香港昆蟲報
Hong Kong Entomological Bulletin
Volume 1. Issue no. 2
November 2009
ISSN 2079-178X

Contents

香 港 昆 蟲 學 會
Hong Kong Entomological Society
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Chrysomelidae of Hong Kong Part 1 Introduction and key to subfamilies

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Abstract

A key to the 13 subfamilies of Chrysomelidae occurring in Hong Kong and a photographic guide to each of these subfamilies is given. The aquatic subfamily Donaciinae is recorded in Hong Kong for the first time.

Key words:
Chrysomelidae, Coleoptera, Hong Kong.

Introduction

This is the first of a series of articles on the Chrysomelidae or leaf beetles of Hong Kong. Its main purpose is not only to enable entomologists to accurately identify species of this vast and variable family occurring in the Hong Kong SAR by the use of keys, but also for the more general reader to use as a quick photo guide, as all commonly found species will be illustrated in photographs. Part 3 of the series, on the subfamily Galerucinae, is also published in this issue of HKEB. Part 2 (subfamily Alticinae) has already been published (Aston, 2009).

The Chrysomelidae is an abundant and highly speciose group of phytophagous beetles, many of which are agricultural pests and have therefore been well studied. Members of this family can be identified by having the tarsi all apparently four-segmented (pseudotetramerous), antennae larger than palps, and elytra nearly always covering the abdomen, only occasionally exposing the pygidium. The Cerambycidae (longhorn beetles) are closely related to the Chrysomelidae and can be distinguished generally by being very elongate in shape, the head projecting and prominent, the eyes oblique and more or less divided and the antennae being quite rigid and perpendicular to the body. As a general rule, Chrysomelidae show none of these features. Another abundant group, the Curculionidea (weevils) are distinguished from leaf beetles by having one or more of the following features: a rostrum (or snout); elbowed antennae; body covered with scales.

Although there are 13 subfamilies of Chrysomelidae known from Hong Kong, it should be noted that these are very variable in species representation. The Galerucinae, Alticinae and Eumolopinae are the largest and commonest groups, each with probably over 50 species, followed by the Cassidinae, Cryptocephalinae and Criocerinae each with about 20 species locally. The Hispinae, Chlamydinae, Clytrinae and Chrysomelinae are all quite scarce; it seems likely that these subfamilies are represented by less than ten or at most 15 species each. The Donaciinae, Lamprosominae and Sagrinae are all represented by single species, the first two being very scarce to rare.

Methods

Most of the material for this study came from the collection of the author and was made between 2004 and 2009. Although this collection is derived from locations throughout Hong Kong, there is a strong bias in this material towards Lantau Island. Additional material was viewed in AFCD's Tai Lung Farm Insect collection and a small collection on loan from Mr. Yiu Vor from his personal collection. Identification of species for most subfamilies was done using Gressitt and Kimoto 1963.

The structure of the key follows Jacoby (1908), who divided the Chrysomelidae into five divisions, Camptosomes, Eupodes, Cyclica, Trichostomes and Cryptostomes. As these divisions are occasionally referred to in modern publications I have included them here. The key to the Trichostomes and Cryptostomes was extracted from Maulik (1919 & 1926).

KEY TO THE SUBFAMILIES OF CHRYSOMELIDAE KNOWN TO OCCUR IN HONG KONG

1 Mouth placed anteriorly. Head porrect or vertical 3
- Mouth not normal, small, hidden or nearly so (Figure 1). Maxillary palpi two-segmented. Head in front bent inwards (Division CRYPTOSTOMES) 2

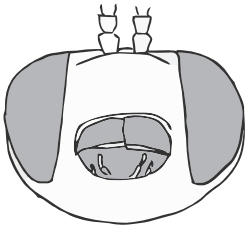

Figure 1. Ventral surface of head. Eyes and mouth shaded. Hispinae [Figure by Paul Aston]

2 (1) Rotundate or oval form with an explanate margin all round, so that when the insect is viewed from above and in repose the antennae and legs are not visible. Larvae generally surface feeders . . . . . ***Cassidinae***

— Normally elongate-oblong insects. Many species have long well developed pointy spines on body, though may be quite smooth and plain . . . . . ***Hispinae***

3 (1) Antennae not widely separated at base, generally closely approximate; elytra more or less soft in texture. (Division TRICHOSTOMES) 4
Antennae widely separated at base; elytra of hard texture 5

4 (3) Live specimens never jump. If hind legs thickened, corresponding tibiae are long. Anterior coxae conically prominent at apex. . . . . ***Galerucinae***

— Live specimens almost always jump to evade capture. Hind femora much thickened; invariably thicker than in the two anterior pairs of legs. Anterior coxae not conically prominent at apex. Hind tibiae short in most species . . . ***Alticinae***

5 (3) Pygidium not exposed. Intermediate ventral segments not medially constricted 9
- Pygidium usually exposed. Intermediate ventral segments constricted as in Figure 2. (Division CAMPTOSOMES) 6

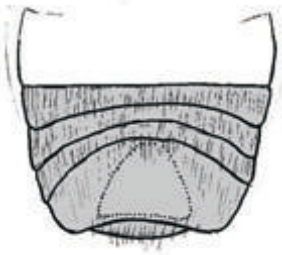

Figure 2. Ventral surface of abdomen of Cryptocephalus tri-fasciatus Fabricius 1787 showing the constricted intermediate ventral segments in Camptosomes. [Figure by Paul Aston]

6 (5) Antennae long and generally filiform, never serrate, sometimes shorter with terminal joints thickened . . . . . ***Cryptocephalinae***

— Antennae short, the joints serrate 7

7 (6) Thorax with grooves on the flanks for antennae; elytra tuberculate . . . . . ***Chlamydinae***

— Thorax without grooves on the flanks; elytra not tuberculate. Posterior femora without teeth; claw joint normal. Last joint of maxillary palpi more or less truncate . . . . . ***Clytrinae***

8 (5) Thorax without distinct lateral margins, head produced, eyes prominent. Prosternum exceedingly narrow (Division EUPODES). 9

— Thorax with distinct lateral margins (rarely without), head not produced, eyes not prominent. Prosternum broad (Division CYCLICA) 11

9 (8) Antennae not separated by entire front of head . . . . . ***Donaciinae***

— Antennae separated by entire front of head 10

10 (9) Posterior femora very strongly incrassate; large sized insects of brilliant metallic coloration . . . . . ***Sagrinae***

— Posterior femora only slightly incrassate; much smaller insects, less brilliant, rarely metallic. . . . . ***Criocerinae***

11 (8) Last joint of tarsi deeply bi-lobed 12

— Last joint of tarsi not bi-lobed; entire, front coxae transverse . . . . . ***Chrysomelinae***

12 (11) Thorax as wide as elytra at base. Legs compressed; abdomen grooved for reception of legs. . ***Lamprosominae***

— Thorax generally narrower than elytra at base. Legs not compressed; abdomen not grooved for reception of legs . . . . . ***Eumolopinae***

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Quick photographic guide to the subfamilies of Chrysomelidae recorded in Hong Kong

Cassidinae

Aspidomorpha miliaris
Fabricius 1775

Hispinae

Dactylispa pungens
(Boheman) ,1859

Cryptocephalinae

Cryptocephalus trifasciatus
Fabricius, 1787

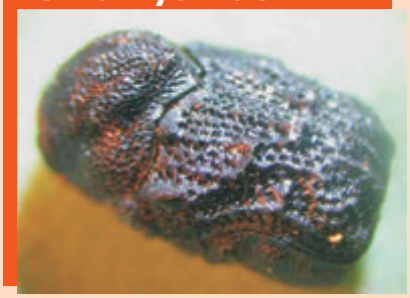
Galerucinae

Hoplosomoides costata
(Baly 1878)

Alticinae

Nonarthra variabilis
baly 1862

Chlamydinae



Chlamisius maculiceps
Gressitt 1942

Clytrinae

Smaragdina aurita
(Linnaeus, 1767)

Donaciinae

Donacia lenzi
Schonfeldt, 1888

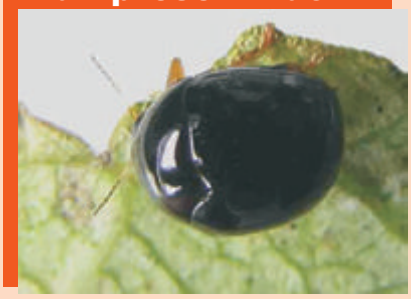
Sagrinae

Sagra femorata purpurea
Lichtenstein

Criocerinae

Lilioceris egena
(Weise, 1922)

Lamprosominae



Oomorphoides pallidicornis
Gressitt and Kimoto 1961

Eumolopinae

Platycorynus undatua
(Olivier, 1791)

Chrysomelinae

Chrysomela octodecimguttata
(Fabricius 1775)

Chrysomelidae of Hong Kong Part 3 Subfamily Galerucinae

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Abstract

This is the third part of a series of papers on the Chrysomelidae occurring in Hong Kong. The current paper deals with the large subfamily Galerucinae. Thirty-seven species are listed, all of which are covered by the keys.

Key words:
Chrysomelidae, Galerucinae, Coleoptera, Hong Kong.

Introduction

The Galerucinae is the most frequently encountered and speciose subfamily of the Chrysomelidae, or leaf beetles as they are commonly known. Members of the subfamily are characterised by having the mouth placed anteriorly; antennae not widely separated at the base, generally closely approximate; elytra more or less soft in texture; posterior femora not usually thickened, or if thickened, not significantly more so than in the two anterior pairs of legs.

In some species of Galerucinae, the male shows variously enlarged and modified segments of the antennae. When this occurs the basal segments below the enlargement are proportionally shorter and stouter as compared to the female. The genera *Taumacera* and *Agetocera* are examples of this in Hong Kong. Similarly, enlargement occurs on the first tarsal segment of the anterior tarsi in some Hong Kong species of the genus *Mimastra*.

Methods

As in Part 2 of this series of articles (Aston 2009), the keys have been built on and modified from Gressitt and Kimoto (1963a and 1963b), and are best used for fresh specimens, though older specimens should pose no problem for more experienced users. Note that colours do generally become darker in older specimens. It is very likely that many more species will be discovered in Hong Kong, but most or all of our commonly occurring species should be adequately covered in the keys.

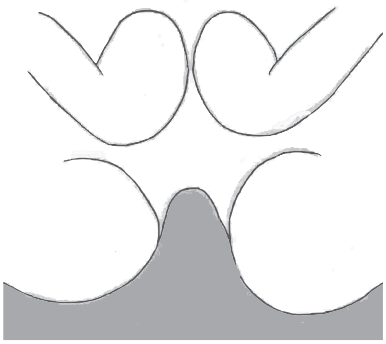
In the systematic section, for each species are given the length and description. Host plant information, if known, is generally taken from existing literature on south China, and is only listed if the species of plant is included in the *Agriculture*, *Fisheries* and *Conservation Department* Bulletin 1 (revised) *Checklist of Hong Kong Plants 2004*. The period when adults can be seen in Hong Kong is also given, mostly from personal notes of the author; also for south China, as indicated by literature records. World distribution is given for each species.

