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THE IDIONYCHINAE FROM HONG KONG, WITH A DESCRIPTION OF *MACROMIDIA ELLENAE* SPEC. NOV. (ANISOPTERA: CORDULIIDAE)

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M. ellenae sp. n. is described and illustrated from Hong Kong (holotype ♂: Sha Lo Tung, 24-VI-1995). It is compared with its closest congeners from China and South East Asia. Further records and additional descriptive notes are given for *M. rapida* Martin. New records are provided for *Idionyx victor* Hämäläinen and *I. claudia* Ris is recorded from Hong Kong for the first time.

INTRODUCTION

The Idionychinae TILLYARD & FRASER, 1940 is comprised of two genera; the *Macromidia* and *Idionyx*. Both of these genera are restricted to the Oriental region. ASAHINA (1965, 1988) documented the Anisoptera of Hong Kong and provided the first published Hong Kong records of *Macromidia* and *Idionyx*. He recorded *M. rapida* Martin and *I. yolanda* Selys. Another *Macromidia* has recently been found in Hong Kong, with a distinctive thoracic pattern of yellow spots. The patterning sets it apart from other known *Macromidia* and it is described here as a new species. Hämäläinen examined Hong Kong *yolanda* material and having decided it was not true *yolanda* established a new species, *I. victor* HAMALAINEN (1991). Further records of *I. victor* are given here. Additional records are provided for *M. rapida* and *I. claudia* Ris, previously known only from north Guangdong, is recorded from Hong Kong for the first time.

MACROMIDIA MARTIN, 1907

Hitherto ten species of *Macromidia* have been described from India, South East Asia and the Ryukyu archipelago of Japan. These include three from China and

one from Hong Kong. The *Macromidia* species, including *ellenae* described below, and their distribution are given below in Table I. Three of these species, *rapida, kelloggi* and *hangzhouensis* are known from southern and south-east China. The only *Macromidia* previously recorded from Hong Kong is *rapida* (ASAHINA, 1965, 1988) which is the type species of the genus.

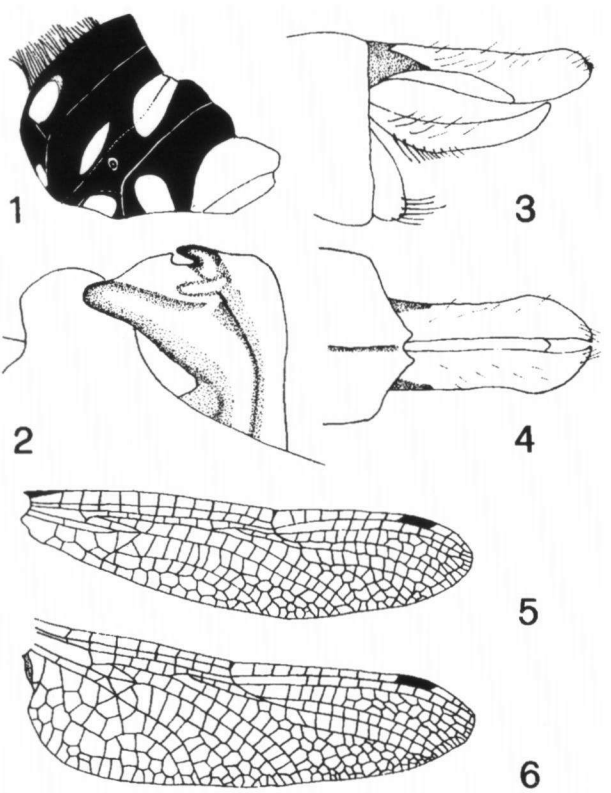
MACROMIDIA ELLENAE SP. NOV.
Figures 1-8

Macromidia sp.: WILSON, 1995, pp. 138-139, 149, 151, "♂, ♀, Hong Kong (photos)".

M a t e r i a l. – Holotype: (mature ♂): Sha Lo Tung (Cloudy Hill), Hong Kong, 26-VI-1994. – Allotype ♀: Sha Lo Tung (Lei Uk), Hong Kong, 24-VI-1995; – teneral ♀: Sam Tam Lo, Wu Kau Tang, Hong Kong, 16-X-1994. – Holotype and allotype specimens to be deposited in the British Museum Natural History.

A small *Macromidia* with numerous yellow spots at side of thorax.

