

ODONATA OF HAINAN, CHINA

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The odon. fauna from Hainan is enumerated. *Vestalis miao* sp. n., *Bayadera kirbyi* sp. n. (Calopterygidae), *Burmargiolestes xinglongensis* sp. n., *Rhinagrion hainanense* sp. n., *Podolestes pandanus* sp. n. (Megapodagrionidae), *Drepanosticta zhoui* sp. n., *D. elongata* sp. n., *Sinosticta hainanense* sp. n. (Platystictidae), *Chlorogomphus icarus* sp. n., *C. gracilis* sp. n. (Chlorogomphidae), *Planaeschna celia* sp. n. and *Oligoaeschna sabre* sp. n. (Aeshnidae) are described. *Lamelligomphus hongkongensis* Wilson is assigned as a synonym of *L. hainanensis* Chao. 6 spp. of *Macromia* are treated. *Macromia hamifera* Lieftinck is synonymised with *M. clio* Ris and other potential synonymies of Vietnamese and South China macromias are discussed. *Pseudagrion australasiae* Lieftinck, *Ceriagrion indochinense* Asahina, *Gomphidia a. abbotti* Williamson and *Macromia calliope* Ris are recorded from Chinese territory for the first time. A checklist of dragonfly species from Hainan and details of 71 taxa not previously recorded from Hainan are provided.

INTRODUCTION

Odonata were collected by a team from the Hong Kong based Kadoorie Farm and Botanic Garden during April 1998 and May-June 1999. Keith Wilson and Graham Reels collected the majority of dragonflies, with assistance from John Fellowes, Michael Lau and Billy Hau Chi-hang. The sites surveyed are listed in Table I. The programme was conducted in collaboration with the Hainan Forestry Department, the South China Institute of Botany and other organisations.

Hainan gained provincial status in 1988. It has a land area of 32,200 km² and lies in a tropical zone between 18°12'-20°10'N and 108°40'-111°03'E. The highest peak is Mt Wuzhi, 1,867 m. In geological terms it was separated from the mainland comparatively recently i.e. during the late Quaternary period. Sea levels have risen dramatically in the northern South China Sea during the last 8,000 years. Hainan

is biologically very rich. The flora is estimated at 4,200 species with 630 endemics (MacKINNON et al., 1996). Two birds and two mammals are considered endemic to the island.

One hundred and twenty-seven species of dragonfly recorded from Hainan are listed in the checklist provided at Table II. Details of original source are given. Seventy-one of these taxa are recorded from Hainan for the first time including 12 new species. There are now twenty odonates known only from Hainan. Several of these may prove to be genuine endemics when the fauna of neighbouring China, especially Guangxi, has been catalogued in greater detail. Taiwan, with a slightly larger land area of 35,760 km², has 139 species of dragonfly recorded (WANG & HEPPNER, 1997). Given Hainan's similar size, its proximity to the equator and known centres of endemism in Indo-China, it is highly likely that the total number of odonates to be recorded from Hainan will exceed that of Taiwan. However, permanent losses may have occurred in Hainan due to the almost complete destruction of lowland primary forest habitat.

Open lowland habitats have not been extensively surveyed. Our survey team has concentrated on the remaining forest habitat, which is largely confined to montane areas in excess of 500m. Few marsh systems, lakes, ponds and lowland rivers have been surveyed. Consequently, the somewhat cosmopolitan Libellulidae and Coenagrionidae, whose members mostly prefer lentic habitats, are poorly recorded and almost certainly under represented. Judging by the number of gomphids already known from Hainan a total species list exceeding 160 is likely. With the addition of 71 new species records for Hainan one would assume that Hainan had been poorly surveyed. Nevertheless a considerable amount of work has already been devoted

Table I
Sites surveyed

Site	Date
Bawangling National Nature Reserve, W Hainan (19°02'-19°08'N by 109°02'-109°13'E)	April 1998
Jiangfengling National Nature Reserve, SW Hainan (18°37'-18°47' by 108°45'-108°56'E),	April 1998
Jianling Nature Reserve, Hainan (18°41'N by 109°32'E) & 18°50'-18°59'N by 110°15'-110°16'E)	May 1999
Qingpilin Nature Reserve, Hainan	May 1999
Niujialin Station, Hainan	May 1999
Tongtielin, Xinglong, Hainan	May 1999
Xinglong Botanical Gardens, Hainan	May 1999
Diaoluoshan Nature Reserve, Hainan	May 1999
Wuzhishan Nature Reserve, Hainan (18°49'-18°58'N by 109°39'-109°47'E)	June 1999
Jiaxi, Hainan (18°50'-18°56'N by 109°05'-109°14'E)	June 1999
Limushan, Hainan (19°16'N by 109°48'E)	June 1999
Lumuwan, Nature Reserve, Hainan,	June 1999

to the study of Hainan odonates. A short review of previous work is given below.

Before 1930 very little work had been published on Hainan dragonflies. The first odonate to be recorded, *Rhinocypha perforata* (Percheron), was published by SELYS (1873). Details of 14 species from Hainan were published by KIRBY (1900) who included descriptions of *Zygonyx iris insignis* and the remarkable Hainan endemic *Pseudolestes mirabilis* (Pseudolestidae). Kirby also listed *Euphaea decorata* (not of Selys), which was subsequently described as the Hainan endemic species, *E. ornata* (CAMPION, 1924).

NEEDHAM (1930) added five more species including descriptions of two new species, *Nannophypopsis clara* (Needham) and *Agriocnemis amelia*. The latter is now considered a synonym of *Ischnura aurora* Brauer, 1865 (DAVIES & TOBIN, 1984). NEEDHAM (1931a) and LIEFTINCK (1950) treated female material collected from Hainan as *Macromia urania* RIS, 1916 but it will be shown that this material was in fact *M. calliope* RIS, 1916.

NEEDHAM (1931a) published further material from Hainan, collected during an expedition made in 1929 by the Lingnan University. Needham also redescribed the Hainan endemic *Pseudolestes mirabilis* and described two new species, *Labrogomphus torvus* and *Paragomphus hoffmanni*. A second *Paragomphus* species, *P. pardalinus*, was described from Hainan by NEEDHAM (1942).

In LAIDLAW's (1932) revision of the genus *Coeliccia* he established a Hainan endemic subspecies *C. scutellum hainanense*. LAIDLAW (1950) also recorded a further chlorocyphid species from Hainan, *Rhinocypha b. biforata* Selys.

CHAO (1953a) described *Asiagomphus hainanensis* and the following year described the endemic *Lamelligomphus hainanensis* CHAO (1954). A further three endemic species of gomphid were established from Hainan by CHAO (1982) comprising *Anisogomphus wuzhishanus*, *Nychogomphus flavicaudus* and *Leptogomphus celebratus*. In his 1954 paper Chao placed Kirby's *thomassoni* in the genus *Nihonogomphus*. LIU (1988) added yet another *Paragomphus* species, the endemic *P. wuzhishanensis*.

A single aeschnid has been described from Hainan, which is *Oligoaeschna petalura* LIEFTINCK (1968) one of only two representatives of this Oriental genus in China. A further species is described below, also from Mt. Wuzhi.

SUI & SUN (1984) recorded *Aciagrion olympicum* Laidlaw and *Rhinocypha spuria* Selys but provided no documentation of the material. The picture of a specimen, identified as *Rhinocypha spuria* by Sun & Sui, resembles *Rhinocypha fenestrella* Rambur. These latter records require confirmation.



Map 1. Hainan province showing location of surveyed sites.

1998-1999 SURVEYS

Synonymic notes are provided for species newly recorded from Hainan and for records of species, which hitherto have been poorly recorded from South China. Details of material belonging to common

Table II
Checklist of Hainan Odonata

Species	Source
<i>Philoganga robusta</i> Navás, 1936	this paper
<i>Matrona b. basilaris</i> Selys, 1853	KIRBY (1900) as <i>M. basilaris</i>
<i>Mnais mneme</i> Ris, 1916	ASAHINA (1975)
<i>Calopteryx melli</i> Ris, 1912	this paper
<i>Vestalis miao</i> sp. n. *	this paper
<i>Neurobasis c. chinensis</i> (Linnaeus, 1758)	NEEDHAM (1931a) as <i>N. chinensis</i>
<i>Rhinocypha p. perforata</i> (Percheron, 1835)	SELYS (1873); note KIRBY (1900) as <i>R. whiteheadi</i>
<i>Rhinocypha fenestrella</i> (Rambur, 1842)	this paper
<i>Rhinocypha b. biforata</i> Selys, 1859	LAIDLAW (1950)
<i>Libellago lineata</i> (Burmeister, 1939)	NEEDHAM (1931a) as <i>Micromerus lineata</i>
<i>Euphaea ornata</i> (Campion, 1924)	KIRBY (1900) as <i>Pseudophaea decorata</i>
<i>Dysphaea basitincta</i> Martin, 1904	this paper
<i>Bayadera kirbyi</i> sp. n. *	this paper; note KIRBY (1900) as <i>Bayadera</i> sp.
<i>Orolestes selysi</i> McLachlan, 1895	this paper
<i>Lestes concinna</i> Hagen in Selys, 1892	NEEDHAM (1931a) as <i>L. umbrina</i> Selys, 1892; note <i>umbrina</i> & <i>concinna</i> are very similar and were considered synonyms from 1934 until 1960 when LIEFTINCK (1960) reestablished their separate taxonomic status; * <i>L. umbrina</i> is not known outside of India
<i>Lestes</i> sp.	NEEDHAM (1931a) as <i>L. paedisca</i> (Eversmann, 1836); note <i>paedisca</i> is considered a synonym of <i>virens</i> (Charpentier, 1825) in BRIDGES (1994), however <i>virens</i> not recorded E of Altai Mountains
<i>Agriomorpha fusca</i> May, 1933	this paper
<i>Burmargiolestes xinglongensis</i> sp. n. *	this paper
<i>Pseudolestes mirabilis</i> Kirby, 1900 *	KIRBY (1900)
<i>Podolestes pandanus</i> sp. n. *	this paper
<i>Rhinagrion hainanensis</i> sp. n. *	this paper; note NEEDHAM (1942) as <i>Rhinagrion</i> sp.
<i>Philosina alba</i> Wilson, 1999	this paper
<i>Agriocnemis femina oryzae</i> (Lieftinck, 1962)	NEEDHAM (1931a) as <i>A. femina</i>
<i>Agriocnemis lacteola</i> Selys, 1877	NEEDHAM (1931a)
<i>Agriocnemis pygmaea</i> (Rambur, 1842)	this paper; note NEEDHAM (1931a) as <i>Agriocnemis</i> sp.?
<i>Mortonagrion</i> sp.	this paper
<i>Aciagrion tillyardi</i> Laidlaw, 1919	this paper; note NEEDHAM (1931a) as <i>Aciagrion</i> sp.?
<i>Ischnura aurora</i> Brauer, 1865	NEEDHAM (1930) as <i>Agriocnemis amelia</i>
<i>Ischnura senegalensis</i> (Rambur, 1842)	this paper
<i>Cercion calamorum dyeri</i> (Fraser, 1919)	this paper
<i>Ceragrion auranticum ryukyuanum</i> (Asahina, 1967)	ASAHINA (1967b) as <i>C. latericum ryukyuanum</i>

Table II, continued

<i>Ceriagrion indochinense</i> Asahina, 1967	this paper; note KIRBY (1900) as <i>Ceriagrion coromandelianum</i> (nec Fabricius, 1798)
<i>Pseudagrion australasiae</i> Selys, 1876	this paper
<i>Pseudagrion microcephalum</i> (Rambur, 1842)	this paper
<i>Pseudagrion rubriceps</i> Selys, 1876	this paper
<i>Pseudagrion pruinosum fraseri</i> Schmidt, 1934	this paper
<i>Coeliccia scutellum hainanense</i> Laidlaw, 1932 *	LAILAW (1932)
<i>Coeliccia cyanomelas</i> Ris, 1912	this paper
<i>Copera marginipes</i> (Rambur, 1842)	NEEDHAM (1931a) as <i>Platycnemis marginipes</i>
<i>Copera ciliata</i> (Selys, 1863)	this paper
<i>Drepanosticta zhoui</i> sp. n. *	this paper
<i>Drepanosticta elongata</i> sp. n. *	this paper
<i>Sinosticta hainanense</i> sp. n. *	this paper
<i>Prodasineura autumnalis</i> (Fraser, 1922)	NEEDHAM (1931a) as <i>Indoneura dolorosa</i>
<i>Prodasineura croconata</i> (Ris, 1916)	this paper
<i>Chlorogomphus icarus</i> sp. n. *	this paper
<i>Chlorogomphus gracilis</i> sp. n. *	this paper
<i>Anax guttatus</i> (Burmeister, 1839)	NEEDHAM (1931a)
<i>Anax immaculifrons</i> Rambur, 1842	this paper
<i>Polycanthagyna erythromelas</i> (McLachlan, 1896)	this paper
<i>Tetracanthagyna waterhousei</i> McLachlan, 1898	this paper
<i>Gynacantha subinterrupta</i> Rambur, 1842	NEEDHAM (1931a)
<i>Gynacantha saltatrix</i> Martin, 1909	this paper
<i>Periaeschna magdalena</i> Martin, 1909	this paper
<i>Planaeschna celia</i> sp. n. *	this paper
<i>Oligoaeschna petalura</i> Lieftinck, 1968 *	LIEFTINCK (1968)
<i>Oligoaeschna sabre</i> sp. n. *	this paper
<i>Asiagomphus hainanensis</i> (Chao, 1953)	NEEDHAM (1942) as <i>Gomphus personatus</i>
<i>Asiagomphus septimus</i> Needham, 1930	NEEDHAM (1931a) as <i>Gomphus septimus</i>
<i>Stylurus amicus</i> (Needham, 1930)	this paper
<i>Burmagomphus vermicularis</i> (Martin, 1904)	this paper
<i>Labrogomphus torvus</i> Needham 1931a	NEEDHAM (1931a)
<i>Heliogomphus retroflexus</i> (Ris, 1912)	this paper
<i>Heliogomphus scorpio</i> (Ris, 1912)	this paper
<i>Anisogomphus koxingai</i> Chao, 1954	ZHAO (1990)
<i>Anisogomphus wuzhishanus</i> Chao, 1982 *	CHAO (1982)
<i>Merogomphus paviei</i> Martin, 1904	this paper
<i>Fukienogomphus prometheus</i> Lieftinck, 1939	this paper
<i>Stylogomphus chunliuae</i> Chao, 1954	this paper
<i>Leptogomphus celebratus</i> Chao, 1982	CHAO (1982)
<i>Nychogomphus flavicaudus</i> (Chao, 1982) *	CHAO (1982)
<i>Paragomphus pardalinus</i> Needham, 1942	NEEDHAM (1942)
<i>Paragomphus wuzhishanensis</i> Liu, 1988 *	LIU (1988)
<i>Paragomphus hoffmanni</i> Needham, 1931 *	NEEDHAM (1931a) as <i>Gomphus hoffmanni</i>
<i>Nihonogomphus thomassoni</i> (Kirby, 1900) *	KIRBY (1900) as <i>Aeshna thomassoni</i>
<i>Orientogomphus armatus</i> Chao et Xu, 1987	this paper
<i>Amphigomphus hansonii</i> Chao, 1954	this paper
<i>Megalogomphus sommeri</i> (Selys, 1854)	this paper

Table II, continued

<i>Lamelligomphus camelus</i> (Martin, 1904)	this paper
<i>Lamelligomphus hainanensis</i> (Chao, 1954)	NEEDHAM (1931a) as <i>Onychogomphus micans</i>
<i>Phaenandrogomphus tonkinicus</i> (Fraser, 1926)	this paper
<i>Ictinogomphus pertinax</i> (Hagen, 1854)	NEEDHAM (1942) as <i>Ictinus rapax</i>
<i>Gomphidia a. abbotti</i> Williamson, 1907	this paper
<i>Gomphidia k. kruegeri</i> Martin, 1904	NEEDHAM (1931a) as <i>G. kruegeri</i>
<i>Epophthalmia elegans</i> (Brauer, 1865)	this paper
<i>Macromia berlandi</i> Liefstinck, 1941	this paper
<i>Macromia calliope</i> Ris, 1916	this paper; note NEEDHAM (1931a) as <i>M. urania</i>
<i>Macromia clio</i> Ris, 1916	this paper
<i>Macromia katae</i> Wilson, 1993	this paper
<i>Macromia moorei malayana</i> Laidlaw, 1928	this paper
<i>Macromia</i> sp.	this paper. (cf. <i>Macromia icterica</i> Liefstinck, 1929)
<i>Macromia urania</i> Ris, 1916	LIEFTINCK (1950) (♂, Ta Hian, Hainan, 17-VI-1935)
<i>Macromidia rapida</i> Martin, 1907	this paper
<i>Idionyx victor</i> Hämäläinen, 1991	this paper
<i>Nannophyopsis clara</i> (Needham, 1930)	NEEDHAM (1930) as <i>Nannodiplax clara</i>
<i>Tetrathemis platyptera</i> Selys, 1878	this paper
<i>Brachydiplox chalybea flavovittata</i> Ris, 1911	this paper
<i>Cratilla lineata</i> (Brauer, 1878)	NEEDHAM (1931a)
<i>Lyrithemis tricolor</i> Ris, 1919	this paper
<i>Pseudothemis zonata</i> (Burmeister, 1838)	this paper
<i>Orthetrum chrysis</i> (Selys, 1891)	this paper
<i>Orthetrum luzonicum</i> (Brauer, 1868)	this paper
<i>Orthetrum pruinosum neglectum</i> (Rambur, 1842)	NEEDHAM (1930) as <i>O. neglectum</i>
<i>Orthetrum s. sabina</i> (Drury, 1770)	NEEDHAM (1931a) as <i>O. sabina</i>
<i>Orthetrum testaceum</i> Burmeister, 1839	KIRBY (1900)
<i>Orthetrum t. triangulare</i> (Selys, 1878)	this paper
<i>Potamarcha congener</i> (Rambur, 1842)	NEEDHAM (1931a) as <i>P. obscura</i>
<i>Acisoma p. panorpoides</i> Rambur, 1842	KIRBY (1900) <i>A. panorpoides</i>
<i>Brachythemis contaminata</i> (Fabricius, 1793)	NEEDHAM (1931a)
<i>Crocothemis servilia</i> (Drury, 1770)	KIRBY (1900)
<i>Diplacodes nebulosa</i> (Fabricius, 1793)	KIRBY (1900)
<i>Diplacodes trivialis</i> (Rambur, 1842)	KIRBY (1900) as <i>Trithemis trivialis</i>
<i>Neurothemis intermedia</i> Rambur, 1842	NEEDHAM (1931a)
<i>Neurothemis fulvia</i> (Drury, 1773)	NEEDHAM (1931a)
<i>Neurothemis t. tullia</i> (Drury, 1773)	KIRBY (1900) as <i>N. tullia</i>
<i>Trithemis aurora</i> (Burmeister, 1839)	NEEDHAM (1931a)
<i>Trithemis festiva</i> (Rambur, 1842)	NEEDHAM (1931a)
<i>Palpopleura s. sexmaculata</i> (Fabricius, 1787)	NEEDHAM (1931a) as <i>P. sexmaculata</i>
<i>Pantala flavescens</i> (Fabricius, 1798)	NEEDHAM (1931a)
<i>Rhyothemis variegata aria</i> (Drury, 1773)	this paper
<i>Tholymis tillarga</i> (Fabricius, 1798)	this paper
<i>Onychothemis testaceum tonkinensis</i> Martin, 1904	this paper
<i>Hydrobasileus croceus</i> (Brauer, 1867)	this paper

Table II, continued

<i>Tramea virginia</i> (Rambur, 1842)	NEEDHAM (1931a) as <i>T. chinensis</i>
<i>Urothemis s. signata</i> (Rambur, 1842)	NEEDHAM (1930) as <i>U. signata</i>
<i>Zygonyx iris insignis</i> (Kirby, 1900)	KIRBY (1900) as <i>Zygonidia insignis</i>
<i>Zygonyx takasago</i> Asahina, 1966	this paper

* = Current status: only known from Hainan

species with widespread distributions and common species previously recorded from Hainan are tabulated in Table III.

