidae	Hesperiinae	<i>Pelopidas subochracea</i>	Large Branded Swift	近赭穀弄蝶	VR	Y
39	Hesperiidae	Hesperiinae	<i>Polytremis lubricans</i>	Contiguous Swift	黃紋孔弄蝶	C	Y
40	Hesperiidae	Hesperiinae	<i>Potanthus confucius</i>	Chinese Dart	孔子黃室弄蝶	C	Y
41	Hesperiidae	Hesperiinae	<i>Potanthus pava</i>	Yellow Dart	寬紋黃室弄蝶	UC	Y
42	Hesperiidae	Hesperiinae	<i>Potanthus pseudomaesa</i>	Common Dart	擬黃室弄蝶	R	Y
43	Hesperiidae	Hesperiinae	<i>Potanthus trachala</i>	Lesser Band Dart	斷紋黃室弄蝶	R	Y
44	Hesperiidae	Hesperiinae	<i>Pseudoborbo bevani</i>	Bevan's Swift	擬袖弄蝶	R	Y
45	Hesperiidae	Hesperiinae	<i>Suastus gremius</i>	Indian Palm Bob	素弄蝶	UC	Y
46	Hesperiidae	Hesperiinae	<i>Taractrocera ceramas</i>	Tamil Grass Dart	草黃弄蝶	VR	Y
47	Hesperiidae	Hesperiinae	<i>Taractrocera maevius</i>	Common Grass Dart	薇黃弄蝶	VR	Y
48	Hesperiidae	Hesperiinae	<i>Telicota bambusae</i>	Greenish Palm Dart	竹長標弄蝶	UC	Y
49	Hesperiidae	Hesperiinae	<i>Telicota besta</i>	Hainan Palm Dart	黑脈長標弄蝶	VR	Y
50	Hesperiidae	Hesperiinae	<i>Telicota colon</i>	Pale Palm Dart	長標弄蝶	UC	Y
51	Hesperiidae	Hesperiinae	<i>Telicota ohara</i>	Dark Palm Dart	黃紋長標弄蝶	R	Y
52	Hesperiidae	Hesperiinae	<i>Thoressa monastyrskyi</i>	Monastyrskyi's Ace	黑斑陀弄蝶	VR	Y
53	Hesperiidae	Hesperiinae	<i>Udaspes folus</i>	Grass Demon	薑弄蝶	UC	Y
54	Hesperiidae	Hesperiinae	<i>Zographetus satwa</i>	Purple and Gold Flitter	黃裳腫脈弄蝶	R	Y
55	Hesperiidae	Pyrginae	<i>Abraximorpha davidii</i>	Magpie Flat	白弄蝶	R	Y
56	Hesperiidae	Pyrginae	<i>Caprona alida</i>	Spotted Angle	白彩弄蝶	VR	Y
57	Hesperiidae	Pyrginae	<i>Celaenorhinus leucocera</i>	Common Spotted Flat	白角星弄蝶	R	Y
58	Hesperiidae	Pyrginae	<i>Gerosis phisara</i>	White-banded Flat	匪夷捷弄蝶	R	Y
59	Hesperiidae	Pyrginae	<i>Odontoptilum angulata</i>	Chestnut Angle	角翅弄蝶	UC	Y

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60	Hesperiidae	Pyrginae	<i>Tagiades litigiosa</i>	Water Snow Flat	沾邊裙弄蝶	C	Y
61	Hesperiidae	Pyrginae	<i>Tagiades menaka</i>	Dark Edged Snow Flat	黑邊裙弄蝶	UC	Y
62	Lycaenidae	Curetinae	<i>Curetis acuta</i>	Toothed Sunbeam	尖翅銀灰蝶	UC	Y
63	Lycaenidae	Lycaeninae	<i>Heliophorus epicles</i>	Purple Sapphire	彩灰蝶	C	Y
64	Lycaenidae	Miletinae	<i>Miletus chinensis</i>	Common Brownie	中華雲灰蝶	VR	Y
65	Lycaenidae	Miletinae	<i>Taraka hamada</i>	Lesser Forest Blue	蚜灰蝶	UC	Y
66	Lycaenidae	Polyommatainae	<i>Acytolepis puspa</i>	Common Hedge Blue	鈕灰蝶	C	Y
67	Lycaenidae	Polyommatainae	<i>Catochrysops panormus</i>	Silver Forget-me-not	藍咖灰蝶	VR	Y
68	Lycaenidae	Polyommatainae	<i>Catochrysops strabo</i>	Forget-me-not	咖灰蝶	C	Y
69	Lycaenidae	Polyommatainae	<i>Celastrina lavendularis</i>	Plain Hedge Blue	薰衣琉璃灰蝶	UC	Y
70	Lycaenidae	Polyommatainae	<i>Chilades lajus</i>	Lime Blue	紫灰蝶	C	Y
71	Lycaenidae	Polyommatainae	<i>Chilades putli</i>	Grass Jewel	普紫灰蝶	R	Y
72	Lycaenidae	Polyommatainae	<i>Cupido lacturnus</i>	Tailed Cupid	長尾藍灰蝶	UC	Y
73	Lycaenidae	Polyommatainae	<i>Euchrysops cnejus</i>	Gram Blue	棕灰蝶	UC	Y
74	Lycaenidae	Polyommatainae	<i>Famegana nisa</i>	Small Grass Blue	瑤灰蝶	VR	Y
75	Lycaenidae	Polyommatainae	<i>Jamides alecto</i>	Metallic Cerulean	素雅灰蝶	C	Y
76	Lycaenidae	Polyommatainae	<i>Jamides bochus</i>	Dark Cerulean	雅灰蝶	C	Y
77	Lycaenidae	Polyommatainae	<i>Jamides celeno</i>	Common Cerulean	錫冷雅灰蝶	UC	Y
78	Lycaenidae	Polyommatainae	<i>Lampides boeticus</i>	Long-tailed Blue	亮灰蝶	C	Y
79	Lycaenidae	Polyommatainae	<i>Luthrodes pandava</i>	Plains Cupid	曲紋紫灰蝶	UC	Y
80	Lycaenidae	Polyommatainae	<i>Megisba malaya</i>	Malayan	美姬灰蝶	UC	Y
81	Lycaenidae	Polyommatainae	<i>Nacaduba berenice</i>	Rounded 6-line Blue	百娜灰蝶	UC	Y
82	Lycaenidae	Polyommatainae	<i>Nacaduba kurava</i>	Transparent 6-line Blue	古樓娜灰蝶	C	Y
83	Lycaenidae	Polyommatainae	<i>Neopithecops zalmora</i>	Quaker	一點灰蝶	C	Y
84	Lycaenidae	Polyommatainae	<i>Pithecops corvus</i>	Forest Quaker	黑丸灰蝶	R	Y
85	Lycaenidae	Polyommatainae	<i>Prosotas dubiosa</i>	Tailless Line Blue	疑波灰蝶	C	Y
86	Lycaenidae	Polyommatainae	<i>Prosotas nora</i>	Common Line Blue	波灰蝶	R	Y
87	Lycaenidae	Polyommatainae	<i>Syntarucus plinius</i>	Oriental Striped Blue	細灰蝶	VR	Y
88	Lycaenidae	Polyommatainae	<i>Udara albocaerulea</i>	Albocaerulean	白斑嫵灰蝶	R	Y
89	Lycaenidae	Polyommatainae	<i>Udara dilecta</i>	Pale Hedge Blue	嫵灰蝶	R	Y

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90	Lycaenidae	Polyommatainae	<i>Zizeeria karsandra</i>	Dark Grass Blue	吉灰蝶	UC	Y
91	Lycaenidae	Polyommatainae	<i>Zizeeria maha</i>	Pale Grass Blue	酢漿灰蝶	VC	Y
92	Lycaenidae	Polyommatainae	<i>Zizina otis</i>	Lesser Grass Blue	毛眼灰蝶	C	Y
93	Lycaenidae	Polyommatainae	<i>Zizula hylax</i>	Tiny Grass Blue	長腹灰蝶	UC	Y
94	Lycaenidae	Theclinae	<i>Ancema blanka</i>	Silver Royal	白襯安灰蝶	R	Y
95	Lycaenidae	Theclinae	<i>Ancema ctesia</i>	Bi-spot Royal	安灰蝶	VR	Y
96	Lycaenidae	Theclinae	<i>Arhopala bazalus</i>	Powdered Oak Blue	百嬌灰蝶	UC	Y
97	Lycaenidae	Theclinae	<i>Arhopala birmana</i>	Burmese Bush Blue	緬甸嬌灰蝶	R	Y
98	Lycaenidae	Theclinae	<i>Arhopala centaurus</i>	Centaur Oak Blue	銀鏈嬌灰蝶	VR	Y
99	Lycaenidae	Theclinae	<i>Arhopala paramuta</i>	Hooked Oak Blue	小嬌灰蝶	VR	N ⁵
100	Lycaenidae	Theclinae	<i>Arhopala rama</i>	Dark Himalayan Oak Blue	齒翅嬌灰蝶	VR	Y
101	Lycaenidae	Theclinae	<i>Artipe eryx</i>	Green Flash	綠灰蝶	UC	Y
102	Lycaenidae	Theclinae	<i>Cigaritis lohita</i>	Long-banded Silverline	銀線灰蝶	UC	Y
103	Lycaenidae	Theclinae	<i>Cigaritis syama</i>	Club Silverline	豆粒銀線灰蝶	UC	Y
104	Lycaenidae	Theclinae	<i>Creon cleobis</i>	Broadtail Royal	克灰蝶	VR	Y
105	Lycaenidae	Theclinae	<i>Deudorix epijarbas</i>	Cornelian	玳灰蝶	UC	Y
106	Lycaenidae	Theclinae	<i>Deudorix smilis</i>	Princess Flash	斯米玳灰蝶	VR	Y
107	Lycaenidae	Theclinae	<i>Horaga albimacula</i>	Brown Onyx	白斑灰蝶	VR	Y
108	Lycaenidae	Theclinae	<i>Horaga onyx</i>	Common Onyx	斑灰蝶	R	Y
109	Lycaenidae	Theclinae	<i>Iraota timoleon</i>	Silver Streak Blue	鐵木異灰蝶	UC	Y
110	Lycaenidae	Theclinae	<i>Mahathala ameria</i>	Falcate Oak Blue	瑪灰蝶	R	Y
111	Lycaenidae	Theclinae	<i>Pratapa deva</i>	White Royal	珀灰蝶	R	Y
112	Lycaenidae	Theclinae	<i>Rachana jalindra</i>	Banded Royal	艾灰蝶	R	Y
113	Lycaenidae	Theclinae	<i>Rapala manea</i>	Slate Flash	麻燕灰蝶	C	Y
114	Lycaenidae	Theclinae	<i>Remelana jangala</i>	Chocolate Royal	萊灰蝶	C	Y
115	Lycaenidae	Theclinae	<i>Sinthusia chandrana</i>	Broad Spark	生灰蝶	R	Y
116	Lycaenidae	Theclinae	<i>Sinthusia nasaka</i>	Narrow Spark	娜生灰蝶	R	Y
117	Lycaenidae	Theclinae	<i>Tajuria cippus</i>	Peacock Royal	雙尾灰蝶	R	Y
118	Lycaenidae	Theclinae	<i>Tajuria maculata</i>	Spotted Royal	豹斑雙尾灰蝶	R	Y
119	Lycaenidae	Theclinae	<i>Zeltus amasa</i>	Fluffy Tit	珍灰蝶	UC	Y

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120	Nymphalidae	Acraeinae	<i>Acraea issoria</i>	Yellow Coster	苧麻珍蝶	VR	Y
121	Nymphalidae	Amathusiinae	<i>Discophora sondaica</i>	Common Duffer	鳳眼方環蝶	UC	Y
122	Nymphalidae	Amathusiinae	<i>Faunis eumeus</i>	Large Faun	串珠環蝶	C	Y
123	Nymphalidae	Charaxinae	<i>Charaxes bernardus</i>	Tawny Rajah	白帶螯蛱蝶	C	Y
124	Nymphalidae	Charaxinae	<i>Charaxes marmax</i>	Yellow Rajah	螯蛱蝶	UC	Y
125	Nymphalidae	Charaxinae	<i>Polyura athamas</i>	Common Nawab	窄斑鳳尾蛱蝶	UC	Y
126	Nymphalidae	Charaxinae	<i>Polyura eudamippus</i>	Great Nawab	大二尾蛱蝶	R	Y
127	Nymphalidae	Charaxinae	<i>Polyura nepenthes</i>	Shan Nawab	忘憂尾蛱蝶	UC	Y
128	Nymphalidae	Danainae	<i>Danaus chrysippus</i>	Plain Tiger	金斑蝶	UC	Y
129	Nymphalidae	Danainae	<i>Danaus genutia</i>	Common Tiger	虎斑蝶	VC	Y
130	Nymphalidae	Danainae	<i>Euploea core</i>	Common Indian Crow	幻紫斑蝶	C	Y
131	Nymphalidae	Danainae	<i>Euploea midamus</i>	Blue-spotted Crow	藍點紫斑蝶	VC	Y
132	Nymphalidae	Danainae	<i>Euploea mulciber</i>	Striped Blue Crow	異型紫斑蝶	UC	Y
133	Nymphalidae	Danainae	<i>Ideopsis similis</i>	Ceylon Blue Glassy Tiger	擬旖斑蝶	VC	Y
134	Nymphalidae	Danainae	<i>Parantica aglea</i>	Glassy Tiger	絹斑蝶	C	Y
135	Nymphalidae	Danainae	<i>Parantica melaneus</i>	Chocolate Tiger	黑絹斑蝶	VR	Y
136	Nymphalidae	Danainae	<i>Parantica sita</i>	Chestnut Tiger	大絹斑蝶	R	Y
137	Nymphalidae	Danainae	<i>Parantica swinhoei</i>	Swinhoe's Tiger	史氏絹斑蝶	R	Y
138	Nymphalidae	Danainae	<i>Tirumala limniace</i>	Blue Tiger	青斑蝶	C	Y
139	Nymphalidae	Danainae	<i>Tirumala septentrionis</i>	Dark Blue Tiger	靑青斑蝶	R	Y
140	Nymphalidae	Limenitidinae	<i>Neptis cartica</i>	Plain Sailer	卡環蛱蝶	VR	Y
141	Nymphalidae	Limenitidinae	<i>Neptis clinia</i>	Southern Sullied Sailer	珂環蛱蝶	C	Y
142	Nymphalidae	Limenitidinae	<i>Neptis hylas</i>	Common Sailer	中環蛱蝶	VC	Y
143	Nymphalidae	Limenitidinae	<i>Neptis miah</i>	Small Yellow Sailer	彌環蛱蝶	UC	Y
144	Nymphalidae	Limenitidinae	<i>Neptis nata</i>	Burmese Sailer	娜環蛱蝶	R	Y
145	Nymphalidae	Limenitidinae	<i>Neptis soma</i>	Sullied Sailer	娑環蛱蝶	R	Y
146	Nymphalidae	Nymphalinae	<i>Argyreus hyperbius</i>	Indian Fritillary	斐豹蛱蝶	C	Y
147	Nymphalidae	Nymphalinae	<i>Ariadne ariadne</i>	Angled Castor	波蛱蝶	C	Y
148	Nymphalidae	Nymphalinae	<i>Athyma cama</i>	Orange Staff Sergeant	雙色帶蛱蝶	VR	Y
149	Nymphalidae	Nymphalinae	<i>Athyma nefte</i>	Colour Sergeant	相思帶蛱蝶	C	Y