MALE. – Labium pale yellow; labrum dark blackish brown with central three fifths of distal border pale brownish white; anteclypeus pale yellow; postclypeus black; frons and vertex black with bluish green metallic reflections; occiput black. Prothorax a matt dark brown with hind lobe and fine border of frontal lobe pale yellowish brown. Lateral synthorax illustrated in Figure 1. Syn-



Figs 1-6. *Macromidia ellenae* sp. n., ♂, Sha Lo Tung (Cloudy Hill), Hong Kong: (1) thorax, lateral view; – (2) secondary genitalia, lateral view; – (3) caudal appendages, lateral view; – (4) caudal appendages, dorsal view; – (5) fore wing; – (6) hind wing.

Table I.
List of *Macromidia* species with distribution

Species	Author	Distribution
asahinai	LIEFTINCK, 1971	Palawan (Philippines)
atrovirens	LIEFTINCK, 1935	Sumatra
donaldi	(FRASER, 1924)	India
ellenae	this paper	Hong Kong
fulva	LAIDLAW, 1915	Borneo
g. genialis	LAIDLAW, 1923	Peninsular Malaysia
g. erratica	LIEFTINCK, 1948	Sumatra, Java
g. shanensis	FRASER, 1927	Burma, North & Central Thailand
hangzhouensis	ZHOU & WEI, 1979	Zhejiang (China)
ishidai	ASAHINA, 1964	Ryukyus (Japan)
kelloggi	ASAHINA, 1978	Fujian (China)
rapida	MARTIN, 1907	Hong Kong, Guangdong (China), Thailand, Vietnam
samal	NEEDHAM & GYGER, 1937	Mindanao (Philippines)

thorax black with metallic green reflection marked with seven yellow spots each side. Dorsum covered with a thick fringe of pale fawn hairs; yellow antehumeral stripe/spot located at basal third of mesepisternum not continued on to the mesinfraepisternum. The short antehumeral stripe fades to brown at upper end. Mesepimeron with lens shaped yellow spot anterior of spiracle. Extreme ventral tip of mesinfraepisternum yellow. Metinfraepisternum with pale yellow spot. Large yellow spot covering mesometaplural suture. Metepimeron with circular yellow spot occupying anterior ventral corner and large triangular yellow spot covering posterior half. Metapostepimeron yellow. Antealar sinuses black. Legs black with base of ventral surface of fore leg pale yellow. Outer face of coxae and fore coxae entirely pale yellow. Legs black with hind leg and middle legs keeled typical of the genus.

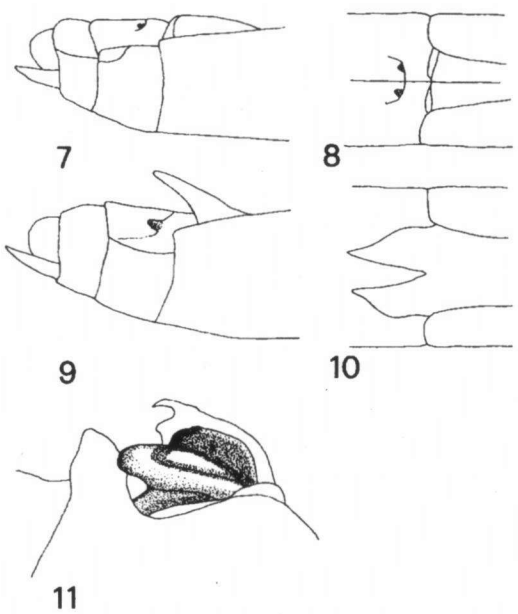
Wings (Figs 5-6) with a low density of venation with nodal index of fore wings 6:13|12:7; hind wings 9:9|8:8. Anal field 8:8. Fore wing with 3 proximal Px and hind wing with 4 proximal Px that do not continue into adjacent space between R and M1. All wings strongly enfumed pale amber. Pterostigma black and short, 2.0 mm length, covering two cell widths or less.

Abdomen black with yellow triangular spot on dorsum of segment 1. A continuous, extremely fine yellow dorsal stripe extends from base of segment 2-6. Irregular shaped yellow spot at ventral side of segment 1 and triangular yellow spot at lateral, ventral, posterior corner of segment 2. Auricle yellow. Segments 7-10 uniformly black with the exception of segment 7 which has an extremely faint hint of a yellow dorsal stripe in posterior half. Segments 7-8 markedly expanded to 3 mm which is double the width of the base of segment 6. Dorsum of segments 9 and 10

strongly carinated. Secondary genitalia illustrated in Figure 2 and caudal appendages in Figures 3-4. Superior anal appendages bright citron yellow with base of lateral, exterior face blackish brown and extreme tip black. Inferior appendage brown.