THE KEYS

Key to tribes of *Galerucinae*

1. Mesosternum free, horizontal or inclined, not covered by metasternum. Anterior of mesosternum meeting posterior of the prosternum. 2

– Mesosternum largely covered by an anterior process of the metasternum as in sketch (right) of the underside of *Gallerucida singularis* . . . . . Tribe Gallerucidini



Gallerucida singularis - shaded area - anterior of mesosternum forming a process covering the posterior of the prosternum (centre). Figure Paul Aston

2. Occiput and pronotum deeply punctured; antennal insertions generally close, at level of anterior margins of eyes or further anterior (as in photo of the head and pronotum of *Pyrrhalta kwangtungensis* right). Last abdominal sternite of male with a triangular or rounded depression with posterior border often emarginate, but never tri-lobed . . . . . Tribe Galerucini

– Occiput and pronotum not heavily punctured, antennal insertions generally separated, situated near, but behind, anterior borders of eyes, but when weakly separated placed further forward; last sternite of male 3-lobed, with medium lobe always distinct . . . . . Tribe Luperini

Gallerucidini

This tribe is easily identified by the mesosternum projecting forward through the mid coxae and covering part or most of the metasternum. Single genus and species in Hong Kong.

01. ***Gallerucida singularis*** Harold, 1880

Length 7-8.5mm. Elytra variable in colour from pale to reddish with a purplish sheen and generally with the humeral and apical angles yellowish. The latter with usually two, occasionally three black spots. Hong Kong specimens have additional spots on the humeral angles. Underparts dark brown. Antennae segment 2 is the shortest, 3 sightly longer and 4 twice as long as 3. This species was first recorded in Hong Kong by Hadden in 1932 (Bishop Museum).

Host: Japanese Smart-weed *Polygonum japonicum* Meisn.

Imago: March–December.

Distribution: Himalayas, northern Vietnam, China (Guangdong, Fujian, Sichuan).

Note: Gressitt and Kimoto (1963a) treated *Gallerucida gebieni* (Weise), as a synonym of *G. singularis*. However Kimoto (1967) retracted this, and recorded his specimens from Hong Kong as *gebieni*, which he subsequently moved to the genus *Leptarthra*. In a more recent publication (Kimoto, 1989), he refers to these specimens as *G. singularis*, which I have followed here, mainly because the anterior process of the metasternum is not a character of the genus *Leptarthra*.

Pale form

Darker purplish form

Mesosternum largely covered by an anterior process of the metasternum is diagnostic of this tribe.

Galerucini

The rough texture of the pronotum is indicative of this tribe; for other diagnostic features see the Key to Tribes of *Galerucinae* above. Six species in three genera have been recorded in Hong Hong.

Key to species of Galerucini

1.Primary setigerous pore on anterior part of lateral margin of pronotum and not actually on the corner, as in other genera in this tribe. . . . . *Apophylia flavovirens*
—Primary setigerous pore on anterior corner of pronotum 2

2. Disc of pronotum with a large glabrous space in the middle . . . . . *Galerucella grisescens*
—Disc of pronotum entirely covered by hairs, but in some cases anterior and lateral margins glabrous 3

3. Elytron reddish brown with all margins black, though this is sometimes difficult to see in the centre of the anterior border. Pronotum with three dark spots. Length 3.7-4.5mm . . . . . *Pyrrhalta nigromarginata*
—Without dark margins to the elytra 4

4. Antenna almost ½ length of body; pronotum and elytron sparsely covered with erect hairs; dorsum reddish brown with middle of vertex, three spots on pronotum, scutellum (except reddish apical area), and humeri, blackish; length 6-7mm. . . . . *Pyrrhalta maculicollis*
—not as above 5

5. Length 6.5-7.5mm; elytral epipleuron not always distinct in apical third or half. Yellowish brown or brown; pronotum with a black spot near side; apical end of femora and bases of tibiae black . . . . . *Pyrrhalta kwangtungensis*
— Length 3.5-3.8mm; antennae blackish with bases of basal segments yellowish; anterior border of pronotum glabrous; apex of scutellum truncated, at apex testacous; vertex sometmes black at middle; elytron testaceous usually with humeri black; meso- and metathorax and in some cases abdominal segments 1-3 also blackish . . . . . *Pyrrhalta pusilla*

02. ***Apophylia flavovirens*** (Fairmaire, 1878)


Length 4.5-5.8mm. Pronotum en-tirely yellowish brown (much darker in old specimens); elytra green; eye large, gena narrower than half transverse diameter of eye; abdomen entirely black. The genus is unusual in having distinct sexual dimorphism in the structure of claws, which are bifid in males and appendiculate in females.

This species was first recorded in Hong Kong by Thompson (California Academy of Science) in 1909.

Host: common on several local grass species and has been recorded as a pest on Maize *Zea mays* Lin.

Imago: March–October.

Distribution: Korea and China (Fujian, Anhui, Zhejiang, Hebei, Hubei, Sichuan, southeastern Tibet, Hainan and Guangdong).

03. ***Galerucella grisescens*** Joannis, 1866

Length 3.7-5.5mm. Orange or dirty brown (darker orange in older specimens) with the following black or piceous: eyes, scutellum, antennae and parts of the legs. The posterior point of the scutellum often has a notch in the middle. Sutural angle of elytron obtusely rounded; antennal segments 7-10 each two times as long as broad; glabrous discal area of pronotum strongly widened anteriorly, reaching anterior angles. This species was first recorded in Hong Kong by Thompson (California Academy of Science) in 1909.

Host: *Polygonum* spp. and *Rumex* spp.

Imago: March–October.

Distribution: Huge range from Europe, Siberia, throughout China to Japan, Korea, Taiwan and Vietnam.

04. ***Pyrrhalta kwangtungensis*** Gressitt & Kimoto, 1963

Length 6.5-7.5mm. Dirty yellow (or ochraceous in older specimens) with black eyes and a black dot on both sides of the pronotum. Legs yellow (ochraceous in older specimens) with apices of femora and extreme bases of tibiae pitch black. This species is endemic to Guangdong province and Hong Kong. A paratype of this species was taken from Hong Kong in 1909. It is one of the earliest Galerucinae species to emerge, adults having been recorded as early as 16 January, and is common by February or March; scarce after May.

Imago: January-August.

Distribution: China (Guangdong).

05. ***Pyrrhalta nigromarginata*** (Jacoby, 1885)

Length 3.7-4.5mm. Oblong, subparallel-sided; yellowish brown; middle of vertex, scutellum and all margins of elytron blackish, metathorax and three spots on pronotum much darker than ground colour. This is a rare species, the type originated from Japan (but has since been unrecorded there), one record from Hainan and three records at Tai Po Kau, Hong Kong, the first being reported by Kimoto 1967.

Imago: March–April.

Distribution: Japan and China (Hainan).

06. ***Pyrrhalta maculicollis*** Motschulsky, 1853

Length 6-7mm. Antenna almost half length of body; pronotum and elytron sparsely covered with erect hairs; dorsum reddish brown; with middle of vertex, three spots on pronotum, scutellum (except reddish apical area), and humeri, blackish. This species is listed as occurring in Hong Kong by Ogloblin (1936).

Host: *Ulmus* spp. In northeastern China this species is classified as a pest on elms.

Imago: May–August.

Distribution: SE Siberia, Japan and China (Liaoning, Hubei, Henan, Jiangsu, Zhejiang, Fujian, Jianxi and Guangdong).

07. ***Pyrrhalta pusilla*** Duftschmidt, 1825

Length 3.5–3.8mm. Antennae blackish with bases of basal segments yellowish; anterior border of pronotum glabrous; apex of scutellum truncated at apex; testaceous; vertex sometimes black at middle; elytron testaceous usually with humeri black; meso- and metathorax and in some cases abdominal segments 1-3 also blackish. This species was recorded as occurring in Hong Kong by Liu (1935).

Imago: September.

Distribution: Europe, Russia and China (S. Shanxi, Shandong, Jilin and Liaoning).

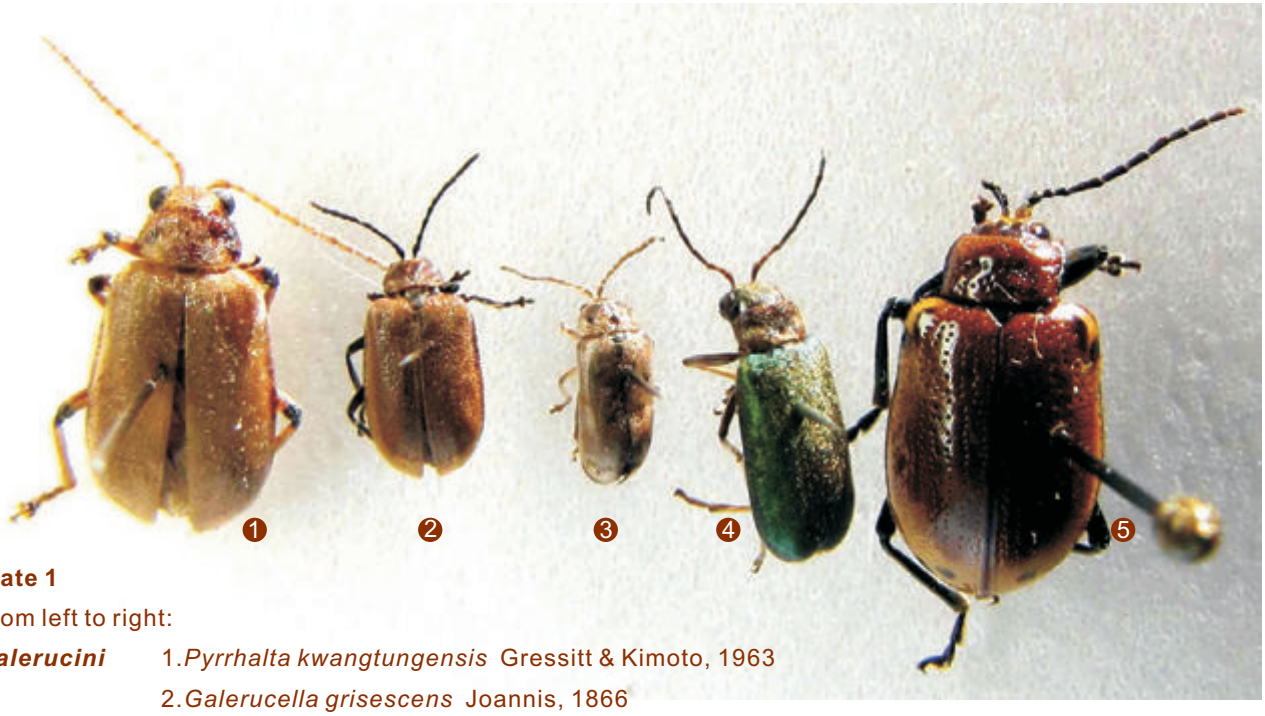


Plate 1

From left to right:

Galerucini 1.*Pyrrhalta kwangtungensis* Gressitt & Kimoto, 1963
2.*Galerucella grisescens* Joannis, 1866
3.*Pyrrhalta nigromarginata* Jakoby, 1885
4.*Apophylia flavovirens* Fairmaire, 1878

Gallerucidini 5.*Gallerucida singularis* Harold, 1880

Luperini

This is by far the largest tribe, in China, containing roughly four times the number of species as the two previous tribes combined. This tribe has been divided into four groups.