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150	Nymphalidae	Nymphalinae	<i>Athyma perius</i>	Common Sergeant	玄珠帶蛺蝶	UC	Y
151	Nymphalidae	Nymphalinae	<i>Athyma ranga</i>	Black-vein Sergeant	離斑帶蛺蝶	UC	Y
152	Nymphalidae	Nymphalinae	<i>Athyma selenophora</i>	Staff Sergeant	新月帶蛺蝶	C	Y
153	Nymphalidae	Nymphalinae	<i>Cethosia biblis</i>	Red Lacewing	紅鋸蛺蝶	R	Y
154	Nymphalidae	Nymphalinae	<i>Cirrochroa tyche</i>	Common Yeoman	幸運轆蛺蝶	VR	Y
155	Nymphalidae	Nymphalinae	<i>Cupha erymanthis</i>	Rustic	黃襟蛺蝶	VC	Y
156	Nymphalidae	Nymphalinae	<i>Cynitia whiteheadi</i>	Green Skirt Baron	綠裙蛺蝶	UC	Y
157	Nymphalidae	Nymphalinae	<i>Cyrestis thyodamas</i>	Common Mapwing	網絲蛺蝶	C	Y
158	Nymphalidae	Nymphalinae	<i>Dichorragia nesimachus</i>	Constable	電蛺蝶	UC	Y
159	Nymphalidae	Nymphalinae	<i>Euripus nyctelius</i>	Courtesan	芒蛺蝶	UC	Y
160	Nymphalidae	Nymphalinae	<i>Euthalia aconthea</i>	Baron	矛翠蛺蝶	UC	Y
161	Nymphalidae	Nymphalinae	<i>Euthalia lubentina</i>	Gaudy Baron	紅斑翠蛺蝶	UC	Y
162	Nymphalidae	Nymphalinae	<i>Euthalia phemius</i>	White-edged Blue Baron	尖翅翠蛺蝶	C	Y
163	Nymphalidae	Nymphalinae	<i>Hestina assimilis</i>	Red Ring Skirt	黑脈蛺蝶	C	Y
164	Nymphalidae	Nymphalinae	<i>Hypolimnas bolina</i>	Great Eggfly	幻紫斑蛺蝶	VC	Y
165	Nymphalidae	Nymphalinae	<i>Hypolimnas misippus</i>	Danaid Eggfly	金斑蛺蝶	UC	Y
166	Nymphalidae	Nymphalinae	<i>Junonia almana</i>	Peacock Pansy	美眼蛺蝶	C	Y
167	Nymphalidae	Nymphalinae	<i>Junonia atlites</i>	Grey Pansy	波紋眼蛺蝶	C	Y
168	Nymphalidae	Nymphalinae	<i>Junonia hierta</i>	Yellow Pansy	黃裳眼蛺蝶	VR	Y
169	Nymphalidae	Nymphalinae	<i>Junonia iphita</i>	Chocolate Pansy	鈎翅眼蛺蝶	C	Y
170	Nymphalidae	Nymphalinae	<i>Junonia lemonias</i>	Lemon Pansy	蛇眼蛺蝶	C	Y
171	Nymphalidae	Nymphalinae	<i>Junonia orithya</i>	Blue Pansy	翠藍眼蛺蝶	R	Y
172	Nymphalidae	Nymphalinae	<i>Kallima inachus</i>	Orange Oakleaf	枯葉蛺蝶	VR	Y
173	Nymphalidae	Nymphalinae	<i>Kaniska canace</i>	Blue Admiral	琉璃蛺蝶	C	Y
174	Nymphalidae	Nymphalinae	<i>Lexias pardalis</i>	Common Archduke	小豹律蛺蝶	C	Y
175	Nymphalidae	Nymphalinae	<i>Limenitis sulphita</i>	Five-dot Sergeant	殘鏢線蛺蝶	C	Y
176	Nymphalidae	Nymphalinae	<i>Moduza procris</i>	Commander	穆蛺蝶	UC	Y
177	Nymphalidae	Nymphalinae	<i>Pantoporia hordonia</i>	Common Lascar	金蟠蛺蝶	C	Y
178	Nymphalidae	Nymphalinae	<i>Parasarpa dudu</i>	White Commodore	丫紋俳蛺蝶	UC	Y
179	Nymphalidae	Nymphalinae	<i>Phaedyma columella</i>	Short-banded Sailer	柱菲蛺蝶	C	Y

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180	Nymphalidae	Nymphalinae	<i>Phalanta phalantha</i>	Common Leopard	玳瑁蛱蝶	R	Y
181	Nymphalidae	Nymphalinae	<i>Polygonia c-aureum</i>	Comma	黃鈎蛱蝶	R	Y
182	Nymphalidae	Nymphalinae	<i>Rohana parisatis</i>	Black Prince	羅蛱蝶	C	Y
183	Nymphalidae	Nymphalinae	<i>Sephisia chandra</i>	Eastern Courtier	帥蛱蝶	VR	Y
184	Nymphalidae	Nymphalinae	<i>Symbrenthia lilaea</i>	Common Jester	散紋盛蛱蝶	C	Y
185	Nymphalidae	Nymphalinae	<i>Vagrans egista</i>	Vagrant	彩蛱蝶	VR	Y
186	Nymphalidae	Nymphalinae	<i>Vanessa cardui</i>	Painted Lady	小紅蛱蝶	UC	Y
187	Nymphalidae	Nymphalinae	<i>Vanessa indica</i>	Indian Red Admiral	大紅蛱蝶	UC	Y
188	Nymphalidae	Nymphalinae	<i>Yoma sabina</i>	Australian Lurcher	瑤蛱蝶	VR	Y
189	Nymphalidae	Satyrinae	<i>Elymnias hypermnestra</i>	Common Palmfly	翠袖鋸眼蝶	C	Y
190	Nymphalidae	Satyrinae	<i>Lethe chandica</i>	Angled Red Forester	曲紋黛眼蝶	UC	Y
191	Nymphalidae	Satyrinae	<i>Lethe confusa</i>	Banded Tree Brown	白帶黛眼蝶	C	Y
192	Nymphalidae	Satyrinae	<i>Lethe europa</i>	Bamboo Tree Brown	長紋黛眼蝶	UC	Y
193	Nymphalidae	Satyrinae	<i>Lethe rohria</i>	Common Tree Brown	波紋黛眼蝶	VR	Y
194	Nymphalidae	Satyrinae	<i>Lethe verma</i>	Straight-banded Tree Brown	玉帶黛眼蝶	VR	Y
195	Nymphalidae	Satyrinae	<i>Melanitis leda</i>	Common Evening Brown	暮眼蝶	UC	Y
196	Nymphalidae	Satyrinae	<i>Melanitis phedima</i>	Dark Evening Brown	睇暮眼蝶	C	Y
197	Nymphalidae	Satyrinae	<i>Mycalesis mineus</i>	Dark-brand Bush Brown	小眉眼蝶	VC	Y
198	Nymphalidae	Satyrinae	<i>Mycalesis mucianus</i>	South China Bush Brown	平頂眉眼蝶	C	Y
199	Nymphalidae	Satyrinae	<i>Neope muirheadii</i>	Muirhead's Labyrinth	蒙鏈蔭眼蝶	R	Y
200	Nymphalidae	Satyrinae	<i>Ypthima baldus</i>	Common Five-ring	矍眼蝶	VC	Y
201	Nymphalidae	Satyrinae	<i>Ypthima imitans</i>	False Four-ring	擬四眼矍眼蝶	R	Y
202	Nymphalidae	Satyrinae	<i>Ypthima lisandra</i>	Straight Five-ring	黎桑矍眼蝶	C	Y
203	Nymphalidae	Satyrinae	<i>Ypthima norma</i>	Small Three-ring	罕矍眼蝶	VR	Y
204	Nymphalidae	Satyrinae	<i>Ypthima praenubila</i>	Common Four-ring	前霧矍眼蝶	R	Y
205	Papilionidae	Papilioninae	<i>Byasa confusus</i>	Chinese Windmill	中華麝鳳蝶	VR	Y
206	Papilionidae	Papilioninae	<i>Graphium agagemnon</i>	Tailed Jay	統帥青鳳蝶	VC	Y
207	Papilionidae	Papilioninae	<i>Graphium cloanthus</i>	Glassy Bluebottle	寬帶青鳳蝶	UC	Y
208	Papilionidae	Papilioninae	<i>Graphium doson</i>	Common Jay	木蘭青鳳蝶	C	Y
209	Papilionidae	Papilioninae	<i>Graphium sarpedon</i>	Common Bluebottle	青鳳蝶	VC	Y

No.	Family	Subfamily	Scientific Name	Common Name	Chinese Name	Local restrictedness 2011-2023 ¹	Record(s) in protected areas ²
210	Papilionidae	Papilioninae	<i>Lamproptera curius</i>	White Dragontail	燕鳳蝶	UC	Y
211	Papilionidae	Papilioninae	<i>Pachliopta aristolochiae</i>	Common Rose	紅珠鳳蝶	UC	Y
212	Papilionidae	Papilioninae	<i>Papilio agestor</i>	Tawny Mime	褐斑鳳蝶	R	Y
213	Papilionidae	Papilioninae	<i>Papilio bianor</i>	Chinese Peacock	碧鳳蝶	C	Y
214	Papilionidae	Papilioninae	<i>Papilio clytia</i>	Common Mime	斑鳳蝶	C	Y
215	Papilionidae	Papilioninae	<i>Papilio demoleus</i>	Lime Butterfly	達摩鳳蝶	C	Y
216	Papilionidae	Papilioninae	<i>Papilio dialis</i>	Southern Chinese Peacock	穹翠鳳蝶	R	Y
217	Papilionidae	Papilioninae	<i>Papilio helenus</i>	Red Helen	玉斑鳳蝶	VC	Y
218	Papilionidae	Papilioninae	<i>Papilio memnon</i>	Great Mormon	美鳳蝶	VC	Y
219	Papilionidae	Papilioninae	<i>Papilio paris</i>	Paris Peacock	巴黎翠鳳蝶	VC	Y
220	Papilionidae	Papilioninae	<i>Papilio polytes</i>	Common Mormon	玉帶鳳蝶	VC	Y
221	Papilionidae	Papilioninae	<i>Papilio protenor</i>	Spangle	藍鳳蝶	VC	Y
222	Papilionidae	Papilioninae	<i>Papilio xuthus</i>	Swallowtail	柑橘鳳蝶	UC	Y
223	Papilionidae	Papilioninae	<i>Pathysa antiphates</i>	Five-bar Swordtail	綠鳳蝶	C	Y
224	Papilionidae	Papilioninae	<i>Troides aeacus</i> ³	Golden Birdwing	金裳鳳蝶	R	Y
225	Papilionidae	Papilioninae	<i>Troides helena</i> ⁴	Common Birdwing	裳鳳蝶	UC	Y
226	Pieridae	Coliadinae	<i>Catopsilia pomona</i>	Lemon Emigrant	遷粉蝶	VC	Y
227	Pieridae	Coliadinae	<i>Catopsilia pyranthe</i>	Mottled Emigrant	梨花遷粉蝶	C	Y
228	Pieridae	Coliadinae	<i>Dercas verhuelli</i>	Tailed Sulphur	檀方粉蝶	UC	Y
229	Pieridae	Coliadinae	<i>Eurema blanda</i>	Three-spot Grass Yellow	檠黃粉蝶	C	Y
230	Pieridae	Coliadinae	<i>Eurema brigitta</i>	Small Grass Yellow	無標黃粉蝶	VR	Y
231	Pieridae	Coliadinae	<i>Eurema hecabe</i>	Common Grass Yellow	寬邊黃粉蝶	VC	Y
232	Pieridae	Coliadinae	<i>Eurema laeta</i>	Spotless Grass Yellow	尖角黃粉蝶	VR	Y
233	Pieridae	Pierinae	<i>Appias albina</i>	Common Albatross	白翅尖粉蝶	R	Y
234	Pieridae	Pierinae	<i>Appias lyncida</i>	Chocolate Albatross	靈奇尖粉蝶	VR	Y
235	Pieridae	Pierinae	<i>Cepora nadina</i>	Lesser Gull	青園粉蝶	R	Y
236	Pieridae	Pierinae	<i>Cepora nerissa</i>	Common Gull	黑脈園粉蝶	C	Y
237	Pieridae	Pierinae	<i>Delias acalis</i>	Red-breast Jezebel	紅腋斑粉蝶	R	Y
238	Pieridae	Pierinae	<i>Delias belladonna</i>	Hill Jezebel	艷婦斑粉蝶	VR	Y
239	Pieridae	Pierinae	<i>Delias hyparete</i>	Painted Jezebel	優越斑粉蝶	C	Y

No.	Family	Subfamily	Scientific Name	Common Name	Chinese Name	Local restrictedness 2011-2023 ¹	Record(s) in protected areas ²
240	Pieridae	Pierinae	<i>Delias pasithoe</i>	Red-base Jezebel	報喜斑粉蝶	VC	Y
241	Pieridae	Pierinae	<i>Hebomoia glaucippe</i>	Great Orange Tip	鶴頂粉蝶	C	Y
242	Pieridae	Pierinae	<i>Ixias pyrene</i>	Yellow Orange Tip	橙粉蝶	UC	Y
243	Pieridae	Pierinae	<i>Pieris canidia</i>	Indian Cabbage White	東方菜粉蝶	VC	Y
244	Pieridae	Pierinae	<i>Pieris rapae</i>	Small Cabbage White	菜粉蝶	C	Y
245	Pieridae	Pierinae	<i>Prioneris philonome</i>	Red-spot Sawtooth	紅肩鋸粉蝶	VR	Y
246	Pieridae	Pierinae	<i>Prioneris thestylis</i>	Spotted Sawtooth	鋸粉蝶	R	Y
247	Riodinidae	Nemeobiinae	<i>Abisara echerius</i>	Plum Judy	蛇目褐蛺蝶	VC	Y
248	Riodinidae	Nemeobiinae	<i>Dodona egeon</i>	Orange Punch	大斑尾蛺蝶	R	Y
249	Riodinidae	Nemeobiinae	<i>Zemeros flegyas</i>	Punchinello	波蛺蝶	C	Y

¹ Reviewed using AFCD data from 1 Jan 2011 to 31 Dec 2023. VR: Very Rare; R: Rare; UC: Uncommon; C: Common; VC: Very Common.

² Record(s) in protected areas on or before 31 Dec 2023.

³ Protected under the Protection of Endangered Species of Animals and Plants Ordinance (Cap. 586).

⁴ Protected under the Wild Animals Protection Ordinance (Cap. 170), and the Protection of Endangered Species of Animals and Plants Ordinance (Cap. 586).

⁵ *Arhopala paramuta* was recorded in protected area in 2024.

Working Group Column

Overwintering Aggregation of *Tirumala limniace* at Shui Long Wo

K.C. Tam¹, Charles Y. Lam¹, Nelson C.F. So² and Cody H.Y. Lee²

¹Country Parks Management Division 1

²Butterfly Working Group

漁農自然護理署於 2023 年 11 月在香港西貢水浪窩發現青斑蝶的越冬群聚。本文為該次發現的青斑蝶的越冬群聚提供基本資料，並探討香港青斑蝶越冬群聚的獨特性。

Introduction

Overwintering aggregation of danaiids (Nymphalidae: Danainae) have been occasionally observed from November to February in the countryside of Hong Kong. The earliest written record of danaiids overwintering aggregation in Hong Kong dates back to December 1938, when a huge danaiids cluster of *Euploea midamus* and *Euploea core* was observed in northeast Lai Chi Kok (Chan 1939). In the early 1960s, Tang (1962) recorded over 10,000 *E. midamus* aggregating at the piedmont of Tai Mo Shan and the Lam Tsuen area. Years later, members of the Hong Kong Lepidopterists' Society recorded 10,000 danaiids, primarily *Danaus genutia*, aggregating at Fan Lau, Lantau Island in December 1998; and around 30,000 danaiids, mainly formed by *E. midamus*, at Siu Lang Shui, Tuen Mun in January 1999 (Yiu 2002; Yiu 2009). And in December 2003, Tang (2004) reported an overwintering aggregation of over 10,000 danaiids at Deep Water Bay Valley, which mainly consisted of *E. midamus*, *E. core*, and *Ideopsis similis*. There is only limited record describing the behaviour of *Tirumala limniace* overwintering aggregation in Hong Kong.

Table 6. Major aggregating Danainae species and locations recorded by the AFCD Butterfly Working Group during the overwintering period from November to February between 2002 and 2025.

Locations	Major aggregating Danainae species						
	<i>Danaus genutia</i>	<i>Euploea core</i>	<i>Euploea midamus</i>	<i>Euploea mulciber</i>	<i>Ideopsis similis</i>	<i>Tirumala limniace</i>	<i>Tirumala septentrionis</i>
Chi Ma Wan	✓	✓	✓	✓	✓	✓	✓
Deep Water Bay Valley	✓	✓	✓	✓	✓	✓	✓
Pui O	✓	✓	✓	✓	✓	✓	✓
Shui Hau	✓	✓	✓	✓	✓	✓	✓
Fan Lau	✓	✓	✓		✓	✓	✓
Lamma Island	✓	✓	✓		✓	✓	✓
Tai Lam		✓	✓	✓	✓	✓	✓
Repulse Bay		✓	✓		✓	✓	✓
Siu Lang Shui		✓	✓	✓	✓		
Tuen Mun		✓	✓		✓		✓
Shing Mun Reservoir		✓	✓			✓	
Shek Pik Reservoir		✓	✓				
Tai Mei Tuk		✓	✓				
Shui Long Wo						✓	

The AFCD Butterfly Working Group has been conducting danaiids overwintering aggregation surveys since 2002. Table 6 summarises the aggregating danaiids in Hong Kong recorded by the AFCD Butterfly Working Group between 2002 and 2025. According to the survey records, *T. limniace* has been sighted at various overwintering aggregation sites in Hong Kong (e.g. Chi Ma Wan, Deep Water Bay, Pui O, Shui Hau, Lamma Island, Tai Lam, Repulse Bay), typically accounts for 0.1% to 26% of the total number of aggregating danaiids. Apart from a report of 600 *T. limniace* aggregated at Mui Tsz Lam Road in November 2005 (Yiu 2009), no major *T. limniace* aggregation was recorded until November 2023, when *T. limniace* made up 99% of the total number of aggregating danaiids at Shui Long Wo.

Record of Overwintering Aggregation of *Tirumala limniace* at Shui Long Wo

On 15 November 2023, Mr Lam Yau, Charles (Field Officer I, AFCD) observed an overwintering aggregation of *T. limniace* during a regular inspection at the Kei Ling Ha Forest Track near the Shui Long Wo Campsite, Sai Kung (Figure 11). Over 200 individuals of *T. limniace* were observed resting at the canopy of a *Zanthoxylum avicennae* tree at around 5 metres height above ground, beside the concrete trail. The aggregating *T. limniace* cluster grew in numbers continuously. On 17 November 2023, there were approximately 500 individuals of *T. limniace* aggregating, marking the highest number recorded at this site. A few *D. genutia* were also observed in the *T. limniace* cluster. On 20 November 2023, the aggregation was no longer found at the site. No *T. limniace* were found aggregating at the same location again as of December 2025.