Measurements (mm). – abd. + app. 32, hind wing 30.

FEMALE. – Very similar to male but yellow markings brighter and more extensive. Labium bright yellow; labrum dark blackish brown with central third of distal border finely marked pale yellow; anteclypeus bright yellow smoked blackish at lateral margins; postclypeus black with metallic bluish green reflections; frons and vertex black with bluish green metallic reflections; occiput black. Thorax with pattern of yellow markings identical to male but yellow dorsal stripe larger occupying basal half of mesepisternum and not fading to brown at distal border. Antealar sinuses brilliant yellow, teneral and mature adult. Legs black except basal ventral half of fore leg, ventral face of coxae of all legs and trochanters of fore and middle legs which are bright yellow. Wings of teneral specimen tinted bright amber orange from base to fourth antenodal nerve including the discoidal cells. Wings of mature female strongly tinted pale amber throughout with slightly darker, brownish wing tips and brighter amber base. Nodal index of fore wings 7:12|12:7; hind wings 9:8|7:9. Anal field 11:11 with central cell. Abdomen black with yellow dorsal stripe from base of segment 1 to distal border of segment 6. Dorsal stripe on segment 7 just visible under 10 X power. Dorsal stripe expanded in basal halves and distal halves of segments 1-3. Ventral margin of segments 1-3 broadly yellow and finely bordered yellow segments 4-8. Superior appendages yellow. The valvula vulvae (Figs 7-8) form a shallow flap only minutely indented by a small notch at central, posterior margin.



Figs 7-11. *Macromidia ellenae* sp. n., ♀, Sha Lo Tung (Lei Uk), Hong Kong, [Figs 7-8]: (7) caudal appendages, lateral view; – (8) valvula vulvae, ventral view. – *M. rapida* Martin, Sha Lo Tung, Hong Kong, [Figs 9-11]: (9) ♀, valvula vulvae, lateral view; – (10) ♀, valvula vulvae, ventral view; – (11) ♂, secondary genitalia, lateral view.

Measurements (mm). – abd. + app. 28.5-33.5, hind wing 29.0-31.0.

DISCUSSION. – The elaborate yellow patterning of the *ellenae*

Table II

Comparison of *Macromidia ellenae* sp. n. with original descriptions of the male *M. hangzhouensis* Zhou & Wei and the female *M. kelloggi* Asahina

ellenae	*hangzhouensis*
MALE	MALE
Abd. + app. 32 mm, hind wing 30 mm.	Abd. + app. 39 mm, hind wing 33-35 mm.
Synthorax: (Fig. 1) Black with metallic green reflection marked with seven yellow spots each side. Metepisternum largely black with no broad yellow stripe covering the spiracle.	Synthorax: Broad yellow thoracic stripe covering the spiracle, but not extending to the wing and a broad antehumeral stripe occupying the basal half of the mesepisternum.
Abdomen: A continuous, extremely fine yellow dorsal stripe extends from base of segment 2-6.	Abdomen: Black with yellow dorsal stripe segments 1-8. Sides of segments 1-3 yellow.
Anal appendages (Figs 3-4): Superior anal appendages bright citron yellow with base of lateral, exterior face blackish brown and extreme tip black. Inferior appendage brown. Caudal appendages much straighter than the sinuous appendages of *hangzhouensis.*	Anal appendages (Figs 16-17): Superior appendages yellow with base and tip black. Inferior appendage yellowish brown with tip blackish brown.
ellenae	*kelloggi*
FEMALE	FEMALE
Abd. + app. 28.5-33.5 mm, hind wing 29-31 mm.	No size given
Synthorax: Yellow dorsal stripe occupying basal half of mesepisternum and not fading to brown at distal border. Metepisternum largely black with spiracle free of yellow stripe.	Synthorax (Fig. 12): Mesothoracic episternum (mesepisternum) with broad and abbreviated yellow stripe. Metepisterum largely marked by yellow stripe which covers the spiracle.
Abdomen: Black with yellow dorsal stripe from base of segment 1 to distal border of segment 6. Dorsal stripe on segment 7 just visible under 10 X power.	Abdomen: A mid-dorsal yellowish streak is present on 2,3,4,5 and 7 but never on 8.
Valvula vulvae (Figs. 7-8): Forms a shallow flap only minutely indented by a small notch at central, posterior margin.	Valvula vulvae (Fig. 14): Shallow bilobed flap never making a deeply divided lobe with pointed ends.