Key to species of Luperini

1.Tarsal claws bifid. . . . . Luperini Group 1
—Tarsal claws not bifid 2

2. Anterior coxal cavities open behind or partly open. 3
—Anterior coxal cavities closed behind . . . . . Luperini Group 4

3. Posterior tibia unspined . . . . . Luperini Group 2
—Mid and posterior tibia with spines . . . . . Luperini Group 3

Key to the species in Luperini Group 1

1.Pronotum without a transverse depression; disc sub-evenly convex. Body broadly ovate; elytral epipleuron wide, inferior, recurved basally. 2
—Pronotum with a transverse depression, sometimes divided in the middle 3

2. Elytral disc almost entirely metallic blue or green . . . . . *Oides bowringi*
—Elytron with five distinct subround spots, each smaller than spaces between spots, usually 2:2:1; elytral epipleuron at middle quarter as wide as disc; pronotum unspotted . . . . . *Oides decempunctata*

3. Tibiae distinctly spined apically 4
— Tibiae not distinctly spined apically; elytral epipleuron narrow but distinct almost to the apex . . . . . *Hoplasoma unicolor*

4. Elytral epipleuron strongly narrowed behind basal third, abbreviated behind middle . . . . . *Aulacophora*
—Elytral epipleuron gradually narrowed posteriorly . . . . . *Agetocera mirabilis*

08. ***Oides bowringi*** (Baly, 1863)

Length 12.5-15mm. In the male one or both of these characters may be present: (1) the first segment of the tarsi of the front and middle legs is more dilated than the corresponding segment on the hind legs; (2) the apex of the last visible abdominal sternite is strongly and obliquely cut away on each side.In both sexes the elytral disc is almost entirely covered with a broad metallic blue or green stripe extending most of elytral length, though the width of the stripe does appear to be quite variable. This species was described from Hong Kong.

Host: species of *Schisandraceae.*

Imago: June–September.

Distribution: Japan, Korea and China (Guangdong, Fujian, Jianxi, Hubei, Sichuan and southeastern Tibet).

09. ***Oides decempunctata*** (Billberg, 1808)

Length 10-12mm. Rich orange. Pronotum unspotted. Each elytron with five distinct subrounded spots, each smaller than spaces between. Elytral epipleuron at middle quarter as wide as disc. Hoffman (1932) Lingnan Sci. Jour, I I page 565, gave notes on the life history of this species. This species was first listed as occurring in Hong Kong by Redtenbacher in 1868.

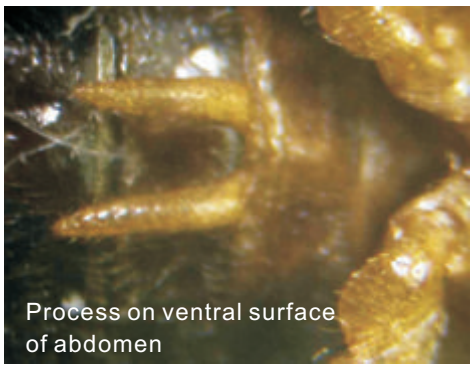
Host: *Vitis vinifera* L.

Imago: May-October.

Distribution: Korea China (as far west as Sichuan).

10. ***Hoplasoma unicolor*** (Illiger, 1800)


Adult


Process on ventral surface of abdomen


Bifid claw

Length 7-8.5mm. This genus is characterized by the prothorax being much narrower than the base of the elytra. General colour shining yellow brown. The colour of the abdomen and other parts of the underside varies from black to dark brown or piceous. Prothorax with side slightly sinuate and with basal and apical angles prominent; pronotal disc with transverse depression barely reaching forward of middle; elytron sub-regularly punctured and without carinae on disc. Males of this species possess two processes extending from the posterior margin of the second abdominal segment (centre photo above).

Host: *Clerodendrom inerme* (L).

Imago: June–September.

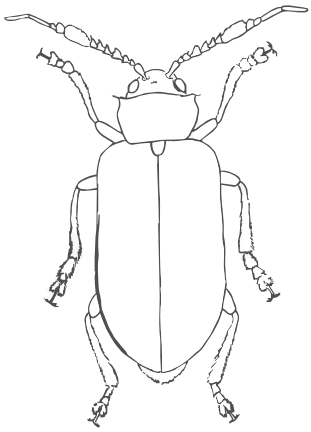
Distribution: India, Burma, Malaysia, Philippines, Vietnam and China (Hainan, Jianxi and Guangdong).

11. ***Agetocera mirabilis*** (Hope, 1831)

Length 13.5-16mm. Large species. General colour bright yellow, yellow brown or dark brown. The elytra deep violet or purplish blue. Antennae pale on basal half, with segment 4 deformed, somewhat sinuate. Male: antennae segment 8 very large, segment 9 very broad basally and bearing a large flat membrane-like surface. The last visible sternite is divided into three lobes, the medium being depressed in the middle. Female: The last visible sternite is uniformly and widely emarginate at the apex. The type of *Aplosonyx heterocera* Redtenbacher, 1868, a synonym of this species, was taken in Hong Kong.

Imago: June-September.

Distribution: Nepal, India, Burma, Laos, Vietnam and China (Hainan and Zhejiang).


Agetocera mirabilis after Maulik 1935

Key to species of ***Aulacophora***

1.Elytron black, or at least black on entire basal half. 2

—Elytron entirely pale; antennal scape broadened and humerus covered with erect hairs in male; scutellum not black . . . . . *Aulacophora indica*

2. Antenna segments 3-5 of male strongly broadened. Antennal segment 3 longer than broad, flat and subtriangular; antennal segment 4 broader than long, quite flat, produced endo-apically. Medium ridge of frontoclypeus of female much shorter than scape . . . . . *Aulacophora palliata*

—Antenna of male not specially modified, but sometimes rather stout 3

3. Male antennae with segments fairly stout, but not otherwise modified; head entirely pale; elytron slightly uneven, not very shiny, with punctures mostly one third to half as wide as interspaces . . . . . *Aulacophora lewisii*

— Antennae of male rather slender. Legs almost entirely black; apex of last abdominal sternite of female nearly transverse . . . . . *Aulacophora nigripennis*

12. ***Aulacophora indica*** (Gmelin, 1790)

Length 6.4-7.5mm. Dorsal surface entirely pale, except for eyes which are black. In male antenna scape broadened but inter-antennal area not modified. Humerus covered with erect hairs in male. *A. femoralis* and *A. similis* are synonyms of this species. This is a wide ranging species, first recorded in Hong Hong by Muir in 1906.

Host: Cucurbitaceae.

Imago: April-October.

Distribution: E Siberia, Vietnam, Korea, Japan, Philippines, SE Asia and China (Hebei, Shaanxi, Shandong, Jiangsu, Zhejiang, Fujian, Guangdong, Jiangxi, Hubei, Sichuan, southeastern Tibet, Guizhou, Yunnan and Hainan).

13. ***Aulacophora palliata*** (Schaller, 1783)


Male


Male antennae


Female antennae

Length 6.5mm. Elytra and eyes black, rest of body orange (bright brown in older specimens). Best distinguished from *A. lewisi*i by the male antennae, which are only very slightly modified in that species. Also in *A. lewisii* the head, pronotum and underparts are testaceous to brownish yellow in colour. Male: (1) head with a transverse ridge on each side of the vertical area; (2) antennae segments 1 and 3-5 modified (see photo); (3) last visible abdominal sternite tri-lobed. First recorded in Hong Kong by Kimoto 1967.

Imago: May-July.

Distribution: India, Vietnam and China (Hainan, Guangdong and Yunnan).

14. ***Aulacophora lewisi*** Baly, 1886

Length 5.3-6mm. Head, pronotum and underparts are testaceous to brownish yellow in colour. Male: (1) the last visible sternite is tri-lobed (2) the third, fourth and fifth segments of the antennae are very slightly thickened, more so than in the female. The type specimen is from Hong Kong Island.

Host: Cucurbitaceae.

Imago: March-December.

Distribution: Japan, India, SE Asia and China (Sichuan, Jiangxi, Fujian and Guangdong)

15. ***Aulacophora nigripennis*** Motschulsky, 1857.

Length 5.6-6.3mm. Distinguished from other similar species by almost totally black legs. In the male, the last visible sternite is tri-lobed and antennal segments 3-5 are somewhat thicker than in the female.

Host: *Glycine max* (Lin.)

Imago: March-October.

Distribution: E Siberia, Korea, Japan, Vietnam and China (Taiwan, Hainan, Sichuan, Jiangxi, Anhui, Fujian and Guangdong).

Plate 2 Luperini Group 1 .

From left to right: 1. *Oides bowringi* Baly
2. *Oides decempunctata* Billberg
3. *Hoplasoma unicolor* (Illiger)
4. *Aulacophora indica* (Gmelin)
5. *Aulacophora palliata* (Schaller)
6. *Aulacophora lewisi* Baly
7. *Aulacophora nigripennis* Motschulsky

Key to the species in Luperini Group 2

1.Anterior and posterior borders of pronotum unmargined, though posterior border with two tubercles either side of centre; prothorax no broader than long; body slender .. . . . . *Cerophysella basalis*

– posterior border of pronotum margined 2

2. Anterior border of prothorax unmargined. Pronotal disk with distinct impressions 3

– Anterior border of prothorax margined, elytra more or less glabrous. Pronotum with distinct depressions. Antennal segments with with close pubescence beyond segment 4, which is longer than 2+3. Mesosternum narrow and not connected with metasternum. Elytral epipleuron wide basally and narrowing in basal third . . . . . *Mimastra* sp.

3. Elytra non-carinate. Dorsum glabrous; body elongate-oval, widened posteriorly; occiput smooth; penultimate segment of maxillary palp moderately thickened; antennae slightly more than half as long as body; antennal segments 7-8 enlarged in male. Length 5-5.6mm . . . . . *Taumacera biplagiata*

– Elytra longitudinally carinate behind humerus, generally with a groove separating two carinae posteriorly; gena short; eye very large in male . . . . . *Hoplosomoides* sp.

16. ***Cerophysella basalis*** (Baly, 1874)

Length 5–6mm. This is a highly variable species, but the two tubercles on the otherwise unmargined posterior border of the pronotum and the male having two depressions either side of the elytral suture, just behind the scutellum (sketch right with scutellum grey and depressions black) make this species quite distinctive. Several forms are known: (1) basal part of elytra black, elytra otherwise reddish, as in photo on the left above; this seems to be the commonest form in Hong Kong and very similar to the syntype in Harvard University; (2) elytra entirely black, as in centre photo above; (3) elytra black with a yellowish area in the middle; (4) entire elytron yellowish or reddish. Almost always found on grass, usually at dawn after the dew has formed. It can be found from sea level to over 900m altitude. Although fairly common, this is the first record for Hong Kong.

Imago: April–May.

Distribution: Japan, Vietnam and China (Guangdong, Hainan and Jiangxi).

17. ***Taumacera biplagiata*** (Duvivier, 1885)

Length 5-5.6mm. In addition to the sexual variations in the antennae structure there is also considerable colour variation, the thorax may be black or reddish brown and the elytron sometimes has a reddish brown spot. However, in Hong Kong most specimens are similar to the male (left) and female (right) pictured above. This species is invariably found on flowers of the open hillsides and scrubby forest. This species was originally described from Hong Kong.

Imago: April–May.

Distribution: China (Sichuan, Fujian, Guangdong and Hainan).

Key to species of ***Hoplosomoides***

1.Elytral carinae weak. Elytra pale . . . . . *H. annamitus*
—Elytral carinae quite sharp and distinct. Elytra black . . . . . *H. costata*

18. ***Haplosomoides annamitus*** Allard, 1888

Length 6mm. Prothorax weakly trapeziform, venter generally pitch-coloured. Dorsum dull testaceous. Prothorax slightly emarginate (obtusely) at middle of anterior margin. Although not particularly brightly coloured this species is quite distinctive with the shining head and pronotum and large, almost circular black eyes. In older publications this species is known as *Haplosomoides egena* Weise. This is a common species found from sea level to over 900m in altitude. First recorded in Hong Kong by Kimoto (1967).