During the aggregation period, the weather was sunny and windy, with temperatures ranging from 15°C to 22°C. The sex ratio of the aggregating *T. limniace* was approximately equal, with similar numbers of male and female. No feeding, courtship, or mating behaviour were observed among the aggregating individuals. Most were seen sunbathing or resting on trees, and occasionally flying at the canopy or above when disturbed by wind (Figures 12 and 13).

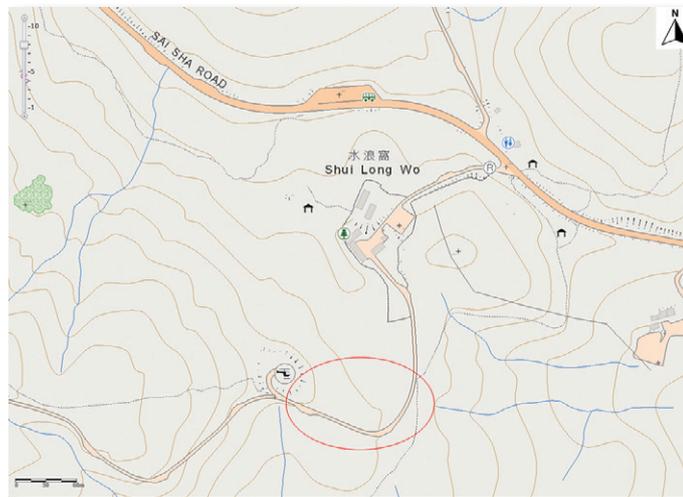


Figure 11. Location of overwintering aggregation of *T. limniace* at Shui Long Wo.



Figure 12. *T. limniace* aggregating and resting on a *Zanthoxylum avicennae* tree at Shui Long Wo.



Figure 13. Aggregating *T. limniace* flew above the canopy when disturbed by strong wind.

Discussion

Members of the Danainae, like *Danaus plexippus* in North America and *Euploea* species in Taiwan, are famous for their long-distance flight and massive aggregations formed during their migration journey. Although *T. limniace* is also a well-known migratory butterfly species (Vane-Wright 1993), its aggregation and migration behaviours are seldom recorded by naturalists or documented in literature and publications.

Outside of Hong Kong, there are published records of danaiids aggregation involving *T. limniace* in Taiwan and India. In Taiwan, *Tirumala* spp. (*T. limniace* and *T. septentrionis*) and *Euploea* spp. (*E. eunice*, *E. hobsoni*, *E. mulciber* and *E. tulliolus*) were reported aggregating at the same overwintering location in the Dawu area of Taitung. The total number of aggregating danaiids were estimated to be 320,000 individuals, with *T. limniace* making up less than 5% of the total population (Chao et al. 2007). In India, *T. limniace* was reported aggregating with *D. genutia* and *E. core* at Maharashtra (Patil et al. 2014) and Corbett (Larsen 1986), where *T. limniace* constituted the smallest proportion of the entire aggregating danaiids population. In view of these typical species composition of danaiids aggregations, the two records in Hong Kong at Shui Long Wo and Mui Tsz Lam (Yiu 2009) are rare, as their aggregations comprised 99% *T. limniace*.

The sex ratio of the *T. limniace* aggregating at Shui Long Wo was also notable, with females making up around half of the aggregating population. This contrasted with the male-dominated *T. limniace* found at the adjacent Kei Ling Ha Management Centre during the same period, which had a sex ratio over 9 (male) : 1 (female). The site was located 200 m away from the overwintering aggregation at Shui Long Wo, where the butterflies were taking in Pyrrolizidine Alkaloids (PA) from *Crotalaria retusa* plants. The difference in sex ratio might suggest that the *T. limniace* aggregation at Shui Long Wo was indeed overwintering rather than an aggregation attracted by a PA source.

The well-recognised migratory Danainae species, such as *Danaus plexippus* in North America and *Euploea* species in Taiwan, have stops along their long migratory routes, where aggregations are found. The aggregation of *T. limniace* at Shui Long Wo may imply that it is one of the stops along their migratory route. Currently, there is very limited observation and evidence regarding how *T. limniace* migrates through Hong Kong and what their migration destinations are. Mark-release-recapture studies conducted by researchers from The University of Hong Kong's "Danaiid Butterfly Research Hong Kong" project provide valuable insights into the individual movements of *T. limniace* in Hong Kong. For instance, one recaptured *T. limniace* was found travelling from Pak Tam Chung to Tai Po in October 2023, another moved from Chi Ma Wan to Tai Lam in November 2023, and a third one journeyed from Fan Lau to Pui O between November and December 2023 (Danaiid Butterfly Research HK 2023; 2024a; 2024b). In addition to Hong Kong, *T. limniace* has also been reported to have southward migrations on the islands of Sri Lanka (Williams 1930, as cited in Wang and Emmel 1990). More recapture records of tagged *T. limniace* will be valuable and essential in mapping their migration routes in the region.

In the future, conducting more thorough survey of previously known *T. limniace* aggregation sites, such as Shui Long Wo and Mui Tsz Lam, during the overwintering season and encouraging public reporting of danaiids aggregation sighted will provide more information to help unravel the mystery of local *T. limniace* migration.

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Ghost Crabs of Hong Kong

Terence P.T. Ng, Mariah B. Stewart, Kevin K.Y. Ho, Kian K.K. Tam and Nelson P.L. Wong
Wetland Specialist Working Group

香港的潮間帶有林林總總的穴居蟹類，當中不少活躍於夜間，而「鬼蟹」（即沙蟹科沙蟹屬物種）便是其中之一。在夏季夜幕低垂時，這些蟹類時常會在沙灘上到處奔走，神出鬼沒，因而得名。本港所記錄的「鬼蟹」有三種，分別為角眼沙蟹、摩氏沙蟹及中華沙蟹。本文整合本署近年的調查記錄、文獻資料和公民科學所收集的數據，介紹這三種「鬼蟹」的特徵和在香港的分布。

Introduction

Ocypode and *Hoplocypode* species from the family Ocypodidae, commonly known as “ghost crabs”, are found along intertidal sandflats and mudflats in the tropics and subtropics (Shih et al. 2016). These crabs are typically predators, scavengers and/or deposit feeders that play an important role in the nutrient cycling of intertidal ecosystems (Rae et al. 2019). They are fast runners. Adult *Ocypode ceratophthalmus* can run at speeds of 1.8 to 2.0 m per second (Burrows and Hoyle 1973). Reaching ghost crabs from their burrows can be very challenging as they can dig deep burrows of various shapes, with a mean depth of over 350 mm (Chan et al. 2006). Though many species are known to primarily forage at night, there are also exceptions (Weinstern 1995; Shih et al. 2015; Pombo et al. 2018). Given that these crabs are highly sensitive to human disturbance, their population size has been used in some studies as a measure of human impacts on sandy beaches (Barros 2001).

There are 21 known species of ghost crabs worldwide (Shih et al. 2016), and three of them can be found in Hong Kong, including *Ocypode ceratophthalmus*, *O. mortoni*, and *O. sinensis* (George 1982; Wong et al. 2012; Shih et al. 2015). All three species inhabit high-shore areas, while *O. sinensis* is usually found higher up on the shore than the other two species and even up to back-shore areas (Wong et al. 2012). *O. cordimanus* was previously recorded in some studies in Hong Kong (George 1982; Morton and Morton 1983; Choi 1992), but these records were believed to be records of *O. sinensis* instead (Huang et al. 1998).

Identification

Ghost crabs have deep, box-like bodies, and chelae are unequal in both sexes. Several morphological features can be used to distinguish among the three *Ocypode* species in Hong Kong, especially their eyestalks and stridulating (sound-producing) ridges on the inner surface of the palm of their major chelae. While the morphological differences between species in stridulating ridge are normally applicable to both sexes and juveniles, differences in eyestalk can be less prominent in females and juveniles. It is recommended that a macro lens be used to identify species based on the stridulating ridge. Below, we provide a simplified identification key based on the above features after Wong et al. (2012) and Shih et al. (2015).

- 1) Eyestalk tipped with horn-like projection and stridulating ridge consists of striation 2
 - No horn-like projection on eyestalk (Figure 14a) and stridulating ridge has no striation (Figure 15a) ***O. sinensis***
- 2) Eyestalk tipped with long horn-like projection (Figure 14b) and stridulating ridge consists of unevenly-spaced striation (Figure 15b)..... ***O. ceratophthalmus***
 - Eyestalk tipped with short horn-like projection (Figure 14c) and stridulating ridge consists of evenly-spaced striation (Figure 15c) ***O. mortoni***

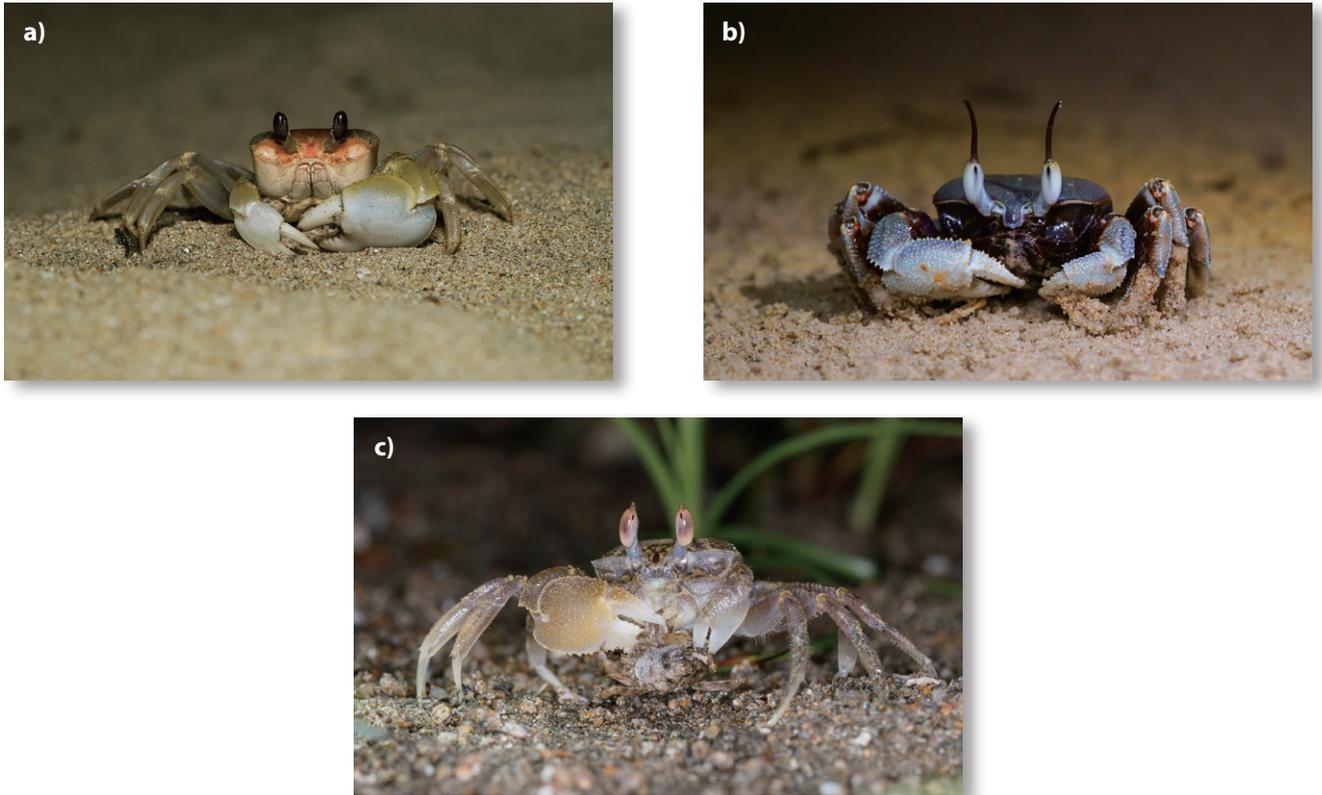


Figure 14. Males of the three *Ocypode* species found in Hong Kong: (a) *O. sinensis*; (b) *O. ceratophthalmus*; and (c) *O. mortoni*.

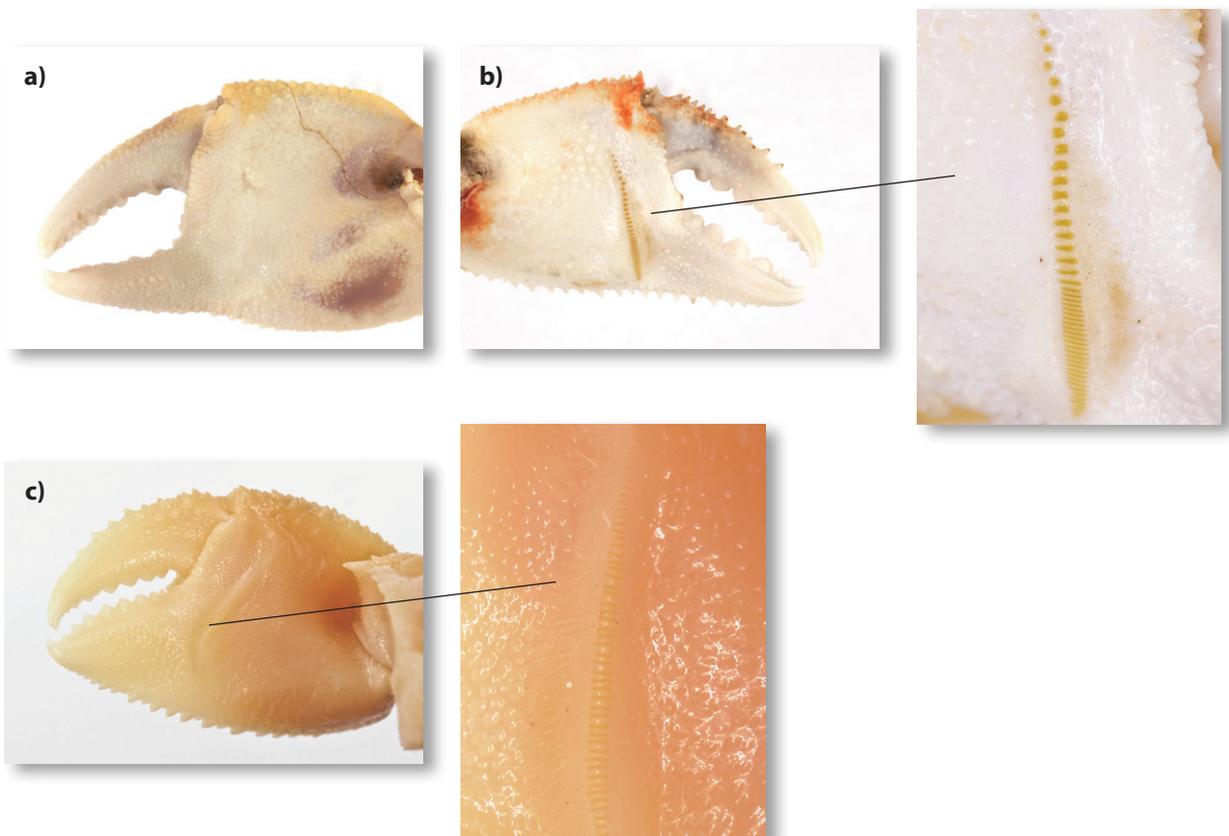


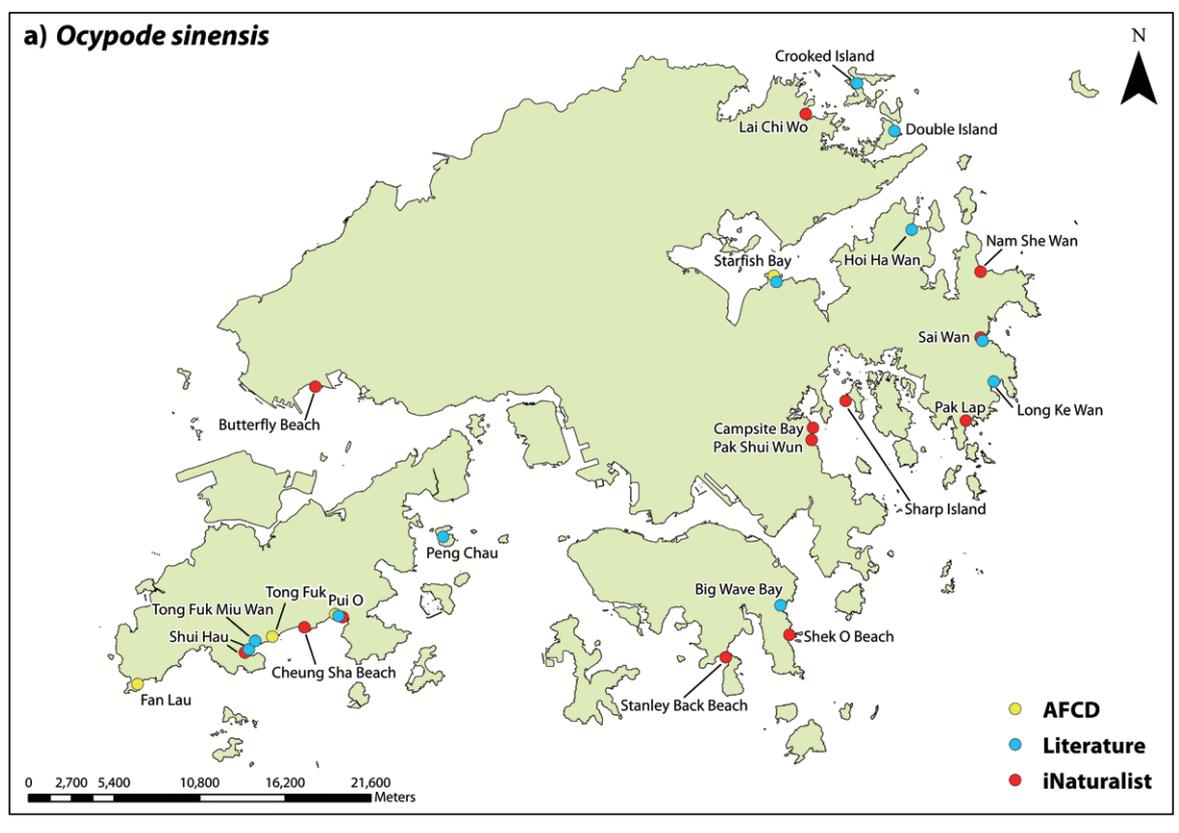
Figure 15. Stridulating ridges on the inner surface of the major chela (palm area) in the three local *Ocypode* species: (a) *O. sinensis* (without striation); (b) *O. ceratophthalmus* (with unevenly-spaced striation); and (c) *O. mortoni* (with evenly-spaced striation).