synthorax (Fig. 1) is very distinctive and markedly different from all other *Macromidia* species. *Macromidia* known from China, which include *rapida, kelloggi* and *hangzhouensis*, are marked with a broad yellow stripe on the metepisternum covering the spiracle, whereas the spiracle of *ellenae* is free of any yellow marks. *M. ellenae* is easily separated from the larger, stouter and densely veined *rapida* which does not possess a yellow dorsal thoracic stripe.

M. ellenae's closest congeners are the Chinese *kelloggi* and *hangzhouensis*. *M. kelloggi* was described by ASAHINA (1978) from a single female from Fujian province and *M. hangzhouensis* was described shortly afterwards by ZHOU & WEI (1979) from the neighbouring Zhejiang province. The descriptions of *kelloggi* and *hangzhouensis* were published within one year of each other in December 1978 and November 1979 respectively. Zhou and Wei did not compare *hangzhouensis* with *kelloggi*. ASAHINA (1978, p. 10) remarked that *kelloggi* was allied rather closely to *ishidai* (cf. ASAHINA, 1964, pp. 304-306, figs 16-22; ASAHINA, 1978, p. 9, fig. 31) and ZHOU & WEI (1979) similarly remarked that *hangzhouensis* was closest to *ishidai*. There are slight differences in the descriptions of the thoracic pattern of yellow marks between *kelloggi* and *hangzhouensis*. The male *hangzhouensis* is described with a broad yellow thoracic stripe covering the spiracle, but not extending to the wing and a broad antehumeral stripe occupying the basal half of the mesepisternum. *M. kelloggi* is illustrated by ASAHINA (1978) with a broad yellow stripe on the metepisternum which extends to the wing and a broad basal yellow antehumeral stripe (Fig. 12). The metinfraepisternum of *kelloggi* is unmarked whereas *hangzhouensis* is described with a yellow spot. These are minor differences and it is not clear from the two descriptions that these are distinct species. Their status can only be confidently determined when the male of *kelloggi* is available.

The antealar sinuses of *kelloggi* are, according to ASAHINA (1978, pp. 9-10), "largely yellowish" whereas this feature in *ellenae* is black in the mature male and brilliant yellow in the teneral and mature females examined. The mesinfraepisternum and metinfraepisternum of *kelloggi* (Fig. 12) were illustrated by ASAHINA (1978) without the yellow markings found in *ellenae*. The distal ventral halves of the superior appendages of *hangzhouensis* and *ellenae* are distinctly bulbous when viewed laterally. The male superior caudal appendages of *ellenae* are much straighter than the sinuous appendages of *hangzhouensis* (Figs 16-17), illustrated by ZHOU & WEI (1979). *M. ishidai* from the Ryukyus is a large, densely veined *Macromidia* whereas *hangzhouensis* and *ellenae* are small and thinly veined.