Imago: April–June.

Distribution: Vietnam, India and China (Zhejiang, Guangdong, Fujian, Taiwan, Sichuan and southeastern Tibet).

19. ***Hoplosomoides costata*** (Baly, 1878)

Length 6–7mm. Elytron entirely black. Head, pronotum and legs bright orange fading to yellowish brown in older specimens. The costa on the elytra of this species is much more noticeable than in *H. annamitus*, but as with that species the large black eyes are a distinctive feature.

Imago: single Hong Kong record 5 July 2008 Pak Kung Au, Lantau, but in China April – July.

Host: in Japan has been recorded on a species of *Clerodendrum.*

Distribution: Japan, Vietnam and China (Taiwan, Hainan, Zhejiang, Fujian, Guizhou, Sichuan, Guangdong and southeastern Tibet).

Key to species of ***Mimastra***

1. Dorsal surface entirely brownish, except pronotum which may have indistinct dark markings. Third antennal segment nearly 1.5x times as long as second, and fourth more than twice as long as third. Pronotum with lateral margin rounded, and with a shallow pair of lateral depressions in addition to an anterior and a posterior median depression . . . . . *M. soreli*
– Dorsal surface with blackish or blueish markings 2

2. Prothorax with corners somewhat rounded. Elytron with apical third greenish or bluish, sometimes with a fine line extending forwards. Length 7.5–9mm . . . . . *M. unicitarsis*
– Prothorax with corners fairly angular. Elytron with at least apical two fifths steel blue to purplish. First tarsal segment of male anterior leg enlarged and rounded. Length 9–10 mm . . . . . *M. cyanura*

20. ***Mimastra cyanura*** (Hope, 1831)

Length 9–10mm. This species is similar to *M. unicitarsis* in general colouration, but unlike that species the corners of the prothorax are angular and the first tarsal segment of the anterior leg is rounded in a similar way to *M. soreli*. This is not a common species in Hong Kong and as far as I am aware has only been recorded with certainty by Kimoto in April and May 1965 (Kimoto 1967).

Imago: April–May (June in China).

Distribution: India and China (Fujian, Jiangxi, Guangdong, Hubei, Sichuan and southeastern Tibet).

21. ***Mimastra soreli*** Baly, 1878

Length 7.5-9mm. Pronotum 1.5x times as wide as long. In the male the first segment of the anterior tarsi is expanded and round (photo above left and centre). Female (above right) cannot be identified with certainty in Hong Kong unless with male, due to possible confusion with a locally recorded form of *M. unicitarsis* (see under that species for notes). This is the commonest species of *Mimasta* found in Hong Kong and can be frequently seen on various flowers in spring. First recorded in Hong Kong by Kimoto (1967).

Imago: March–June, though recorded to August in China.

Distribution: Thailand, Vietnam, China (Jiangsu, Zhejiang, Fujian, Guangdong and Sichuan).

22. ***Mimastra unicitarsis*** Laboissiere, 1940

Length 7.5–9mm. This species has the anterior of the elytra with a metal blue colouration. However, Kimoto (1967) noted that the only specimen of this species he collected in Hong Kong was ''Distinctly different from any other known form of *M. uncitarsis*, in having elytra entirely brownish''. First recorded in Hong Kong by Kimoto (1967).

Imago: April–June (to July in China).

Distribution: Myanmar, Thailand, Laos and China (Zhejiang, Fujian, Jiangxi, Guangdong and Yunnan).

From left to right:
1. *Cerophysella basalis* (normal form)
2. *C. basalis* (dark elytra form)
3. *Taumacera biplagiata* (female)
4. *T. biplagiata* (male)
5. *Haplosomoides annamitus*
6. *H. costata*
7. *Mimastra soreli* (male)
8. *M.unicitarsis* (male)

Key to the species in Luperini Group 3

1.First segment of posterior tarsus distinctly shorter than remainder combined. Elytral epipleuron distinct only before middle. Abdominal segments yellowish with a pair of black markings on each. Pronotum yellow with a row of large dark or black spots. Elytra dark or black. Length 7.5-8.5mm . . . . . *Morphosphaera chrysomeloides*

— First segment of posterior tarsus as long as, or longer than remainder combined. Dorsal surface glabrous or elytron sparsely covered with short hairs. Elytral epipleuron wide at base. Anterior border of pronotum unmargined. . . . 2

2.Anterior margin of labrum emarginate. Postantennal swellings widely separated by frons. Frons broad, depressed in middle, without a longitudinal interantennal ridge . . . . . *Sinoluperus subcastatus*

— Anterior margin of labrum entire; postantennal tubercles elongate, triangular and not widely separated by frons. Frons not depressed but with a longitudinal inter-antennal ridge. Setigerous pore set back one fifth to one sixth of length of pronotum from anterior angle . . . . . *Medythia suturalis*

23. ***Morphosphaera chrysomeloides*** (Bates, 1866)

Length 7.5-8.5mm. Elytral epipleuron distinct only before middle. Abdominal segments yellowish with a pair of black markings on each. Pronotum yellow with a row of large dark or black spots. Elytra dark or black. In older publications this species is known as *Oides chrysomeloides*. Two specimens of this species were collected from Hong Kong by Stimpson prior to 1884 according to Duvivier (1884); possibly unrecorded since, other than from Taiwan, where quite common.

Distribution: China (south China? and Taiwan).

24. ***Sinoluperus subcostatus*** Gressitt & Kimoto, 1963

Length 5.5mm. A distinctive feature of this species is the very broad concave frons. Pale ochraceous and slightly reddish on parts of the elytra. Antennae thinly clothed with fairly short oblique pale hairs. Head and posterior of elytra with just a few sub-erect hairs. Collected in Hong Kong by T.K. Ho in 1940 (Gressitt & Kimoto, 1963a).

Imago: May (May–August in China).

Distribution: China (Jiangxi, Guangdong, Sichuan, Hainan and Zhejiang).

25. ***Medythia suturalis suturalis*** (Motschulsky, 1858)

Length 3.4-3.9mm. This very distinctive species is unlikely to be mistaken for any other species occurring locally. Distinguished from other subspecies by the black elytral stripe extending to the humerus. Named in older publications as *Paraluperodes suturalis* or *Luperodes suturalis*.

Host: *Glycine max* (Soybean).

Imago: May–October.

Distribution: Indonesia, Vietnam, Philippines, Japan and China (Hainan, Guangdong, Sichuan, Taiwan). Other subspecies found in northern China, Russia, Korea and Japan.

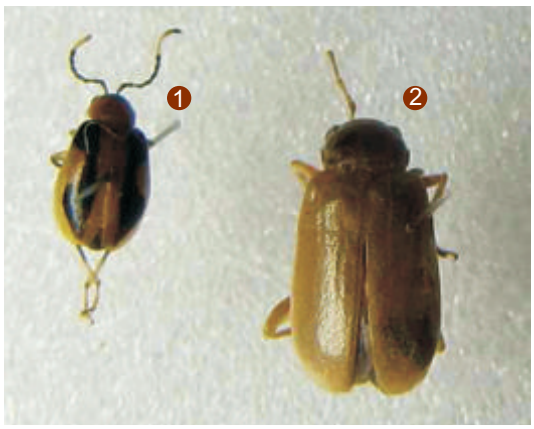


Plate 4 Luperini Group 3.

From left to right:

1. *Medythia suturalis suturalis*

2. *Sinoluperus subcastatus*

Key to species in Luperini Group 4

1. First segment of posterior tarsus distinctly longer than remainder combined. Tibia with a long spine at the apex .M . soreli 2
— First segment of posterior tarsus usually shorter than or sometimes equal to the remainder combined (include here *Trichobalya bowringii* which has the first segment of posterior tarsus longer than remainder, but only has a small spine at apex to tibia) 3

2. Elytral epipleuron gradually narrowed behind, and wider at middle than half width in basal portion. Apex of elytron not truncate but rounded . . . . . *Sermyloides* sp.
— Elytral epipleuron suddenly narrowed at end of basal third and distinctly narrower at middle than half width in basal portion . . . . . *Monolepta* sp.

3. Basal border of pronotum not margined except near side. Posterior corner of of pronotum rounded and sub-obtuse. Antennae robust, segments 2 and 3 subequal. Pronotum without a distinct fovea laterally . . . . . *Sphenoraia nebulosa*
— Basal border of pronotum entirely margined 4

4. Pronotum with a pair of short longitudinal furrows which start from the basal margin . . . . . *Sphenoraia nebulosa*
— Pronotum without longitudinal furrows. Posterior tibia with a single spine at apex 5

5. Pronotum without a distinct depression laterally. Antennae barely longer than half body length. Prosternum narrow, but visible between coxae. Anterior border of pronotum strongly emarginate . . . . Pseudoides tibialis
— Pronotum with a distinct depression laterally. Each elytron with double rows of longitudinal punctures, with a short scutellar row, interstices raised between double rows. 6

6. Dorsal surface of elytron thickly covered by hairs . . . . . *Trichobalya bowringii*
— Elytra surface sparsely covered by hairs. . . . . *Theopea smaragdina*

26. ***Sermyloides* sp.**

This is quite a distinctive genus with at least eight species previously being recorded in China, none of which matches this species. Length 5.4mm. Upper parts testaceous. The front of head has a deep frontal cavity with a central transverse ridge and on the border of this frontal cavity, close to the eyes and antennal insertions is a hairy ridge. The above photos, of the only specimen of this species recorded in Hong Kong, were taken by Yiu Vor on 15 April 2007, at Yi Tung Shan.

Key to species of ***Monolepta***

1. Dorsal surface of elytra with at last some black or piceous areas other than on the extreme basal margin 2
— Other than on the extreme basal margin, no black or piceous areas on dorsal surface of elytra 5

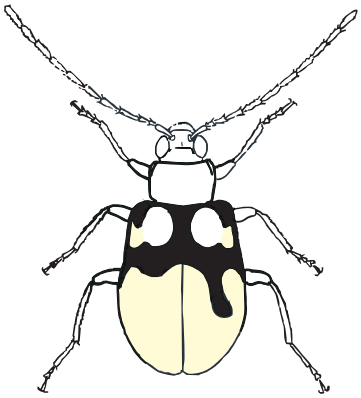
2. Elytron of male with a longitudinal cavity on outer part of disc. In female suture depressed behind scutellum, then slightly raised at end of basal ¼ and behind this a small shallow depression on suture. Elytron with 3 black bands and 2 pale bands. Length 4.5–5mm . . . . . *M. cavipennis*
— Not as above 3

3. Elytral ground colour orange with basal area (other than on lateral, basal or sutural margins) and discal spot in the apical area of elytra piceous . . . . . *Monolepta* sp. 1
— Not as above 4

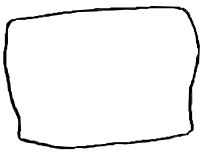
4. Elytra with black, yellow and gold markings as illustrated on right . . . . . *M. hieroglyphica*
— Ground colour of elytron black, with two yellowish markings (before and behind middle). Head, thorax and abdomen reddish brown . . . . . *M. signata*

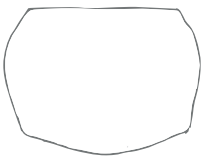
5. Ground colour of elytron pale reddish brown, with two yellowish markings (before and behind middle). Head, thorax and abdomen reddish brown . Monolepta sp. 2
— Ground colour yellow to yellow brown 6

6. Pronotum subquadrate (sketch right) and the elytra sub-parallel-sided. Specimens yellowish brown in colour (much paler in life), except metathorax, lateral half of basal margin of elytra and basal half of interior margin of elytral epipleurae blackish. Length 3–3.8mm . . . . . *M. hongkongense*
— Pronotum distinctly wider anterior of centre (sketch right). Apical two thirds of elytral epipeuron narrow. Abdomen yellowish with meso- and metathorax slightly darker. No black or dark patches on elytra. Length 2.2–2.8mm . . . . . *M. palliparva*



Above: *Monolepta hieroglyphica*





27. ***Monolepta cavipennis*** Baly, 1878

Length 4.5–5mm. This is quite a common and easily identified species. Elytron with three black bands and two pale bands. Male: photo above right with a longitudinal cavity on outer part of disc. Female: photo above left with suture depressed behind scutellum, then slightly raised at end of basal quarter and behind this a small shallow depression on suture.