Occurrences

We conducted walk-through surveys during the summer months (June to September) between 2020 and 2023 to record occurrences of the three ghost crabs in Hong Kong. The surveys were conducted mostly at night for two to three hours at nine sites across the territory, including Pui O, Shui Hau, Starfish Bay, Fan Lau, Ha Pak Nai, Tong Fuk, Double Island, Sunshine Island, and Bluff Island. The findings are presented in Figure 16 along with records collected from 1982 to 2025 by researchers and citizen scientists. "Research grade" records from the iNaturalist platform (<https://www.inaturalist.org>) were further examined based on adult morphological features of the photo records, and the identification accuracy was deemed high. However, a few occurrence records on the iNaturalist platform were either with location obscured or possibly mistaken by the observers (i.e. found in inland areas), and hence these data were excluded in Figure 16.

Among the three *Ocypode* species, *O. ceratophthalmus* was found to be the most common and widely distributed species in Hong Kong (Figure 16b), followed by *O. sinensis* (Figure 16a) and *O. mortoni* (Figure 16c). *O. ceratophthalmus* was also generally the most abundant species among the sites with multiple species based on our observations.

The soft shores of some sites can be considered major local habitats of ghost crabs. For example, all three species were recorded at Shui Hau, Starfish Bay, Pui O, Fan Lau, Tong Fuk, and Sai Wan (Figure 17). We also observed that ghost crabs were especially abundant at a few sites on Lantau Island, such as Fan Lau and Pui O. Ghost crabs may also occur on outer islands that are less frequently surveyed. For example, we observed burrows that were likely made by ghost crabs based on burrow size and location of occurrence on a sandy beach at Tung Ping Chau (Figure 18), but further verification would be needed.



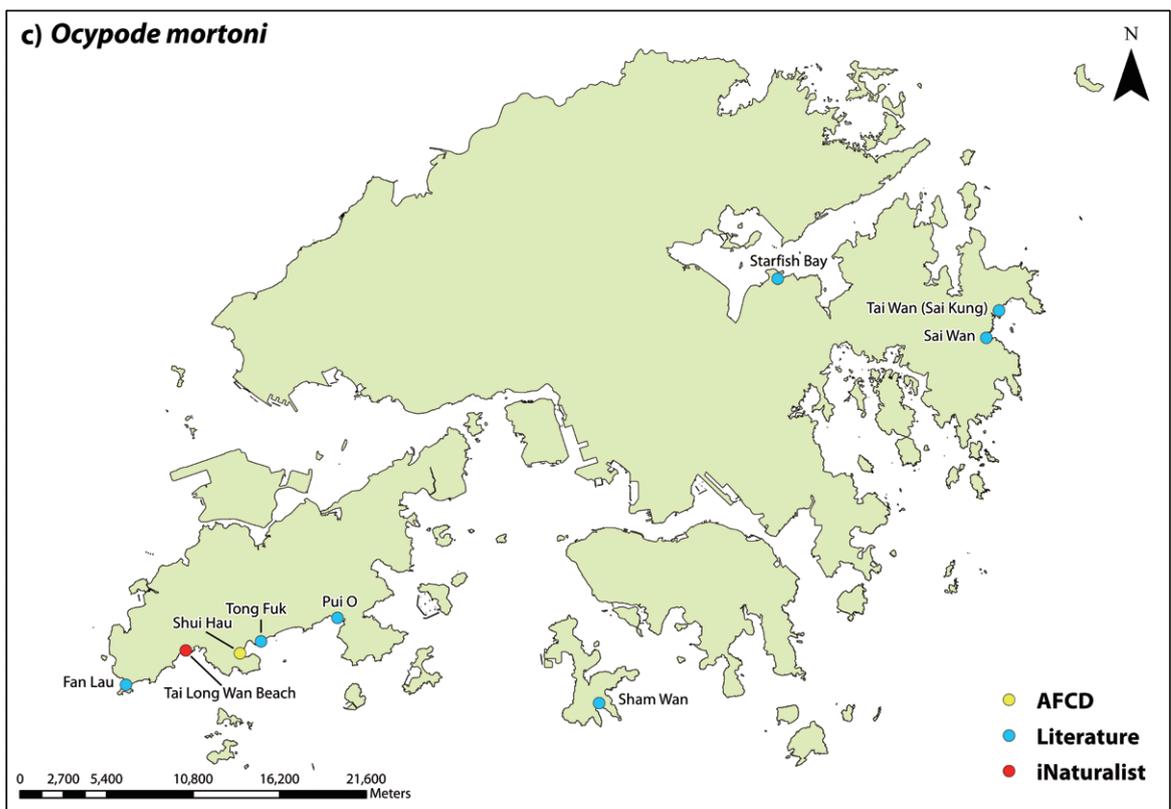
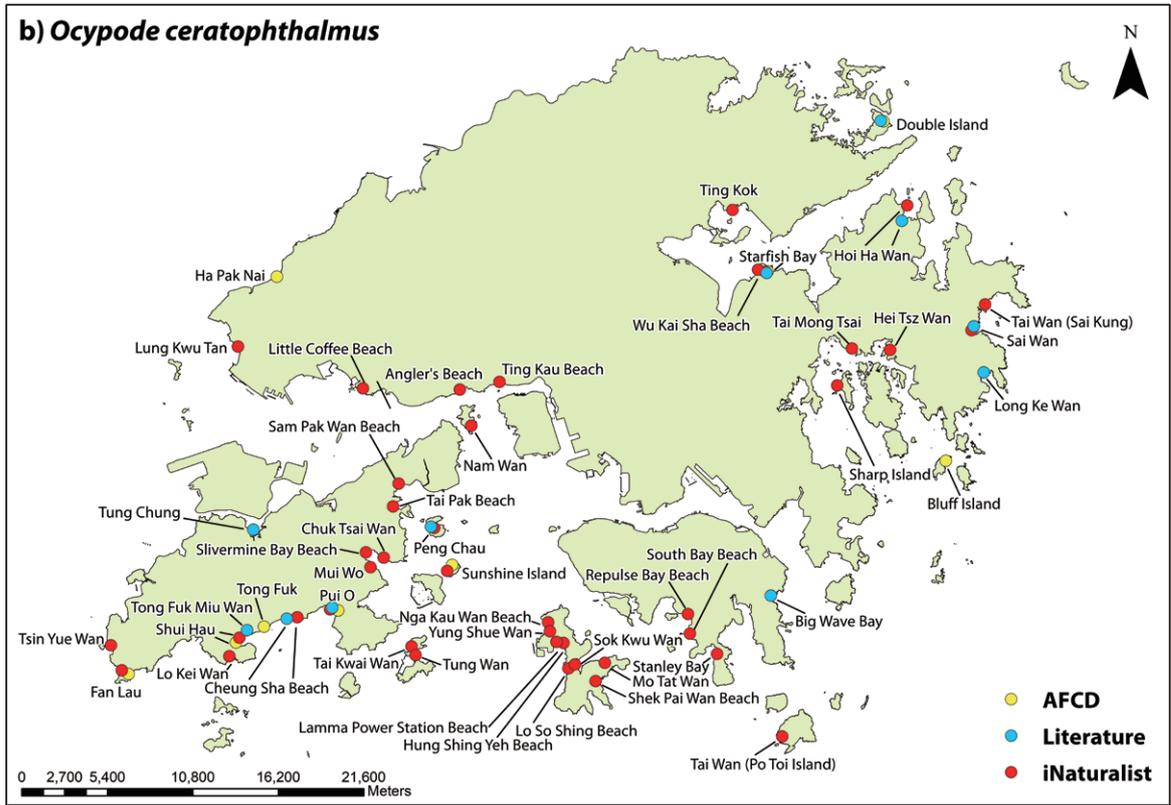


Figure 16. Occurrence records (1982–2025) of *Ocypode* species found in Hong Kong: (a) *O. sinensis*; (b) *O. ceratophthalmus*; and (c) *O. mortoni*. “Literature” refers to the records collected in past studies (George 1982, Morton and Morton 1983, Wong 1990, Choi 1992, Wong et al. 2012, Shih et al. 2016, Bravo et al. 2021). “iNaturalist” refers to the “research grade” data, with doubtful data excluded, collected by citizen scientists through the iNaturalist platform (<https://www.inaturalist.org>) (data retrieved on 1 September 2025).

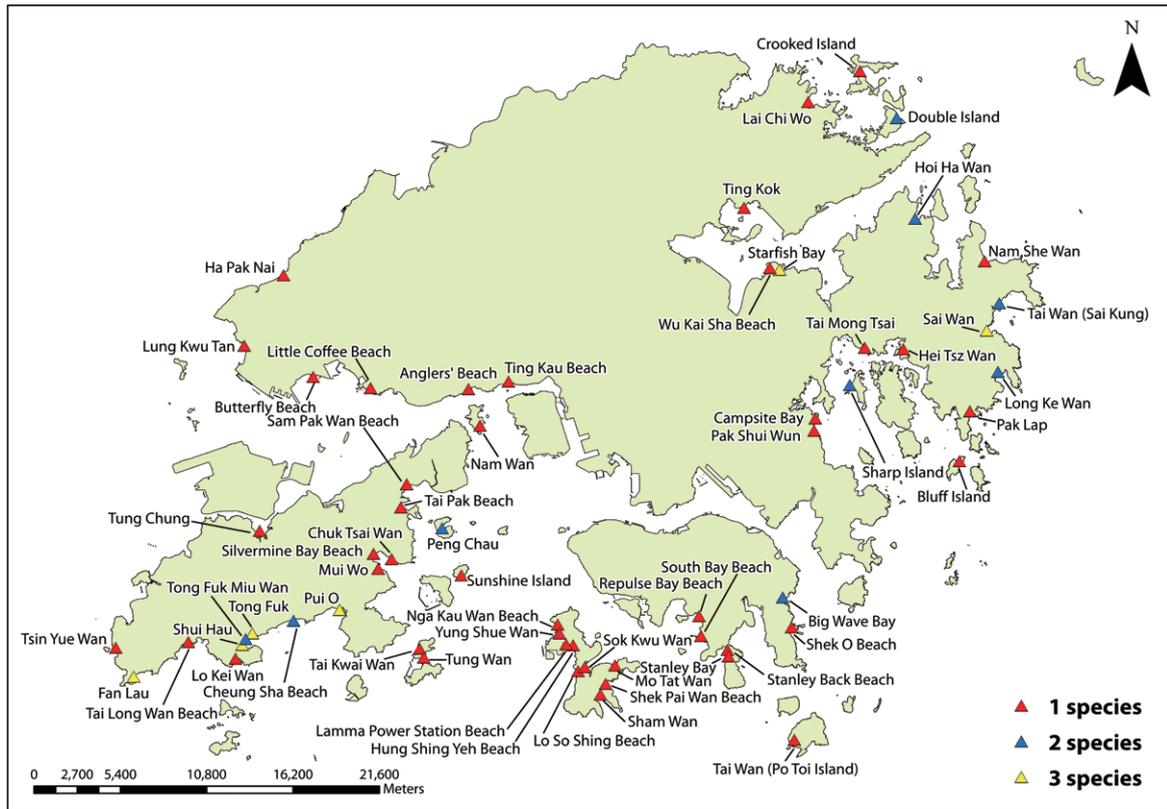


Figure 17. Sites in Hong Kong with ghost crabs recorded during 1982–2025. Pooled records from Figure 16.



Figure 18. Suspected ghost crab burrow at Tung Ping Chau beach. Photo taken on 5 April 2024.

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Enhancing Habitat and Monitoring of Bamboo Bats in Hong Kong

C.T. Shek, Nick K.W. Chan, Jason W.C. Wong, Wing W.C. Tsui
Mammal Working Group

香港有兩種棲息在竹筒內的蝙蝠——扁顛蝠 (*Tylonycteris fulvida*) 和褐扁顛蝠 (*T. tonkinensis*)。漁農自然護理署哺乳動物工作小組開展了一項創新的項目，透過在竹稈上鋸開人工切口，為扁顛蝠屬蝙蝠 (Genus *Tylonycteris*) 提供額外的棲所。工作小組於 2020 年至 2024 年間共製造及監察了 206 個備有人工切口的竹筒棲所，並發現其中的 41.7% 曾有扁顛蝠屬蝙蝠在內棲息，部分更錄得育幼行為。這個簡單並具成本效益的方法，不但成功記錄了本地稀有的褐扁顛蝠，亦有助更有效地調查和了解本地扁顛蝠屬蝙蝠的生態，為保育這類蝙蝠提供重要參考。本文旨在概述這研究的發現和成果。

Introduction

Bamboo bats, belonging to the genus *Tylonycteris* Peters, 1872 (Chiroptera, Vespertilionidae), are a remarkable group of small insectivorous bats renowned for their unique adaptations and specialised ecological niche using bamboo habitats. These bats are among the smallest bats in the world, measuring just about 34 to 45 mm in head-to-body length. They have dorsoventrally flattened skulls and specially adapted wrist and thumb pads, which enable them to roost inside hollow bamboo internodes (Wilson and Mittermeier 2019). They enter hollow bamboo internodes through slits created by beetles (Medway and Marshall 1970) or naturally formed cracks, staying upside down as they move up the bamboo cavity. They mainly feed on small flying insects while in flight. Bamboo bats are predominantly distributed across Southeast Asia, including Thailand, Malaysia, Indonesia, Myanmar, and parts of India and China (Simmons 2005). Their reliance on bamboo for roosting and breeding makes them highly dependent on bamboo-rich habitats.

Hong Kong is home to two bamboo bat species: *T. fulvida* (Lesser Bamboo Bat, 扁顛蝠) and *T. tonkinensis* (Greater Bamboo Bat, 褐扁顛蝠), formerly known as *T. pachypus* and *T. robustula*, respectively (Tu et al. 2017). In the field, these two species can be distinguished by their pelage colouration: *T. fulvida* adults typically display shades of yellow, brown, or orange, while *T. tonkinensis* adults are characterised by a dark brown coat (Figure 19).

The first local record of *T. fulvida* was documented in 1996, when a male bat accidentally entered a building at the Kadoorie Farm and Botanic Garden (Ades 1996). This species has been frequently captured in AFCD mist net surveys (Shek and Chan 2006), indicating that it is relatively abundant in Hong Kong. In contrast, *T. tonkinensis* was first recorded in Hong Kong in 2005, when a female was captured during an AFCD mist net survey at So Lo Pun (Shek and Chan 2005). To date, this remains the only individual of *T. tonkinensis* captured in AFCD mist net surveys, along with no public sighting reports, suggesting its rarity and elusiveness across the territory.

Natural roosts of bamboo bats are often challenging to locate in the wild, hence the limited understanding of their roosting preferences and behaviours, as well as population dynamics. This underscores the need for species-targeted survey designs and conservation methods to better understand and support these extraordinary bats with such specialised ecology.