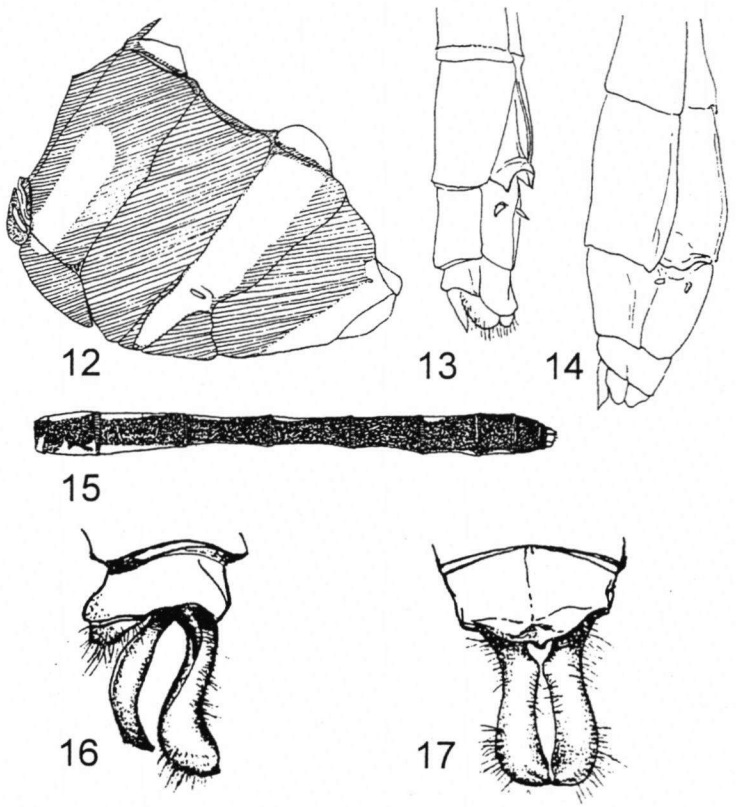
The valvula vulvae of *ellenae* (Fig. 8) and *kelloggi* (Fig. 14) are flap like and not deeply excised or forked. ASAHINA (1978) indicates that the valvula vulvae of *ishidai* (Fig. 13) are shallow with bilobed flap making a deeply divided lobe with pointed ends. It should be noted that the valvula vulvae of *ishidai* are nevertheless very short when compared with *rapida* (Fig. 10), *donaldi, fulva* and all subspecies of *genialis*. Species with rather undeveloped valvula vulvae include *samal, kelloggi* and *ellenae* with *ishidai* intermediate.

A summary comparison of the key characters of *ellenae*, female *kelloggi* and male *hangzhouensis* is given in Table II.

MACROMIDIA RAPIDA MARTIN, 1907
Figures 9-11

Macromia cantonensis TINKHAM, 1936, pp. 457-459, "♂, Canton; ♀, Hong Kong"
Macromidia rapida ASAHINA, 1965, p. 500, "1 ♂, 1 ♀, Ho Chung, Hong Kong, 31-V-1965"; – ASAHINA, 1988, pp. 696-697, figs 23-29, "1 ♀, Tai Po Kau, Hong Kong, 17-VI-1973"; – WILSON, 1993, pp. 233-235; – WILSON, 1995, pp. 136-137 (photos), 147, 149, "♂, ♀, Hong Kong".

Material (Hong Kong). – ♂ Sha Lo Tung, 16-V-1992; – 2 ♂, Sha Lo Tung, 20-VI-1992; – 1 ♂, Tai Po Kau, 24-VI-1992; – 1 ♂, Mau Ping (Ma On Shan), 27-VI-1992; – 3 ♂, Wu Kau Tang, 30-V-1993; – 2 ♂, 1 ♀, Sam A Chung, 29-V-1994; – 1 ♂, 1 ♀, Sha Lo Tung (Cloudy Hill), 26-VI-1994; – 4 ♂, 1 ♀, Tsing Fai Tong, 2-VII-1994; – 6 ♂, 2 ♀, Sham Tseng Settlement Basin, 2-VII-1994; – 1 ♂, Big Wave Bay, Hong Kong Island, 29-VI-1996.



Figs 12-17. *Macromidia kelloggi* Asahina, ♀, Fujian, [12, 14-15] (from ASAHINA, 1978): (12) thorax, lateral view; – (14) valvula vulvae, ventral view; – (15) abdomen, lateral view. – *M. ishidai* Asahina, ♀, Yayeyama Islands, Ryukyus, [13] (from ASAHINA, 1978): (13) valvula vulvae, ventral view. – *M. hangzhouensis* Zhou and Wei, ♂, Zhejiang, [16-17] (from ZHOU & WEI 1979): (16) caudal appendages, lateral view; – (17) caudal appendages, dorsal view.

Measurements (mm). – ♂ abdomen 36-38, hind wing 32-34; – ♀ abd. + app. 36-38, hind wing 32-36.