Holotypes and where available, paratype material of newly described species will be temporarily deposited at Tai Lung Experimental Station, Agriculture, Fisheries and Conservation Department, Lin Tong Mei, Sheung Shui, Hong Kong SAR, China prior to transfer to Hainan. Transfer to Hainan will take place when suitable premises have been identified or established.

DIPHLEBIIDAE

PHILOGANGA ROBUSTA NAVÁS, 1936

Figure 1

Philoganga robusta: NAVAS, 1936: 43-44, "Kuling, China" (Guling, Jiangxi); – CHAO, 1953: 137-143, pl. 1., figs 1-2, 7-8, "1 ♂, taken between Shaowu Dazhulan and Jianyang Huang Keng Lu Shang, north Fujian, 22-V-1943; 2 ♀, Jianyang Daoshui, north Fujian, 8-V-1943; 1 ♂, Suifu, Szechuan, 3-V-1929, coll. D.C. Graham, stored in National Museum, Washington, USA; 1 ♀, do; 1 ♂, coll. D.C. Graham (?), stored at Cornell University, USA; 2 adults, Guling, Jiangxi, stored at Zhendan Museum, Shanghai; 1 ♀, Meitan, Guizhou, 6-V-1943 (according to Chao's text this date should be 1941, coll. Hsü)".

Material. – 1 ♂, Jiangfengling, 9-IV-1998, coll. G.T. Reels; – 1 ♂, Wuzhishan, 9-VI-1999; – 1 ♀, do., 10-VI-1999, coll. G.T. Reels.

Measurements (mm). – Male abd. + app. 61.0, hindwing 49.0-51.0; – female abd. + app. 48.0, hindwing 53.0.

DISTRIBUTION. – China (Fujian, Guangxi, Guizhou, Hainan, Jiangxi and Sichuan). *P. robusta infantua* YANG & LI (1994: 460-462, figs 10-14) is also known from Shaanxi. *Philoganga vetusta* has been confirmed to occur in Fujian, Guangdong and Hong Kong.

REMARKS. – The present distribution of *Philoganga* in China is poorly understood and somewhat confused. There are two species known from China; the other species being *P. vetusta* RIS (1912). NEEDHAM (1930) and ASAHINA (1987) have identified all Chinese material they have examined as *vetusta*. These records are reviewed here.

When NAVÁS (1936) described *robusta* he commented that it was very similar to

Table III
 Details of widespread species or common species material collected during 1998-1999

Species	Material
<i>Matrona basilaris basilaris</i> Selys	2 ♂, Jiangfengling, Hainan, 9. IV-1998
<i>Mnais mneme</i> Ris	2 ♂, Bawangling, Hainan, 7-IV-1998; 9 ♂, 3 ♀, Jiangfengling, Hainan, 9-IV-1998
<i>Neurobasis c. chinensis</i> (Linnaeus)	3 ♂ 1 ♀, Jianling, 18-V-1999
<i>Rhinocypha p. perforata</i> (Percheron)	2 ♂, Nga Ga, Bawangling, Hainan, 6-IV-1998
<i>Aciagrion tillyardi</i> (Laidlaw, 1919)	2 ♂, Diaoluoshan, 25-V-1999
<i>Agriocnemis pygmaea</i> (Rambur)	1 ♂, Qingpilin, 19-V-1999
<i>Agriocnemis femina</i> (Lieftinck)	1 ♂, Qingpilin, 19-V-1999
<i>Ischnura senegalensis</i> (Rambur)	1 ♀, Tung Chang County, Hainan, 1-IV-1998; 1 ♂, Qingpilin, 19-V-1999
<i>Cercion calamorum dyeri</i> (Fraser)	2 ♂, Xinglong Botanical Gardens, 23-V-1999
<i>Ceriagrion auranticum ryukyuanum</i> (Asahina)	1 ♂, Southern Hainan, 12-IV-1998
<i>Ceriagrion coromandelianum</i> (Fabricius)	1 ♂, Jiayi, 14-V-1999
<i>Pseudagrion microcephalum</i> (Rambur)	2 ♂, Qingpilin, 19-V-1999
<i>Pseudagrion r. rubriceps</i> Selys	1 ♂, Tongtielin, Xinglong, 22-V-1999
<i>Pseudagrion pruinatum fraseri</i> Schmidt	1 ♂, 1 ♀, Jianling, 21-V-1999
<i>Copera ciliata</i> (Selys)	Observed
<i>Copera marginipes</i> (Rambur)	1 ♀, Bawangling, Hainan, 5-IV-1998; 1 ♂, 2 ♀, Jiangfengling, Hainan, 10-IV-1998; 1 ♂, Jianling, 18-V-1999; 3 ♂, Qingpilin, 19-V-1999; 1 ♂, Tongtielin, Xinglong, 22-V-1999; 1 ♂, Lumuwan, 17-VI-1999
<i>Prodasineura autumnalis</i> (Fraser)	1 ♀, Bawangling, Hainan, 5-IV-1998
<i>Anax guttatus</i> (Burmeister)	Observed
<i>Ictinogomphus pertinax</i> (Hagen)	1 ♂, Xinglong Botanical Gardens, 23-V-1999
<i>Epophthalmia elegans</i> (Brauer)	1 ♂, Tongtielin, Xinglong, 22-V-1999
<i>Brachydiplax chalybea flavovittata</i> Ris	2 ♂, Qingpilin, 19-V-1999
<i>Pseudothemis zonata</i> (Burmeister)	Observed
<i>Orthetrum chrysis</i> (Selys)	1 ♂, 1 ♀, Diaoluoshan, 27-V-1999
<i>Orthetrum pruinatum neglectum</i> (Rambur)	1 ♂, Tongtielin, Xinglong, 22-V-1999
<i>Orthetrum s. sabina</i> (Drury)	1 ♂, Bawangling, Hainan, 6-IV-1998; 1 ♂, Qingpilin, 19-V-1999
<i>Orthetrum t. triangulare</i> (Selys)	1 ♂, 1 ♀, Jia Xi, 14-VI-1999; 1 ♂, Limoshan, 16-VI-1999
<i>Orthetrum luzonicum</i> (Brauer)	1 ♂, Qingpilin, 19-V-1999
<i>Potamarcha congener</i> (Rambur)	1 ♂, Bawangling, Hainan, 5-IV-1998; 1 ♂, 2 ♀, Jianling, 18-V-1999
<i>Acisoma p. panorpoides</i> Rambur	1 ♂, Qingpilin, 19-V-1999
<i>Brachythemis contaminata</i> (Fabricius)	3 ♂, Qingpilin, 19-V-1999
<i>Diplacodes trivialis</i> (Rambur)	1 ♂, Diaoluoshan, 27-V-1999
<i>Neurothemis fulvia</i> (Drury)	1 ♂, Bawangling, Hainan, 6-IV-1998; 2 ♂, Jianling, 18-V-1999
<i>Neurothemis t. tullia</i> (Drury)	1 ♂, Qingpilin, 19-V-1999
<i>Trithemis aurora</i> (Burmeister)	1 ♂, Diaoluoshan, 25-V-1999
<i>Trithemis festiva</i> (Rambur)	1 ♂, Diaoluoshan, 25-V-1999
<i>Palpopleura s. sexmaculata</i> (Fabricius)	1 ♂, Diaoluoshan, 26-V-1999

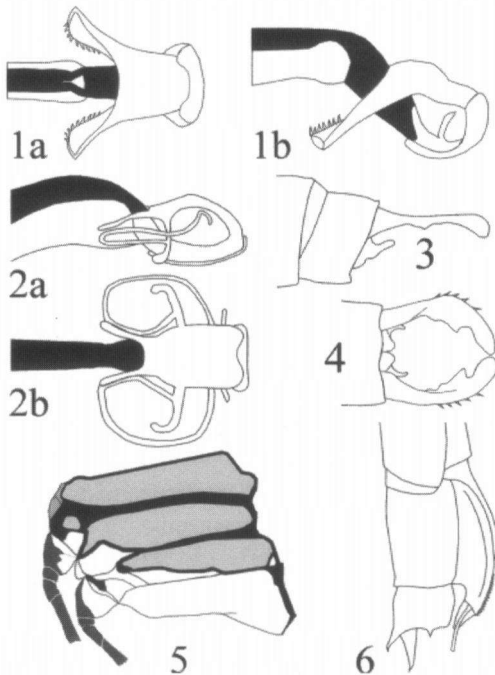
Table III, continued

<i>Pantala flavescens</i> (Fabricius)	2 ♂, Qingpilin, 19-V-1999
<i>Rhyothemis variegata arria</i> (Drury)	2 ♂, 1 ♀, Qingpilin, 19-V-1999
<i>Tholymis tillarga</i> (Fabricius)	1 ♂, Jianling, 18-V-1999
<i>Hydrobasileus croceous</i> (Brauer)	1 ♂, Xinglong Botanical Gardens, 23-V-1999
<i>Urothemis s. signata</i> (Rambur)	2 ♂, Xinglong Botanical Gardens, 23-V-1999
<i>Tramea virginia</i> (Rambur)	2 ♂, Xinglong Botanical Gardens, 23-V-1999

vetusta but had a different number of antenodal and postnodal veins. Navás stated *robusta* had 14 antenodal veins and 27-28 postnodals and quotes NEEDHAM (1930) as indicating that *vetusta* has 50 postnodals. Indeed NEEDHAM (1930) stated, "... 18 antenodals and more than 50 postnodals" in his description of *vetusta*. This is surely a typographical error and should have been written as, "... more than 30 postnodals". An inspection of the type wings, figured by RIS (1912: 47, fig 1), in his original description, clearly shows about 30 postnodals.

CHAO (1953) redescribed *robusta* based on 1 male and 2 females from Fujian, 2 adults collected from the type locality, at Guling, Jiangxi, 3 specimens examined from the US National Museum (1 male, Sichuan housed at Washington and 1 male, 1 female, from Sichuan housed at Cornell University), and 1 male from Guizhou. The US material was previously examined and treated by NEEDHAM (1930) and ASAHINA (1987) as *vetusta* along with two other specimens. Of the four US *Philoganga* specimens Chao examined, he considered three from Sichuan belonged to *robusta* and a single Fujian female to be *vetusta*. Following an invitation by Chao, the Fujian specimens were compared with the two specimens from Guling, Jiangxi by A. de Cooman at the Shanghai Museum. Cooman confirmed the Fujian specimens to be conspecific with the museum's *robusta* specimens. Lieftinck confirmed Chao's conclusions regarding *robusta* and *vetusta* following a comparison of Chao's material with *vetusta* specimens, collected by Klapperich in Fujian and RIS (1912) and MAY's (1935) descriptions. CHAO (1953) separated *robusta* and *vetusta* based on two principal characters. According to Chao, *robusta* has three cell rows between the apical half of 1A and the wing border of both fore and hindwings, whereas *vetusta* has just two cell rows in the fore wing and two or three cell rows in the hindwing. In addition Chao stated that *robusta* has both a dorsal stripe and an antehumeral stripe, whereas *vetusta* has just a dorsal stripe adjacent to the dorsal carina and no antehumeral stripe.

ASAHINA (1961) recorded a female specimen from Lushan, Jiangxi as *P. vetusta*, which is very close to the type-locality of *robusta* at Kuling (Guling) Jiangxi. ASAHINA (1967a) then recorded the larvae of *P. vetusta* from Hong Kong. Later ASAHINA (1977) examined a broken, teneral male, collected by Graham, from Suifu in Sichuan, stored at the National Museum of USA, and two males from Foochow, Fukien, which were taken by C.R. Kellogg in 1938, and treated them all as *vetusta*. Then, based on material from Hong Kong, Guangdong and Fujian, ASAHINA



Figs 1-6. [1a-1b] *Philoganga robusta*, Hainan: penile organ; - [2-6] *Vestalis miao* sp. n., Hainan: (2a-2b) penile organ; - (3-4) male caudal appendages; - (5) male synthorax, lateral; - (6) female caudal appendages.

(1987) redescribed *vetusta*. Asahina did not make reference to CHAO's (1953) study of Chinese *Philoganga* and made no reference to *robusta*. Asahina had no knowledge of live male specimens and speculated (ASAHINA, 1987) that the dorsal abdomen of *vetusta* might be blue in life! Asahina and Needham's records of *vetusta* from Sichuan and Jiangxi are doubtful.

In view of the discrepancy between Chao and Asahina's treatments of the same material from Sichuan, three Hainan *robusta* specimens (2 males and 1 female) and four Guangxi *robusta* specimens (1 male, 3 females) were compared with 16 Hong Kong *P. vetusta* Ris specimens (11 males and 5 females) by the principal author. The first of Chao's characters used to separate *robusta* and *vetusta* is not consistent. Two of eleven Hong

Kong *vetusta* males examined possessed three cell rows in both fore and hindwings and four out of five Hong Kong *vetusta* females examined had both fore and hindwings with three cell rows. Both the Hainan males have two cell rows and the female possesses three cell rows in both fore and hindwings. With regard to the thoracic markings there is more consistency with Chao's assessment. All the Hong Kong *vetusta* specimens examined do not possess an antehumeral stripe. The Hainan female possesses an antehumeral stripe whereas the two Hainan males are intermediate between *vetusta* and *robusta*, with a short one-quarter length antehumeral stripe commencing anteriorly at the junction with the mesokatepisternum. The Hainan and Guangxi specimens are larger and darker than Hong Kong *vetusta*. The most obvious difference, at least in the males, is the entirely dark reddish brown dorsum from segments 2-4 and blackish abdomen from 5-10. This compares with the dorsum of abdominal segments 2-4 in Hong Kong *vetusta*, which is predominantly bright orange (cf. WILSON, 1995a: 36-38, "photo live male, Hong Kong"). The extent of the orange on the Hong Kong *vetusta* dorsal abdomen progressively narrows and fades to black at segment 6. Segments 7-10

are black. The Hainan penile organ (see figs 1a and 1b) is slightly more robust than Hong Kong *vetusta* and resembles *P. loringae* Fraser, 1927 (cf. ASAHINA, 1985d: fig 19). This species, known from Burma and Thailand, also has a dark reddish brown abdomen but is much smaller species (male abd. + app. 42.0 mm, hw. 37-39 mm).

Three females and a single *robusta* male were collected by the authors at Shi Wan Da Shan, south-west Guangxi in 1998. These large, dark coloured specimens were entirely consistent with Chao's descriptions of *robusta*, with both male and females possessing an antehumeral stripe and three cell rows in both fore- and hindwing. *P. robusta* can be separated from *vetusta* based on larger size, general dark colouration, the presence of a complete or partial antehumeral stripe, lack of a bright coloured abdominal dorsum in the male and slightly more robust penile organ. The differences between *vetusta* and *robusta* are relatively minor and non-structural in nature. Nevertheless live male specimens are easily separated in the field since *robusta* is predominantly dark coloured with greenish blue markings, whereas *vetusta* is extensively marked with bright orange on the thorax and abdomen.

CALOPTERYGIDAE

CALOPTERYX MELLI RIS, 1912

Calopteryx melli: RIS, 1912: 55-56, pl. 3 (fig. 3), "Tsaiyiusan, Kwungtung".
Agrion melli: NEEDHAM, 1930: 195, "Tsaiyiusan, Kwungtung".

Material. — 1♂, Diaoluoshan, 24-V-1999, coll. K.D.P. Wilson.

DISTRIBUTION. — China (Guangdong, Guangxi [unpublished data], Hainan)

VESTALIS MIAO SP. NOV.

Figures 2-6

Material. — **Holotype** ♂, Diaoluoshan, 25-V-1999, coll. K.D.P. Wilson. — **Paratypes**: 1♂, Niujialing, 21-V-1999, coll. K.D.P. Wilson; 2♂, Diaoluoshan, 25-V-1999, coll. K.D.P. Wilson; 1♀, do., 26-V-1999. — Holotype will be deposited at Tai Lung Experimental Station, Agriculture, Fisheries and Conservation Department, Lin Tong Mei, Sheung Shui, Hong Kong SAR, China.

Etymology. — Named after the Miao (Hmong) people who live at the hilltop areas of Diaoluoshan.

DESCRIPTION. — **MALE**: Medium-sized, bright metallic green calopterygid. Head bright metallic green. The antenna is matt black with base of second segment coloured metallic green. Labium black. Labrum and clypeus shiny metallic green. Sides of face shiny black below antennae with a narrow extension along margin of eye above antennae. Frons and top of head bright metallic green but not as shining

as clypeus due to the presence of numerous fine puncti. Prothorax bright metallic green with sutures broadly coloured matt black giving rise to an H-shaped figure at centre of dorsum. Thorax bright metallic green above and yellow below with matt black sutures (Fig. 5). Legs black. Wings of all three males slightly enfumed pale yellow with darkish smokey cell centres at anterior wing tips. Pterostigma absent. Abdominal segments 1-6 bright metallic green progressively fading to matt black from segment 1 to segment 6. Segments 7-10 predominantly matt black with very faint green metallic highlights. Dorsum of segments 9-10 pruinosed white. Tip of abdomen is illustrated in Figures 3-4. The inferior appendages are less than one quarter the length of the superior appendages. Penile organ is illustrated in Figures 2a & 2b.

M e a s u r e m e n t s (mm): male abd. + anal app. 47.0-49.5, hindwing 36.0-37.0.

FEMALE. — Head and thorax coloured as male. Abdomen as male without pruinescence at tip (Fig. 6). Ventrums of abdominal segments 9-10 pale yellow. Wings uniformly pale amber.

M e a s u r e m e n t s (mm): abd. + anal app. 38.0, hindwing 48.0.

REMARKS. — *V. miao* is closely allied to *V. s. smaragdina* Selys, 1879 and *V. s. veluta* (Ris, 1912). ASAHINA (1977: 434, 492-493, figs 25-27) figured the secondary and caudal genitalia of *V. s. veluta*. The inferior and superior appendages are similar to the nominate subspecies, *V. s. smaragdina*, also figured by ASAHINA (1985a: 8-10, figs 11-16). The inferior appendages of both subspecies are nearly half the length, or more than half the length, of the superior appendages. The inferior appendages of *miao* are approximately one quarter the length of the superior appendages. This character will serve to separate male *miao* from both subspecies of *smaragdina*. The penile organ is similar to *V. s. veluta*. *V. s. smaragdina* is known from Burma, India and Thailand and *V. s. veluta* is recorded from China (Fujian, Guangdong and Sichuan). The only other *Vestalis* known from Chinese territory is *V. gracilis* (Rambur, 1842), which is recorded from Burma, Bangladesh, India Cambodia, Laos, Peninsular Malaysia Nepal, Thailand and Vietnam.

CHLOROCYPHIDAE

RHINOCYPHA F. FENESTRELLA (RAMBUR, 1842)

Rhinocypha fenestrella: FRASER, 1934: 17-20, "Borneo, Burma, India, P. Malaysia".

Aristocypha f. fenestrella: VAN TOL & ROZENDAAL, 1995: 94, "Vietnam".

Rhinocypha (Aristocypha) fenestrella: ASAHINA, 1996a: 189-190, "Vietnam".

M a t e r i a l. — 2 ♂, Jiangfengling, 9-IV-1998; — 1 ♂, Niujialin, 21-V-1999; 10 ♂, 3 ♀, Diaoluoshan, 24-V-1999; — 2 ♂, do., 28-V-1999; — 3 ♂, Wuzhishan, 9-VI-1999; — 1 ♂, 1 ♀, Limushan, 16-VI-1999.

DISTRIBUTION. — Burma, China (Hainan and Yunnan), Laos, Peninsular Malaysia, Thailand and Vietnam.

REMARKS. — *Rhinocypha baibarana* Matsumura, 1931, which is closely related to *R. fenestrella*, is recorded from Taiwan.

RHINOCYPHA B. BIFORATA SELYS, 1859

Rhinocypha biforata biforata: LAIDLAW, 1950: 253, "Malaya, Tonkin, Hainan"

Rhinocypha (Aristocypha) biforata biforata: ASAHINA, 1985b: 10-12, 16, figs 21-25, 46-48, "Thailand".