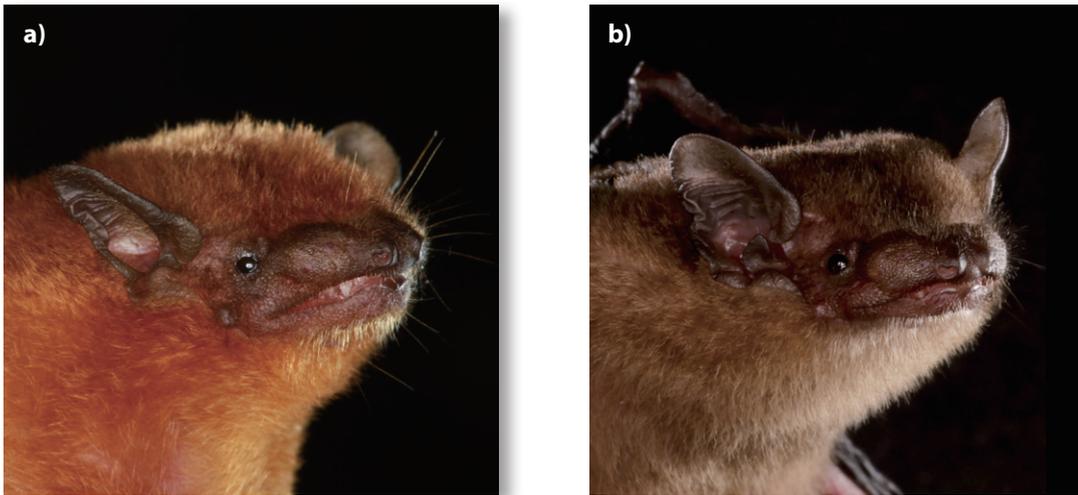


Figure 19. (a) *Tylonycteris fulvida* (Lesser Bamboo Bat, 扁鼻蝠); (b) *Tylonycteris tonkinensis* (Greater Bamboo Bat, 褐扁鼻蝠).

In 2012, the AFCD Mammal Working Group launched a habitat enhancement initiative, primarily in Tai Lam Country Parks, by crafting vertical slits in selected bamboo internodes to create additional roosting sites for bamboo bats. This initiative yielded promising results, with bamboo bats observed occupying the newly created roosting sites, with some even breeding in them.

Building on the success of this initiative and to expand its application to more bamboo-rich sites in Hong Kong, the AFCD Mammal Working Group conducted a comprehensive study to more systematically assess the effectiveness of creating additional roosting sites in supporting bamboo bat roosting and breeding, and to establish a practical, reliable method for surveying bamboo bats in bamboo habitats.

Methodology

Starting in November 2020, active searches were conducted to identify suitable study locations with bamboo stands characterised by thicker culms, regardless of whether bamboo bats had been previously recorded at these locations. Openings were created by crafting vertical slits in bamboo culms of various species and sizes to mimic natural cracks and openings that bamboo bats utilise. Using a small chainsaw (model: GTA 26 by STIHL), slits approximately 1 cm wide and 6 cm long were created near the bottom of bamboo internodes. Each selected bamboo culm contained one to three created slits, strategically positioned in different directions and to ensure unobstructed bat access.

For each slit, physical measurements were recorded, including dimensions of the opening, height above ground, culm circumference, internode length and upper internode length (Figure 20). Bamboo culm sheaths and leaves were collected and sent to the Hong Kong Herbarium for species identification when necessary.

Following the creation of artificial openings, monitoring was conducted from November 2021 to October 2024 using a handheld digital endoscope (model: P50 by INNOVN). The monitoring aimed to assess bamboo bat occupancy and usage, as well as to identify the species present in the additional roosting sites. Due to the endoscope's limited field of view and the clustering behaviour of bats inside the bamboo, accurate estimates were often difficult to obtain when there were more than five individuals. Therefore, any count of more than five bats was categorised as "more than 5". The occupancy rate was determined by calculating the percentage of additional roosting sites occupied by bamboo bats at least once during the monitoring period. To further study the characteristics of bamboo bat colonies, data on group size and sex ratio were gathered from selected roosts. If ants were found occupying or obstructing the opening, they would be carefully removed to make room for the bats.

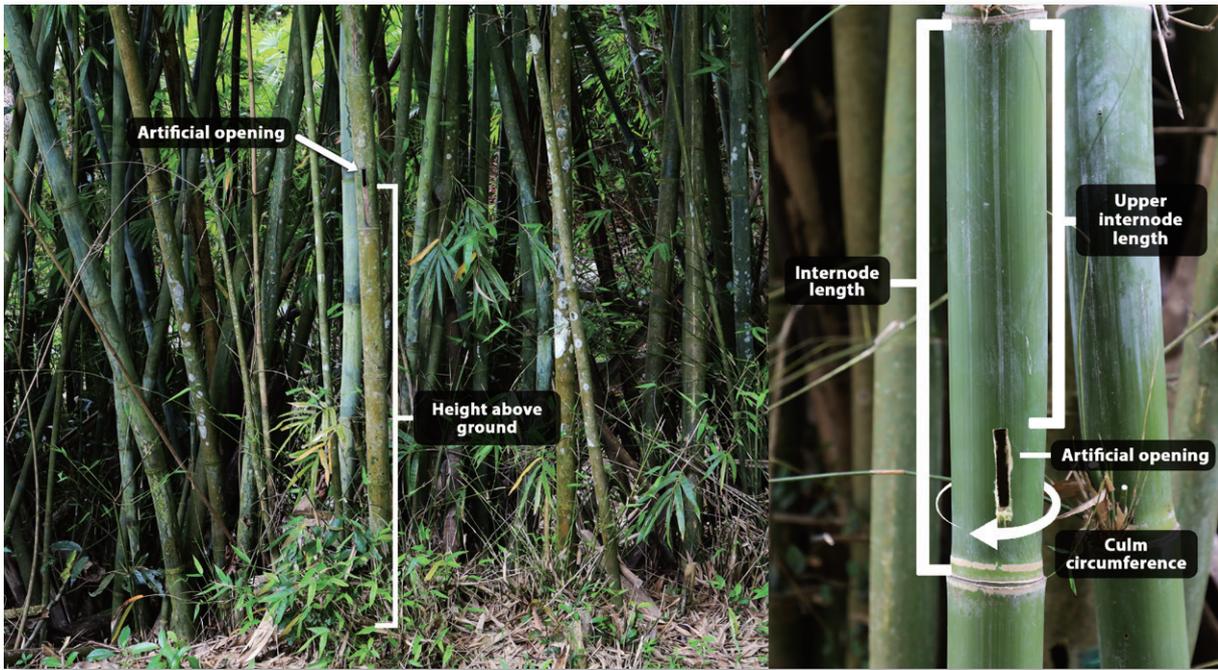


Figure 20. Physical measurements for additional roosting sites on bamboo culms.

Results

During the study period, a total of 206 additional roosting sites were created and monitored across 17 bamboo-rich study locations in the New Territories and on Lantau Island (Figure 21). Of these, bamboo bats were recorded in 12 study locations, and occupying 41.7% of the overall additional roosting sites (n=86), with *T. fulvida* in 80 roosts and *T. tonkinensis* in six roosts. No co-inhabitation of the two species was recorded (Figure 22).

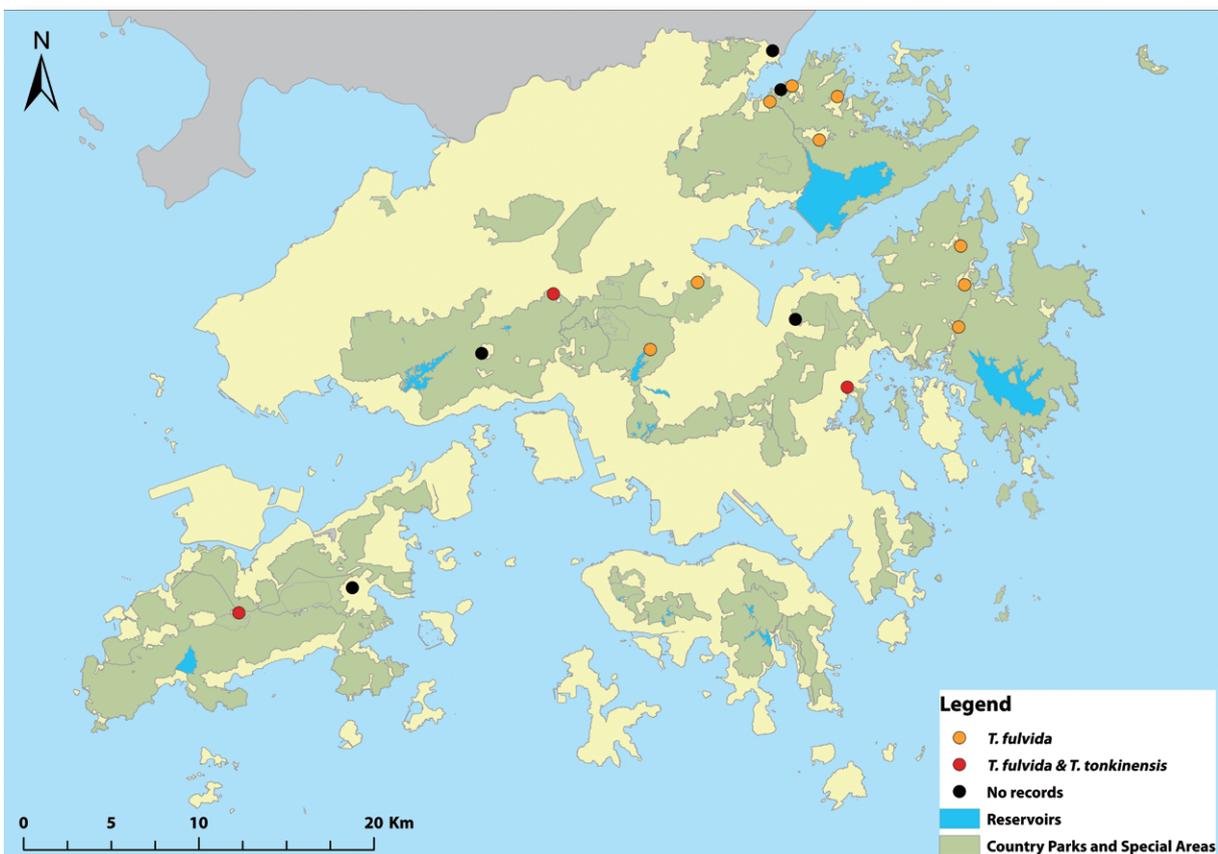


Figure 21. Distribution of study locations and their recorded bamboo bat species.

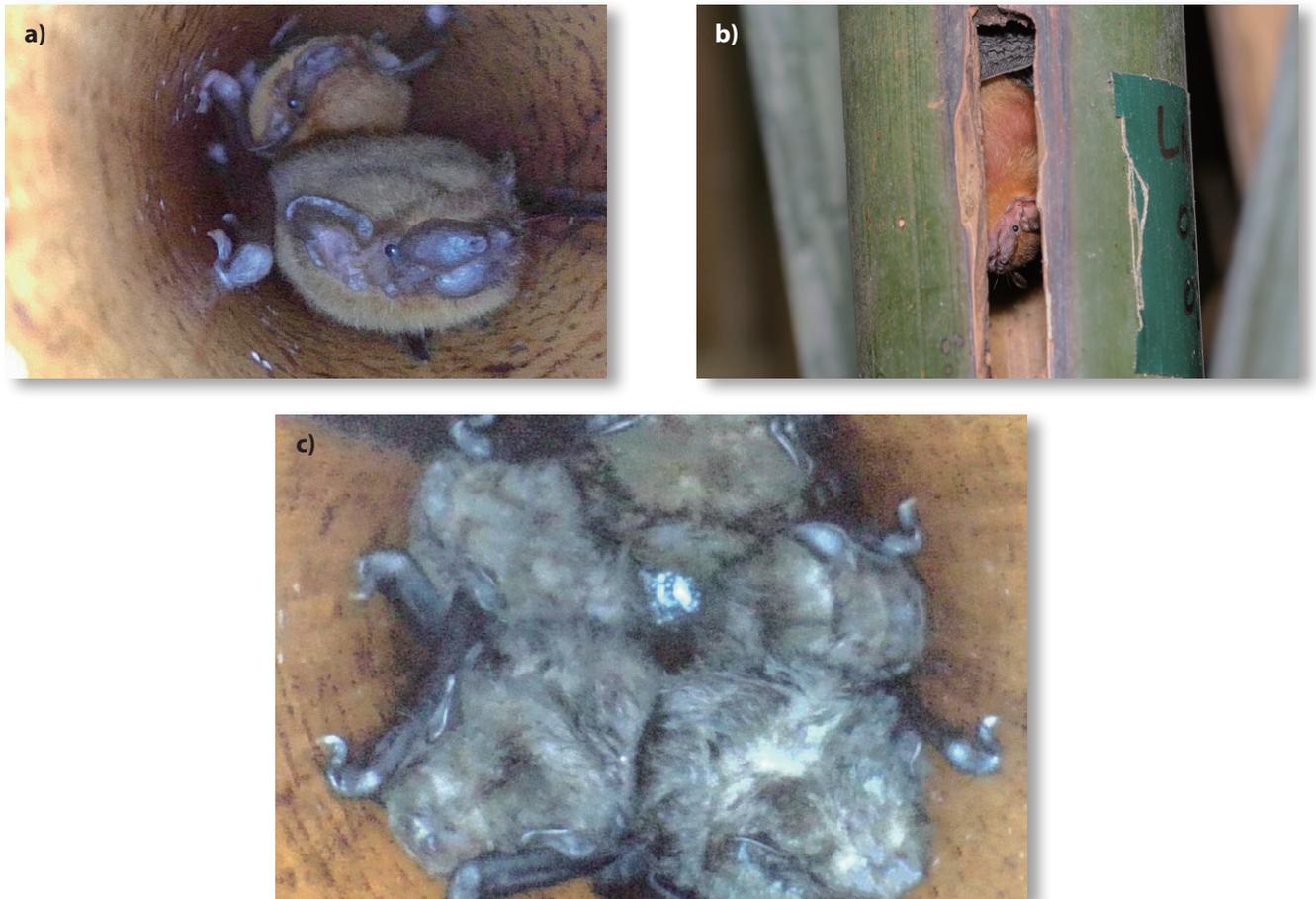


Figure 22. (a and b) *T. fulvida* (Lesser Bamboo Bat) and (c) *T. tonkinensis* (Greater Bamboo Bat) found in additional roosting sites.



Figure 23. The same artificial opening (a) freshly created and (b) after four years.

The average occupancy rate within the 12 study locations with bat presence (comprising a total of 184 additional roosting sites) was 46.7%. Site-specific occupancy rate ranged from 20.0% to 90.0%, indicating a high level of acceptance of the newly created roosting sites by bamboo bats in certain study locations. While the majority of roosting sites showed sporadic use, with bats being recorded only once or intermittently during monitoring, 41 sites were consistently recorded with bat presence over two to 25 months. Figure 24 shows the distribution of roost size determined by endoscopy, with the majority of *T. fulvida* roosts containing more than five individuals.

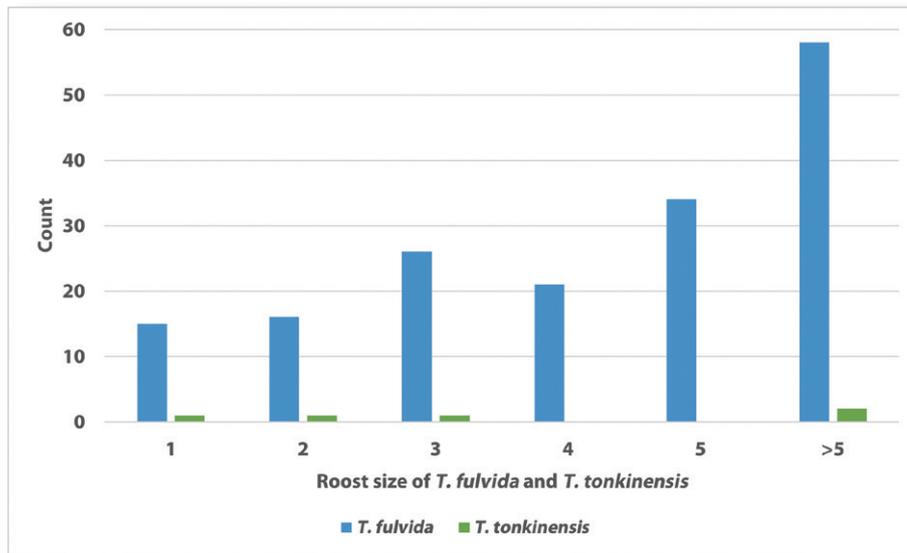


Figure 24. Distribution of roost size of *T. fulvida* and *T. tonkinensis*, determined by endoscopy.

In order to obtain more accurate information on roost size and composition, a total of 35 roosts were selected for further examination. These roosts encompassed a total of 246 *T. fulvida* and 26 *T. tonkinensis* individuals, including juveniles of both species recorded in 13 roosts. After excluding juveniles, the overall adult male-to-female sex ratio was 1:1.53 for *T. fulvida* and 1:4.5 for *T. tonkinensis*. Most of the *T. fulvida* roosts (n=30) were occupied by mixed-sex groups (63.3%), followed by multiple males (20%), multiple females (10%), and solitary males (6.7%); while among the *T. tonkinensis* roosts (n=4), there was one record each for mixed-sex groups (25.0%), multiple males (25.0%), solitary females (25.0%) and solitary males (25.0%). Among the mixed-sex roosts of adult *T. fulvida*, more than half were recorded with a single male forming a harem with multiple females; the adult male-to-female sex ratio was 1:6.19. The largest *T. fulvida* colony was recorded in Shing Mun Country Park, comprising 28 individuals (6 adult males, 21 juvenile males, and 1 juvenile female), in a roost created for approximately two months. For *T. tonkinensis*, the largest colony was recorded at Tai Lam Country Park, consisting of 14 individuals (1 adult male, 10 adult females, and 3 juvenile females).