DISCUSSION. – ASAHINA (1988, pp. 696-697, figs 23-29) described and illustrated both male and female *M. rapida* for the first time following Martin's original 1907 record of a male from Tonkin. LIEFTINCK (1971, p.18) described the wing venation of *M. rapida* as dense with the discoidal field commencing with two rows of cells. The specimens from Hong Kong, that I have to hand, have a discoidal field which typically commences with a single row of four cells before two cell rows form. Otherwise the wing venation is dense with a high nodal index and three rows of cells between the anal field and the wing margin. The pterostigma is large, 3.5 mm. The secondary genitalia (Fig. 11) resemble those of *M. fulva* (cf. LIEFTINCK, 1935, p. 194, fig. 8). In side view the elevated anterior portion of the *rapida* hamulus is strongly curved inward and backward with the hook shaped tip obscured from view by the posterior portion of the hamulus. The tip of the *rapida* penis is hook shaped and is clearly visible when viewed laterally. The valvula vulvae of the female (Figs 9-10) and also illustrated in ASAHINA (1988, p. 697, fig. 29) are deeply and triangularly excised to produce two broad, flattened, pointed triangular prominences. The valvula vulvae are much longer than those of *ishidai* (Fig. 13). Another significant difference is the presence of a broad yellow dorsal thoracic stripe in *ishidai* which is a feature absent in *rapida.* Both *ishidai* and *rapida* are large, robust *Macromidia* with densely veined wings.

BIOLOGICAL NOTES. – Several specimens of *M. rapida* were taken a few hundred metres downstream of *ellenae* in the same stream on the same day. The male *ellenae* was found flying in erratic circles at a height of 2-3 m above the stream surface at mid-day. The teneral female was also found flying in erratic circles at 2-3 m height in a clearing adjacent to a thickly wooded, pooled section of mountain stream at mid day during a brief cloudy spell and the mature female was found roosting in trees overhanging a broad forest stream. The flight is extremely jerky and rapid not unlike that of *Idionyx. M. rapida* also has a rapid, flitting, flight but in comparison with *ellenae* is more direct. The male *ellenae* capture site was located in an extremely well shaded section of a

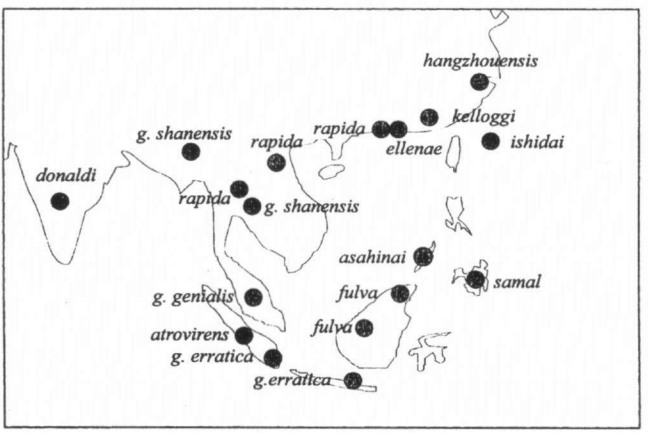


Fig. 18. *Macromidia* species distribution.

small stream immediately below a sizable waterfall. *M. rapida* appears to favour slightly more open locations in shaded mountain streams. Males of *Macromidia rapida* appear at suitable breeding sites during dull periods during the day and shortly before dusk.

BIOGEOGRAPHY

The *Macromidia* are closely related to *Idionyx*. For a comparison of the two genera see LIEFTINCK (1971, pp. 2-6, 16-19). According to Lieftinck *Macromidia*, "neatly bridges the gap between *Macromia* and *Idionyx*". The presence of sympatric populations of two *Macromidia* species occurring in the same stream is a noteworthy occurrence. It prompts a closer look at the phylogenic relationships of the eleven species now known.

A comprehensive analysis including sufficient characters to establish the phylogenic relationships of the known *Macromidia* species is hampered by the lack of material. Descriptions of the males of *atrovirens, kelloggi* and *samal* and the female of *asahinai* have not been published. Many features such as density of wing venation, presence of antehumeral stripe are not even consistent within the *genialis* species complex. For instance, *M. genialis erratica* has a completely clear metallic green thoracic dorsum whereas *genialis genialis* has a brown lower antehumeral stripe and *genialis shanensis* has a yellow antehumeral stripe. An analysis of the eleven species, which was completed with information obtained from published descriptions using eight principal characters, did not convincingly separate the species into distinct groups. A more comprehensive and complete data set is required, using a much larger number of characters, in order to establish reliable phylogenic relationships.