Imago: March–November.

Distribution: India, Thailand, Vietnam and China (Guangdong, Hubei, Sichuan).

28. ***Monolepta sp.*** 1

Length 4.5–5 mm. Elytral ground colour orange, with basal area (other than on lateral, basal or sutural margins) and discal spot in the apical area of elytra piceous. Much darker in older specimens. First three antennal segments orange, other segments almost black.

Imago: recorded in April–May on Lantau Island, Hong Kong.

29. ***Monolepta hieroglyphica*** (Motschulsky, 1858)

Length 3.5–4 mm. See sketch of this species in the key to the species of *Monolepta*. Basal margin and basal half of lateral and sutural margins, humerus and a transverse band, which is joined with lateral and sutural margins, black. In some cases transverse band not reaching lateral margin. Abdomen yellow brown. Metathorax black.

Imago: May–October in China.

Distribution: SE Asia and China (Jilin, Liaoning, Hubei, Sichuan, Jiangxi, Fujian, Guangdong, Shanxi, Henan, Zhejiang, Taiwan, Yunnan, Guizhou, Yunnan and Nei Mongol).

30. ***Monolepta signata*** Olivier, 1808

Length 3–3.8mm. Ground colour of elytron black with two yellowish markings (before and behind middle). Head, thorax and abdomen reddish brown in older specimens, much brighter in fresh specimens.

Imago: March–September.

Distribution: India, Burma, Thailand, Vietnam and China (Yunnan, Sichuan, Fujian, Guangdong, Gwangxi and Hainan).

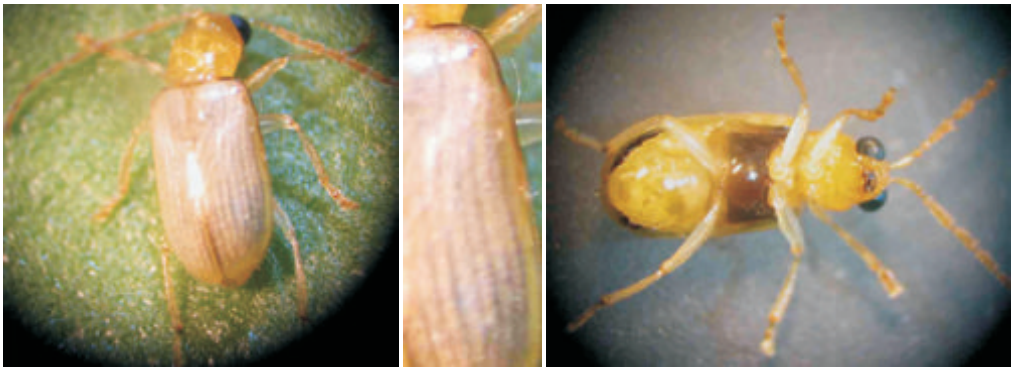
31. ***Monolepta* sp. 2**

Length 3.2–3.6mm. Specimens are slightly smaller than *M. signata* and have basal colour of the elytra a bright orange brown (less bright in dead specimens); other than that they are quite identical to that species. It is quite possible this may simply be a form of *M. signata*.

Imago: June-October.

32. ***Monolepa hongkongense*** Kimoto, 1967

Length 3–3.8mm. This species together with *M. palliparva* appears to be the commonest very small pale Galerucine in Hong Kong. They are both easily overlooked due to their inconspicuous colouration and tiny size. Yellowish brown in colour (much paler in live insects), except metathorax (photo above right), lateral half of basal margin of elytra (centre photo above) and basal half of interior margin of elytral epipleurae blackish. The pronotum of this species is subquadrate and the elytra subparallel-sided. This species was described from Hong Kong and to date has not been recorded elsewhere.



Imago: May–June.

33. ***Monolepta palliparva*** Gressitt & Kimoto, 1963

Length 2.2–2.8mm. Fresh individuals are much paler than older specimens. Antennal segment 1 slender, slightly arched; segment 2 swollen, twice as long as broad; 3 barely longer than 2. First three segments more or less the same colour as pronotum; antennae otherwise pitchy brown, apical segment slightly reddish. Unusually for any Chrysomelidae the individual to the right was circling about 5cm off the ground over bare earth, on which it landed well away from any plant. This species was first recorded in Hong Kong by Kimoto (1965).

Imago: May–October.

Distribution: China (Guizhou, Yunnan and Jiangxi).

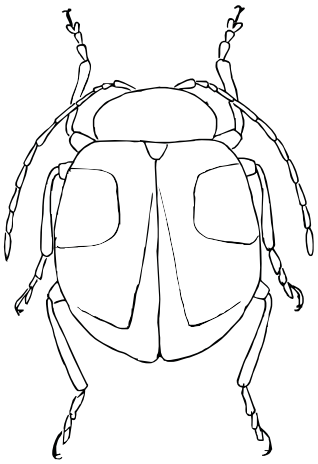
34. ***Sphenoraia nebulosa*** (Gyllenhal, 1808)

Length 5.5–7 mm. Elytron entirely irregularly punctured. Dorsal surface reddish to yellowish brown with seven black spots; the pronotum pale with two black spots. Elytron can be blackish in some specimens. Antennae very robust. I am slightly uneasy placing this name with this species as it seems quite different to Maulik's (1935) description and the illustration of the type. However Kimoto (1989) illustrates this species. The species may be confused with the Chrysomelinae species *Gonioctena tredecimmaculata*.

Imago: March–September (commoner after July).

Distribution: India, Burma, Thailand, Laos, Vietnam and China (Hainan and Guangdong).

35. ***Cassena tricolor*** (Gressitt and Kimoto, 1963)



Length 5.5mm. Head, prothorax and scutellum reddish ochraceous. Antennae pitchy back, reddish on scape. Elytron pitchy black on basal two thirds except for a very large testaceous spot immediately behind the humerus as well as a reddish sutural stripe which widens posteriorly. Apical third of elytra testaceous. Holotype from Yuen Long, September 1940. Illustration right after Gressit and Kimoto (1963).

[Pseudoides tibialis (Chen, 1942).]

Length over 5mm. This species is included as it is listed by Hua (2002) as occuring in Hong Kong, but there is no information on specimens. Dorsum entirely pale except extreme margins of elytra. Prothorax about three fifths as long as broad. Middle antennal segments about 4x as long as broad. Elytral punctures distinct.

Distribution: China (Fujian and Guangxi).

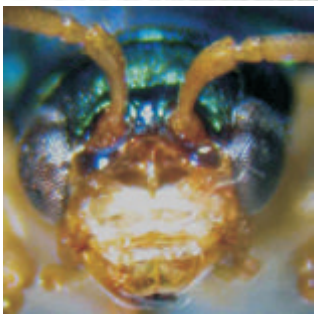
36. ***Trichobalya bowringii*** (Baly, 1890)

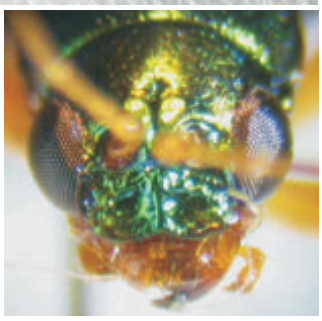
Length 5–8mm. Head and pronotum reddish brown. Pronotum nearly one and a quarter times as wide as long. Elytron violaceous to bluish black. The type of this species is from Hong Kong. Gressitt and Kimoto (1963a) give a rather confusing key to this species; however Baly's 1890 original description is clearer and Kimoto (1989) gives a good workable description.

Imago: March–October.

Distribution: Thailand, Laos, Vietnam and China (Yunnan, Guangdong and Hainan).

37. ***Theopea smaragdina*** Gressitt and Kimoto, 1963

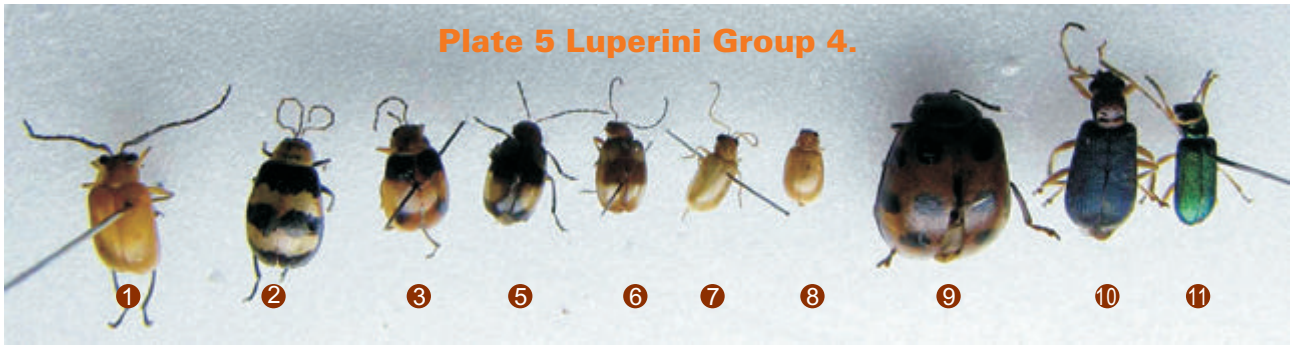




Length 4.5–5.8mm. A golden green colour with blue reflections. The male is characterised by a deep excavation in the frons (photo centre above) whereas the female has most of the face green. Note *T. coerulea* is a similar species which may well occur in Hong Kong, it has the antennae pitch brown with the pronotum having a fairly deep rounded impression either side of the disk, whereas in *T. smaragdina* it is more transverse.

Imago: April–July.

Distribution: China (Hainan and Guangdong).



From left to right:
1. Sermyloides sp.
2. Monolepta cavipennis
3. Monolepta sp 1
4. Monolepta hieroglyphica
5. Monolepta signata
6. Monolepta sp 2
7. Monolepa hongkongense
8. Monolepta palliparva
9. Sphenoraia nebulosa
10. Trichobalya bowringii
11. Theopea smaragdina

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Notes on biology and nests of a hover wasp, *Eustenogaster nigra* (Vespidae: Stenogastrinae), in Hong Kong

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Abstract

Active and abandoned nests of *Eustenogaster nigra* Saito & Nguyen, 2006 were collected in Hong Kong. They are described and the results presented in this paper. Additional notes on some aspects of the biology of this species are provided.