In this study, bamboo bats were found to utilise additional roosting sites in nine bamboo species: *Bambusa beecheyana* (Beechey Bamboo, 吊絲球竹), *B. chungii* (White Powdery Bamboo, 粉簕竹), *B. eutuldoides* (Da Ngan Bamboo, 大眼竹), *B. gibba* (Nai Bamboo, 坭竹), *B. glaucescens* (Hedge Bamboo, 孝順竹), *B. sinospinosa* (Chinese Thorny Bamboo, 車筒竹), *B. vulgaris* var. *vittata* (Stripe Bamboo, 黃金間碧竹), *Gigantochloa atroviolacea* (Black-haired Giantgrass, 紫稈巨竹), and one unidentified *Bambusa* species.

Statistical comparisons on roosting preferences of bamboo bats were conducted using SPSS. Mann-Whitney U tests were applied based on the results of the Kolmogorov-Smirnov test for normality of distribution, and the analyses revealed several findings. Firstly, there was no significant difference in bamboo circumference between the occupied and unoccupied roosting sites ($p > 0.05$). A significant difference was observed in the height of the occupied roosts above ground, with roosts more frequently found occupied at higher levels within bamboo culms ($p < 0.01$). Besides, occupied roosts were more commonly found in additional roosting sites with longer internode and upper internode length ($p < 0.01$).

During monitoring, it was found that 20.1% of the additional roosting sites were once occupied by other animals, including ants, snails, spiders, frogs, and geckos (Figure 25). Although it is suspected that these guest visitors could affect the likelihood of these roosting sites being used by bamboo bats, there was once instance where three *T. fulvida* individuals were observed sharing a roost with an arboreal snail (Figure 26).



Figure 25. (a) Ants and (b) a Brown Tree Frog occupying the opening of additional roosting sites.



Figure 26. *T. fulvida* sharing the same roost with an arboreal snail.

Discussion

This study demonstrated that crafting slits in bamboo culms offers a cost-effective and low-maintenance way of providing additional roosting opportunities for bamboo bats. Remarkably, some bamboo bats began inhabiting these additional roosting sites within just two months of their creation, and bat presence was recorded consistently in certain sites for periods up to 25 months. The presence of juveniles further indicates that some additional roosting sites served as breeding and maternity roosts for bamboo bats, performing ecological functions similar to those of natural roosts. These findings suggest that the additional roosting sites could meet the habitat requirement of bamboo bats and remain durable for prolonged use. In addition, this study has led to the valuable documentation of *T. tonkinensis*, which was previously considered extremely scarce with a highly restricted distribution. Our records of this species in Tai Lam, Sai Kung, and on Lantau Island, together with the evidence of breeding, have shed new light on its status in Hong Kong.

Regarding roost composition, the overall adult sex ratio in *T. fulvida* has reflected the female-biased pattern commonly reported in this species (Zhang et al. 2004), with one male roosting alongside multiple females in mixed-sex groups – a typical social structure observed in harem-forming bats like the bamboo bats (Zhang et al. 2011). It is presumed that *T. tonkinensis* exhibits a similar pattern; however, our limited sample size precludes drawing any definitive conclusions for this study. While both bamboo bat species were recorded coexisting in three study locations, the two were not observed sharing the same roosts, though sharing the same bamboo culms was indeed observed. This observation aligns with previous findings that, despite both species demonstrating a strong association with woody bamboo groves and being known to occur sympatrically, roost cohabitation is rarely sighted (Zhang et al. 2004).

Additionally, this study found that bamboo culm circumference was not a determining factor in bat occupancy. Instead, bamboo bats displayed a preference for longer roosts and those located higher above the ground, likely due to increased safety, larger roosting space, and reduced disturbance.

The findings of our study underscore the success and effectiveness of this habitat enhancement initiative. By creating and strategically positioning additional roosting sites in accessible locations for monitoring, this initiative provides a reliable method for monitoring the presence and population of our lesser-known and elusive bamboo bats in natural environments, and hence enables our deeper understanding of their distribution, ecology and roosting behaviour in Hong Kong to guide targeted conservation efforts.

Acknowledgements

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Knock Knock, Who's There? - An Overview of Animal Visitors to Chinese Pangolin (*Manis pentadactyla*) Burrows

C.H. Leung, Nick K.W. Chan and Wing W.C. Tsui
Mammal Working Group

為觀察中華穿山甲的活動習性及其洞穴的使用情況，漁農自然護理署哺乳動物工作小組於 2022 年至 2024 年期間，針對本港穿山甲洞穴進行監測。除了穿山甲，監測亦同時記錄了其他動物在穿山甲洞穴附近的出沒情況及與洞穴的互動。調查結果共錄得 466 次的互動記錄，涵蓋 26 個物種，顯示穿山甲洞穴不僅為穿山甲自身所用，亦為其他動物提供了活動、覓食和棲息的空間，展現其在生態系統中的多重功能。

Introduction

The Chinese Pangolin (*Manis pentadactyla*) is well known for its burrowing behaviour and is listed as Critically Endangered on the International Union for Conservation of Nature (IUCN) Red List due to its rarity and significant threats it faces (Challender 2011; Challender et al. 2019). Like other pangolin species, the Chinese Pangolin has a peculiar appearance – its body is covered in scales and it uses its powerful forelimbs and claws to dig up burrows. The burrows serve various purposes, including foraging, shelter, and rearing young (Wu et al. 2020). The species is considered very rare, with a scattered and patchy distribution in Hong Kong (Shek 2006; AFCD 2019). To better understand this elusive and rare species and how its burrows are utilised, the AFCD Mammal Working Group deployed camera traps in its local distribution range. Through targeted monitoring of pangolin burrows, these camera traps have captured not only images of the Chinese Pangolin but also of other animals interacting with these burrows. In this article, we share our findings on the diverse range of animal visitors recorded in and around pangolin burrows.

Methodology

To compile a list of pangolin burrow visitors, camera trap data spanning 18 months from 28 burrows were gathered for analysis. The data were collected using RECONYX HP2X, HC600 and XR6 cameras between November 2022 and May 2024. The cameras were positioned in front of burrows suspected to be created by the Chinese Pangolin, and were set to record continuously and capture images triggered by heat and motion sensors. Each trigger generated either a sequence of 10 consecutive photos or a 30-second video, depending on the camera model.

Pangolin burrows were identified based on their location (typically situated on hillside embankments in forested areas or grasslands), physical measurements (dimensions of burrow opening and depth), and other characteristics (e.g. presence of claw marks, soil spray) (Wu et al. 2020; Liang et al. 2025; Sun et al. 2025a). Both resting burrows (typically larger and deeper, and with a large chamber at the end) and feeding burrows (smaller and shallower) were included in the study. Any burrow-like cavities that raised doubts were excluded from the monitoring.

All animal individuals observed interacting with pangolin burrows, including those merely showing interest in the burrows, were recorded, and categorised into four types of behaviours: foraging (eating or searching for food, includes digging soil at the burrow entrance), investigating (sniffing or putting the head into the burrow), mating, and passage (entering or exiting the burrow). Each count is defined as the presence of an individual captured in the image or footage. To avoid over-representation of lingering individuals, serial photographs of the same animal taken within a 30-minute interval were treated as a single count (O'Brien et al. 2003; Shek et al. 2007). Individuals simply passed by the cameras without interacting with the burrows were excluded from the count.

Results

Our survey recorded that the Chinese Pangolins visited some of the burrows under monitoring (Figure 27), accounting for 5.4% of the total counts. Besides, our findings show that a total of 13 mammal species (including the Chinese Pangolin), 12 bird species, and one reptile species were observed interacting with pangolin burrows, resulting in a total of 466 counts. The East Asian Porcupine was the most recorded mammal, with 148 counts, representing 31.8% of the total counts, followed by rodents (13.5%), shrews (1.9%) and Eurasian Wild Pig (1.9%) (Table 7 and Figure 28).



Figure 27. A Chinese Pangolin visiting the burrow.

Non-mammal species accounted for 40.1% of all counts, with birds as the dominant group. The Greater Necklaced Laughingthrush was the most recorded bird (30.0%) and was often observed mating or briefly entering the burrows. This was followed by the Blue Whistling Thrush (6.0%), which was primarily observed foraging in or near the burrow entrances. Apart from these two species, other birds were less frequently recorded and typically only put their heads into the burrows briefly (Figure 29). Additionally, skinks were the only reptiles observed interacting with the burrows, with only two counts recorded (0.4%).

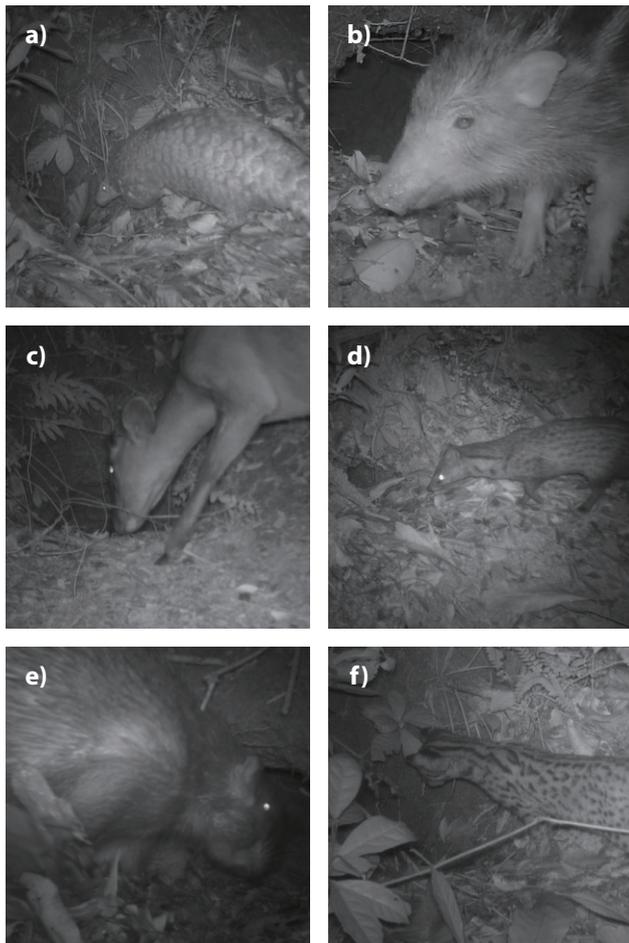


Figure 28. Mammal species observed visiting burrows: (a) Chinese Pangolin; (b) Eurasian Wild Pig; (c) Red Muntjac; (d) Small Indian Civet; (e) East Asian Porcupine; (f) Leopard Cat.



Figure 29. Bird species observed visiting burrows: (a) Orange-headed Thrush; (b) Siberian Rubythroat; (c) Grey-backed Thrush; (d) Blue Whistling Thrush; (e) Japanese Thrush; (f) Chinese Hwamei.

Table 7. Frequencies of species observed interacting with Chinese Pangolin burrows, categorised by behaviour types.

Species	Individual Count	Percentage	Behaviour Type			
			Foraging	Investigating	Mating	Passage (entering/exiting burrow)
East Asian Porcupine	148	31.8%	46	84	14	25
Greater Necklaced Laughingthrush	140	30.0%	20	48	26	56
Rodent(s) (Muridae)	63	13.5%	9	24	0	36
Blue Whistling Thrush	28	6.0%	15	13	0	1
Chinese Pangolin	25	5.4%	1	12	0	12
Shrew(s)	9	1.9%	0	0	0	9
Eurasian Wild Pig	9	1.9%	7	2	0	0
Masked Palm Civet	7	1.5%	0	5	0	2
Crab-eating Mongoose	5	1.1%	0	2	0	3
Rufous-tailed Robin	5	1.1%	1	3	0	1
Small Asian Mongoose	4	0.9%	0	4	0	0
Red Muntjac	3	0.6%	0	3	0	0
Chinese Hwamei	3	0.6%	1	2	0	0
Small Indian Civet	2	0.4%	0	2	0	0
Leopard Cat	2	0.4%	2	0	0	0
White's Thrush	2	0.4%	0	2	0	0
Skink(s)	2	0.4%	0	0	0	2
Small-toothed Ferret Badger	1	0.2%	0	1	0	0
Rhesus Macaque	1	0.2%	0	1	0	0
Indochinese Green Magpie	1	0.2%	0	1	0	0
Collared Scops Owl	1	0.2%	0	1	0	0
Masked Laughingthrush	1	0.2%	0	1	0	0
Orange-headed Thrush	1	0.2%	0	1	0	0
Japanese Thrush	1	0.2%	1	0	0	0
Siberian Rubythroat	1	0.2%	0	1	0	0
Grey-backed Thrush	1	0.2%	0	1	0	0

Notes:

- Some individuals displayed more than one behaviour during a single count. For example, if a Greater Necklaced Laughingthrush was observed mating and foraging within the same photo sequence, both behaviours were recorded under a single count.
- If more than one individual of the same species appears at the same time (e.g. mating), they are recorded as separated counts.
- Percentages may not sum to 100% due to rounding.

Discussion

The East Asian Porcupine was the most frequent visitor to the pangolin burrows, engaging in behaviours such as digging and foraging, and making brief burrow entries (Figure 30). These interactions suggest that porcupines may use pangolin burrows as shelters or foraging sites. The loose soil around burrows is believed to offer easier access to food resources, such as exposed roots. Apart from that, the porcupines commonly appeared in pairs or groups, and were often seen mating at the burrow entrances. This observation was also reported by Sun et al. (2021b), which noted that pangolin burrows are occasionally used as mating sites by other animals. However, there is no evidence to indicate that such mating behaviour is directly dependent on the presence of pangolin burrows. While the burrows were created by pangolins, they were observed interacting with the burrows less frequently than some other animals such as porcupines. This is likely due to the naturally low population density of the Chinese Pangolin and its habit of utilising multiple burrows within its home range, and the fact that some burrows, mostly feeding burrows, were dug for single use (Wu et al. 2020; Sun et al. 2021a; Sun et al. 2025b).



Figure 30. A group of East Asian Porcupines investigating the pangolin burrow.

Rodents were also frequently observed entering and exiting pangolin burrows (Figure 31). This behaviour suggests that burrows may provide a safe space and thermal refuge for these rodents, serving as temporary and overnight shelters. According to Bao et al. (2013), pangolin burrows are typically found in habitats with high canopy coverage and hidden under dense shrubs. The reduced air convection around the burrow entrance contributes to a more stable internal environment compared to the fluctuating external conditions, thereby providing a thermal refuge for the animals within.

The presence of rodents around pangolin burrows may, in turn, attract predators (Sun et al. 2021b). In our study, medium-sized predators, such as the Small Indian Civet, Leopard Cat and Crab-eating Mongoose (Figure 32), were occasionally recorded interacting with pangolin burrows. This suggests that, although not primary users, small predators may benefit indirectly from the burrows.



Figure 31. Rodent (Muridae).



Figure 32. Crab-eating Mongoose.

Birds were the second most frequently observed taxa, after mammals. All of the recorded bird species were ground-dwelling species, consisting mainly of laughingthrushes and thrushes. The Greater Necklaced Laughingthrush was often recorded in groups, vocalising, and foraging around the burrow entrances, alongside mating behaviour and male birds competing for females (Figure 33). A Collared Scops Owl was also recorded inspecting the pangolin burrow (Figure 34), presumably in search of prey like rodents or insects, taking advantage of the burrow's one-entrance structure to increase its hunting success (Sun et al. 2025b). The attraction of birds to soil mounts created by pangolins was also documented by Liu et al. (2025), resonating with our findings.



Figure 33. Greater Necklaced Laughingthrush.



Figure 34. Collared Scops Owl.

Several challenges were encountered during the preparation of this article. First of all, there was likely under-documentation of small, ectothermic, or fast-moving species, such as rodents and reptiles. They might not have been captured effectively due to limitations in the camera trap's trigger mechanism. Secondly, classifying animal behaviours can be challenging, such as telling apart foraging from investigation, as they can appear similar in certain species. Thirdly, pangolin burrows were identified based on their physical characteristics, making reference to both literatures and our experience with confirmed pangolin presence. However, we cannot rule out the possibility that some burrows may have been created by other burrowing species, such as the East Asian Porcupine. This presents an ongoing challenge in accurately distinguishing pangolin burrows from those of sympatric species based on visual assessment in pangolin research (IUCN SSC Pangolin Specialist Group 2018).

While our study documents species interactions with pangolin burrows, it does not further explore the relationships between these animal behaviours (such as mating) and the presence of burrows. Further studies are needed to confirm potential relationships and provide stronger scientific evidence to support the hypothesis that pangolin burrows attract a greater diversity of animals.

Conclusion

As a keystone species, the Chinese Pangolin plays a vital role in maintaining the forest ecosystem balance by controlling ant and termite populations. The burrows they dig also aerate the soil and enhance habitat heterogeneity, thereby promoting the growth of diverse plant species (Sun et al. 2025c). By documenting a variety of species interacting with pangolin burrows, this study highlights their additional ecological functions within our local ecosystem—providing shelter and foraging sites not only for the Chinese Pangolin but a wide array of wildlife.