M a t e r i a l. — 1 ♂, Jianling, 18-V-1999, coll. K.D.P. Wilson; — 1 ♂, Tongtielin, Xinglong, coll. G.T. Reels, 22-V-1999; — 3 ♂, Xinglong Botanical Gardens, 23-V-1999, coll. K.D.P. Wilson.

DISTRIBUTION. — Burma, China (Hainan), Indonesia, India, Laos, Nepal, Peninsular Malaysia, and Thailand.

LIBELLAGO L. LINEATA (BURMEISTER, 1839)

Micromerus lineatus: NEEDHAM, 1930: 225-226, "Taiwan"; — NEEDHAM, 1931a: 232, "Nodoa, Hainan".

Libellago lineata lineata: FRASER, 1934: 60-63, "India"; — LIEFTINCK et al., 1984: 15, "Taiwan".

M a t e r i a l. — 1 ♂, Mingwanghe, nr Bawangling, 5-IV-1998, coll. G.T. Reels; — 1 ♂, Lumuwan, 17-VI-1999, coll. G.T. Reels.

DISTRIBUTION. — Burma, China (Guangxi, Hainan and Taiwan), India, Indonesia (incl. Java and Borneo), Laos, Peninsular Malaysia, Nepal, Thailand and Vietnam.

EUPHAEIDAE

EUPHAEA ORNATA (CAMPION, 1924)

Pseudophaea ornata: CAMPION, 1924: 175, "Hainan"; — NEEDHAM, 1930: 215, "Hainan".

M a t e r i a l. — 2 ♂, Jiangfengling, 9-IV-1998, coll. G.T. Reels; — 3 ♂, 2 ♀, Jianling, 18-V-1999, coll. K.D.P. Wilson; — 1 ♂, Tongtielin, Xinglong, 22-V-1999, coll. K.D.P. Wilson; 3 ♂, 1 ♀, Diaoluoshan, 24-V-1999, coll. K.D.P. Wilson; — 5 ♂, 1 ♀, do., 25-V-1999; — 2 ♂, Wuzhishan, 9-VI-1999, coll. G.T. Reels; — 1 ♂, Limushan, 16-VI-1999, coll. G.T. Reels.

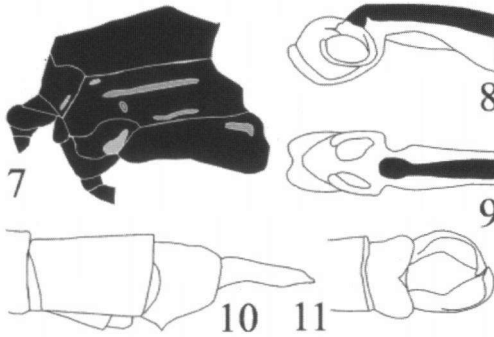
DYSPHAEA BASITINCTA MARTIN, 1904

Figures 7-11

Dysphaea basitincta: MARTIN, 1904: 218, "Tonkin".

Material. — 3 ♂, Lumuwan, 17-VI-1999, coll. G.T. Reels.

DESCRIPTION. — MALE: Large black euphaeid with bases and tips of fore and hindwings black. Head black. Labium, labrum, clypeus and sides of face glabrous; frons, antennae and top of head matt black. Prothorax, synthorax and legs matt black. Synthorax with pale orange brown marks (Fig. 7). Abdomen matt black with small white spots at lateral base.



On one specimen the white spots join to form a dorsal half-ring, which is extremely fine at centre of dorsum. Caudal genitalia matt black (Figs 10-11). Penile organ as illustrated in Figures 8-9. Wings strongly enfumed amber brown with base and tip jet black. Basal third of hindwing jet black. Jet black basal section of forewing occupies slightly less than one third wing length at 28%. Wing tip sections of both fore and hindwings are coloured jet black, beginning at centre of elongate

Figs 7-11. *Dysphaea basitincta*, Hainan, ♂: (7) synthorax, lateral; — (8-9) penile organ; — (10-11) caudal appendages.

pterostigmas. Forewing slightly longer than hindwing by 2.0 mm.

Measurements (mm): Male abd. + anal app. 42.0-42.5, hindwing 39.0-40.5.

DISTRIBUTION. — China (Guangxi and Hainan), Laos and Vietnam.

REMARKS. — Six species of the Oriental genus *Dysphaea* are currently recognised. Only two have been recorded from China. The other Chinese recorded species is *D. gloriosa* Fraser, which has also been recorded from India, Laos, Thailand and Vietnam. *D. gloriosa* is the closest congener, with a similar male penile organ and similar caudal superior appendages to *basitincta*. However, *D. gloriosa* has wings without darkened bases. According to ASAHINA (1985c) the wings of *gloriosa* are entirely reddish brown with darkened tips. The wing colouration resembles the northern form of the Thai and Malay *D. dimidiata* Selys, 1853, but this species has a penile organ with outward projecting, curled horns (cf. ASAHINA 1985c: 32, figs 38-42).

BAYADERA KIRBYI SP. NOV.

Figures 12-16

Bayadera sp.: KIRBY, 1900: 536, "1 ♂, leg. J.T. Thomasson".

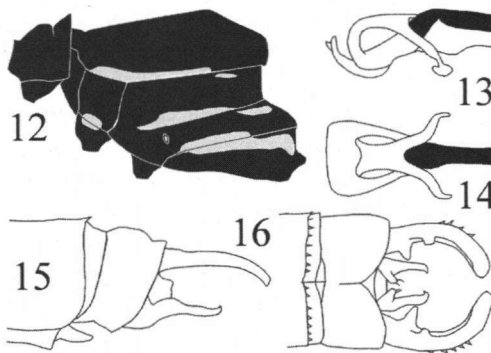
Material. — **Holotype** ♂, Wuzhishan, 10-VI-1999, coll. G.T. Reels. — **Paratypes** 3 ♂, Wuzhishan, 9-VI-1999, coll. G.T. Reels. — Holotype will be deposited at Tai Lung Experimental Station, Agriculture, Fisheries and Conservation Department, Lin Tong Mei, Sheung Shui, Hong Kong SAR, China.

Etymology. — Named in honour of W.F. Kirby who listed this species as *Bayadera* sp in the first account of the Hainan odonate fauna.

DESCRIPTION. — **MALE:** Blackish, medium sized *Bayadera* with wings tipped blackish brown. Head matt black with sides of face, base of mandibles and labrum shining pale bluish yellow. Labium matt black with lateral margins pale orange. Frons and occipital margin with many long black hairs. Ocelli reddish brown. Small pale spot on first segment of antennae. Thorax matt black. Synthorax with faintly discernable pale yellowish mauve markings (Fig. 12). Legs black. Wings enfumed amber with dark blackish brown tips from middle of pterostigma. Pterostigma is black, elongate and broad in middle. Abdomen matt black with small pale spot at lateral base of segments 2 and 3. Penile organ as in Figures 13-14. Caudal appendages as in Figures 15 and 16. Superior appendages possess a prominent basal spine, which is not strongly directed ventrally, and a well developed tubercle. Inferior appendages long, approximately half the length of the superior appendages, with prominent basal truncated projection, directed inwards.

Measurements (mm). — Male abd. + anal app. 40.0-41.0, hindwing 32.0-34.0.

REMARKS. — DAVIES & YANG (1996) recently named three new species of *Bayadera* and produced a key to the 13 known species and 2 subspecies. Nine of these species are known from China with *B. bidentata* Needham, 1930 recorded from neighbouring Guangxi. This species has hyaline wings and bright blue markings on the face. As pointed out by Davies & Yang the caudal appendages of all *Bayadera* are very similar in style. The caudal appendages and penile organ of *kirbyi* are closest to *B. nephelopennis* Davies & Yang, 1996, from Sichuan. However, the wings of *nephelopennis* are not blackened



Figs 12-16. *Bayadera kirbyi* sp. n., Hainan. (12) thorax, lateral; — (13-14) penile organ; — (15-16) caudal appendages.

at the tips and the thoracic pattern is markedly different. The inferior appendages of *kirbyi* have a more prominent basal projection. *B. melanopteryx* Ris, 1912, known from Hubei, Zhejiang, Sichuan and Guangdong is also similar to *kirbyi* but has superior appendages without a well defined tubercle.

LESTIDAE

OROLESTES SELYSI McLACHLAN, 1895

Orolestes selysi: LIEFTINCK et al., 1984: 17, "Taiwan".

Material. — 1 ♂, 9-IV-1998, Jiangfengling, coll. G.T. Reels.

DISTRIBUTION. — India, Laos, China (Guangxi, Hainan and Taiwan) and Vietnam.

REMARKS. — The single male specimen found possessed hyaline wings. In neighbouring Guangxi the most common form has wings which are coloured black, except for the wing tips.

MEGAPODAGRIONIDAE

AGRIOMORPHA FUSCA MAY, 1933

Figures 17-22

Agriomorpha fusca: MAY, 1933: 342, "type-loc. Fan-Chi-Shan, Guangdong"; — ASAHINA, 1965: 497, figs 14-15, "Hong Kong"; — ASAHINA, 1987a: 17-18, 22, figs 48-55, 72-73, "Hong Kong"; — WILSON, 1995a: 44, 51, "photo, male, female, Hong Kong"; — WILSON, 1999: 25, "Dinghu Shan, Guangdong".

Material. — 3 ♂, Bawangling, 7-IV-1998, coll. B. Hau & G.T. Reels; — 1 ♀, 10-IV-1998, Jiangfengling, Hainan, coll. G.T. Reels; — 1 ♂, 10-IV-1998, Jiangfengling, Hainan, coll. G.T. Reels.

DESCRIPTION. — **MALE:** Labium pale brown. Labrum, clypeus and front of frons creamy orange. Upper frons and top of head blackish brown. Hind central margin of head bordered pale brown. Lower side of prothorax black. Upper side with white lateral stripe. Central dorsum dark brown. The synthorax and prothorax are illustrated in Figure 19. The synthorax is predominantly black with white humeral stripe and distinctive white striped sides. The stripe begins just below the humeral suture, at the base of the forewing, then abruptly crosses to the dorsum, following the line of suture to the prothorax. White stripes along interpleural and metapleural sutures of metepisternum forming a distinctive v-shaped mark, which covers the spiracle. Metepimeron with large white triangular spot occupying posterior, upper quarter. Legs pale with dark brown stripes on hind margin of femora. Abdomen dark blackish brown with pale rings at base of segments 3-7. Segments 8-10 with white dorsal markings. Superior abdominal

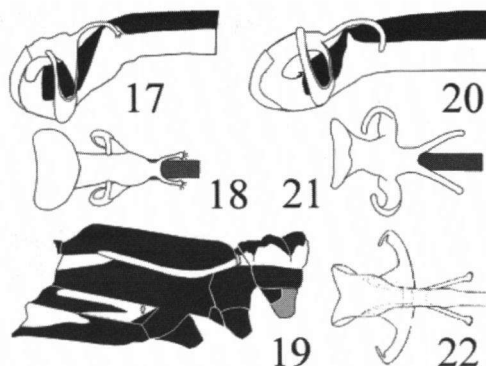
appendages black with groove in tip.

FEMALE. — Orange markings on face of male replaced with a subdued dull yellow. Otherwise similar to male with identical prominent white stripes forming a white V-mark on the metepisternum with the apex of the V located at the spiracle.

Measurements (mm): male abd. + app. 42.0-43.5, hw 31.0-32.0; female abd. + app. 41.5, hw 33.0.

REMARKS. — *A. fusca* MAY (1933), is also known from Guangdong and Hong Kong. There are significant differences

in the Hainan *fuscus* thoracic markings, when compared with Hong Kong material, but not when compared with material, which we have collected from Baiyong, southwest Guangdong. The Hainan form differs very slightly from both Hong Kong and Guangdong *fuscus* in the shape of the male penile organ. The bifid tip of the Hainan *fuscus* penile organ (Figs 17-18), is shorter with slightly more flattened and more hirsute tips. The bifid tip is also positioned slightly tighter to the main shaft of the penile organ (cf. Figs 20-21). The penile organ of the Baiyong and Hong Kong forms are similar. The penile organ figured by MAY (1933) in reverse angle, is also similar to other Guangdong forms from Hong Kong and Baiyong. May's figure is reproduced here in Figure 22. Having examined a number of specimens from Hong Kong and Hainan it is apparent there is considerable variability in the shape of the penile organ with some overlap. In Hong Kong *fuscus* the thoracic humeral stripes are restricted in length to a short distance from the wing base (cf. ASAHINA, 1987a: 17-18, figs 48-55) whereas in Hainan and Baiyong, Guangdong forms the pattern is more extensive, as illustrated in Figure 19. The Hong Kong forms are the darkest with a synthorax almost completely black. The Hainan forms are the most patterned with elaborate striped synthorax as illustrated in Figure 19. The synthoracic pattern of the north Guangdong form, where the type was described, is intermediate between the Hainan and Hong Kong forms.



Figs 17-22. [17-19] *Agriomorpha fusca*, ♂, Hainan: (17-18) penile organ; — (19) thorax, lateral; — [20-21] ♂, Hong Kong: penile organ; — [22] ♂, Fan-Chi-Shan, Guangdong, from MAY, 1933: penile organ (inverted).

BURMARGIOLESTES XINGLONGENSIS SP. NOV.

Figures 23-29

Material. — **Holotype** ♂: Tongtielin, Xinglong, 17-V-1999, coll. G.T. Reels. Holotype will be deposited at Tai Lung Experimental Station, Agriculture, Fisheries and Conservation Department, Lin Tong Mei, Sheung Shui, Hong Kong SAR, China.

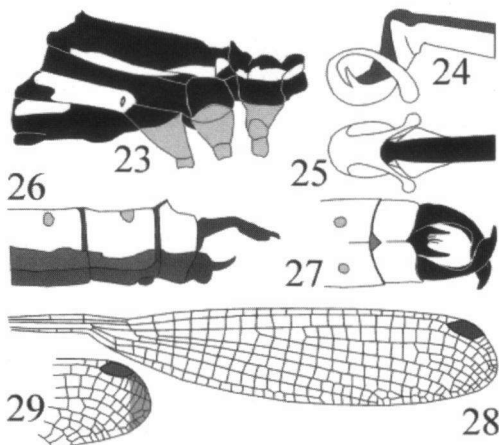
DESCRIPTION. — MALE: Small sized, dark coloured argiolestine with creamy white tip to abdomen and black-tipped hindwings. Labium and mandibles dark brown. Labrum and clypeus shiny black. Genae dark brown adjacent to mandibles with irregular creamy white spot below antennae. Antennae pale brown. Frons and top of head matt black. Top of head with faint oblique pale brown spots between lateral ocelli and base of antennae. Occipital ridge with minute faints pale brown spots at lateral margins. Prothorax and synthorax black with creamy white markings (Fig. 23). Top of synthorax matt black and upper sides of thorax shiny black with metepisternum and metepimeron dark brown. Coxae and legs pale brown. Forewings hyaline. Wing venation of forewing as illustrated in Figure 28. Hindwing hyaline apart from extreme tip, which is heavily pigmented dark brown (Fig. 29). Abdomen dark brown. Segments 2-7 with pale brown rings at base. Segments 8-10 creamy white on dorsum and upper sides. Segments 8-9 with a pair of pale brown spots on dorsum (Figs 26-27). Penile organ relatively simple, as illustrated in Figures 24-25. Caudal appendages as shown in Figures 26-27.

Measurements (mm). — Male abd. + app. 33.0, 25.0 hw.

REMARKS. — Only two other species of *Burmargiolestes* are currently recognised. These are *B. laidlawi* Lieftinck, 1960, recorded from India, and *B. melanothorax*

(Selys, 1891), known from Burma, Laos, Thailand and Vietnam. The wing venation of the genus *Burmargiolestes* is unusual amongst the argiolestines. IR_{iii} arises at or slightly distal to the subnodus and there are at least one or more basal supplementary postcubital crossveins (pcv) in addition to the anal crossing. In this respect the wing venation is similar to *Agriomorpha*. The structure and appearance of the head and thorax also strongly resembles *Agriomorpha*. However, the penile organs of these two genera are structurally very different.

B. xinglongensis is easily separated from *laidlawi* and *melanothorax*. The colour patterns of the head and abdomen are distinct and the inferior appendages of *xinglongensis* are much more developed than those of *laidlawi* and *melanothorax*.



Figs 23-29. *Burmargiolestes xinglongensis* sp. n., Hainan: (23) thorax, lateral; — (24-25) penile organ; — (26-27) caudal appendages; — (28) forewing; — (29) hindwing.

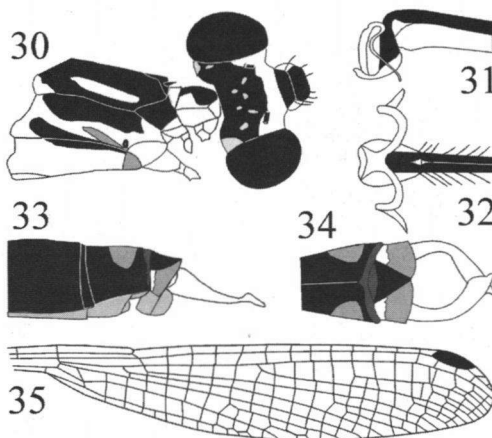
RHINAGRION HAINANENSE SP. NOV.

Figures 30-35

Rhinagrion sp.: NEEDHAM, 1942: 251, "Hainan".

Material. — **Holotype** ♂, Lumuwan, 17-VI-1999, coll. G.T. Reels. Holotype will be deposited at Tai Lung Experimental Station, Agriculture, Fisheries and Conservation Department, Lin Tong Mei, Sheung Shui, Hong Kong SAR, China.

DESCRIPTION. — **MALE:** A small blackish damselfly with creamy yellow head and thoracic markings with two pairs of blue spots at dorsal tip of abdomen, which is reddish below. Head large relative to body size. Labium pale white. Labrum and clypeus shiny black. Base of mandibles and genae creamy yellow. Front of frons bluish yellow with top partly black (Fig. 30). Top of head blackish brown with small irregular mid brown spots (Fig.30). Antennae black. Thorax black with creamy yellow pattern (Fig. 30). Frontal ridge of pterothorax with lateral conical projections. Femora creamy yellow with blackish brown hind margin. Tibia and tarsi black. Wings hyaline with black unbraced pterostigma extending across 2-3 cells. Hindwing illustrated in Figure 35. Abdomen predominantly dark brown with distal margin of segments 3-7 black. Base, lateral and distal portions of segment 2 and segment 1 creamy yellow. Segment 9 and 10 with a pair of bluish spots. Base of segment 10 with creamy dorso-lateral yellow spots. Ventrums of segments 7-10 bright brick red. Superior appendages pale yellow. Caudal appendages and tip of abdomen are illustrated in Figures 33-34. Penile organ as featured in Figures 31-32.



Figs 30-35. *Rhinagrion hainanense* sp. n., Hainan: (30) head and thorax; — (31-32) penile organ; — (33-34) caudal appendages; — (35) hindwing.

Measurements (mm). — Male abd. + app. 34.0, hw 26.0.

REMARKS. — Only six species of *Rhinagrion* are known. Two are known from continental southeast Asia and the remaining four species from Indonesia, Philippines and North Borneo. *R. hainanense* is the first member of this genus from Chinese territory.

PHILOSINA ALBA WILSON, 1999

Philosina alba: WILSON, 1999: 26-28, 50, figs 2-8, 26 A-C, "type-loc. Dinghu Shan, Guangdong, 13-VI-1994".

Material. — 1 ♀, Diaoluoshan, 25-V-1999, coll. K.D.P. Wilson; — 2 ♂, do, 26-V-1999, K.D.P. Wilson.

Measurements (mm). — Male abd. + app. 38.5-40.0, 32.0-32.5 hw; female abd. + app. 38.0, hw. 36.0.

REMARKS. — The male of this species holds territory on horizontal surfaces of logs and tree roots, which overhang small fast running hill streams. The white pruinescence, which completely covers the mature male abdomen, is mostly removed if preserved with acetone.