Key words:
Eustenogaster nigra, nests, geometry, colony, Stenogastrinae, Vespidae

Introduction

The Stenogastrinae or hover wasps are poorly studied, maybe as a result of the limited geographical distribution of the subfamily, and their shy habits and cryptic nest locations. They are however regarded as a very important subfamily for the study of insect behaviour, having developed behavioural traits marking the early phases of evolution of eusociality in social wasps (Turillazzi, 1991). In fact the Stenogastrinae represent the basal clade of the social Vespidae (Carpenter, 1991).

Plate 1. *Eustenogaster nigra*. Lateral view of a female. (Photo. Author)

Plate 2. *Eustenogaster nigra*. Dorsal view of a female. (Photo. Author)

The primitively eusocial hover wasp *Eustenogaster nigra* Saito & Nguyen, 2006 has been recorded from various localities in Hong Kong by the author. To the author's knowledge it is the only record of a Stenogastrinae species locally, Hong Kong being at the northern edge of the subfamily's geographical distribution. This species has commonly been misidentified as *Stenogaster seitula* (Bingham, 1897), a misspelling of the original designation *Ischnogaster scitula* by Bingham and a synonym of *Eustenogaster scitula* Nguyen & Khuat, 2003. This hover wasp is by no means uncommon locally and can be found all over the territory. This paper is a short description of the species with emphasis on nest structure.

Plate 3. *Eustenogaster nigra*. Head view of a female. (Photo. Author)

Distribution and morphology

This species has so far been recorded only from Thailand, northern Vietnam and China: in Hong Kong, "Yanping" and possibly Yunnan (Carpenter 1996; Saito et al. 2006).

Stenogastrinae can be differentiated from other eusocial wasps by the elongated petiole (first abdominal segment), bulbous thorax and elongated mandibles. They can be confused with solitary potter wasps (Eumeninae) but are readily differentiated by the following characters:

- morphology of the first abdominal segment, elongated with only a slight swelling at the posterior end, rather than notably bulbous as in Eumeninae;
- the projecting and acute or narrowly rounded clypeus rather than not projecting or broadly rounded in Eumeninae; and
- the nesting habits, both in terms of nest location, nest architecture and behaviour (social).

Females measure between 19.5 mm and 21 mm, while males are slightly smaller, rarely exceeding 20 mm. Dimensions are taken from the frons to the second abdominal segment due to the collapse of the final gastral segments in dried specimens.

Eustenogaster nigra locally is mainly black in coloration with a yellow mark on the mesopleuron (second thoracic segment) and an incomplete yellow band on the anterior part of the third metasomal segment, while the posterior half of the first metasomal segment has localised reddish hues. The clypeus is sharply pointed at the apex, eyes are bulbous and only slightly emarginated. The mesoscutum, scutellum, metanotum and propodeum are covered with fine white hairs. Wings are semi-hyaline and not folded longitudinally at rest, contrary to other Vespidae.

Biological notes

Nesting habits and nest morphology

Nests of this species are found in dark and humid places, either close to streams or in abandoned and ruined houses across the territory. They are affixed to their support on the dorsal side of the comb with no pedicel, the first cells having their ends reinforced and thickened, overlapping and enclosing the thread-like substrate: often strands of *Lygodium* sp. (climbing fern) or wires hanging loose from various structures (see plate 4 & 5). A gelatinous substance is placed on the substrate approximately 10 mm above the nest attachment on most nests observed to date (Plate 5). This substance is hypothesised to be an ant guard (Turillazzi, 1991) although it is not always present.

Plate 4. *Eustenogaster nigra*. View of a nest affixed to strands of *Lygodium* sp. Note the peculiar horn like extension build on the apical side of the nest as well as the windows on the tubular entrance vestibule. (Photo. Author).

Plate 5. ***Eustenogaster nigra***. A different nest of the same species. Note the gelatinous substance on the substrate and the fanning structure of the ventral part of the entrance vestibule. (Photo. Author)

The material used appears to be composed of very fine plant material (probably rotten wood pulp finely masticated by the wasp), with fibres less than 1/10 mm in length, mixed with occasional sand grains (very few) and a small amount of possibly salivary secretion. The presence of sand is possibly accidental and most likely the result of contamination due to a material source lying on the ground. The nest envelope and combs are extremely brittle and the whole structure rather fragile. It has been hypothesised that the inherent physical limitations of the nest material in Stenogastrinae may have inhibited the development of large colonies (Hansell, 1981). However, nests have been observed to withstand heavy rain and wind (tropical storm conditions). The nests are overall brown in colour with transverse strips of alternating lighter and darker shades indicating various sources of construction material.

Plate 6. ***Eustenogaster nigra***. An open nest showing larvae at various developmental stages. Note the unique larvae positioning: coiled around the long axis of the cells as opposed to parallel to this as in all other Vespidae. The two yellow masses are in fact pupae which are bend parallel to the long axis. The bottom cell reveals the gelatinous substance that has been deposited despite the lack of any egg.(Photo. Author)

The nest has the shape of an inverted flask in agreement with descriptions of nests in this genus. The envelope (pseudo-envelope) is in fact the continuation of the peripheral cells (Turillazzi, 1991 & 1996). The nest structure can be described as having three main components: a) the entrance vestibule; b) the vestibular chamber and; c) the comb proper.

The entrance vestibule is an elongated tube hexagonal in cross-section; the six surfaces fan out to form the outer layer of the vestibular chamber and intersect with the peripheral cell walls of the comb. Sometimes, the ventral part of the vestibule similarly fans out (Plate 5). The entrance vestibule is formed of the same material as the rest of the structure but is “meshed” with numerous “windows', gaps where no material has been laid. Each summit of the hexagon is reinforced by a ridge that twirls up the sides of the nest, terminating just before the dorsal side of the comb. Regardless of the cell number, there are always six major continuous ridges between the entrance vestibule and the comb's outer rim. These ridges are centred on six peripheral cells, here called base cells. The cells in between, the intercalary cells, may sometime develop a minor ridge when there is more than one intercalary cell between two base cells. The role of these ridges may be structural, giving higher resistance/rigidity to the structure and to the flimsy vestibule while optimising material usage.

The top of the nest reveals the outline of the cells inside, forming as many small near hemispherical bulges as there are cells. It is often crowned by flat crest-like protuberances or keels (Plate 4 & 5) with an unclear function; possibly they act as heat exchange devices and/or mimic dead leaves (Nguyen et al., 2006). These crests are apparently homologous to the ventral fanning structure of the entrance vestibule. These formations follow major and minor ridges but are not always present and clearly built asynchronically with the rest of the nest structure, as revealed by the different material colour (Plate 4 & 5).

All nests dissected to date had between eight and 21 cells with an average of 15 cells (see Table 1 for quantitative data on six nests). The cells are more-or-less hexagonal in section, some being near-circular; the width (cross-section) is even longitudinally (non-conical), the length varying from 13 to 16 mm with a diameter of six to seven mm. The cell walls are on average 0.5 mm thick. The comb occupies the top one-third of the nest. There is no marked variation in cell dimensions and they seem to be similar in size for males and females.

Colony founding and development

The colonies are probably founded by a single inseminated female (haplometrosis) and locally I have never found more than four individuals present in one nest, although up to 11 adults wasps have been recorded in northern Vietnam (Saito et al., 2006). Males are apparently produced throughout the colony cycle and possibly soon after the emergence of the first wasps. It has not been possible locally to determine the relationships within a colony, but it is probable there is no clear hierarchy within this species, as with other Stenogastrinae studied to date.

Saito et al. (2006) noted that unfertilised females and males over-wintered in a (possibly natal) nest, an observation not recorded for any other Stenogastrinae or even Vespidae (although it has been observed locally that some species of Eumeninae do over-winter in their last nesting site). Over-wintering remains to be demonstrated locally for *E. nigra*. However, nests are often re-used even though they have been abandoned the previous season (see Plate 7). This is in fact very unusual in Vespidae, possibly for hygienic reasons. Indeed in most Vespidae, the meconia (faecal matter) ejected by the post-feeding larva accumulates at the bottom of the cell and could be a source of fungal infection and also an attractant to scavenging insects. However, it has been noted that the adults of Stenogastrinae remove the meconia through the cell aperture, thanks to the unique position of the pupa inside (Kojima, 1990), thus eliminating the above problem.

A nest was reared and it was possible to examine the pupal process. There were no pupal caps; at pupation time the cells are merely covered by the active female(s) with a truncated hemispherical extension made of the same material as the rest of the structure, leaving an aperture to the pupating larvae inside, presumably as a way of extracting the meconium. The larva does not spin a complete cocoon but merely applies a thin silk lining on the cell walls.

As with other Stenogastrinae the larva is coiled around the long axis of the cell (Plate 6), in contrast to other Vespidae larvae which are always parallel to the long axis. The pupating larva is positioned with head towards the entrance; the metasoma is bent against the mesosoma.

The bottom of the cell is furnished with a gelatinous substance (homologous to the ant guard). This substance may serve several purposes (Turillazzi, 1991) such as:

- a tool for oviposition: before laying an egg the wasp secretes the substance from the tip of the abdomen which is transferred to the mandibles; she then bends her abdomen, lays an egg on it and deposits the mass in the cell with her mandibles. The egg is often covered by an extra droplet of the same substance, produced by the Dufour's gland;
- a resting substrate for the larvae; and
- a food and liquid store, or rather a way of storing & preserving food. Often this substance is mixed with nectar (Turillazzi et al., 2008).

Five larval instars are recognized within the family (Kojima, 1990), as with species of Vespinae and Polistinae.

Plate 7. *Eustenogaster nigra*. Re-used nests. The picture on the left shows the additions (in clear) to a nest that was in-occupied the year before the picture was taken. On the right a female has laid eggs in a structure that was partially destructed (Photos. Author)

Food sources

The specific diet of *Eustenogaster nigra* is unknown but the species is probably a specialist scavenger on arthropods caught in spider webs. Krombein (1991) examined the gut contents of larvae of *E. eximia* from Sri Lanka and found that they contained many araneoid fangs, suggesting that this species scavenges not only on arthropods caught in spider webs but on spiders also, most likely commensal individuals of larger species. Experimentally, *E. nigra* larvae readily accepted mashed-up crickets and caterpillars (John X.Q. Lee, pers.comm.).

Natural enemies

No direct record of predation by other wasps has been made locally, however circumstantial evidence suggest that some species of *Vespa* might be active predators of *E. nigra*. I witnessed *V. ducalis* actively searching an area with a cluster of nests, one with a severely damaged envelope, suggesting previous attacks (see plate 7). Hornets and many species of ants are known to attack Stenogastrinae nests (Turillazzi 1991). Predation by vertebrates has not been observed and is not well documented for the subfamily. The cryptic location of the nest as well as its external keels (mimicking leaves) may provide some level of protection against predators using visual clues for food source location.

Very few parasites are recorded from nests of Stenogastrinae (Turillazzi, 1991), and no such incidence has been observed locally.

Acknowledgments

I thank Fuki Saito, Natural History Laboratory, Faculty of Science, Ibaraki University, Mito, Japan and Junichi Kojima, Natural History Laboratory, Faculty of Science, Ibaraki University, Mito, Japan for identifying my specimens of *Eustenogaster nigra*; John X.Q. Lee in Hong Kong, China, for sharing enriching conversations and rearing experiences and John Fellowes (UK) for his patient review of the manuscript and the valuable comments made during the process.