Macromidia ellenae is closely related to the Chinese *kelloggi* and *hangzhouensis* from tropical southern China and subtropical south-eastern China. Both *kelloggi* and *hangzhouensis* occur to the east of Guangdong and Hong Kong in Fujian and Zhejiang provinces respectively. The records of *M. rapida* from Hong Kong are the furthest east in its range from Thailand, through Vietnam to central Guangdong and Hong Kong. *M. rapida*'s closest congeners are the *genialis* species complex, *fulva* and *donaldi.*

IDIONYX HAGEN, 1867

BRIDGES (1994) lists 28 species of *Idionyx* from India, Nepal and South East Asia and of these five are known from China and one from Hong Kong. All of the six species of *Idionyx* known from China are confined to the warmer subtropical and tropical areas located to the west, south and south-east of the country. *I. carinata* FRASER (1926) is known from Fujian and Guangdong. *I. claudia* RIS (1912) was described from north Guangdong. *I. victor* HÄMÄLÄINEN (1991), described from

Hong Kong material, also occurs in central Guangdong at Dinghu Shan (pers. obs.). Three species are therefore known from Guangdong. *I. stevensi* FRASER (1924) is widespread in Indo-China with records from Bangladesh, western China, India and Nepal. *I. lieftincki* ZHOU (1984) was described from Zhejiang and *Idionyx yunnanensis* ZHOU et al., (1994) was recently described from Yunnan.

IDIONYX VICTOR HÄMÄLÄINEN, 1991

Idionyx yolanda (nec. Selys, 1871) ASAHINA, 1965, pp. 499, 501, figs 18-20, "1 ♂, 1 ♀, Tai Po Kau, Hong Kong, 29-V-1965; – 1 ♂, Sha Tin, Hong Kong, V-1958."
Idionyx victor HAMALAINEN, 1991, pp. 343-347, figs. 1-4, "1 ♂, type-loc. Chuk Yueng, New Territories, Hong Kong, 24-VI-1988"; – WILSON, 1995, pp. 140-141 (photos), 151, 153, "♂, ♀, Hong Kong".

Material (Hong Kong). – 1 ♂, 1 ♀, Tai Po Kau, 2-VI-1992; – 1 ♂, 1♀, Sha Lo Tung, 20-VI-1992; – 2 ♂, Tsing Fai Tong, Sham Tseng, 2-VII-1994; – 1 ♂, Sha Lo Tung, 2-V-1995; – 4♂, 4 ♀, do., 27-V-1995; – 1 ♂, Tung Shan Ha, Hok Tau, 31-V-1995; – 1 ♂, Ng Tung Chai, Tai Mo Shan, 1-VII-1995.

IDIONYX CLAUDIA RIS

Idionyx claudia RIS, 1912, pp. 83-84, figs 18-19, pl. 3 (fig. 2), "2 ♂, 4 ♀, type-loc. Tsa-Yiu-San, north Guangdong, 25°30'N, 114°E, 3,4,16,18-VII-1910"; – WILSON, 1995, p. 202, "Hong Kong".

Material. – 1 ♀, Ng Tung Chai, Tai Mo Shan, Hong Kong, 25-VI-1995; 1 ♂, do., 1-VII-1995.

DISCUSSION. – It is worth noting that both *carinata* and *claudia* were taken on the same dates 14 and 16 July 1910 by Mell from the site at Tsa-Yiu-San, north Guangdong (RIS, 1912). This location is approximately 200 miles north from Hong Kong. Ris doesn't provide an altitude for the *Idionyx* records but earlier in the same paper he gives 1500 m as the mountain peak height for Tsa-Yiu-San (RIS, 1912, p. 47). The range of mountains in this region are the highest in Guangdong, reaching a maximum height of 1903 m. *I. victor* has been found in small wooded mountain streams in Hong Kong, with fast flows, at altitudes ranging from close to sea level to 200 m. At Ng Tung Chai in Hong Kong *victor* and *claudia* were taken from the same stream, on the same day, but at slightly different altitudes; 150 m and 250 m respectively. Ng Tung Chai is located on the northern slopes of Tai Mo Shan, which at 957 m is the highest mountain in Hong Kong. Undoubtedly *I. claudia* is a mountain stream specialist which, on the basis of the two known site records, appears to prefer sites at fairly high altitude on relatively high mountains.

BIOLOGICAL NOTES. – *I. claudia* was observed in flight only during gloomy spells preceding rain and during rainfall. The males fly in large, fast, erratic, circular beats over the forest canopy and above the stream watercourse. Females were seen at the stream very briefly and were observed to oviposit in leaf strewn pools close

to waterfalls in a fast flowing stream with a substrate dominated by boulders and bedrock.

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