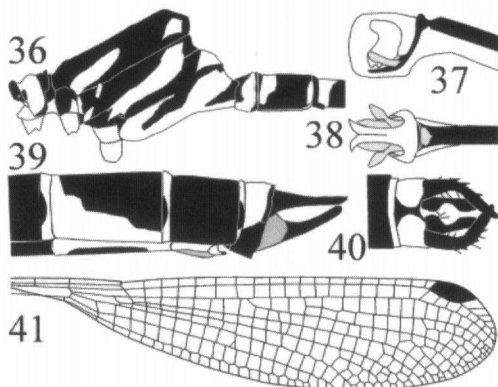
PODOLESTES PANDANUS SP. NOV.

Figures 36-41

Material. — **Holotype** ♂, Qingpilin, 17-V-1999, coll. K.D.P. Wilson. — **Paratypes**: 2 ♂, Qingpilin, 17-V-1999, coll. K.D.P. Wilson. — Holotype will be deposited at Tai Lung Experimental Station, Agriculture, Fisheries and Conservation Department, Lin Tong Mei, Sheung Shui, Hong Kong SAR, China.

Etymology. — All three males were discovered in well-shaded damp depressions in thick coastal screw pine (*Pandanus* sp.) scrub. The species is thus named after the plant it was found in association with.

DESCRIPTION. — **MALE**: Medium sized brownish damselfly with highly patterned thorax and abdomen coloured with golden yellow markings and occasional mauve and green highlights. Labium pale cream. Base of mandibles, genae and labrum golden yellow. The golden yellow at side of face is continued narrowly upwards at margin of eye. Labrum finely bordered with dark brown at distal margin. Postclypeus greenish. Anteclypeus, frons, top of head and base of antennae matt black. Rest of antennae mid brown. Faint mid brown spot between base of antennae and lateral ocelli. Prothorax pale golden yellow centrally with



Figs 36-41. *Podolestes pandanus* sp. n., Hainan: (36) thorax, lateral; — (37-38) penile organ; — (39-40) caudal appendages; — (41) hindwing.

blackish fore and hind lobes. Pterothorax black with pale yellow or greenish yellow interrupted humeral stripe. Thorax patterned as illustrated in Figure 36. The lateral markings are pale mauvish yellow or greenish yellow. Prothorax, lower pterothorax, coxae and dorsum of segments 1-3 with pruinescence. Legs pale brown. Wings hyaline with black pterostigma, which is braced at or near proximal base. Wing venation of hindwing as shown Figure 41. Abdomen predominantly dark brown with middle of segments 3-6 mid brown. Segments 1-2 and 8-10, patterned as illustrated in Figures 36 and 39. The pale spots of segments 1 and 2 of one specimen are golden yellow and in two specimens the yellow is superimposed with pale bluish green colouration. Segments 2-7 with narrow pale yellow basal rings and broad dark brown distal rings. Segment 8-10 predominantly black. Segment 7-8 pale yellow ventrally. Segment 10 with large creamy white lateral spots. Caudal appendages black with inferior appendages pale brown at base. A few short golden hairs are visible along the basal margin of the inferior appendages. Superior appendages are slightly longer than the rounded tipped, slender inferior appendages (Figs 39-40). Penile organ with lateral basal projections as shown in Figures 37-38. Caudal appendages as shown in Figures 39-40.

M e a s u r e m e n t s (mm). — Male abd. + app. 34.0-34.5, hw 28.0-28.5.

REMARKS. — Seven species of *Podolestes* have been described from Indonesia and Malaysia with just one species, *P. orientalis* Selys, known from continental Southeast Asia. LIEFTINCK (1935: 177-181, figs 1-2), provided the first full description of the male of *P. orientalis*. He described *orientalis* material from Borneo and Sumatra with illustrations of thoracic pattern and male caudal appendages. *P. pandanus* is very closely allied to *P. orientalis* with similar body pattern and colouration. The most obvious differences are the inferior appendages of *pandanus*, which are longer, more slender and less hirsute basally than *orientalis*. As observed by Lieftinck for *P. orientalis*, at rest the wings of *pandanus* are held outstretched in the manner of a lepidopteran.

PSEUDOLESTIDAE

PSEUDOLESTES MIRABILIS KIRBY, 1900

Pseudolestes mirabilis: KIRBY, 1900: 537-539, pl. XII, fig. 3, "type-loc Hainan"; — NEEDHAM, 1931a: 230-232, figs 8-9, "Nodoa, Hainan".

M a t e r i a l. — 2 ♀, Bawangling, 4-IV-1998, coll. G.T. Reels; — 1 ♂, do., 6-IV-1998; 2 ♂, do, 7-IV-1998; — 1 ♀, Jiangfengling, 9-IV-1998, coll. G.T. Reels; — 10 ♂, 2 ♀, Niujialin, 21-V-1999, coll. K.D.P. Wilson; — 1 ♂, Tongtielin, Xinglong, 22-V-1999, coll. K.D.P. Wilson; — 5 ♂, 1 ♀, Diaoluoshan, 24-V-1999, coll. K.D.P. Wilson; — 1 ♂, do., 26-V-1999; 3 ♂, Wuzhishan, 9-VI-1999, coll. G.T. Reels.

REMARKS. — Apparently quite common and widespread in forested areas throughout Hainan. On approaching male territories males may respond by hovering

and slowly sculling their orange and black patterned hindwings to give a strong bee-like impression. Disputes over territories may be resolved by males, hovering and facing each other. They slowly rise up together, into the top of the forest canopy, without making contact.

COENAGRIONIDAE

MORTONAGRION SP.

M a t e r i a l. — 1 ♂, Qingpilin, 19-V-1999, coll. K.D.P. Wilson.

REMARKS. — Unfortunately the caudal abdomen is missing.

CERIAGRION INDOCHINENSE ASAHINA, 1967

Ceriagrion coromandelianum (not of Fabricius, 1798): KIRBY, 1900: 537, "Hainan".

Ceriagrion indochinense: ASAHINA, 1967b, 288-289, 320-326 (key), figs 86-92, "Thailand and S. Vietnam".

M a t e r i a l. — 1 ♂, Jiaxi, 14-V-1999, coll. G.T. Reels.

DISTRIBUTION. — China (Hainan), Thailand and S. Vietnam.

REMARKS. — A single male was collected which lacked segments 8-10. Nevertheless the lack of black markings on the face, characteristic mesostigmal plate, uniform pale yellow abdomen with dorsum of segment 7 a little brownish, abdomen with minute transverse wrinkles and simple round-headed penile organ are exactly as ASAHINA (1967) described for the type material from South Vietnam.

PSEUDAGRION AUSTRALASIAE SELYS, 1876

Pseudagrion bengalense: FRASER, 1933: 282-284, fig. 119 (a-b), "Bengal, Assam and Burma".

Pseudagrion australasiae: LIEFTINCK, 1954: 179, "P. Malaysia, Sumatra, Java".

M a t e r i a l. — 3 ♂, Xinglong Botanical Gardens, 23-V-1999, coll. K.D.P. Wilson.

DISTRIBUTION. — Bangladesh, Burma, Cambodia, Indonesia, India, Nepal, Peninsular Malaysia, Singapore, Thailand.

REMARKS. — These are the first records of *Pseudagrion australasiae* from China.

PLATYCNEMIDIDAE

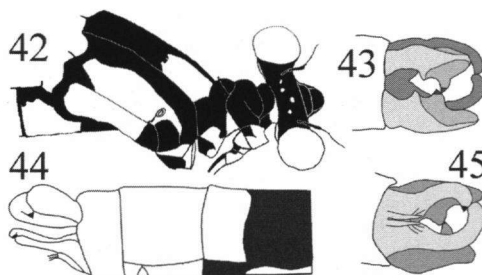
COELICCIA SCUTELLUM HAINANENSE LAIDLAW, 1932

Figures 42-45

Coeliccia scutellum hainanense: LAIDLAW, 1932: 23, "4 ♂, Mt Wuchi, Hainan, 19-V-1903".

Material. — 1 ♂, Jiangfengling, 11-IV-1998, coll. J.R. Fellowes; — 10 ♂, Niujialin, 21-V-1999; — 1 ♀, Tongtielin, Xinglong, 22-V-1999, coll. K.D.P. Wilson; — 1 ♂, Diaoluoshan, 26-V-1999, coll. K.D.P. Wilson; — 1 ♂, Wuzhishan, 9-VI-1999, coll. G.T. Reels; — 1 ♂, Jiaxi, 14-VI-1999, coll. G.T. Reels.

REMARKS. — According to LAIDLAW (1932) the chief differences of the Hainan subspecies from the nominate subspecies from Tonkin are the greater size of the synthoracic marks and the posterior half of the segment 8 of the abdomen, which, as well as segments 9 and 10, are yellow (see figs 7-10). In the nominate subspecies only the apical half of abdominal segment 9 and 10 are yellow. Recently ASAHINA (1997: 23-24, figs 24-28) described *C. tomokunii* from Mt Tan Vien, Ba Vi, Ha Tay Prov. and Cuc Phuong, Gia Vien, Ninh Binh Pro., North Vietnam. Asahina did not mention whether he had examined Laidlaw's type specimens of *scutellum* in the BMNH or whether he had considered the species in his description of *tomokunii*. There is a strong possibility that these two taxa are synonymous. *C. s. scutellum* was originally described from the same general area as *tomokunii* at two mountains, Ngai Tio and Bao Ha, in North Vietnam.



Figs 42-45. *Coeliccia scutellum hainanense*, Hainan: ♂: (42) thorax, lateral; — (43) caudal appendages, dorsal; — (44) caudal appendages, lateral; — (45) caudal appendages, ventral.

COELICCIA CYANOMELAS RIS, 1912

Coeliccia cyanomelas: RIS, 1912: 66-67, fig. 7, pl. 4 (fig. 8), "Taiwan, Guangdong"; — ASAHINA, 1965: 496, "Hong Kong"; — WILSON, 1995a: 68-69, 75, 77, "photo ♂, ♀, Hong Kong".

Material. — 5 ♂, 2 ♀, Jiangfengling, 9-IV-1998; — 1 ♂, do, 10-IV-1998; — 3 ♂, 1 ♀, Jianling, 21-V-1999; — 1 ♀, Tongtielin, Xinglong, 22-V-1999; — 2 ♂, Wuzhishan, 9-VI-1999.

DISTRIBUTION. — China (Fujian, Guangdong, Guangxi, Hainan, Sichuan, Taiwan and Zhejiang).

PLATYSTICTIDAE

DREPANOSTICTA ZHOUI SP. NOV.

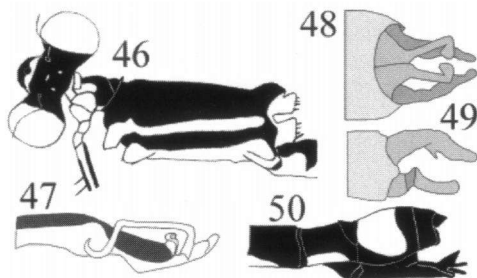
Figures 46-50

Drepanosticta brownelli (not Tinkham): ZHOU, 1986: 208, figs 1-5, "female, Hainan".

Material. — **Holotype** ♂, Diaoluoshan, 24-V-1999, coll. K.D.P. Wilson. — **Paratypes:** 1 ♀, Jiangfengling, 9-IV-1998, coll. G.T. Reels; — 1 ♀, Bawangling, 4-IV-1998, coll. G.T. Reels; — 1 ♂, do., 7-IV-1998; — 1 ♂, do., 7-IV-1998, leg. B. Hau; — 1 ♂, Jiangfengling, 10-IV-1998, leg. M. Lau; — 2 ♂, Jiandogling, 10-IV-1998, G.T. Reels; — 2 ♀, do., 10-IV-1998; — 6 ♂, Niujialin, 21-V-1999, coll. K.D.P. Wilson; — 14 ♂, 4 ♀, Tongtielin, Xinglong, 22-V-1999, coll. K.D.P. Wilson; — 7 ♂, Diaoluoshan, 24-V-1999, coll. K.D.P. Wilson; — 1 ♂, do., 25-V-1999; — 3 ♂, 2 ♀, Wuzhishan, 9-VI-1999, coll. G.T. Reels; — 2 ♂, 2 ♀, Jiayi, 14-VI-1999, coll. G.T. Reels; — 1 ♂, 1 ♀, Limushan, 16-VI-1999, coll. G.T. Reels. — Holotype will be deposited at Tai Lung Experimental Station, Agriculture, Fisheries and Conservation Department, Lin Tong Mei, Sheung Shui, Hong Kong SAR, China.

Etymology. — This damselfly is named in honour of Zhou Wen-bao who first studied this species from Hainan in 1986.

DESCRIPTION. — **MALE:** Typical slight bodied, blackish platystictid with reddish brown pterostigmas and blue-tipped abdomen. Labium pale brownish black. Basal border of labrum ivory white, which is continued onto the distal border of the clypeus. Mandibles mainly black with upper two fifths white. Clypeus, frons and top of head shining black. Dorsum of prothorax pale darkish brown with sides pale creamy brown. Thorax (Fig. 46) black with horizontal narrow pale blue or white



Figs 46-50. *Drepanosticta zhoui* sp. n., Hainan: (46) ♂ thorax, lateral and head; — (47) penile organ, lateral; — (48) ♂ caudal appendages, ventral; — (49) ♂ caudal appendages, lateral; — (50) ♀ caudal abdomen, lateral.

stripe through centre of metepisternum. Basal half of metepimeron pale blue or white. Wings with large reddish brown pterostigma, which have a larger base than outer margin. At some localities tips of male wings are heavily smoked blackish. Legs mainly blackish with femora white with outer and inner margins black. Abdomen mainly dark brownish black with pale white basal rings segments 3-7. Dorsum of segments 1-2 dark

brownish black. Dorsum of segments 8-10 cyan blue. Caudal appendages black (Figs 48-49). Tips of inferior caudal appendages abruptly angled inwards to form characteristically pipe-shaped, clubbed tips. Tip of penile organ (Fig. 47) with extended tip.

FEMALE. — Very similar to male but more extensive white or pale blue markings. The frons is white and the prothorax is predominantly pale with only the hind dorsal margin marked dark brown. The tip of the abdomen is blackish with basal two thirds of segment 9 white. Caudal tip of abdomen illustrated in Fig. 50.

Measurements (mm). — Male abd. + app. 39.0-41.5 hw. 21.5-24.0; female abd. + app. 35.0 hw. 22.0-24.0.

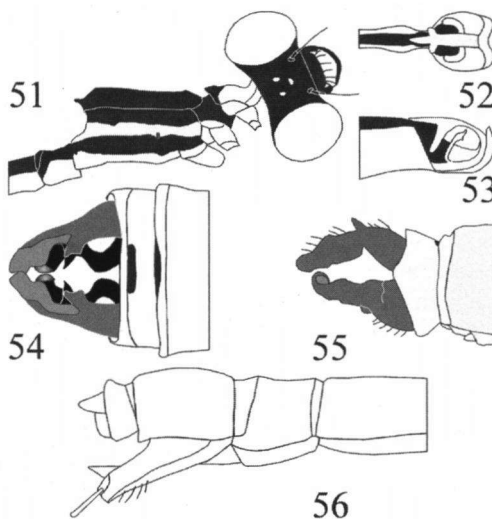
REMARKS. — Easily differentiated from all other *Drepanosticta* in the region from the distinctive structure of the male inferior appendages.

DREPANOSTICTA ELONGATA SP. NOV.

Figures 51-56

Material. — **Holotype** ♂: Niujialin, 21-V-1999, coll. K.D.P. Wilson. — **Paratypes**: 7 ♂, 1 ♀, Niujialin, 21-V-1999, coll. K.D.P. Wilson. — **Additional material**: 3 ♂, 1 ♀, Diaoluoshan, 24-V-1999, coll. K.D.P. Wilson. — Holotype will be deposited at Tai Lung Experimental Station, Agriculture, Fisheries and Conservation Department, Lin Tong Mei, Sheung Shui, Hong Kong SAR, China.

DESCRIPTION. — **MALE:** Slight, but very elongated platystictid with blue tipped abdomen. Labium pale cream. Labrum ivory or occasionally cyan blue with distal margin broadly bordered black. Mandibles black with ivory white triangular shaped spot at upper margin adjacent to labrum. Face of clypeus bright cyan blue or deeper blue. Top of clypeus shiny black. Frons and top of head black with metallic green reflective margins. Antennae dark brown. Prothorax creamy white with hind margin black. Coxae creamy white. Synthorax black with green metallic reflections. Sides of thorax with two narrow creamy white stripes covering mesepimeron and majority of metepimeron (Fig. 51). Legs pale



Figs 51-56. *Drepanosticta elongata* sp. n., Hainan: (51) ♂ thorax, lateral and head; — (52-53) penile organ; — (54) ♂ caudal appendages, dorsal; — (55) ♂ caudal appendages, lateral; — (56) ♀ caudal abdomen, lateral.

with blackish tint. Tibia with sparse fringe of very elongate hairs. Wings hyaline with black pterostigma covering just over one cell. Segments 1-3 of abdomen with brown dorsum and creamy white ventrum. Segments 4-6 brown, progressively darkening towards distal margin, with pale basal rings. Segment 9 brown. Dorsum of segments 8-10 cyan blue with base of segment 8 dark brown and distal margin of segment 10 black. Superior appendages black and inferior appendages dark brown (Figs 54-55). Penile organ illustrated in Figures 52-53.

FEMALE. — Almost identical to male in colouration but with much shorter body. Anal appendages as illustrated in Figure 56. The tip of the abdomen is entirely blackish brown. Abdomen predominantly blackish brown. Segments 1-2 with ventral basal four fifths pale. Segment 3 entirely brown save for a pale basal ventral base. Segments 5-8 with basal quarter ringed dull white. Segments 9-10 and caudal appendages blackish brown except for a small quadrate dull white spot at ventral base of segment 9.

Measurements (mm). — Male abd. + app. 49.0-53.0, 25.0-28.0 hw; female abd. + app. 39.0, hw. 27.5.

REMARKS. — Female observed ovipositing in bark of tree overhanging margin of swift flowing montane stream. The number of *Drepanosticta* known from China is increased to four species. *D. brownelli* (TINKHAM, 1938) is known from Guangdong and *D. hongkongensis* WILSON (1997b) was recently described from Hong Kong.

SINOSTICTA HAINANENSE SP. NOV.

Figures 57-63

Material. — **Holotype** ♂, Niujialin, 21-V-1999, coll. K.D.P. Wilson. — **Paratype:** 1 ♀, Niujialin, 21-V-1999, coll. K.D.P. Wilson. — Other material: 1 ♀, Bawangling, 7-IV-1998, coll. G.T. Reels; — 1 ♂ (teneral), Diaoluoshan, 24-V-1999, coll. G.T. Reels. — Holotype will be deposited at Tai Lung Experimental Station, Agriculture, Fisheries and Conservation Department, Lin Tong Mei, Sheung Shui, Hong Kong SAR, China.