Table 1: *Eustenogaster nigra*, nest quantitative data

Nest reference [c]	Date collected	Nest width (mm)	Nest length (mm)	Number of cells	Max. number of adults observed
SLT-1	05/05/2006	27	46	8	[a]
SLT-2	05/05/2006	40	[b]	21	1
SLT-3	05/05/2006	34	55	12	2
SLT-4	05/05/2006	30	50	13	[a]
TPK-3	20/07/2006	28	63	[b]	2
TPK-4	20/07/2006	36	70	21	4
Average 2.25		**32.5**	**56.8**	**1**	**5**

Notes:

a nest abandoned.

b not recorded.

c Nests referenced SLT were collected/observed from Sha Lo Tong village, Hong Kong, UTM: 50Q KK 103 885; 260 m asl. Those referenced TPK from Tai Po Kau Forest Reserve, Hong Kong, UTM: 50Q KK 094 813; 370 m asl

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Dragonfly emergence at a small newly-created pond in Hong Kong

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Abstract

Dragonfly (Odonata: Anisoptera) emergence was monitored at a small (0.02ha) pond in Hong Kong from March 2004 to July 2005. The pond was created in late 2003, with emergent vegetation established along the margin.

Dragonfly exuviae were much more abundant in 2004 (597 exuviae in 12 species) than in 2005 (49 exuviae in three species). Exuviae abundance was highest in March in 2004; April in 2005. In 2004, exuviae were recorded until September; in 2005, they were not recorded after May. Exuviae were estimated to have an average persistence of 3.4 days in the field.

Emergence patterns varied between species. Most aeshnids and libellulids emerged in March and April 2004, although *Anax guttatus* had a second pulse of emergence in June 2004; *Sinictinogomphus clavatus* and *Ictinogomphus pertinax* (Gomphidae), and *Epophthalmia elegans* (Corduliidae) were late emergers in 2004, their exuviae first appearing in June or July. The two gomphid species emerged in greater numbers in April and May 2005.

The dramatic decline of emergence in 2005 was probably due to the growth and proliferation of predatory fish in the pond.

More dragonfly species were recorded as adults than as exuviae, suggesting adult immigration. Surveys of adult dragonflies alone may not give a completely accurate impression of the value of particular ponds for breeding dragonflies.

Key words: Odonata, dragonflies, Anisoptera, Hong Kong, exuviae, emergence, pond.

Introduction

The colonisation by dragonflies (Odonata: Anisoptera) of newly-created wetlands was until recently poorly-studied in Hong Kong. Prior to the present study, no systematic attempt had been made to monitor dragonfly emergence, by identification and counting of exuviae, at any wetland site in the territory. This was mainly due to the relative ease of monitoring adult dragonflies by field observations, compared with collecting and identifying exuviae. However, as noted by Moore & Corbet (1990), the best method for monitoring odonate populations, particularly Anisoptera, at a specific wetland is to undertake regular counts of exuviae, and such counts should ideally be conducted daily, or failing this at a minimum of once per week throughout the emergence period. This is because exuviae provide irrefutable proof of successful breeding, and exuviae counts give a measure of the dragonfly production of particular wetlands.

Corbet & Hoess (1998) commented on the desirability of undertaking standardised exuviae collections, noting that exuviae normally remain on emergence supports for several days and, especially in Anisoptera, are conspicuous and readily identifiable to species, that counts of exuviae give a clearer picture of real dragonfly abundance than do male-biased counts of adults, and that numbers emerging from a small or medium-sized water body can usually be monitored by a single researcher.

In 2004 - 2005, the author had the opportunity to conduct a systematic study of dragonfly emergence at a small pond near Kam Tin, which had been created in late 2003, on land owned by the Kowloon-Canton Railway Corporation (KCRC).

Methods

Study site

The study pond, approximately 0.02ha, was excavated during 2003 (and completed by autumn of that year) at a site near Ho Pui, Kam Tin, New Territories (22°24'52" N, 114°04'13" E). Rushes (*Juncus*) and sedges (*Cyperus*) were established along the eastern and northern margins; while the western and southern margins held stands of emergent grass (*Panicum*), and a short stretch of reed (*Phragmites*). The pond was muddy-bottomed and sloped gently to a maximum depth of ca. 1.2m. No submerged or floating macrophytes were present. (Plate 1.)

Plate 1. The study pond

Exuviae surveys

Between the commencement of the study on 19 March 2004, and its cessation on 18 July 2005, 97 surveys of dragonfly exuviae were conducted at the study pond (following 18 July 2005, intermittent surveys were conducted until September 2005, but no further exuviae were observed). On each survey, the entire pond margin was searched, in a slow anti-clockwise walk. All anisopteran exuviae attached to the marginal vegetation or floating on the water surface were collected. Exuviae were subsequently identified with the aid of a dissecting microscope, using keys and illustrations provided by Zhou (1994), supplemented by various Japanese texts (Kawai, 1985; Ishida, 1996; Sugimura et al., 1991). Confirmation of exuviae identifications was occasionally made by association with teneral adults, either when the latter had failed to completely emerge from the exuviae, or when they were found perching in a deformed condition, and incapable of flight, beside their exuviae.

Survey frequency and persistence of exuviae in the field

Surveys were conducted on average more frequently than once per week, apart from the period 28 February to 28 March 2005, during which period the study was unfortunately suspended. From 19 March to 19 December 2004, mean interval between surveys was 4.5 days. From 3 January to 28 February 2005 it was 4.7 days, and from 28 March to 18 July 2005 it was 6.2 days.

Between March and June 2004, a total of 45 exuviae in the study pond were tagged (a length of red nylon string tied immediately below the exuviae on its emergence support, with date and species labelled), when known to be no more than three days (usually only one day) old. These tagged exuviae were not collected, and a note was made of the date on which they were found to be absent, in order to obtain an estimate of the mean length of time that exuviae remained in situ before being dislodged into the water or carried away by wind.

Results

Species present

Twelve species of Anisoptera were recorded as exuviae in the study pond between March 2004 and July 2005. These included two species of Aeshnidae, two of Gomphidae, one of Corduliidae and seven of Libellulidae (Table 1). A total of 646 exuviae was recorded over the 16 month study period. The most abundant species was the libellulid *Tramea virginia* (Rambur, 1842), of which 261 exuviae were collected, representing more than 40% of all exuviae. *T. virginia* exuviae were 2.5x more abundant than exuviae of the second and third most abundant species, *Anax guttatus* (Burmeister, 1839) and *Orthetrum sabina* (Drury, 1770). Exuviae were six times less abundant in 2005 than in 2004, and represented only three species.

Temporal trends in overall dragonfly emergence

A total of 180 exuviae, of five species, was recorded on the first survey date (19 March 2004). This was the highest total recorded on any survey date, and strongly indicates that dragonfly emergence was well under way by mid-March 2004. Numbers of exuviae declined in the ensuing months, with exceptions in June and August, when appreciable numbers of *A. guttatus* and *Sinictinogomphus clavatus* (Fabricius, 1775), respectively, were present. No exuviae were observed from 8 September 2004 to 28 February 2005. After 28 February 2005, surveys were suspended for four weeks. Upon their resumption on 28 March 2005, a single exuviae was recorded. Numbers rose appreciably in April 2005, mainly comprising *S. clavatus*, before declining in May. No exuviae were observed after May 2005. The overall dragonfly emergence from March 2004 to July 2005 is indicated in Figure 1.

Table 1. Dragonfly exuviae species and abundance in the study pond, 2004–2005

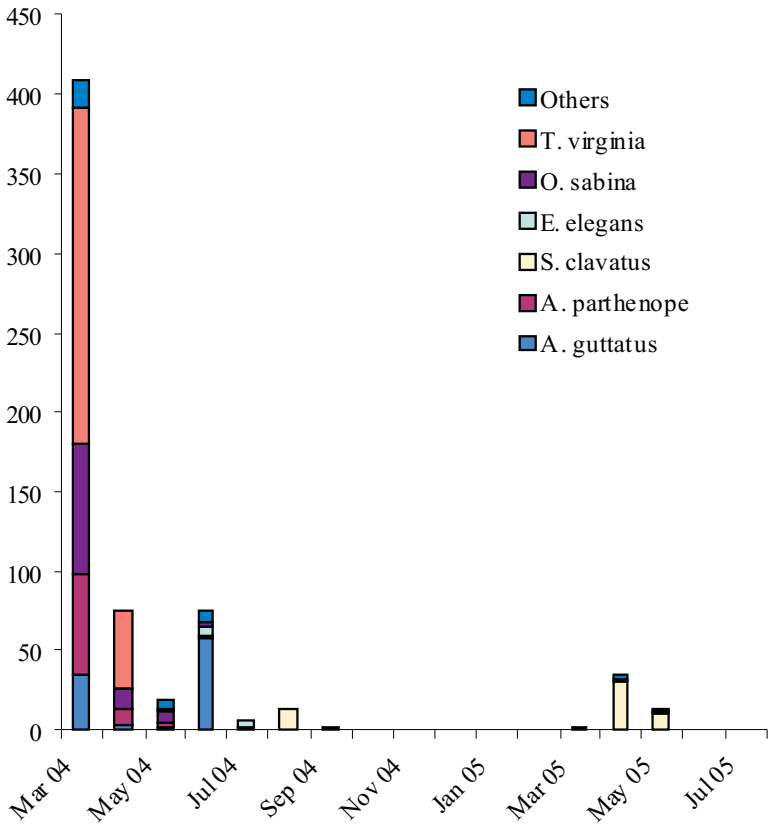
Species	Abundance	
	2004	2005
Anax guttatus	99 (16.6%)	
Anax parthenope	76 (12.7%)	
Ictinogomphus pertinax	2 (0.3%)	4 (8.2%)
Sinictinogomphus clavatus	15 (2.5%)	43 (87.7%)
Epophthalmia elegans	10 (1.7%)	
Brachythemis contaminate	1 (0.2%)	
Crocothemis servilia	2 (0.3%)	
Diplacodes trivialis	15 (2.5%)	
Orthetrum sabina	105 (17.6%)	2 (4.1%)
Pantala flavescens	10 (1.7%)	
Tramea virginia	261 (43.7%)	
Trithemis aurora	1 (0.2%)	
Total	**597 (100%)**	**49 (100%)**

Species emergence

Aeshnidae

The large aeshnid *A. guttatus* was the third most abundant species recorded during the study (99 exuviae in total). The species had two obvious emergence pulses in 2004, with 40 exuviae collected between 19 March and 14 April, and 56 during the month of June (accounting for 77% of all exuviae collected in that month). Two exuviae were collected in May, and a single exuviae collected on 2 July. No further exuviae were found in 2004, and none at all in 2005 (Figure 1; Plate 2). Another large aeshnid, *Anax parthenope* (Brauer, 1865) was the fourth most abundant species, with 76 exuviae. As with its congener, *A. guttatus*, this species emerged in large numbers from mid-March to mid-April (71 exuviae), and was not observed after June 2004; however, unlike *A. guttatus*, there was no second emergence pulse in June, with only two exuviae recorded in that month (Figure 1).

Figure 1. Abundance of dragonfly exuviae collected from the study pond



Gomphidae

Two exuviae of the large gomphid *Ictinogomphus pertinax* (Hagen in Selys, 1854) were collected in early June 2004, three in April 2005, and one in May 2005. *Sinictinogomphus clavatus* was quite scarce in 2004 (15 exuviae, recorded between 31 July and 5 September), but this large species accounted for 87.8% of all exuviae recorded in 2005 (43 exuviae, 31 of which were collected in April, and 11 in May). In August and September 2004, this was the only species which emerged from the study pond (Figure 1; Plate 3).