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A New Species of Rove Beetle, *Naddia flavipes* (Staphylinidae: Staphylininae), in Southern China

K.H. Ng, Jason W.C. Wong, Catherine C.Y. Lam, Joseph K.H. Cheung and Rex C.H. Shih
Beetle Working Group

漁農自然護理署甲蟲工作小組與中國科學院動物研究所於 2017 年進行香港甲蟲多樣性聯合考察期間，發現了一種新的隱翅蟲物種。本文就隱翅蟲及該新物種作出簡短的描述。

Introduction

In 2017, the Beetle Working Group of the Agriculture, Fisheries and Conservation Department collaborated with the Institute of Zoology of the Chinese Academy of Sciences (CAS) to conduct a joint beetle biodiversity survey. During the survey, we collected a rove beetle specimen from the family Staphylinidae (隱翅蟲科), which was later confirmed to be a species new to science. This article provides an overview of rove beetles in general and highlights the distinctive morphological features of the new species, *Naddia flavipes* He, Schillhammer & Zhou, 2023.

Staphylinidae - one of the largest beetle families

Rove beetles, with over 63,000 described species worldwide, form one of the largest and most diverse insect families (Betz et al. 2018). Their adult forms exhibit significant variation in shape, ranging from the typical slender and elongated body to fusiform or ant-mimicking forms, earning them the reputation as masters of disguise in the animal kingdom. Nevertheless, most rove beetles can be recognised by their distinctive short, truncated elytra (鞘翅), which cover the complexly folded hindwings while exposing their characteristically flexible abdomen (Hill et al. 1982; Newton 2015). This feature is reflected in their Chinese common name (隱翅蟲) for this family of beetles. In recent years, the public in Hong Kong has become familiar with a small group of rove beetles, primarily belonging to the genus *Paederus* (毒隱翅蟲屬). These beetles have caught people's attention due to the presence of a toxin called pederin, which can cause severe dermatitis when the beetle is crushed (Chamankar et al. 2023).

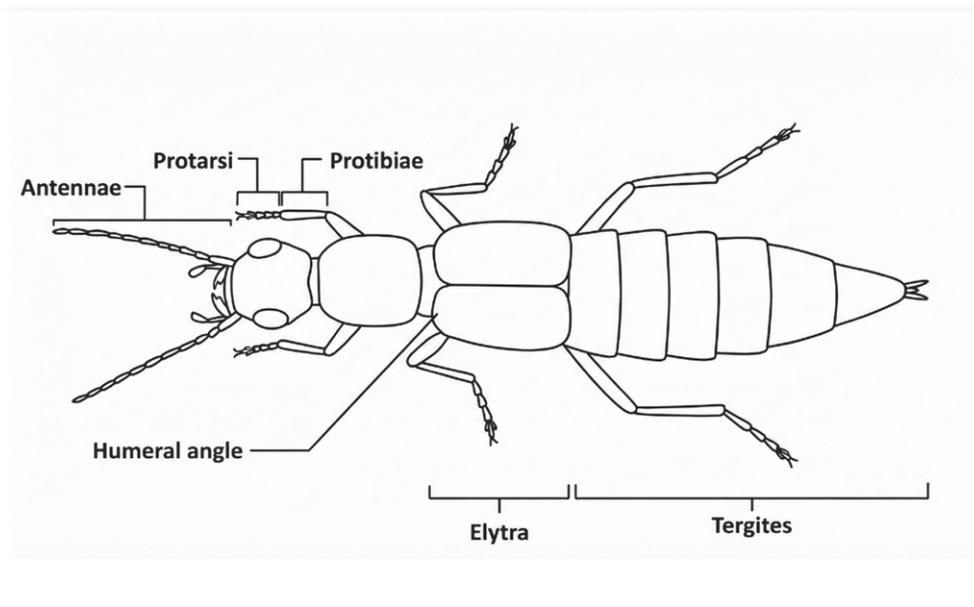


Figure 35. Morphological features of a typical rove beetle.

Despite their small size and cryptic habits, rove beetles are ubiquitous and inhabit a wide range of habitats, from alpine meadows to forest floors and rocky seashores, where they abound in vegetation, leaf litter, decaying logs, rotting fruits, carrion, or dung. The larvae and adults of most rove beetle species are predaceous, preying on other animals for food. However, as one would expect in such a diverse group, there are exceptions, with some species feeding on plants, fungi, algae, or decomposing organic matter, while others are pollen or spore specialists, parasitoids, or ectoparasites (de Rougemont 2001). More intriguingly, some species have evolved to establish complex associations with ants. They mimic their host ants morphologically and chemically, behaving as part of the colony inside or near the nests, where they prey on ant brood or forage as commensals, scavenging discarded debris like dead ants, or in some cases, being fed by the hosts (i.e. ants) (Mynhardt 2013; von Beeren et al. 2018).

Naddia flavipes He, Schillhammer & Zhou, 2023

Specimens of *Naddia flavipes* were collected from Mau Ping during the joint survey with CAS in 2017. The genus *Naddia* (Staphylinidae: Staphylininae) is a group of larger-sized rove beetles that can generally be recognised by their deeply emarginated base of the head (Schillhammer 1996; He et al. 2023). The body of *N. flavipes* is almost entirely black and measures about 13.6 - 18.0 mm in length. The antennae are short, with the last (11th) antennal segment being almost oval. It has a horseshoe-shaped pronotum (前胸背板) with brownish-black pubescence, and its elytra are nearly quadrate with reddish-brown humeral angles (肩角). A patch of black subtomentose pubescence is present in the middle of the first four visible abdominal tergites (腹背板). As its species name suggests, one of the key distinctive features of this species is the bright yellowish-red protarsi (前足跗節), which starkly contrast with the protibiae (前足脛節) covered in dense light-yellow pubescence. Outside of Hong Kong, *N. flavipes* can also be found in Guangdong, Fujian, Zhejiang, Jiangxi, and Hubei.

Many species of *Naddia* are excellent wasp mimics. They are often blackish with golden pubescence on the sides. They crawl with their antennae pointed forward, moving in quick bursts, and frequently shaking their abdomen. The combination of these physical characteristics and behaviours closely resembles that of sphecid or vespid wasps, which may help deceive their potential predators (Xia et al. 2022).



Figure 36. *Naddia flavipes*: (a) habitus (Scale bar = 2.0 mm); and (b) right antenna (Scale bar = 0.5 mm) (from He et al. 2023).

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Genetic Analysis Clarified the Species Identity of Two House Geckos (*Hemidactylus* spp.) in Hong Kong

Eric H.N. Ng¹, Helen L.Y. Wong¹, Y.H. Sung², Henry M.H. Chan² and Ken H.K. Chan¹
¹Herpetofauna Working Group

²Division of Science, WJY School of Interdisciplinary Studies, Lingnan University, Hong Kong

漁農自然護理署兩棲及爬行類工作小組於 2022 年在香港多區收集密疣蜥虎 (*Hemidactylus brookii*) 和疣尾蜥虎 (*H. frenatus*) 的樣本，並以基因分析釐清這些引入物種的分類和來源。

Introduction

Traditional taxonomic identification of species relies primarily on morphological characteristics such as size, shape, colouration and anatomical features to classify organisms. However, this approach faces significant challenges when dealing with species complexes, which are groups of closely related but valid species that are nearly indistinguishable in appearance. Traditional methods may lump multiple distinct species under a single species, obscuring true species diversity and hindering conservation efforts. The use of genetic analysis in taxonomy has revealed hidden lineages within species complexes, prompting taxonomists to re-evaluate classifications and recognise cryptic species that were previously overlooked.

The gekkonid genus *Hemidactylus* is highly diverse and comprises more than 100 species worldwide (Mahony 2011). In Hong Kong, four *Hemidactylus* species have been documented: the native *Hemidactylus bowringii* and *H. garnotii*, and the non-native *H. brookii* and *H. frenatus* (Karsen et al. 1998).

Hemidactylus brookii and *H. frenatus* have achieved an apparent pan-tropical distribution across Asia, Africa, the Americas, Australia and the Pacific. Recent molecular phylogenetic analyses reveal that there are two cryptic species complexes (Mahony 2011, Rocha et al. 2022). Mahony (2011) re-examined the *H. brookii* species complex and concluded that *H. brookii* had been historically misclassified and that it actually comprises multiple distinct species. The species name *H. brookii* should now be restricted to an African lineage, while other Asian populations previously assigned to this name should be reassigned or redescribed. Rocha et al. (2022) recovered at least five lineages within *H. frenatus*, which corroborate a geographic structure, yet the study did not go so far as to recognise any distinct species. In this connection, the AFCD Herpetofauna Working Group commenced a study to resolve the confounding taxonomic status of the two species complexes.

Methodology and Results

From April to October 2022, the AFCD Herpetofauna Working Group surveyed various locations in Hong Kong with sighting records of *H. brookii* or *H. frenatus*, including Hong Kong Island (Aberdeen and Bowen Road), Kowloon (Tsim Sha Tsui and Lei Yue Mun), the New Territories (Kwai Chung, Tsuen Wan, Tai Lam Chung, and Tseung Kwan O) and Lantau Island (Tung Chung). Individuals of *H. brookii* and *H. frenatus* were found on man-made structures like walls and pillars, as well as on natural substrates like tree bark and rocky surfaces. Fourteen specimens (including six *H. brookii* and eight *H. frenatus*) were collected and sent to the Science Unit of Lingnan University (Hong Kong) for genetic analysis.

DNA was extracted from the 14 specimens for the sequencing of their mitochondrial genes (16S, ND2, Cytb). The sequences were compared with the records from GenBank.

All six "*H. brookii*" specimens were found to be *H. tenkatei*. All "*H. frenatus*" specimens were confirmed to be *H. frenatus*, which is consistent with their existing classification.

Discussion

This study reassigned the population of “*H. brookii*” in Hong Kong to *H. tenkatei*. *H. tenkatei* was originally described based on a specimen from Roti Island, Indonesia, in 1895, but was quickly synonymised with *H. brookii* in 1905. The true natural range of *H. tenkatei* is unknown, as it has been recorded under *H. brookii* in the past, and this is further complicated by the widespread introduction of this species and the “*H. brookii*” worldwide. It was only until the 2010s that it was subsequently resurrected to a full valid species (Rösler and Glaw 2010, Mahony 2011). It is currently believed that *H. tenkatei* is native to eastern Indonesia and Timor-Leste, but has since been introduced to Borneo, Penang Island and Myanmar (Kathriner et al. 2014). Wang et al. (2024) confirmed the occurrence of *H. tenkatei* in Zhuhai city on the Chinese Mainland. The finding of this study represents another introduced population of *H. tenkatei* in China.

From our survey records, *H. tenkatei* and *H. frenatus* are widely distributed in Hong Kong. Although there is no apparent ecological impact from the two species, the AFCD Herpetofauna Working Group will continue to monitor the *Hemidactylus* populations in Hong Kong to detect any emerging population changes and inform conservation actions. The story of *H. tenkatei* represents a cautionary tale of how the introduction of non-native species and cryptic diversity can upend our understanding of the natural history of lesser-known species. It underscores the need for prompt taxonomic review and species status updates to inform management.

Species profiles

Species	<i>Hemidactylus tenkatei</i>	<i>Hemidactylus frenatus</i>
Morphological characteristics		
Habitat	<ul style="list-style-type: none"> • Urban environments. 	
Behaviour	<ul style="list-style-type: none"> • Nocturnal and insectivorous. • Active at night, often found near human dwellings or rocky habitats. 	
Global distribution	<ul style="list-style-type: none"> • Believed to be native in eastern Indonesia and Timor-Leste. • Introduced to Borneo, Penang Island, Myanmar and Zhuhai city, China. 	<ul style="list-style-type: none"> • Native range is uncertain. This species has achieved a pan-tropical distribution across Asia, Africa, the Americas, Australia and the Pacific due to introduction by human activities.
Local distribution	<ul style="list-style-type: none"> • Distributed throughout Hong Kong. 	

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Division Column

A Summary of Research Studies Conducted under the Incense Tree Species Action Plan

Ryan H.L. Tsang and Eric K.Y. Liu
Technical Services Division

漁農自然護理署自 2018 年起推出《土沉香物種行動計劃》（《行動計劃》），以提供一個務實框架，讓本地的土沉香種群能夠長期地存活。本文旨在介紹其中在《行動計劃》下支持並已完成的研究及其應用。

Introduction

Incense Tree, *Aquilaria sinensis* (Lour.) Spreng. (土沉香 / 牙香樹 / 白木香), is an evergreen tree native to southern China (ranging from Hainan, Guangdong, Guangxi, Fujian, and Hong Kong) (Harvey-Brown 2018). *A. sinensis* has long been under the threat of illegal harvesting for its premium-priced agarwood (沉香). Due to exploitation, habitat destruction, and the lack of effective recovery plans, natural populations of *A. sinensis* in Chinese Mainland have severely diminished. The remaining viable populations can only be found in a few mountainous regions in Hainan and Guangdong provinces (Zou et al. 2012). To date, populations of *A. sinensis* in Hong Kong are some of the best remaining healthy populations in China, but are currently under threats of illegal harvesting of agarwood from poachers (Jim 2015). To ensure the long-term viability and sustainability of local *A. sinensis* populations, the Agriculture, Fisheries and Conservation Department (AFCD) devised and implemented the “Incense Tree (*Aquilaria sinensis*) Species Action Plan” (the SAP) to provide a pragmatic framework of conservation measures for the species (AFCD 2023).

One of the measures under the SAP is to encourage and support research efforts aimed at conserving *A. sinensis*. This article provides a brief overview of several studies completed under the SAP and their potential applications in conserving the species.

Population genomics of *A. sinensis*

Cross-boundary crime poses a major challenge to the conservation of *A. sinensis* in Hong Kong. Over the years, we have observed that most of the agarwood harvested in Hong Kong is smuggled to Chinese Mainland or overseas. With the aim of identifying the origin of the agarwood specimens intercepted from the smugglers/poachers, the AFCD initiated and supported a series of studies that employed molecular techniques to study the population structure of *A. sinensis* in Hong Kong, and to develop tools that can identify the origin of an individual *A. sinensis*.

Regional origin of Hong Kong's *A. sinensis*

To determine the population structure of *A. sinensis* in Hong Kong, the AFCD commissioned a series of studies using genomic approaches to investigate whether the local *A. sinensis* could be distinguished from their counterparts outside of Hong Kong. One of the studies (Law et al. 2023) involved the extraction of genomic DNA from 346 *A. sinensis* samples collected from Hong Kong and southern China (i.e. Guangdong, Guangxi, and Hainan). The samples were whole genome sequenced and subjected to further phylogenetic analyses. The results revealed that the samples from Hong Kong were genetically distinct from those collected in Guangxi and Hainan. However, some samples from Guangdong were found to be indistinguishable from those collected in Hong Kong. These findings support historical documentation suggesting that *A. sinensis* populations in Hong Kong likely originated from Dongguan, Guangdong, in the past (Lu 1983).

Interestingly, not all Hong Kong's samples were genetically inseparable from their Guangdong's counterparts. *A. sinensis* collected on Lantau Island were found to be genetically distinct from all other samples collected in this study (Figure 37), suggesting that there is a genetically distinct subpopulation of *A. sinensis* on Lantau Island.

DNA fingerprinting

In addition to revealing the subpopulation on Lantau Island, this study also sheds light on the application of resequencing technology to trace the source of individual samples. Over the years, the AFCD has been collecting and maintaining genomic data of selected *A. sinensis* individuals of Hong Kong. Using the resequencing technique, we can match a specific *A. sinensis* individual if it is recorded in the database. This method can potentially be used to inform enforcement agencies of the origin of the confiscated item (e.g. agarwood) and facilitate their law enforcement actions. In a sentenced case involving illegal damaging of *A. sinensis* in 2024 (Legal Reference System 2024a; 2024b), this technique was applied to provide key evidence, leading to the conviction of the defendants (The University of Hong Kong 2024).