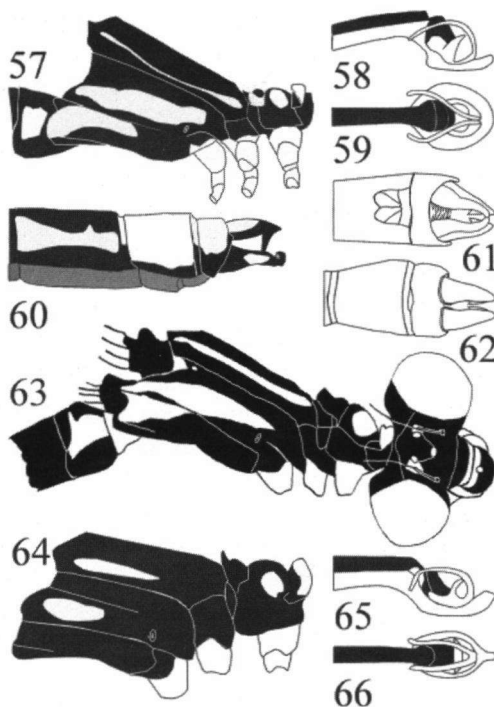
DESCRIPTION. — **MALE:** Large, stout platystictid with blue tipped abdomen. Labium dark blackish brown. Face of clypeus, labrum and mandibles cyan blue. Central distal border of labrum tipped black. Top of clypeus, genae and eye margins shiny black. Frons and top of head matt black. An oblong pale spot adjacent to lateral ocelli. Prothorax dark brown with creamy white frontal lobe and large creamy white lateral spots (Fig. 57). Lateral corner of hind lobe creamy white and hind border sparsely spotted white. Synthorax dark blackish brown with narrow creamy white antehumeral stripe. Sides of synthorax with two large pale cyan blue stripes covering most of metepisternum and metepimeron (Fig. 57). Coxae and legs pale yellow. Wings hyaline with blackish pterostigma. Base of wing with 2-3 supplementary postcubital cross-veins (pcv) in addition to anal crossing and CuP extending well beyond the mid-point of the wing. Abdomen predominantly dark

brown. Segments 1-2 of abdomen with pale blue lateral spots. Segments 3-7 with baso-lateral pale bluish white spots. Segments 9-10 and sides of segment 8 cyan blue. Caudal appendages blackish brown with white spot on dorsum of superior appendages and side of inferior appendages as shown in Figure 60. Shape of caudal appendages is illustrated in Figures 60-61. Penile organ is illustrated in Figures 58-59. The pale facial and synthoracic markings of one of the males, which is teneral, are a rich golden yellow.

FEMALE. — Labrum with basal one third pale blue. Prothorax as male but with hind lobe dark. Antehumeral stripe slightly broader than male. Pale spots on sides of synthorax patterned as male but paler blue (Fig. 63). Segment 8 with pale blue lateral triangular spot and segments 9-10 with dorsum predominantly pale blue.

Measurements (mm). — Male abd. + app. 40.0-48.0, hw 29.0-34.0; female abd. + app. 40.0, hw. 33.0.

REMARKS. — Very similar to *S. ogatai* (MATSUKI & SAITO, 1996). There are no overt differences in the wing venation or physical structure between the two taxa. The main difference is overall colour and markings on the synthorax. For comparison the pattern of the synthorax in *S. ogatai* is illustrated in Figure 64. The penile organ is also slightly different. The long forked tips of the penile organ are not sharply reflexed upwards, towards the body, as are those of *ogatai*, which are drawn here in Figures 65-66. *Sinosticta* WILSON (1997b) is a genus, hitherto known only from the species *S. ogatai*, described from Hong Kong.



Figs 57-66. [57-63] *Sinosticta hainanense* sp. n., Hainan: (57) ♂ thorax, lateral; — (58-59) penile organ; — (60-62) ♂ caudal appendages, dorsal; — (63) ♀ thorax, lateral and head; — [64-66] *Sinosticta ogatai*, Hong Kong: — (64) thorax, lateral; — (65-66) penile organ.

PROTONEURIDAE

PRODASINEURA CROCONOTA (RIS, 1916)

Disparoneura croconota: RIS, 1916: 18, "type-loc. Taiwan"; — NEEDHAM, 1930: 283, 285, "Taiwan".

Prodasineura croconota: MATSUKI, 1991: 27-28, figs 1-4 (larva), "larva descr; Taiwan"; — WILSON, 1995a: 84-87, 89, "photo ♂, ♀, Hong Kong & Guangdong"; WILSON, 1997a: 25, "Hong Kong"; — WILSON, 1999: 30-31, "Guangdong"

Material. — 1 ♂, Jiangfengling, 9-IV-1998, coll. G.T. Reels.

DISTRIBUTION. — China (Guangdong, Hainan, Hong Kong and Taiwan).

REMARKS. — The Hainan form of *croconota* closely resembles the Hong Kong and Guangdong form, with the orange markings on top of the head reduced to a pair of small orange spots. The Taiwanese *croconota* has a thin orange transverse band between the eyes. The dorsum of the tenth abdominal segment of Taiwanese *croconota* is pale yellow whereas the dorsum of the tenth abdominal segment in Hong Kong and Guangdong *croconota* is predominantly black with the posterior margin finely bordered white. Only two small white spots are found on the dorsum of the 10th abdominal segment of the Hainan form, which are located opposite the base of the superior appendages. The sides of prothorax of the Hainan form possess a prominent orange spot larger and more conspicuous than the mainland form.

CHLOROGOMPHIDAE

CHLOROGOMPHUS ICARUS SP. NOV.

Figures 67-75

Material. — **Holotype** ♂: Diaoluoshan, 26-V-1999, coll. K.D.P. Wilson. — **Paratype** ♀: Diaoluoshan, 26-V-1999, coll. K.D.P. Wilson. — Other material: 3 ♂, Jiayi, 14-VI-1999, coll. G.T. Reels. — Holotype will be deposited at Tai Lung Experimental Station, Agriculture, Fisheries and Conservation Department, Lin Tong Mei, Sheung Shui, Hong Kong SAR, China.

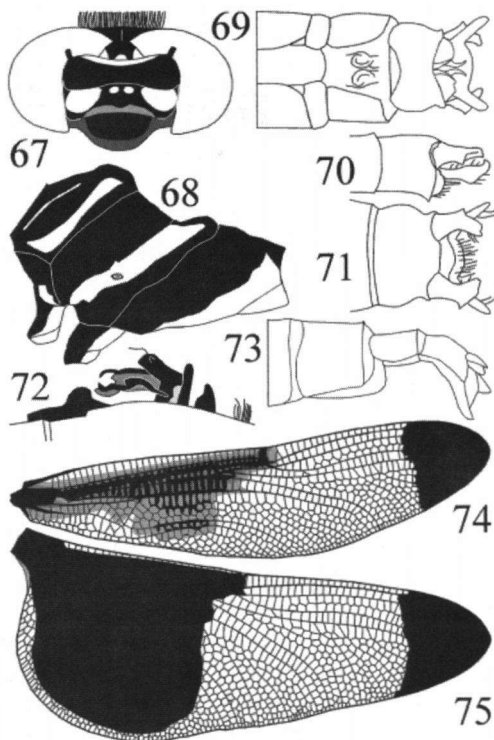
Etymology. — Named after *Icarus* who flew too close to the sun and fell from the sky. The male holotype and female paratype were taken after they both fell to the ground, from considerable height above the forest, after the male unsuccessfully attempted to mate with the female.

DESCRIPTION. — **MALE:** Labium pale cream and extremely hirsute towards front. Palpi of lateral lobes black. Labrum black. Anteclypeus blackish brown with distal border pale. Postclypeus black with two large yellow lateral spots and two small central yellow spots (Fig. 67). Face of frons black. Top of frons black with yellow crest. Top of head black with amber coloured ocelli. Raised smooth broad ridge at posterior base of ocelli. Occipital crest broad triangular-shaped, beset with a thick

fringe of black hairs. Prothorax black finely bordered with pale cream margin. A pair of minute cream spots at centre of dorsum. Synthorax black with fine yellow humeral stripe and broad yellow antehumeral stripe (Fig. 68). Mesokatepisternum with small yellow spot. Metepisternum largely covered with broad yellow stripe. Metaposternum and hind portion of metepimeron yellow. Coxae with broad yellow stripes along hind exterior. Legs black with keeled tibia. Wings hyaline with extreme tips blackish brown. Pterostigma long and black. Abdomen black. Segment 1 with yellow lateral spot located towards distal border. Segment 2 with basolateral yellow spot, yellow stripe along distal margin of transverse carina and distal margin of dorsum yellow. Lateral and ventral margins also yellow. Segment 3 with transverse carina finely yellow. Segments 3-6 with distal pair of yellow spots on dorsum finely divided with black. Segments 7-10 and caudal appendages black. Caudal appendages as shown in Figures 69-71. Secondary genitalia are illustrated in Figure 72.

FEMALE. — Coloured similarly to male with larger head and spectacular blackish coloured wings (Figs 74-75). Forewing at basal half coloured blackish brown; not quite as intensely coloured as hindwing. Hindwing markedly broader than male. Raised broad ridge at posterior base of ocelli with pair of vertical bluntly pointed prominences. Abdomen predominantly black. Segments 1 and 2 as male but 3-10 black, except segment 6, which has a pair of small crescent-shaped spots at distal margin of dorsum. Legs black without keels. Caudal appendages as shown in Figure 73.

Measurements (mm). — Male abd. + app. 51.0-55.0, hw. 44.0-47.0; female abd. + app. 53.0, hw. 54.0.



Figs 67-75. *Chlorogomphus icarus* sp. n., Hainan: (67) ♂ head, frontal; — (68) ♂ synthorax; — (69-71) ♂ caudal appendages; — (72) ♂ secondary genitalia; — (73) ♀ caudal appendages, lateral; — (74) ♀ forewing; — (75) ♀ hindwing.

REMARKS. — Adults observed soaring at high altitude above ravines and mountaintops. Females occasionally flew with a gliding flight, interspersed with a rapid flutter or shimmering of wings. *C. icarus* shares a number of features with *C. nasutus* Needham from China (Fujian, Guangxi, Jiangsu and Sichuan) and N. Vietnam. The males have a similar style of caudal appendages and the female also possess pointed prominences on the occipital process (cf. KARUBE, 1995a: 56-59, figs 53-62). The highly coloured wings of the female are similar to *C. nakamurai* (cf. ASAHINA, 1995: 220, fig. 7.) and *C. risi* ASAHINA (1968: 93, figs 13-14), which both share this feature, although the males of the latter are also sometimes coloured. The three males collected at Jiayi were all taken as they patrolled a forest hill stream at 700 m altitude, flying close to the water's surface.

CHLOROGOMPHUS GRACILIS SP. NOV.

Figures 76-83

Material. — **Holotype** ♂: Diaoluoshan, 24-V-1999, coll. G.T. Reels. — **Paratype** ♀: Diaoluoshan, 24-V-1999, coll. K.D.P. Wilson. — Holotype will be deposited at Tai Lung Experimental Station, Agriculture, Fisheries and Conservation Department, Lin Tong Mei, Sheung Shui, Hong Kong SAR, China.

Etymology. — *gracilis* = slim, thin, slender. Named on account of the fine build and extremely long, slender abdomen.

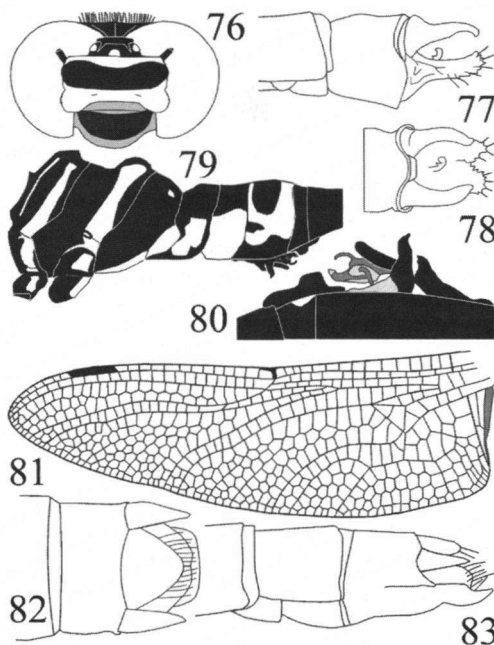
DESCRIPTION. — **MALE:** Extremely long, thin-bodied, clear-winged chlorogomphid with relatively small wings. Labium creamy yellow beset with numerous long golden hairs. Palpi of lateral lobes dark brown. Labrum black. Anteclypeus dark brown. Postclypeus yellow. Face of frons black. Top of frons black with yellow frontal crest, shaped like human lower lip. Ocelli amber. Top of head and occiput black. Face of head is shown in Figure 76. Raised transverse ridge posterior to ocelli slightly divided at centre. Occiput with thick black fringe of hairs. Prothorax black with frontal lobe finely bordered creamy yellow and pair of small semi-circular yellow spots at centre of frontal lobe. Synthorax black with narrow dorsal stripe and broad antehumeral stripe (Fig. 79). Metepisternum with broad yellow stripe. Mesokatepisternum and metakatepisternum with large yellow spots. Metepimeron with small yellow spot at base of hindwing. Metaposternum and hind base of metepimeron yellow. Posterior of coxae with broad dorso-ventral yellow stripe. Legs black with keeled tibiae. Wings hyaline with black pterostigma covering 3 to 4 cells. Hindwing illustrated in Figure 81. Abdomen predominantly black, very thin and extremely elongate. Segment 1 and 2 coloured yellow and black (Fig. 79). Segments 3-7 with pair of partially divided yellow spots at distal border. Dorso-lateral margin of segment 8 with faint patchy yellow border. Caudal appendages black. Curious robust, hooked, peg-like process arising from centre of base plate formed by conjoined inferior appendages (Figs 77, 78). Secondary genitalia as illustrated in Figure 80.

FEMALE. — Almost identical to male. The head is a similar size and there are no overt differences in the transverse ridge located behind the ocelli. The markings of the head, thorax and abdomen are similar. The synthoracic dorsal stripe is broad at the base of the wings tapering to a fine point at the head. On the metepimeron, at the base of the hindwing, there are two small yellow spots, as opposed to the single male spot. The latero-ventral portion of the second abdominal segment is entirely yellow. Wings hyaline, not markedly broader than male. Legs black without tibial keels. Caudal appendages as shown in Figures 82-83. Tenth ventral lobe extends slightly beyond paraprocts.

Measurements (mm). — Male total length 90.0, abd. + app. 72.0, hw. 47.0; female total length 93.0, abd. + app. 74.0, hw. 53.0.

REMARKS. — FRASER (1936) comments that there are no accounts of *Chlorogomphus* females ovipositing. The paratype female *C. gracilis* was taken shortly after ovipositing. The female settled at the water's edge, on a shoal of gravel, beside a small mountain stream at about 900 m altitude. Eggs were quickly inserted into gravel lying in very shallow water, at several places at the water's edge. Males were observed patrolling, flying slowly, close to water's surface on a mountain stream between 500 and 900 m.

C. gracilis is a member of a group of chlorogomphids, possessing very long, slim bodies. KARUBE (1995a) considers *C. sachiyoae*, from North Vietnam, and *C. kitawakii*, from Guangxi, as belonging to the same group. The closest congener to *C. gracilis* is *C. kitawakii* (KARUBE, 1995b). Unlike *gracilis* both *sachiyoae* and *kitawakii* possess superior appendages with robust, prominent lateral spines. The three species correspond to Fraser's Atkinsoni group whose members have the following traits: hindwing of female not markedly broader than male, wings of female hyaline and abdomen markedly longer than hindwing (FRASER, 1936). The robust, hooked, peg-like process arising from centre of inferior appendages of



Figs 76-83. *Chlorogomphus gracilis* sp. n., Hainan: (76) ♂ head, frontal; — (77-78) ♀ caudal appendages; — (79) ♂ synthorax and base of abdomen; — (80) ♂ secondary genitalia; — (81) ♂ hindwing; — (82-83) ♀ caudal appendages.

gracilis is similar to the spine-like process figured and described by FRASER (1936: 16-18, fig. 5) for *C. fraseri* St Quentin from Assam, India, which is not a member of Fraser's *Atkinsoni* group.

Including the two new Hainan species, 41 species of *Chlorogomphus* are currently recognised. Their distribution is confined to the Oriental region. The most species-rich area is north Vietnam and south China. Nine species are known from Vietnam and ten species are now recognised from China. All the Chinese species are restricted to the south with the majority of species occurring in Sichuan and Guangxi. Given the distribution of species hitherto known, Hainan may support further species of this montane genus.

AESHNIDAE

POLYCANTHAGYNA ERYTHROMELAS (McLACHLAN, 1896)

Polycanthagyna erythromelas: WILSON, 1995a: 102, 105, 107, "photo ♂, ♀, Hong Kong"; – WILSON, 1997a: 28, "Hong Kong"; – WILSON, 1999: 34, "Guangdong".

Polycanthagyna erythromelas paiwan: MATSUKI & LIEN, 1985: "larva descr; Taiwan".

Material. – 1 ♀, Nga Ga, Bawangling, coll. G.T. Reels, 6-IV-1998; – 1 ♀, Diaoluoshan, 25-V-1999, coll. K.D.P. Wilson.

DISTRIBUTION. – Burma, China (Guangdong, Guangxi, Hainan, Hong Kong and Taiwan), India, Nepal, Pakistan, Thailand and Vietnam.

TETRACANTHAGYNA WATERHOUSEI McLACHLAN, 1898

Tetracanthagyna waterhousei: FRASER, 1936: 115-119, fig. 35-36, "India"; – ASAHINA, 1986a: 82-84, figs. 42-48, "Thailand"; – ASAHINA, 1988a: 695, "Hong Kong"; – MATSUKI, 1988a: 37-40, figs 1-12, "larva descr; Hong Kong & Thailand"; – WILSON, 1995a: 3, 100-101, 105, pl. 1-5, "photo ♂, ♀, Hong Kong"; – SAITO & OGATA, 1995: 37, figs 71-72, "Hong Kong"; – WILSON, 1997a: 28, "Hong Kong"; – WILSON, 1999: 34, "Guangdong".

Material. – 1 ♂, Jianling, 18-V-1999, coll. K.D.P. Wilson; – 1 ♀, Diaoluoshan, 24-V-1999, coll. M. Lau.

DISTRIBUTION. – Bangladesh, Borneo, Burma, China (Guangdong, Hainan and Hong Kong), India, Laos, Peninsular Malaysia, Thailand and Vietnam.

ANAX IMMACULIFRONS RAMBUR, 1842

Anax immaculifrons: RIS, 1916: 63, "Hong Kong"; – NEEDHAM, 1930: 73,

"Hong Kong"; — ASAHINA, 1965: 500, "Hong Kong"; — ASAHINA, 1986a: 101-104, figs 101-107, "Thailand & Hong Kong"; — WILSON, 1995b: 92-93, 97, 99, "photo ♂, ♀, Hong Kong"; — WILSON, 1997a: 26-27, "Hong Kong"; — WILSON, 1999: 31, "Guangdong".

Material. — 2 ♂, Nga Ga, Bawangling, coll. G.T. Reels, 6-IV-1998.

DISTRIBUTION. — Afghanistan, China (Guangdong, Guangxi, Hainan and Hong Kong), Greece, India, Iran, Nepal, Sri Lanka, Thailand, Turkey and Vietnam.

GYNACANTHA SUBINTERRUPTA RAMBUR, 1842

Gynacantha subinterrupta: NEEDHAM, 1931a: 231, "Hainan"; — WILSON, 1995a: 99, 103, "photo ♂, Hong Kong"; — WILSON, 1997a: 28, "Hong Kong"; — WILSON, 1999: 48, "Guangdong".

Material. — 1 ♂, Bawangling, 6-IV-1998, coll. G.T. Reels.

DISTRIBUTION. — Burma, Cambodia, China (Guangdong, Guangxi, Hainan and Hong Kong) Indonesia, Peninsular Malaysia, Philippines, Thailand and Vietnam.

GYNACANTHA SALTATRIX MARTIN, 1909

Gynacantha saltatrix: ASAHINA, 1965: 500, "Hong Kong"; — ASAHINA, 1966b: 132-134, figs 2-5, 7-10, "Fujian, Taiwan, Thailand, Tonkin and Hong Kong"; — ASAHINA, 1986: 89-91, 103, figs 64-71, 117, "Thailand"; — WILSON, 1995a: 95, 99, "photo ♂, ♀, Hong Kong"; — WILSON, 1997a: 27, "Hong Kong"; — WILSON, 1999: 48, "Guangdong".

Material. — 1 ♂, Jiayi, 14-V-1999, coll. G.T. Reels.

DISTRIBUTION. — Burma, China (Fujian, Guangdong, Hainan, Hong Kong, Taiwan and Sichuan), Thailand and Vietnam.

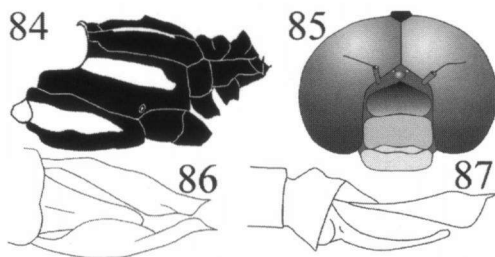
PERIAESCHNA MAGDALENA MARTIN, 1909

Figures 84-87

Cephalaeschna magdalena: NEEDHAM, 1930: 79-80, pl. 8, fig. 15, "Guangxi?".