Corduliidae

Ten exuviae of the very large pond corduliid *Epophthalmia elegans* (Brauer, 1865) were recorded during the study; all in the period 20 June to 26 July 2004 (Figure 1; Plate 4).

Libellulidae

Tramea virginia was the most abundant species recorded in the study, although not seen after 18 May 2004. A total of 71 exuviae of this fairly large libellulid were collected on 19 March 2004, a further 108 five days later on 24 March, and 32 more on 27 March, amounting to 211 exuviae in the first eight days of the study. Numbers declined considerably in April (48 exuviae) and May (two exuviae). (Figure 1). *Orthetrum sabina* was the second most abundant species recorded in the study, and was present in both 2004 and 2005. In 2004, abundance was highest in March (82 exuviae) and steadily declined through April (13 exuviae), May (seven exuviae) and June (three exuviae). The species was not recorded again until 2005; single exuviae being collected in April and May of that year (Figure 1; Plate 5). Ten exuviae of *Pantala flavescens* (Fabricius, 1798) were collected in 2004; five in May and five in June. Thereafter, exuviae of this ubiquitous species were not observed. Only a single exuviae of the common pond libellulid *Brachythemis contaminata* (Fabricius, 1793) was recorded, on 24 March 2004, and only two exuviae of *Crocothemis servilia* (Drury, 1770), also in March 2004. In the same month, fifteen exuviae of the small libellulid Diplacodes trivialis (Rambur, 1842) were recorded, and none thereafter. A single exuviae of *Trithemis aurora* (Burmeister, 1839) was collected on 6 May 2004.

Plate 2. *Anax guttatus* (Aeshnidae)

Plate 3. *Sinictinogomphus clavatus* (Gomphidae)

Plate 4. *Epophthalmia elegans* (Corduliidae)

Plate 5. *Orthetrum sabina* (Libellulidae)

Persistence of exuviae in the field

Mean persistence of anisopteran exuviae in the field was estimated as 3.4 days (n = 45 exuviae, from five species). The shortest duration was one day (12 exuviae, from four species). One *A. guttatus* exuviae remained in situ for at least 31 days after tagging.

Discussion

It is unfortunate that the study did not commence earlier in 2004, as it would be useful to know which, if any, species emerged from the pond as temperatures began to rise in late February / early March 2004. Surveys by the author at numerous ponds over subsequent years (as yet unpublished other than in 'grey' literature) indicate that pond-dwelling dragonflies typically start to emerge in this period. As it was, the start of the study coincided with a mass emergence by several species, which rapidly dwindled, such that by the end of March, at least 68.5% of all of the study pond's dragonfly production in 2004 had been completed (and 81% by the end of April). All of this dragonfly emergence must have derived from oviposition in mid to late 2003. Similarly, the larger gomphid and corduliid dragonflies which began to emerge from June 2004 must have come from eggs laid in 2003: *I. pertinax*, *S. clavatus* and *E. elegans* would all require longer than six months for larval development. The libellulid *P. flavescens* is, however, known to have a short larval development time of about 50 days (Corbet, 1999, p. 227), and it is likely that the ten individuals of this species which emerged in May-June 2004 were from eggs deposited earlier in the year.

It is interesting to compare the emergence patterns for the two *Anax* species in 2004. *A. parthenope* followed the same pattern as exhibited by the seven libellulidae species, with peak emergence in March, followed by a rapid decline in abundance. Its congener *A. guttatus*, however, although quite abundant in March (and declining in April and May), showed an abrupt emergence peak in June. All of the emerging species have a Hong Kong flying and breeding season which extends well into November (Wilson, 2004), and indeed December in many cases, and it is therefore curious that so much of the 2004 emergence in the study pond was concentrated in March – one might expect emergence to be more equably distributed across the warm humid months from March to September.

Even more unexpected was the collapse in dragonfly emergence in 2005, with *S. clavatus* the only species emerging in moderate numbers. Considerable breeding activity was observed among adult dragonflies at the study pond throughout 2004, yet very few larvae emerged in the following year. Perhaps cool weather in early 2005 effectively suppressed dragonfly emergence in that year? Minimum daily temperatures across the North West New Territories dropped below 10ºC for several days in the last week of February 2005, but did not fall below 16ºC in the corresponding period in 2004. Average daily minimum temperatures throughout March 2005 were 3ºC lower than in March 2004. Nevertheless, temperatures in early 2005 were not exceptionally low for Hong Kong. More likely, predatory fish in the pond were too small and too few to impact dragonfly larvae significantly in early 2004, but had become a major threat to larval dragonflies by mid-2004. These fish were introduced as eggs or fry when the pond was initially filled in 2003, with water piped from Ho Pui reservoir. They were more evident in 2005, and would undoubtedly have had a predation impact on dragonfly larvae, particularly smaller ones such as libellulids and early instar aeshnids.

It is worth mentioning that the frequency of exuviae surveys in the present study would not have been sufficient to ensure that all dragonfly emergence from the pond was recorded: in order to achieve such an outcome, daily surveys would be necessary. This was not practicable, but from the tagged exuviae results it seems likely that a survey frequency of every three days would give a very close estimate of total emergence.

It is notable that only 12 species of Anisoptera emerged from the study pond during the period March 2004 to July 2005. Over the same period, the author recorded more than 25 species as adults at the pond (AEC, 2006). This suggests that many dragonflies immigrated to the pond as adults, without having bred there. Monitoring adult dragonflies at a given wetland can therefore give a misleading assessment of its value as a dragonfly breeding site – not all the species observed as adults will successfully breed.

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Acknowledgements

I am grateful to KCRC for permitting access to the study pond, and to Asia Ecological Consultants Ltd, my employers during the study period, for sanctioning the work reported here. Ms Moni Chin of AEC assisted with field surveys during the author's occasional absences from Hong Kong. Mr. Ying Hak-king of AEC assisted with collecting weather station data. Prof. David Dudgeon made several useful suggestions on an earlier draft of this paper.

Propalticidae (Coleoptera: Phytophaga: Cucujoidea) A new family for Hong Kong and China

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Introduction

The most recent overview of the superfamily Cucujoidea, within which Propalticidae belongs, is given by Leschen et al. (2005), who provided evidence for the monophyly of Propalticidae and Laemophloeidae. Von John (1960) gave the most current overview of the Propalticidae and currently Matthew Gimmel of Louisiana State University is working on a world catalogue of the family (Gimmel, M., pers. comm.).

There are two genera in this small family: *Propalticus*, including 26 species, distributed in the southern part of the Palaearctic region, Pacific Islands and Australia; and *Discogenia*, including 13 species, distributed in Africa. Beetles in this family are seldom encountered. Surprisingly, the larvae of Propalticidae have not been formally described. According to Leschen et al. (2005), a larval specimen previously attributed to Propalticidae was a misidentification.

The sister family of Propalticidae, the Laemophloeidae, is a medium-sized family with many species common locally. Beetles in this family bear little resemblance to propalticids, which superficially look more like the Nitidulidae (another more distal member of the Cucujoidea) in general outlook, though the antennal structure is quite different.

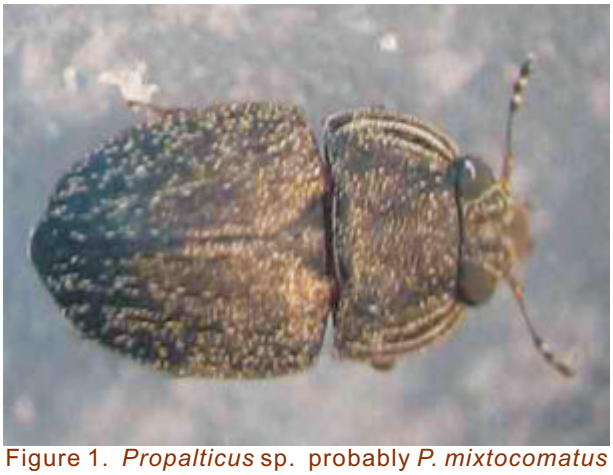

Figure 1. *Propalticus* sp. probably *P. mixtocomatus*

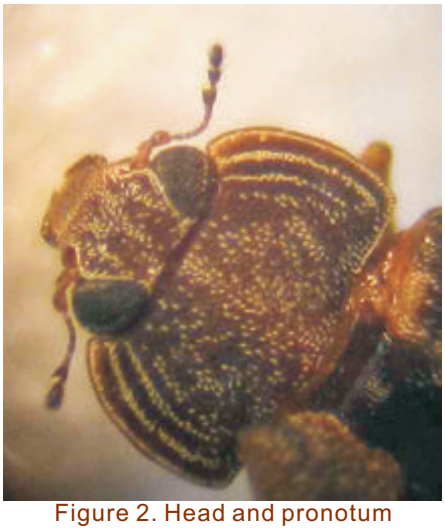

Figure 2. Head and pronotum

Figure 3. Three specimens showing the size variation

Observations

From 28 October 2008 to November 2009 many specimens of a species of *Propalticus* Sharp, 1879, were seen by the author at Wang Tong Village, Mui Wo, Lantau Island, Hong Kong. Ten specimens were taken (Figure 1). They were recorded every month except April to June and may have been associated with a stack of logs, oozing significant amounts of sap from a recently felled pine tree. These beetles were quite distinctive, the three terminal joints of the antennae forming a very loosely articulated and slender club (Figure 2). The pronotum has three lines of pale yellowish, short and thick scales running along the lateral edge, the two inner ones not reaching the basal margin. The whole of the dorsal surface of the pronotum and elytra are randomly covered by similar scales. The specimens varied in length from 1.2 to 1.7mm (Figure 3). They were identified as *Propalticus* primarily from Von John (1960) following extensive literature review.

Comment

A remarkable characteristic of these beetles is the surprising speed and distance they can jump, yet the underside gives no clue as to how they do it: none of the legs are significantly thickened as in the Alticinae or the jumping species of Scirtidae, and there is no sternal process as in Elateridae. Sharp (1879) noted "The hind legs are not dilated, and I believe the saltatorial power must arise from the front legs, the anterior tibiae of which are rather longer than the others, a little thickened towards the extremity and armed with a peculiar stout spur". The Hong Kong specimens I have collected all have the anterior legs longer than the posterior two.

Von John (1960) lists no species of Propalticidae for China; the nearest species he records to Hong Kong are three from Hoa Binh in Tonkin, Vietnam (which is roughly at the same latitude and 900km due west of Hong Kong). Two of these species he describes as new to science. These are *P. tonkinensis* John 1960 and *P. decoomani* John 1960, both of which are well illustrated and do not have any similarities with the Hong Kong specmens. The third species Von John lists from Hoa Binh is *P. mixtocomatus* (John, 1939) a very wide-ranging species, ocuuring from Sri Lanka, to Indonesia and Tonkin. The illustration of *mixtocomatus* given by Von John matches the Hong Kong species closely. The Hong Kong specimens are probably *P. mixtocomatus* (John, 1939), though they need to be compared to the type specimens for certainty.

Acknowledgments

I wish to give my sincere thanks to Lin Meiying and Prof Yang Xingke of The Institute of Zoology, Chinese Academy of Sciences, Beijing for assisting me on the phylogenetics of Cucujoidea and species composition and distribution of the Propalticidae. Mr. Clive Lau read and commented on an earlier draft of this paper.

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