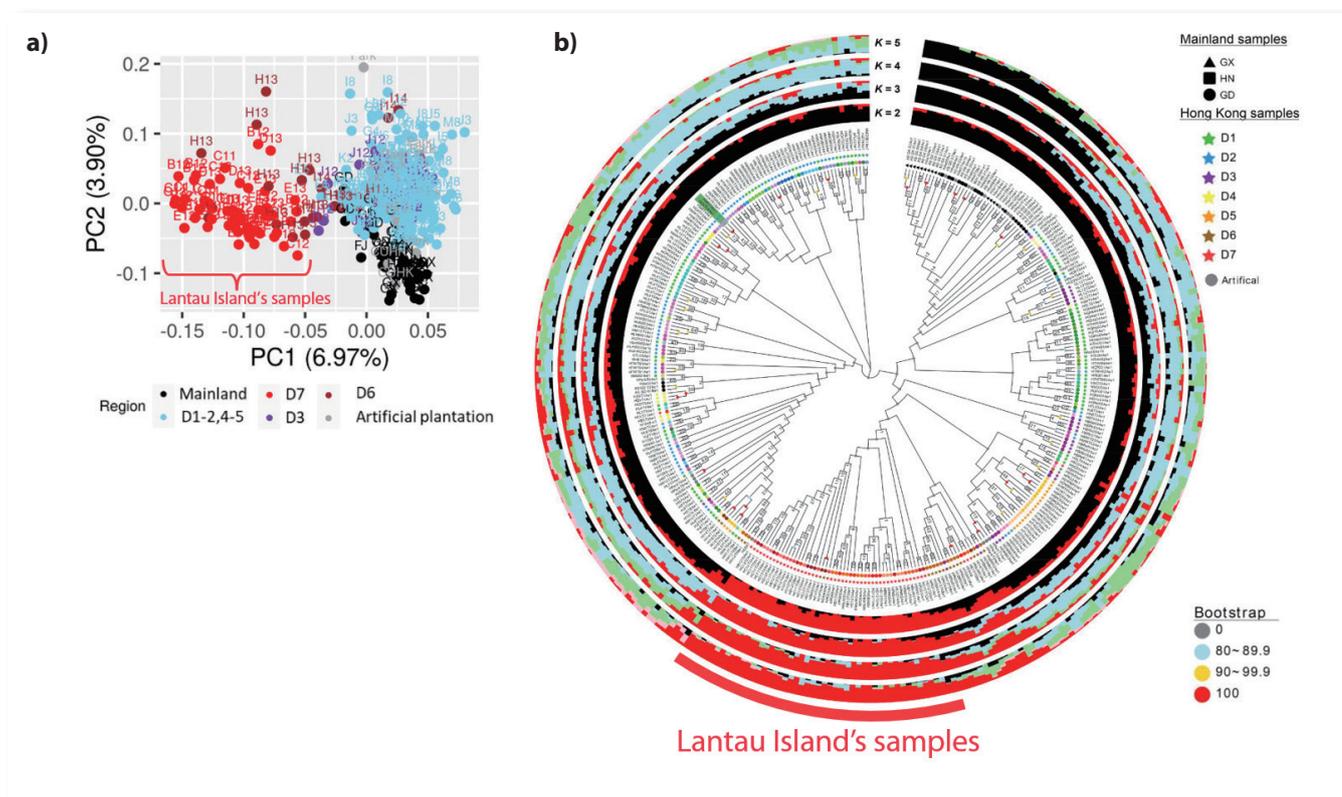


Figure 37. (a) Principal component analysis (PCA) plot and (b) neighbour-joining tree constructed with 1000 bootstraps, based on 346 samples collected from *A. sinensis* in Hong Kong (n = 306) and the Mainland (n = 40). Note that samples collected on Lantau Island (indicated in red) are generally separated from the others, suggesting that this sub-population is genetically different from the others (Remade from Figure 2 in Law et al. 2023).

3D documentation and classification of wounds on *A. sinensis*

Agarwood is formed when *Aquilaria* trees experience physical wounding or damage. When the inner part of the tree is exposed to pathogenic microbes, the defence mechanism of the tree will be elicited, leading to resin production. In a natural setting, wounding or damage can occur due to events like lightning strikes, animal grazing, or pest and disease infestations (Tan et al. 2019). However, the natural formation of agarwood is uncommon and can take a long period of time (> 10 years). As such, agarwood farmers have developed diverse artificial induction approaches, such as nailing, holing, burning, trunk breaking, bark removal, to imitate natural wounding processes (Rahman and Basak 1980; Akter et al. 2013).

In Hong Kong, it is not uncommon to see wounding or damage on *A. sinensis*. To systematically document the various types of wounding methods found on *A. sinensis* in Hong Kong, the AFCD supported the Shiu-Ying Hu Herbarium of The Chinese University of Hong Kong in developing a classification system of wounds found on *A. sinensis*, and recorded each wound type using a novel photogrammetric documentation method (Wang et al. 2022; 2024).

Out of the 802 on-site records of *A. sinensis* wounds examined in this study, 752 were identified as artificial wounds, reflecting the prevalence of illegal damage on *A. sinensis* in the past years. Based on their morphology and the associated wound induction methods, these artificial wounds were classified into 12 different wound types, as shown in Table 8 and Figure 38. Each wound type was photographed, reconstructed into 3D models, and deposited on a dedicated webpage in the Shiu-Ying Hu Herbarium Archive System for demonstration and reference (<https://syhuherbarium.sls.cuhk.edu.hk/collections/3d-digitized-tag/wound/>).

The newly established wound classification system provides a standardised method for classifying wound types found on *A. sinensis*, or other *Aquilaria* species facing similar threats. This system also aids in the objective description of wound types and the purpose of inflicting the wounds, whether to induce agarwood formation or to collect agarwood. As a result, it enhances communication with other parties, such as law enforcement agencies and the Court, during case investigation and enforcement. Besides, the presence of specific wound types, such as drilled-hole patches, which are used to induce the formation of agarwood, can also indicate whether the tree is being targeted for agarwood harvesting. This information can facilitate the planning and implementation of appropriate conservation and enforcement measures to protect *A. sinensis*.

Table 8. A summary of (a) – (l): artificial wound types; (m) natural wound; and (n) non-damage trunk of *A. sinensis* recorded in the study (Remade from Table 3 in Wang et al. 2024).

Wound types	For agarwood formation	For agarwood collection	No. of wounds recorded out of 802 on-site records
(a) Drilled-hole patches (鑽孔)	✓	✗	7
(b) Slash patches (割痕)	✓	✗	44
(c) Peeled bark (剝皮)	✓	✗	163
(d) Vertical cleaving (縱向分裂)	✓	✗	9
(e) Horizontal sawed below breast height (胸下橫鋸)	✓	✓	65
(f) Horizontal sawed above breast height (胸高橫鋸)	✓	✓	19
(g) Angle sawed below breast height (胸下斜鋸)	✓	✓	92
(h) Angle sawed above breast height (胸高斜鋸)	✓	✓	37
(i) Chiseled (鑿孔)	✓	✓	47
(j) Side branch removal (分枝鋸斷)	✓/✗	✓	102
(k) Trunk removal below breast height (胸下鋸斷)	✓/✗	✓	35
(l) Trunk removal above breast height (胸高鋸斷)	✓/✗	✓	132
(m) Natural wound between branches (枝間自然裂傷)	N/A	N/A	14
(n) Non-damaged trunk (無損傷)	N/A	N/A	36

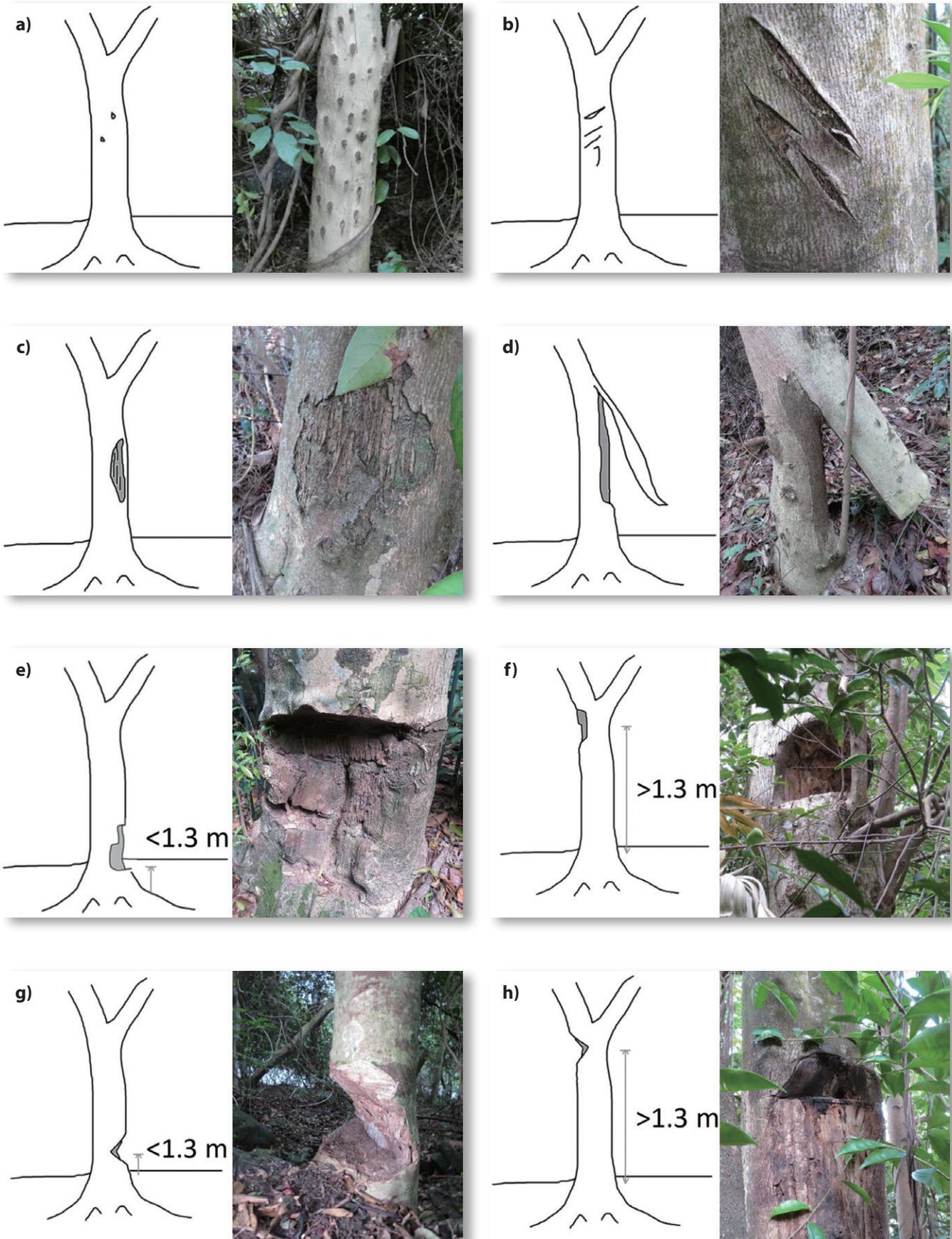


Figure 38. Illustrations and photo references of different wound types (a) - (n) recorded in the study (Remade from Figures 2 and 3 in Wang et al. 2024).

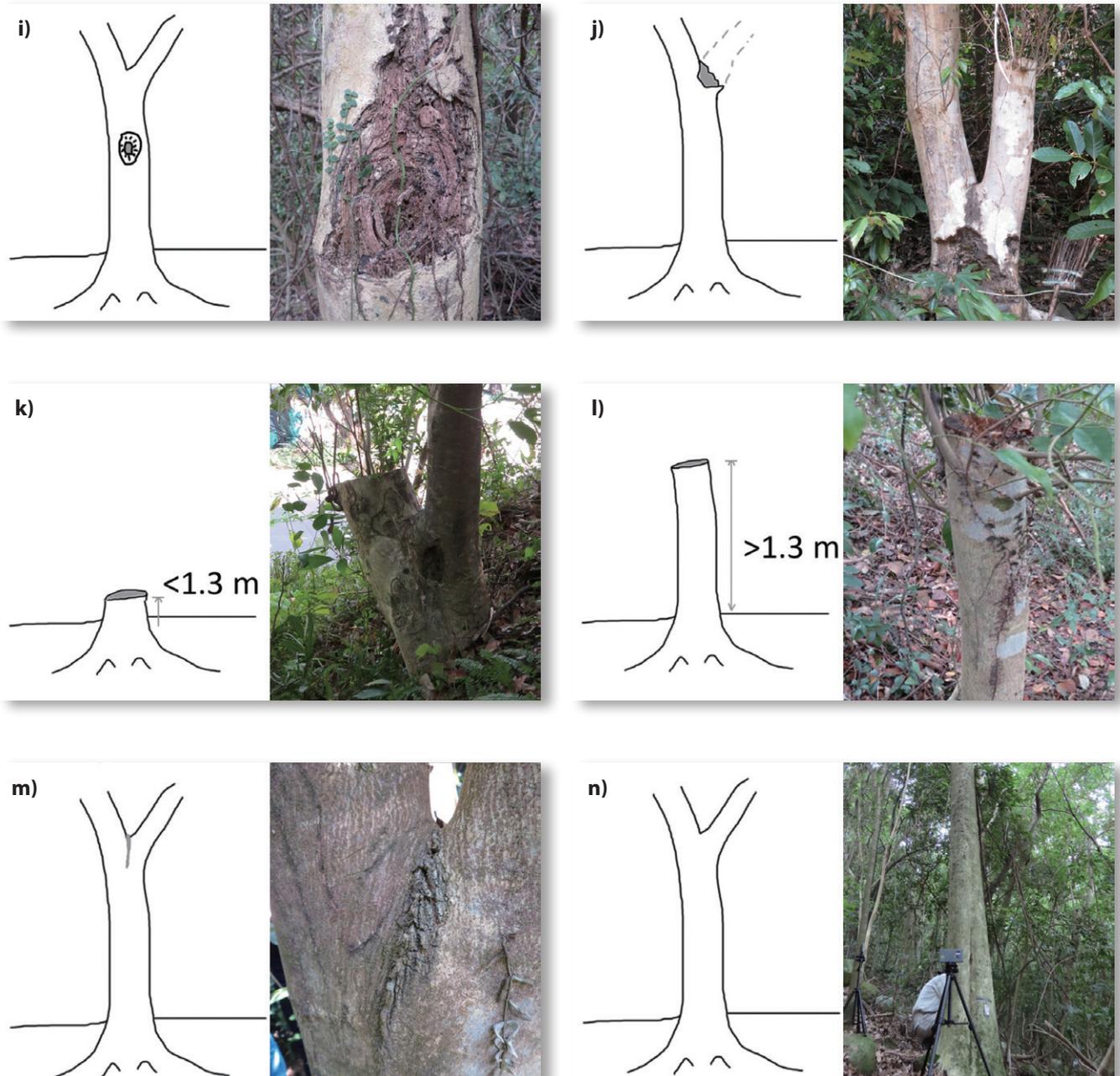


Figure 38 (Cont'd). Illustrations and photo references of different wound types (a) - (n) recorded in the study (Remade from Figures 2 and 3 in Wang et al. 2024).

Conclusion

The above studies have contributed to the conservation of *A. sinensis* and strengthened enforcement actions against illegal activities affecting the species. The AFCD will continue to encourage and support research institutions to conduct scientific studies and new initiatives that aim at conserving this signature tree species in Hong Kong.

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What's New

Rediscovery of an Orchid Species, *Zeuxine membranacea* (膜質線柱蘭), in Hong Kong

Michelle I. Luk, Queenie K.S. Wong and Eric K.Y. Liu
Hong Kong Herbarium

漁農自然護理署香港植物標本室職員於 2023 年 9 月採集到一份膜質線柱蘭 (*Zeuxine membranacea*) 的標本，成為約 50 年後再次被發現的香港記錄。本文就膜質線柱蘭的歷史、分布及生境、其保育狀態等作簡短的介紹。

Introduction

In September 2023, staff from the Hong Kong Herbarium collaborated with Dr Pankaj Kumar, a specialist in orchid taxonomy and conservation, to search for orchids in Hong Kong. During the search, our colleagues encountered a flowering orchid (Figures 39 and 40) that they had not seen before. Photos were taken at the field, and a specimen was collected for further study. Based on the description of Flora of China (Wu et al. 2009) and our Herbarium record, we initially identified the orchid species as *Zeuxine membranacea*, which was last recorded in Hong Kong in 1975.

In Hong Kong, the species has been treated as conspecific with *Z. strateumatica* (線柱蘭) by Hu and Kong (2011), while Barretto et al. (2011) recognise it as a distinct species. Given its complicated nomenclatural history, we invited Dr Kumar to study the orchid together. After studying floral dissection images provided by our Herbarium, along with type specimens, photos, and literature on similar species, Dr Kumar confirmed our proposed identification. We have thereby adopted the treatment of *Z. membranacea* as a separate species from *Z. strateumatica*, and updated the entry of this species in the Hong Kong Plant Database, which has not been recorded over the past 50 years.

History

The orchid species *Zeuxine membranacea* was first discovered by William Griffith in Bhutan and described by John Lindley (1840). *Z. membranacea* has then been treated as conspecific with *Z. strateumatica* by Garay and Sweet (1974). Nevertheless, Pearce and Cribb (2002) clarified that *Z. membranacea* could be readily distinguished from the latter by its taller stature, pubescent inflorescence, and rounded apical lobes of its lip. In general, *Z. membranacea* is considerably rarer and less widespread than *Z. strateumatica*.

In Hong Kong, *Z. membranacea* was first discovered by Tse Shing-Chee in September 1975. It was observed only twice in the mid-1970s (Barretto et al. 2011) and had not been seen again until our recent record in 2023. More details, including species descriptions and images of floral structure, are published in Wong et al. (2025).

Distribution, Habitat and Conservation Status

This species is distributed from the Western Himalayas to the Indo-Myanmar biodiversity hotspot (POWO 2025). Hong Kong lies at the easternmost edge of its distribution range. Its first discovery was in Sai Kung, and the current discovery of this species was from a grassy slope in a different locality, where around 20 mature individuals were observed. Based on the available information, the species qualifies for the status of Critically Endangered preliminarily [CR B2ab(ii,iii,iv,v)]. Despite the presence of similar grasslands in the region, the nearest documented population of this species outside Hong Kong is approximately 900 kilometres away in Vietnam. This significant distance reduces the likelihood of propagule immigration from adjacent populations. Therefore, the preliminary classification of Critically Endangered (CR) is upheld for the final regional assessment of this species in Hong Kong (Wong et al. 2025).



Figure 39. The whole plant of *Z. membranacea* on a grassy slope (Photo credit: Lam Kin-wai).



Figure 40. The inflorescence of *Z. membranacea* (Photo credit: Lam Kin-wai).

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