Periaeschna magdalena: FRASER, 1936: 82-84, "Bengal, Assam, Tonkin"; — ASAHINA, 1956: 224-225, figs 47-48, "Zhejiang"; — ASAHINA, 1961: 5, figs 30-31, "Jiangsu"; — LIEFTINCK et al., 1984: 36, "Taiwan".

Material. — 1 ♂, Bawangling, 5-IV-1998, coll. G.T. Reels; — 1 ♀, Diaoluoshan, 25-V-1999, coll. G.T. Reels.



Figs 84-87. *Periaeschna magdalena*, ♂, Hainan: (84) thorax, lateral; – (85) head, frontal; – (86) caudal appendages, dorsal; – (87) caudal appendages, lateral.

DISTRIBUTION. – Burma, China (Guangxi, Hainan, Jiangsu, Taiwan and Zhejiang), north-east India, Thailand and Vietnam.

PLANAESCHNA CELIA SP. NOV.

Figures 88-91

Material. – **Holotype** ♂, Wuzhishan, 9-VI-1999, coll. G.T. Reels. – Holotype will be deposited at Tai Lung Experimental Station, Agriculture, Fisheries and Conservation Department, Lin Tong Mei, Sheung Shui, Hong Kong SAR, China.

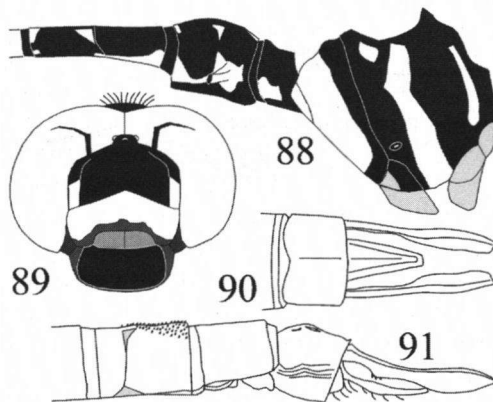
Etymology. – Named in honour of Mrs Celia Wilson.

DESCRIPTION. – **MALE:** Typical sized *Planaeschna* with entirely black labrum. Labium ferruginous brown. Labrum black. Anteclypeus light brown. Postclypeus bright lemon yellow with distal margin broadly bordered dark brown (Fig. 89). Face of frons blackish brown with bright lemon yellow quadrate spots at base of sides. These spots fade to brownish above. Top of frons dark brown fading to mid brown at base. The frons is slightly elevated above to form a bluntly pointed peak. Occiput and vertex black. Prothorax dull blackish brown paling to dull reddish brown at frontal lobe and lateral margins. Synthorax dull black. Short broad dorsal stripe. Dorsal crest entirely black. Mesepimeron broadly striped yellow. Isolated yellow spot adjacent to central thoracic stripe at base of forewing. Mesokatepisternum and coxae pale brown. Metakatepisternum with pale yellow spot at hind quarter. Metepimeron and metaposternum lemon yellow. Synthorax and first three segments of abdomen illustrated in Figure 88. Legs blackish brown with paler brown stripes at basal half of femora on outer and inner faces. Wings hyaline with black veins and black pterostigma covering 2-3 cells. Medial space clear. Abdomen predominantly black. First segment with large yellow lateral spot towards distal border. Second segment with yellow auricle and yellow spot at base of auricle which extends to distal border. Tip of auricle black. A small yellow triangle is located at the dorsal base of segment 2 and a short yellow transverse stripe is located at the distal margin of dorsum. Segments 3-8 with a pair of triangles aligned along the transverse carina and a short yellow transverse stripe is located at the distal margin of dorsum. In segments 4 to 8 the central pair of yellow triangles are narrowly divided

by a slightly ridged central carina. Segments 4-8 with ventral yellow spot at base of transverse carina. This carina dissipates and expands at the centre of segment 8 to a triangular-shaped field of minute posteriorly pointed spines. The base of the triangular field of spines, at the distal margin of segment 8, extends across the dorsum. Abdominal segments 8-10 and caudal appendages illustrated in Figures 90-91. The superior appendages are black whereas the inferior appendage is dark reddish brown. Ventral margin of superior appendages with distinct bulge towards base, which has a small number of minute spines. Inferior appendage approximately half the length of superior appendages.

Measurements (mm). — Male abd. + app. 52.0, hw. 43.0.

REMARKS. — Not including the new Hainan species, eleven species of *Planaeschna* are currently known, ranging from India, Burma, Thailand through China and Taiwan to Japan. Only three species are hitherto known from China with two from Taiwan and one from Zhejiang. The closest Chinese congener to *P. celia* is *P. suichanensis* ZHOU & WEI (1980) from Zhejiang. The superior appendages of *suichanensis* do not possess a basal ventral bulge, the labium has a basal broad yellow band, the tenth segment has a pair of yellow spots on the dorsum and the inferior appendage is short, less than one half of the superior appendages (ZHOU & WEI, 1980: 227-228, figs 1-3). *P. taiwana* ASAHINA (1951, 1996b) is also similar but its superior appendages are also without a basal ventral bulge, its labrum has twin yellow spots and the anteclypeus is entirely yellow. The nearest congeners geographically are from north Vietnam, where three species have been recently described. These comprise *P. tamdaoensis* ASAHINA (1996b), *P. tomokunii* ASAHINA (1996b), and *P. cucphuongensis* KARUBE (1999). ASAHINA (1996b) considers *tamdaoensis* is allied to *P. milnei* ASAHINA (1951) from Japan. *P. tamdaoensis* has superior appendages without a prominent basal ventral bulge, and different facial markings (cf. ASAHINA, 1996b: 70, figs 1-3.). *P. tomokunii* is known from only the female and considered allied to *taiwana*. The facial patterns of male and female *Planaeschna* are similar, and the facial pattern of female *tomokunii* is entirely pale brown (cf. ASAHINA, 1996b: 71, figs 4-6). KARUBE (1999) considers *cucphuongensis* is closest to *P. chiengmaiensis* ASAHINA (1981) from northern



Figs 88-91. *Planaeschna celia* sp. n., ♂, Hainan: (88) synthorax and base of abdomen; — (89) ♂ head, frontal; — (90) caudal appendages, dorsal; — (91) caudal abdomen and appendages, lateral.

Thailand. The facial colour pattern of male *celia* and the shape of its superior appendages will serve to separate it from male *cucphuongensis*. Females of both these species remain unknown.

OLIGOAESCHNA SABRE SP. NOV.

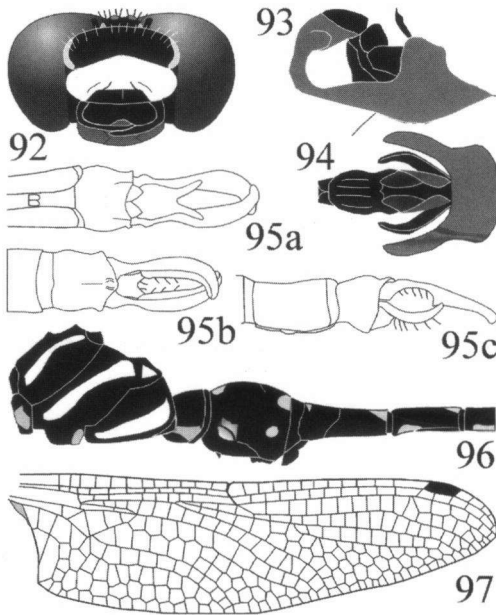
Figures 92-97

Material. — **Holotype** ♂, Wuzhishan, 9-VI-1999, coll. G.T. Reels. — Holotype will be deposited at Tai Lung Experimental Station, Agriculture, Fisheries and Conservation Department, Lin Tong Mei, Sheung Shui, Hong Kong SAR, China.

Etymology. — Named after the sabre-shaped superior appendages, as seen in plan view.

DESCRIPTION. — **MALE:** Labium dark ferruginous brown with irregular patches of black. Labrum black with pair of large ovate reddish brown spots. Anteclypeus black. Postclypeus greenish yellow. Frons protruding with flattish sharp-edged top. The face of the frons is heavily pitted, black with sides greenish yellow stripes,

which extend on to top of frons at base. Top of frons black at central quarter. Vertex and occiput black. Two small just discernible pale spots on top of vertex. The front of the head is illustrated in Figure 92. Prothorax dull black with small cream spot at hind lateral corner of central lobe. Synthorax dark reddish brown. Apple green dorsal stripe. Apple green stripe across mesepimeron. Triangular spot at base of hindwings on the metepisternum. Hind portion of metepimeron apple green. Mesokatepisternum and hind metakatepisternum pale. Coxae pale reddish brown. Legs black. Synthorax and abdominal segments 1-4 illustrated in Figure 96. Wings enfumed pale amber with blackish brown pterostigma covering 2-3 cells. Hindwing illustrated in Figure 97. Abdomen tapers markedly from segment 4



Figs 92-97. *Oligoaeschna sabre* sp. n., ♂, Hainan: (92) head, frontal; — (93) penile organ and vesicle, lateral; — (94) penile organ and vesicle, ventral; — (95a) caudal appendages, ventral; — (95b) caudal appendages, dorsal; — (95c) caudal appendages, lateral; — (96) ♂ synthorax and base of abdomen; (97) hindwing.

towards its tip. Abdomen, beyond initial bulge, is widest at segments 3-4, narrowing to half its width at segment 8. Abdomen is blackish brown. Segment 1 with pale latero-ventral spot. Dorsum of segment 2 with drop-like apple green spot at base and a pair of rounded apple green spots at distal margin. Isolated pale spot located posterior to auricle. Auricle and spot surrounding base are pale greenish yellow. Segments 3-6 with pair of pale greenish yellow rounded triangular spots at distal margin of dorsum and a pale yellow spot at lateral margin towards base. The latter spot decreases in size from segment 3 to segment 6. Segments 7-10 and caudal appendages black. Penile organ and vesicle illustrated in Figures 93-94. Superior appendages sabre-like with smoothly curved distal quarter when viewed from plan. Inferior appendages markedly divided.

M e a s u r e m e n t s (mm). — Male abd. + app. 41.5, hw. 34.0.

REMARKS. — *Oligoaeschna* is a primitive oriental genus, which ranges from India through Southeast Asia to Japan. The majority of species are known from Indonesia, East Malaysia and the Philippines. Only four, of the 28 known species have previously been recorded from China; *O. petalura* from Hainan (LIEFTINCK, 1968), *O. pyanan* from Taiwan (ASAHINA, 1951), *O. lienii* and *O. tsaopiensis* from Taiwan (YEH & CHEN, 2000). *O. petalura* is quite different from *O. sabre*, with leaf-like expanded superior appendages and only slightly divided inferior appendage (cf. LIEFTINCK, 1968: 175, fig. 8). Coincidentally, *O. petalura* was also taken from Wuzhishan, in 1911, by D.E. Kimmins. *O. sabre* is more closely related to *O. pyanan*, which has a similar shaped inferior appendage but much straighter superior appendages. *O. sabre* is easily separated from other *Oligoaeschna* by the unique sabre-like distal curvature of the superior appendages (cf. LIEFTINCK, 1968: 162, fig. 3).

GOMPHIDAE

ASIAGOMPHUS HAINANENSIS (CHAO, 1953)

Gomphus personatus: NEEDHAM, 1930: 251, "Fan Ta Cheun Hung, Hainan".

Gomphus hainanensis: CHAO, 1953a: 398, 404-407, figs 20-24, "type-loc. Hainan";

— ASAHINA, 1966a: 111-112, figs 9-16, 25-26, "Hong Kong & Taiwanese material".

Asiagomphus septimus (not of Needham): ASAHINA, 1988a: 690, "female described as *hainanensis* in Asahina (1966) is reidentified as *septimus*"; — MATSUKI et al, 1990: 15, fig. 13, "Hong Kong"; — WILSON, 1995a: 111, 113, "Hong Kong"; — WILSON, 1995b: 320-321, "Hong Kong"; — SAITO & OGATA, 1995: 31, fig. 30, "Hong Kong"; — MURAKI et al, 1996: 4, "Hong Kong"; — WILSON, 1996b: 20, "Hong Kong".

Asiagomphus hainanensis: ASAHINA, 1988a: 689-691, fig. 1, "Hong Kong and Taiwan"; — ZHAO, 1990: 85, 87-92, 25 figs (male, female, larva); — MATSUKI et al, 1990: 15, fig. 12, "Hong Kong"; — WILSON, 1995a: 102-103, 109, 111, "photo ♂, larva, Hong Kong"; — WILSON, 1995b: 320, "Hong Kong"; — MURAKI et al, 1996: 3-4, "Hong Kong"; — WILSON, 1997a: 29, "Hong Kong".

Kong"; — WILSON, 1999: 35-38, figs 21-23, "revision of Hong Kong *Asiagomphus hainanensis* and *A. septimus* records".

Material. — 1 ♂, Jiangfengling, 9-IV-1998, coll. G.T. Reels; — 2 ♂, 1 ♀, Jianling, 18-V-1999, coll. K.D.P. Wilson; — 1 ♂, Xinglong Botanical Gardens, 23-V-1999, coll. K.D.P. Wilson.

DISTRIBUTION. — China (Fujian, Guangdong, Hainan, Hong Kong and Taiwan).

REMARKS. — The female occipital margin is identical to the common Hong Kong form. It has a concave margin with scattered spines and a large central v-shaped notch.

STYLURUS AMICUS (NEEDHAM, 1930)

Gomphus amicus: NEEDHAM, 1930: 63-64, pl. 6, fig. 5, "Fujian and Kiangsu".
Stylurus amicus: ZHAO, 1990: 111-116, 29 figs, "Fujian, Sichuan".

Material. — 1 ♂, Jianling, 18-V-1999, coll. K.D.P. Wilson.

DISTRIBUTION. — China (Fujian, Hainan and Sichuan).

BURMAGOMPHUS VERMICULARIS (MARTIN, 1904)

Burmagomphus vermicularis: CHAO, 1954: 69, 77-79, figs 272-277, "Fujian"; — MATSUKI, 1978: 139 (larva key), 142, fig. 8, "larva, Taiwan"; — ZHAO, 1990: 161, 173-176, 9 figs male, larva, "Fujian, Taiwan"; — WILSON, 1995a: 104-105, 113, 115, "photos, Hong Kong"; — WILSON, 1995b: 322-323, "Hong Kong"; — WILSON, 1997a: 30, "Hong Kong"; — WILSON, 1999: 38, "Guangdong".

Material. — 2 ♂, 2 ♀, Lumuwan, 17-VI-1999, coll. G. T. Reels.

DISTRIBUTION. — China (Guangdong, Fujian, Hainan, Hong Kong and Taiwan) and Vietnam.

LABROGOMPHUS TORVUS NEEDHAM, 1931

Labrogomphus torvus: NEEDHAM, 1931: 224-227, figs 1-4, "gen. nov., type-loc. Hainan"; — CHAO, 1954: 237-240, figs 352-362, "Fujian"; — ZHAO, 1990: 151-155, 18 figs, "Hainan & Fujian"; — WILSON, 1995a: 104-105, 113, "photo, Guangdong & Hong Kong"; — WILSON, 1995b: 321-322, fig. 1, "Hong Kong"; — WILSON, 1997b: 30, "Hong Kong"; — WILSON, 1999: "Guangdong".

Material. — 1 ♂, Lumuwan, 17-VI-1999, coll. G.T. Reels.

DISTRIBUTION. — China (Fujian, Guangdong, Hainan and Hong Kong).

HELIOGOMPHUS RETROFLEXUS (RIS, 1912)

Leptogomphus retroflexus: RIS, 1912: 68-72, figs 9-11, pl. 5 (fig. 1), "Tonkin".

Heliogomphus retroflexus: LIEFTINCK et al., 1984: 31, "Taiwan"; — ZHAO, 1990: 177-180, pl. 5-8.1 (figs 1-14), "Fujian, Taiwan"; — WILSON, 1999: 40, "Guangdong".

Material. — 1 ♂, Wuzhishan, 9-VI-1999, coll. G.T. Reels.

DISTRIBUTION. — China (Fujian, Guangdong, Hainan and Taiwan) and Vietnam.

HELIOGOMPHUS SCORPIO (RIS, 1912)

Leptogomphus scorio: RIS, 1912: 72-73, figs 12(a-b), 13, pl. 5 (fig. 2), "type-loc.: Guangdong".

Davidius unicornis: NEEDHAM, 1930: 32-33, pl. 5, fig. 5, 5a, "Guangxi".

Heliogomphus scorio: CHAO, 1954: 227-230, figs. 321-331, "Guangdong & Fujian"; — ASAHINA, 1988a: 690-691, figs 2-6, "Hong Kong"; — MATSUKI et al, 1990: 15-16, figs 14-15, "Hong Kong"; — ZHAO, 1990: 177, 181-185, 19 figs. "Guangdong, Hong Kong, Fujian"; — WILSON, 1995a: 110-111, 117, 119, "photo ♂, ♀, larva, Hong Kong"; — WILSON, 1995b: 323, "Hong Kong"; — SAITO & OGATA, 1995: 31-32, fig. 40, "Hong Kong"; — MURAKI et al, 1996: Hong Kong"; — WILSON, 1997a: 30-31, "Hong Kong".

Material. — 1 ♂, Niujialin, 21-V-1999, coll. K.D.P. Wilson; — 1 ♂, Wuzhishan, 9-VI-1999, coll. G.T. Reels.

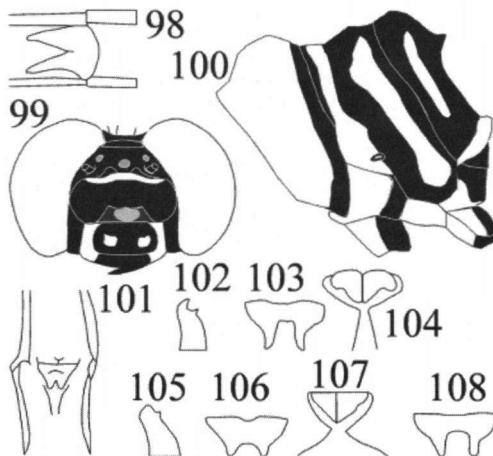
DISTRIBUTION. — China (Fujian, Guangdong, Guangxi, Hainan and Hong Kong).

ANISOGOMPHUS SP.

Figures 98-108

Material. — 1 ♀, Diaoluoshan, 26-V-1999, coll. K.D.P. Wilson.

DESCRIPTION. — FEMALE: Small gomphine with plain occipital margin. Face, synthorax



Figs 98-108. [98-100] *Anisogomphus* sp., ♀, Hainan: (98) valvula vulvae; — (99) head, frontal; — (100) synthorax, lateral; — [101] *Fukiengomphus prometheus* female: valvula vulvae; — [102-103] *Paragomphus pardalinus*, Hainan: (102) ♂ posterior hamulus; — (103) ♀ valvula vulvae; — (104) ♂ valvule; — [105-107] *Paragomphus capricornis*, Hong Kong: (105) ♂ posterior hamulus; — (106) ♀ valvula vulvae; — (107) ♂ valvule; — [108] *Paragomphus capricornis*, Kuala Lumpur, P. Malaysia: ♀ valvula vulvae.

and valvula vulvae are shown in Figures 98-100. Labrum black with pair of yellow spots. Base of mandibles yellow. Anteclypeus black with pale grey central patch. Postclypeus black with yellow crest. Top and rear of frons raised each side of central ocelli. Top of head, antennae and occiput black. Low transverse ridge in posterior to lateral ocelli. Occipital margin uniform. Prothorax black with yellow lateral spot at frontal lobe. Synthoracic with yellow stripes as figured. Wings hyaline with amber tint at base (specimen is slightly teneral). Legs black. Hind femora extends almost to the base of segment 3. Abdomen black with segments 1 and 2 with yellow sides. Segments 2-7 with yellow partially divided spot at dorsum of distal border. Segments 8-10 black. Valvula vulvae elongate.

M e a s u r e m e n t s (mm). — Male abd. + app. 32.5, hw. 30.0.

REMARKS. — This female is very similar to Hainan species, *A. wuzhishanus* Chao, 1982, which was described from only the female. Unlike *wuzhishanus*, the specimen from Diaoluoshan does not possess a pair of spined processes at the occipital margin and the valvula vulvae appear to be slightly longer (cf. ZHAO, 1990: 197-198, figs 1-4). Since no male has been obtained we have refrained from naming a new taxon.

MEROGOMPHUS PAVIEI MARTIN, 1904

Merogomphus paviei: MARTIN, 1904: 214, "Tonkin"; — LIEFTINCK et al., 1984: 31-32, "Taiwan, syn. nov."; — ZHAO, 1990: 202-207, pl. 5-10.2 (figs 1-19), "Taiwan, Zhejiang"; WILSON, 1999: 39, "Guangdong".

Merogomphus chui: ASAHINA, 1968: 90-92, figs 4-8, "Taiwan".

M a t e r i a l. — 1 ♂, 1 ♀, Wuzhishan, 9-VI-1999, coll. G.T. Reels.

DISTRIBUTION. — China (Guangdong, Hainan, Taiwan and Zhejiang), Thailand and Vietnam.

FUKIENOGOMPHUS PROMETHEUS LIEFTINCK, 1939

Figure 101

Fukienogomphus prometheus: CHAO, 1954: 39-40, figs 140-153, "Fujian"; — LIEFTINCK, 1984: 34-35, "Taiwan"; — ZHAO, 1990: 212-214, 14 figs, "Fujian, Guangdong and Taiwan".

M a t e r i a l. — 1 ♀, Niujialin, 21-V-1999, coll. K.D.P. Wilson.

M e a s u r e m e n t s (mm). — Male abd. + app. 45.0, hw. 39.0.

DISTRIBUTION. — China (Fujian, Guangdong, Hainan and Hong Kong).

REMARKS. — The valvula vulvae, which are illustrated in Figure 101, are slightly different to the Fukienese form figured by Zhao (cf. ZHAO, 1990: figs 9, 10). However, the body pattern, low tubercles above the ocelli and lateral horns outside the tubercles are identical.

STYLOGOMPHUS CHUNLIUAE CHAO, 1954

Stylogomphus chunliuae: CHAO, 1954: 57-61, figs 207-218, "type-loc. Fujian"; – MATSUKI et al., 1990: 16-17, figs 19-21, "larvae, Hong Kong"; – ZHAO, 1990: 255, 257-259, 10 figs, "Fujian"; – WILSON, 1995b: 322, 324, figs 2-4 (larva), "Hong Kong"; – WILSON, 1995a: 108-109, 115, 117, "photos, Hong Kong".

Material. – 1 ♂, Jiangfengling, 9-IV-1998, coll. G.T. Reels.

DISTRIBUTION. – China (Fujian, Hainan and Hong Kong).

LEPTOGOMPHUS CELEBRATUS CHAO, 1982

Leptogomphus celebratus: CHAO, 1982: 289, "Hainan"; – ZHAO, 1990: 288-290, "Hainan".

Leptogomphus hainanensis: CHAO, 1984: 277, "Hainan".

Material. – 2 ♀, Nga Ga, Bawangling, 6-IV-1998, coll. G.T. Reels; – 1 ♂, 21-V-1999, coll. G.T. Reels; – 1 ♂, 1 ♀, Diaoluoshan 25-V-1999, coll. K.D.P. Wilson; 1 ♂, do., 26-V-1999; – 1 ♂, Wuzhishan, 9-VI-1999, coll. G.T. Reels.

DISTRIBUTION. – China (Hainan).

NYCHOGOMPHUS FLAVICAUDUS (CHAO, 1982)

Onychogomphus flavicaudus: CHAO, 1982: 293, figs 17-20, "Hainan":

Nychogomphus flavicaudus: CHAO, 1990: 313-314, 6 figs, "Hainan".

Material. – 1 ♀, Jiaxi, 14-VI-1999, coll. G.T. Reels.

DISTRIBUTION. – China (Hainan).

PARAGOMPHUS PARDALINUS NEEDHAM, 1942

Figures 102-104

Paragomphus pardalinus: NEEDHAM, 1942: 251-252, "Hainan"; – ZHAO, 1990: 316-318, 10 figs, "Guangdong, Guangxi and Hainan".

Material. – 1 ♀, Jianling, 18-V-1999; – 4 ♂, Tongtielin, Xinglong, 22-V-1999, coll. K.D.P. Wilson; – 1 ♂, Diaoluoshan, 24-V-1999; – 1 ♂, 2 ♀, do., 25-V-1999; – 2 ♂, 3 ♀, do., 27-V-1999.

DISTRIBUTION. – China (Guangdong, Guangxi and Hainan).

REMARKS. – *P. pardalinus* males are extremely difficult to separate from *P.*

capricornis (Förster, 1914). The best features are male valvule and the posterior hamulus. The valvule of male *P. pardalinus* is comprised of two roundly shaped valves (Fig. 104) and the posterior hamulus has a hooked tooth at its apex and a pronounced peg just below it when viewed laterally (Fig. 102). *P. capricornis* has a male valvule comprised of two triangular shaped valves (Fig. 107) and the posterior hamulus has no obvious hooked apex and a barely visible peg just below the tip, when viewed in profile (Fig. 105). The females are easier to separate. *P. pardalinus* has, like the males of both species, extensive foliaceous outgrowths to segments 8 and 9, whilst *capricornis* females have none. The ventral genital plate of *pardalinus* (Fig. 103) has slightly more pronounced projections than *capricornis* from Hong Kong (Fig. 106) but less so when compared with *capricornis* from Peninsular Malaysia (Fig. 108).

Several of the *pardalinus* specimens examined exhibited the same features described by LIU (1988) in his description of *P. wuzhishanensis*, which was described from only female material (ZHAO, 1990: 318-320, figs 1-4). These include the dorsal stripe joined to the frontal yellow collar, extension of the middle yellow synthoracic spot past the spiracle and the raised ridge above the ocelli. The female subgenital plates are apparently very similar. The dorsal stripe of *pardalinus* can be completely detached in a small number of specimens but is usually connected to the collar stripe by a fine line at the outer margin in most individuals. The occiput of *pardalinus* can be dark coloured or with yellow centre. The separation of *wuzhishanensis* and *pardalinus* appears to rely on the completely joined dorsal and collar stripes and a small tubercle located in front of the occipital margin, which are present in *wuzhishanensis*. This latter character is also present on some *pardalinus* females but absent on others. *P. wuzhishanensis* also has an entire middle stripe on the metepisternum indicating that it may be a genuine species. ASAHINA (1986b) commented that *P. risi* Fraser, 1924 and the Sumatran *P. simplex* Lieftinck (1934) are believed to be synonymous with *capricornis*.

NIHONOGOMPHUS THOMASSONI (KIRBY, 1900)

Figures 109-116

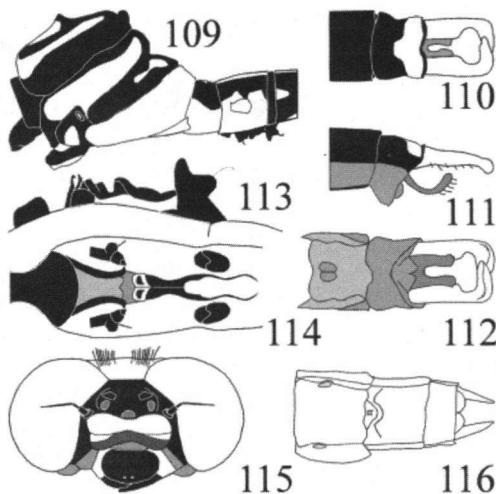
Aeshna thomassoni: KIRBY, 1900: 531, 534-545, 1 fig. "Hainan".

Nihonogomphus thomassoni: CHAO, 1954: 417, "Hainan"; – ASAHINA 1976: 4-7, figs 20-21, "Hainan".

Material. – 2 ♂, Jianling, 18-V-1999, coll. K.D.P. Wilson; – 1 ♂, Diaoluoshan, 25-V-1999, coll. K.D.P. Wilson; – 3 ♂, 1 ♀, do., 27-V-1999.

DESCRIPTION. – **MALE:** Labium cream with black lateral margins and at base of lateral lobes. Labrum black with a pair of yellow spots. These yellow spots are highly variable, sometimes confined to centre as two minute or large spots or located

at lateral margins, one each side. Base of mandibles pale yellow. Anteclypeus dark brown. Postclypeus predominantly black with upper lateral margins broadly pale yellow. Protruding frons greenish yellow. Top of head black with broad occiput yellow bordered with variable black margin. The latter thin in some specimens thicker in others. Occipital ridge thickly fringed with long black hairs. Raised tubercles posterior to lateral ocelli. Prothorax black with pair of minute yellow spots at centre. Synthorax black with yellowish green central portion of dorsal carina, and broad dorsal stripe and collar, which form thickly-shaped



Figs 109-116. *Nihonogomphus thomassoni*, Hainan: (109) ♂ synthorax and base of abdomen; — (110-112) ♂ caudal appendages; — (113-114) ♂ secondary genitalia; — (115) ♀ head, frontal; — (116) ♀ caudal abdomen, ventral.

7s. Thorax and base of abdomen shown in Figure 109. Mesepimeron and metepisternum covered with broad band of greenish yellow, which is invaded towards the base of the hindwing with black. The portion of the greenish yellow band on the upper metepisternum may form a separate spot in some specimens. Legs entirely black except inside face of fore tibia, which is yellow. Wings enfumed pale amber with mid brown pterostigma. Abdomen predominantly black. Segment 1 and 2 with yellow dorsal centre stripe and latero-ventral mostly yellow. Yellow auricle. Segment 3 with central dorsum stripe which does not extend to distal margin and yellow spot at mid-lateral base. Segments 3-6 with pair of basal yellow spots on dorsum partially joined towards base. Segment 7 with large single yellow spot occupying basal third of dorsum, which is traversed by black fine line distally. Segments 8-10 with latero-ventral halves orange yellow smudged with black. Distal half of dorsum of segment 10 creamy orange with black distal margin. Superior appendages pale lemon yellow. Inferior appendages brownish yellow (Figs 110-112). Secondary genitalia illustrated in Figures 113-114.

FEMALE. — The female has not previously been illustrated. Head with labrum almost entirely black save for two central minute yellow spots (Fig. 115). The markings and structure of head are almost identical to male. The occiput is almost entirely yellow with fine lateral black margins. Prothorax with an additional pair of small cream lateral spots. Dorsum of segment 10 of abdomen yellow. Dorsum of segments 8-9 with pair of basal yellow spots. Segment 7 with basal quarter yellow traversed by fine black line distally. Caudal abdomen illustrated in Figure 116.

Measurements (mm). — Male abd. + app. 44.0-48.0, hw. 32.0-36.0; female abd. + app. 43.0, hw. 31.5.

DISTRIBUTION. — China (Hainan).

REMARKS. — KIRBY (1900) illustrated the anterior portion of the type specimen, which is housed in the BMNH. The last five segments of the abdomen were missing. ASAHINA (1976) figured the base of the hindwing and the secondary genitalia of this same specimen. He also mentioned that another specimen from Tonkin was also labelled as *thomassoni*, which had an entirely black postclypeus. He illustrated this specimen with divaricate inferior appendages (ASAHINA, 1976: 4-7, fig. 22-23). Asahina did not consider this specimen to be *thomassoni*. Indeed this supposition is almost certainly correct as none of the Hainan specimens examined possess an entirely black postclypeus or have divaricate inferior appendages. WILLIAMSON (1907: 311-312) also described Tonkinese '*thomassoni*' material as having divaricate inferior appendages. It appears extremely likely that the Tonkinese *Nihogomphus*, hitherto identified as *thomassoni*, is a separate taxon. It is also likely that MARTIN's (1904) records from Tonkin are not *thomassoni*. In view of the confusion a complete description of the male and female *thomassoni* from Hainan is provided here.

Males of *N. thomassoni* settle on prominent positions on rocks or boulders adjacent to cascades in fast flowing boulder-strewn streams and rivers.

ORIENTOGOMPHUS ARMATUS CHAO & XU, 1987

Orientogomphus armatus: ZHAO & XU, 1987: 260-263, 265-266, figs 1-18;
— CHAO & XU, 1990: 342-345, 18 figs.

Material. — 6 ♂, Diaoluoshan, 27-V-1999, coll. K.D.P. Wilson.

DISTRIBUTION. — China (Fujian, and Hainan).

REMARKS. — Males were taken just above the water's surface while actively patrolling quiet water stretches of a fast flowing stream at about 500 m altitude.

AMPHIGOMPHUS HANSONI CHAO, 1954

Amphigomphus hansonii: CHAO, 1954: 403, figs 492-497, "Fujian"; — ZHAO, 1990: 346-348, 8 figs, "Fujian".

Material. — 1 ♂, Wuzhishan, 9-VI-1999, coll. G.T. Reels.

DISTRIBUTION. — China (Fujian and Hainan).

REMARKS. — Closely allied to *Nihogomphus* (LIEFTINCK, 1964: 104). The caudal appendages and secondary genitalia of the Hainan specimen are identical to CHAO's (1954) description.

MEGALOGOMPHUS SOMMERI (SELYS, 1854)

Allogomphus sommeri: NEEDHAM, 1930: 36, "Fujian, China".

Megalogomphus sommeri: NEEDHAM, 1944: 162, "Kuling, China"; – CHAO, 1954: 420-421, "Fujian and Jiangxi"; – ZHAO, 1990: 348-349, "Fujian and Jiangxi"; – WILSON, 1995a: 120-121, 127, 129, 131, "photo ♂, ♀, larva, Hong Kong"; – WILSON, 1995b: 332-334, figs 29-37, "Hong Kong"; – SAITO & OGATA, 1995: 33-34, figs 45-51, "Hong Kong"; – MURAKI et al, 1996: 6, "Hong Kong"; – WILSON, 1997a: 32, "Hong Kong".

Material. – 6 ♂, 1 ♀, Jianling, 18-V-1999, coll. K.D.P. Wilson; 1 male, Lumuwan, 17-V-1999, coll. G.T. Reels.

DISTRIBUTION. – China (Fujian, Hainan, Hong Kong, and Jiangxi).

LAMELLIGOMPHUS CAMELUS (MARTIN, 1904)

Onychogomphus camelus: MARTIN, 1904: 212, "Fujian"; – ZHAO, 1990: 363-354, 9 figs, "Fujian".

Material. – 3 ♂, Wuzhishan, 10-VI-1999, coll. G.T. Reels.

DISTRIBUTION. – China (Fujian and Hainan).

LAMELLIGOMPHUS HAINANENSIS (CHAO, 1954)

Figures 117-119

Onychogomphus micans: NEEDHAM, 1931a: 229, 231, "1 ♂, Grove near Fooi In, NW of Nodoo, Hainan"; – NEEDHAM, 1942: 251, "1 ♂, Grove, Fooi In; – 1 ♂, Lin Kao, District, Hainan".

Onychogomphus hainanensis: CHAO, 1954: 269, figs 458-463, "type-loc. Hainan".

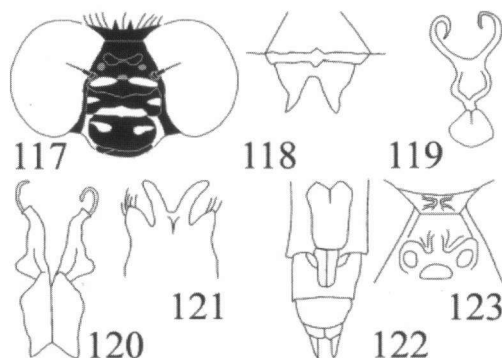
Lamelligomphus hainanensis: ZHAO, 1990: 360-361, 6 figs, "Hainan".

Lamelligomphus sp.: WILSON, 1995a: 118-119, 125, 127, "photo ♂, ♀, exuviae, Hong Kong".

Lamelligomphus hongkongensis: WILSON, 1995b: 329-332, figs. 15-28, "♂, ♀, larvae, Hong Kong"; – WILSON, 1997b: 32, "Hong Kong". Syn. nov.

Material. – 2 ♂, Jianling, 18-V-1999, coll. K.D.P. Wilson; – 6♂, 3 ♀, Diaoluoshan, 27-V-1999, coll. K.D.P. Wilson; – 2 ♂, do., 27-V-1999, coll. G.T. Reels.

DESCRIPTION. – See WILSON (1995b: 329-332, figs 25-28) for a description of both male and female as *L. hongkongensis*. The tip of the male Hainan penile organ is illustrated in Figure 119. The female head and subgenital plate are shown in Figures 117-118.



Figs 117-123. [117-119] *Lamelligomphus hainanensis*, Hainan: (117) ♀ head, frontal; – (118) ♀ valvula vulvae; – (119) ♂ penile organ; – [120-123] *Phaenandrogomphus tonkinicus*, Hainan: (120) penile organ; – (121) ♂ vesicle; – (122) valvula vulvae; – (123) ♀ occipital margin and top of head.

DISTRIBUTION. – China (Hainan and Hong Kong).

REMARKS. – *L. hainanensis* was described from male material. No female *hainanensis* from Hainan has been hitherto described. The male and female *L. hongkongensis* were described and figured by WILSON (1995b) from Hong Kong material. There are no differences in structure or colour pattern of male and female *hongkongensis* when compared to *hainanensis*. It is now clear that the *hainanensis* was illustrated from an individual with broken penile cornua (see ZHAO, 1991: pl. 6-7.4, figs 4, 5).

All *hainanensis* males recently obtained from Hainan possess a penile organ with elongate cornua (Fig. 119) identical to Hong Kong *L. hongkongensis* (cf. WILSON, 1995b: 330, figs 15-17). The female occipital margin and the subgenital plate of *hainanensis* (Figs 117-118) are identical to Hong Kong *hongkongensis* (cf. WILSON, 1995b: figs 21, 22), which confirms their conspecific status.

PHAENANDROGOMPHUS TONKINICUS (FRASER, 1926)

Figures 120-123

Onychogomphus saundersii: MARTIN, 1904: 212, "Inde et Indo-Chine".

Onychogomphus tonkinicus: FRASER, 1926: 481-482, "Tonkin".

Phaenandrogomphus tonkinicus: LIEFTINCK, 1969: 210-214, figs 7-14, "Tonkin"; – ASAHINA, 1986b: 30-31, figs 100-103, "Thailand".

Material. – 1 ♂, 1 ♀, Wuzhishan, 9-VI-1999, coll. G.T. Reels.

DISTRIBUTION. – China (Hainan), Thailand and Vietnam.

REMARKS. – *P. chaoi* ZHU & LIANG (1994) was recently described from Guangdong. This species is very similar to *tonkinicus*. ZHU & LIANG (1994: 113-116, figs 1-11) listed six distinguishing characters for *chaoi*, "incomplete humeral stripes, apex of penis being concaved inside oppositely, penis vesicle being more slender, female occiput with only one swollen tubercle in the median portion and vulvar scale being longer, its rounded apex exceeding the apex of the 9th segment". The Hainan species appears to be somewhat intermediate between *tonkinicus* and

chaoi. The male has incomplete humeral stripe whereas the female has a complete antehumeral stripe, apex of penis is closest to *tonkinicus* and vesicle is closer to *chaoi* (Figs 120-121), the female occiput is identical to *tonkinicus* with divided tubercles, and the vulvar scale is shorter than both *tonkinicus* and *chaoi* (Figs 122-123). These are all minor differences.

GOMPHIDIA A. ABBOTTI WILLIAMSON, 1907

Figures 124-127

Gomphidia abbotti: WILLIAMSON, 1907: 282-285, figs 9-10, "Thailand";
– FRASER, 1934: 385-386, "Burma".

Gomphidia abbotti abbotti: LIEFTINCK, 1948: 261-266, figs 13-15, "Peninsular Malaysia, and Sumatra"; – LIEFTINCK, 1954: 79, "Thailand, Peninsular Malaysia, Sumatra"; – ASAHINA, 1986b: 37-40, figs 136-153, "Thailand".

Material. – 1 ♂, Lumuwan, 17-V-1999, coll. G.T. Reels.

DISTRIBUTION. – Burma, China (Hainan), Indonesia (Sumatra), Peninsular Malaysia and Thailand.

REMARKS. – Pattern of face is similar to ASAHINA's (1986b) B-type, with crest of frons entirely pale yellow. The head, synthorax, secondary genitalia and caudal genitalia are illustrated in Figures 124-127.

GOMPHIDIA K. KRUEGERI MARTIN, 1904

Figures 128-133

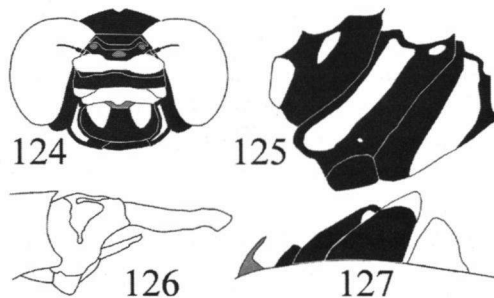
Gomphidia kruegeri: MARTIN, 1904: 216, "Tonkin"; – WILLIAMSON, 1907: 284, 304 fig. 29(4). "Tonkin"; – NEEDHAM, 1930: 26, pl. 3, figs 5, 5a, "Tonkin, Fujian".

Gomphidia kruegeri kruegeri: ZHAO, 1990: 424-425, 477-478 (key), "Fujian, Hainan, Yunnan".

Material. – 1 ♂, Diaoluoshan, 26-V-1999, coll. K.D.P. Wilson; – 2 ♂, do., 27-V-1999; – 3 ♂, 1 ♀, Wuzhishan, 10-VI-1999, coll. G.T. Reels.

DISTRIBUTION. – China (Fujian, Hainan and Yunnan), Thailand and Vietnam.

REMARKS. – *G. k. kruegeri* is separated from *G. k. fukienensis* Chao, 1955, by the form of the second yellow lateral stripe on



Figs 124-127. *Gomphidia a. abbotti*, ♂, Hainan: (124) head, frontal; – (125) synthorax, lateral; – (126) caudal appendages, lateral; – (127) secondary genitalia, lateral.

the metepisternum of the synthorax, which is reduced to two small yellow spots, and a black postclypeus (Figs 128-129). *G. k. fukiensis* has a more extensive second yellow lateral stripe and its postclypeus has two large yellow spots (cf. ZHAO, 1990: 425-428, 15 figs). Note that the Hainan *k. kruegeri* has a pair of small yellow spots on the postclypeus. The male secondary genitalia, caudal appendages and the female occipital margin and subgenital plate are illustrated in Figures 130-133.

CORDULIIDAE

MACROMIA BERLANDI LIEFTINCK, 1941

Figures 134-135

Macromia boreneensis: MARTIN, 1907: 69, fig. A, "1 ♂, Tonkin".

Macromia berlandi: LIEFTINCK, 1941: 94-98, figs. 1(a,c), "type-loc. Tonkin"; – WILSON, 1993: 235-237, figs 1-5, "Hong Kong"; – WILSON & THEISCHINGER, 1996: 275-277, figs 1-7, "larvae, Hong Kong"; – WILSON, 1995a: 134-135, 141, 143, "photo ♂, ♀, larva, Hong Kong"; – SAITO & OGATA, 1995: 39-40, figs, 85-89, "Hong Kong"; – ZHOU et al, 1993: 113, "Guangxi"; – ZHOU et al, 1994: 150, "Guangxi".

Material. – 1 ♂, Tongtielin, Xinglong, 22-V-1999, coll. G.T. Reels.

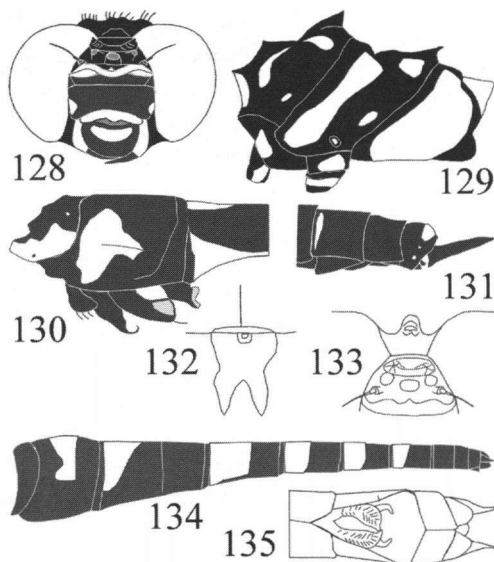
DESCRIPTION. – **FEMALE:** (Hong Kong material): Large brown faced *Macromia*, with well developed yellow abdominal markings. Labium, labrum clypeus and frons a uniform mid brown. Vertex and occiput dark brown. Inner faces of prominences on the upper frons are flat. Prothorax brown. Basal two thirds of dorsum of synthorax ferruginous brown. Upper third of dorsum and sides of synthorax dark blackish brown with slight metallic bluish green reflections. Metepisternum with bright yellow stripe covering the spiracle. Alar sinuses are yellow. The remainder of the synthorax is blackish brown. Legs brown. Wings amber tinted at base not extending to triangles. Abdomen dark brown with large well developed yellow spots (Fig. 134). Segment two is traversed by a broad central yellow stripe. The base of segment 3 is occupied by a large yellow triangular spot and the basal half and slightly beyond of segment 4 is yellow. The basal halves of segments 5-7 are yellow. Segments 8-10 entirely blackish brown. Valvula vulvae leaf-like (Fig. 135).

Measurements (mm). – Male abd. + app. 51.5, hw. 45.0; female (Hong Kong material) abd. + app. 52.0-57.0, hw. 47.0-49.0.

DISTRIBUTION. – China (Guangxi, Hainan and Hong Kong) and Vietnam.

REMARKS. – *M. berlandi* is brown faced without a yellow humeral stripe. In view of the potential confusion with *M. moorei* and *Macromia* sp., which also occur in Hainan, a brief description of the hitherto undescribed female *berlandi* has been provided here, based on Hong Kong material. There is an apparent, very close

similarity with the original description of the female *M. pyramidalis* MARTIN (1907), which like *berlandi* was described from Tonkin. Martin describes *pyramidalis* female as having large yellow rings at the bases of segments 3-7, which fill up half the segments. Apart from this description of *pyramidalis*, in the China and Indo-Chinese region, only *berlandi* females have such an extensive yellow pattern. The male *pyramidalis* was also described by MARTIN (1907). His description does not fit the male of *berlandi*. The tenth abdominal segment is described as having a bump, which forms a not very pointed pyramid, in contrast to *berlandi*, which has a very sharply pointed or spine-like pyramidal process. Martin commented that the male and female types were not in the Selys collection, but the actual location was not given. It would not be surprising if an examination of these types, if they could be found, reveals that the female *pyramidalis* is synonymous with *berlandi*. The male *pyramidalis* seems to be closely allied to *M. moorei*. If the male was indeed *moorei* then *berlandi* would become the junior synonym of *pyramidalis*.



Figs 128-135. [128-133] *Gomphidia k. kruegeri*, Hainan: (128) ♂ head, frontal; – (129) ♂ synthorax, lateral; – (130) ♂ secondary genitalia and base of abdomen; – (131) ♂ caudal abdomen; – (132) ♀ valvula vulvae; – (133) ♀ occipital margin and top of head; – [134-135] *Macromia berlandi*, ♀, Hong Kong: (134) abdomen; – (135) valvula vulvae.

MACROMIA CALLIOPE RIS, 1916

Figures 136-144

Macromia calliope: RIS, 1916: 65, 70-71, figs 44-45, pl. 3 (fig. 4), “♂, type-loc. Tonkin”; – LAIDLAW, 1922: 221, 227-228, “Hainan”.

Macromia urania: RIS, 1916: 68-70, “allotype ♀, Tonkin”; – LIEFTINCK, 1929: 104-106, fig. 22, “♀, Tonkin”; – NEEDHAM, 1931a: 232, “2 ♀, Nodda, Hainan”; – LIEFTINCK, 1950: 685, 702-704, fig 19, “♀, Than Moi, Tonkin; 1 ♀, Fan Ta, Hainan, 4-VI-1935, coll. J.L. Gressitt in J. Cowley coll.”. Stat. nov.

M a t e r i a l. – 1 ♂, Tongtielin, Xinglong, 22-V-1999, coll. K.D.P. Wilson; – 1 ♀, Diaoluoshan, 27.V-1999, coll. K.D.P. Wilson; – 2 ♀, Limushan, 16-VI-1999, coll. G.T. Reels; – 1 ♀, Lumuwan, 17-VI-1999, coll. G.T. Reels.

DESCRIPTION. — MALE: Small sized *Macromia* with superior appendages having centrally located lateral teeth. Labium dark reddish brown paler at base. Mandible dark reddish brown with small yellow spot towards base. Labrum black. Anteclypeus blackish brown. Postclypeus blackish brown with a pair of centrally located small yellow spots (Fig. 139). Face of frons black with metallic bluish green on pyramidal processes which are fairly sharply pointed. Groove between processes matt black. Vertex glossy black with a pair of fairly sharply pointed conical processes. Prothorax matt black. Synthorax black with metallic green reflections. Dorsal stripe covering slightly more than half the dorsum, falling well short of the wing bases. Stripe is continued onto the mesokatepisternum. Metepisternum with broad yellow stripe covering the spiracle. Ventrums of metepimeron finely yellow and metaposternum yellow. Legs black. Nearly the total length of hind tibia keeled. Front and middle legs with keel covering less than half the length. Wings hyaline with black pterostigma covering 3-4 cells. Abdomen predominantly black with segment 2 ringed yellow covering the auricle (Fig. 136). Posterior to the auricle is dull orange. Segment 3 has a small round yellow spot at the lateral base and a pair of larger spots on the centre of the dorsum. Segment 4 with a pair of small yellow, narrowly divided, spots. Segments 1, 5-6 and 9-10 black. Basal third of segment 7 and ventral base of segment 8 yellow. Caudal appendages black (Figs 137-138).

FEMALE. — Similar to male but with more extensive markings which progressively fade with age. The labium is dark blackish brown, paler at base (Fig. 141). The postclypeus of young females is bright yellow becoming progressively darker with age but usually retaining some yellow (Fig. 142). Occiput black and raised, extending along the eye margin for a short distance. Dorsal stripe on synthorax is more extensive than male occupying two-thirds the length. The second abdominal segment is more extensively marked than male, with a broadly ringed yellow base (Fig. 143). Segment 3 has a pair of large yellow spots centrally and a yellow latero-ventral, basal yellow spot. Dorsums of segments 4-6 also possess pairs of yellow spots centrally but on segments 5-6 these spots progressively fade and become invisible in mature specimens. Base of wings amber orange in young specimens. Young female with irregular yellow spot at latero-ventral base of segment 9. Legs black without keels. Caudal tip of abdomen not extensively dilated dorso-ventrally and the tenth segment is very small, equal to half or less than half the width of segment 9, when viewed from the side (Fig. 144). The valvula vulvae are shown in Figure 140.

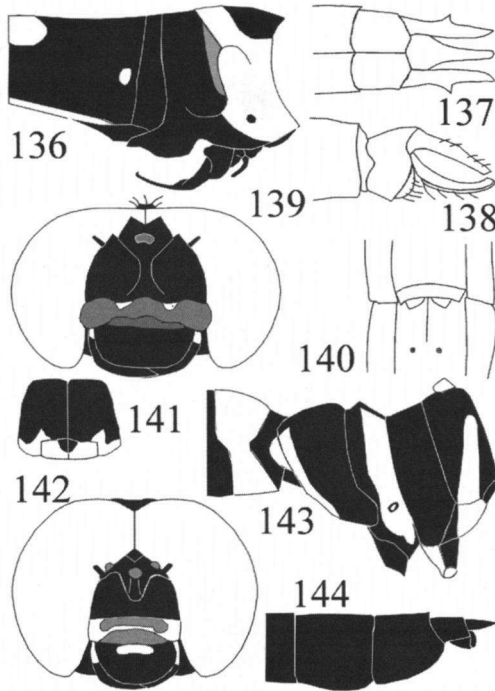
Measurements (mm). — Male abd. + app. 49.0, hw. 39.0; female abd. + app. 46.0-53.0, hw. 42.5-44.0.

DISTRIBUTION. — Vietnam and China (Hainan).

REMARKS. — RIS (1916) described *M. urania* and *M. calliope* in the same paper with material obtained from Tonkin. Unfortunately Ris considered the single female with this material belonged to *urania* rather than with *calliope*. LAIDLAW (1922) correctly placed his female Tonkin material as *calliope* but understandably

LIEFTINCK (1929) reidentified this material as *urania*. Fortunately, several true *urania* females from Hong Kong, where *calliope* does not occur, were available for examination and several true *calliope* females from Hainan. The female *calliope* does not possess a black postclypeus but has a yellow postclypeus with patchy dark brown infusion. The first description of true *urania* female was made by ASAHINA (1964). The most obvious character, which sets it apart from other *Macromia*, is the extreme lateral expansion of the abdomen from segments 7-9. This feature is not possessed by true *calliope* females as shown in Figure 144 (cf. ASAHINA, 1964: 109-114, figs 5, 13, 18, 36; WILSON, 1993: 236-237, fig. 7). For comparison the valvula vulvae and expanded female abdomen of *M. urania*, from Hong Kong, is shown in Figures 145-146. LIEFTINCK (1929: 106, fig. 22) illustrated what he

considered to be the female *urania* valvula vulvae. It is obvious from this drawing that he had in his possession *calliope* and not *urania* since, inter alia, the specimen lacks any caudal expansion. The body of *urania* female, from Than Moi, Tonkin, was figured by LIEFTINCK (1950: 685, fig. 19). Again, this specimen is clearly not *urania* but *calliope*. It has an extensive yellow band on the dorsum and sides of segment 2, which is relatively narrow in true *urania*. It also lacks the extreme expansion of segment 7-9 and the tenth segment is half or less than half the width of segment 9 when viewed from the side. The width of the tenth segment in *urania* is significantly more than half the width of segment 9. The senior author has reared specimens of true *urania* from Hong Kong and even freshly emerged teneral females possess abdomens with extreme expansion from segments 7-9. On checking RIS's (1916) original description of the adult female *urania* it matches not *urania* but true *calliope*. The males are easily separated, since the lateral teeth of the caudal appendages are centrally located in *calliope* and distally located in *urania*.



Figs 136-144. *Macromia calliope*, Hainan: (136) ♂ secondary genitalia and base of abdomen; - (137-138) caudal appendages; - (139) ♂ head, frontal; - (140) ♀ valvula vulvae; - (141) ♀ labium; - (142) ♀ head, frontal; - (143) synthorax and base of abdomen, lateral; - (144) caudal abdomen, lateral.

MACROMIA CLIO RIS, 1916

Figures 147-150

Macromia clio RIS, 1916: 67-68, pl. 1, fig. 3, "♀, type-loc. Hoozan, Formosa";
 ASAHINA, 1968: 94-97, figs 17, 23-31, "♂, ♀, Taiwan".

Macromia hamifera LIEFTINCK, 1955: 253-256, figs 1-4, "♂, type-loc.: Kuantun,
 Fukien Province"; – WILSON, 1998: 469-471, figs 6-7, "♂, ♀, Shi Wan Da Shan,
 Guangxi". Syn. nov.

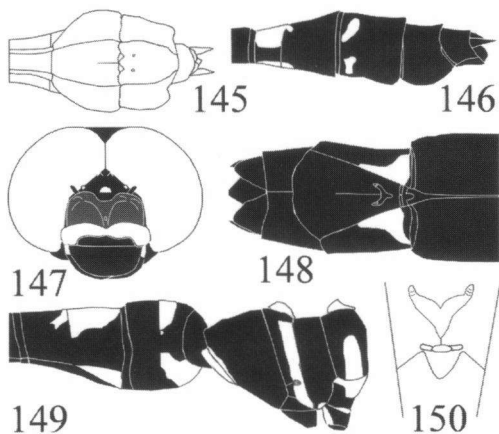
Material. – 1 ♀, Diaoluoshan, 27-V-1999, coll. K.D.P. Wilson.

DESCRIPTION. – **FEMALE:** Large brightly coloured *Macromia* with distinctive yellow body pattern. The female *hamifera* was described and illustrated in WILSON (1998). The Hainan female is virtually identical to the Guangxi females of *hamifera* but differs in a few minor respects. The vertex of the Hainan female has two pointed tubercles, which are not quite as prominent as the Guangxi female specimens. In addition the ventrum of the ninth abdominal segment of the Hainan female is marked with orange triangular spots basally (Fig. 148), whereas the Guangxi females are entirely black. The Hainan female has three cell rows outside the anal field whereas the Taiwan and Guangxi females and Ris's type have two cell rows. The presence of a small but stout black spine at the front of the groove between the rounded prominences on the top of the frons was omitted from WILSON (1998). This spine is present in the two male and two female *hamifera* examined by WILSON

(1998) and is easily overlooked. A minute blunt spine is also present in the frons groove of the Hainan female (Fig. 147). The synthoracic pattern and basal abdominal segments are illustrated in Figure 149. The cerci are short. The valvula vulvae from the Hainan and Guangxi female specimens are illustrated in Figures 148-150 respectively.

DISTRIBUTION. – China (Fujian, Guangxi, Taiwan and Hainan) and Japan (Iromote Island, Ryukyus).

REMARKS. – Following the publication of WILSON (1998) it was apparent that *M. hamifera* might be conspecific with *M. clio*



Figs 145-150. [145-146] *Macromia urania*, ♀, Hong Kong: (145) caudal abdomen, ventral; – (146) caudal abdomen, lateral; – [147-149] *Macromia clio*, ♀, Hainan: (147) head, frontal; – (148) caudal abdomen and valvula vulvae; – (149) synthorax and base of abdomen, lateral; – [150] *M. clio*, ♀, Guangxi: valvula vulvae.

RIS (1916), known from Taiwan. When LIEFTINCK (1955) described *M. hamifera* the male *clio* was undescribed and the female *hamifera* was unknown. ASAHINA (1968) described the first male *clio* along with a further description of the female. The male secondary genitalia and caudal appendages are identical. The female *M. clio* and the female *hamifera* have the same distinctive yellow abdominal markings. They both have the same deep v-shaped median incision, which is the same as the valvula vulvae figured by ASAHINA (1968: 96, fig. 31). The cerci are also very short. Yeh Wen-Chi has kindly examined 4 male *clio* and 2 male *clio* from Taiwan and confirmed that one specimen also possesses a tiny nipple-like protuberance at the anterior part of the dividing groove on the frons. This is an extremely unusual feature amongst *Macromia*, which has not been observed in any other *Macromia* species.

It is noteworthy that one of the females treated by WILSON (1998) as *hamifera*, from Guangxi, possesses a frons with two small dull yellow dorsal spots and a well-marked dull yellow lateral spot on each side. This feature was one of the characters used by ZHOU et al (1994) in their description of *M. macula*, from Zhejiang Province, to separate it from *M. hamifera*.

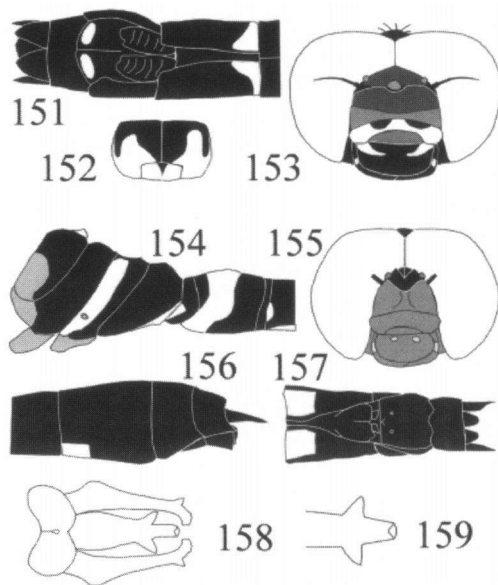
MACROMIA KATAE WILSON, 1993

Figures 151-153

Macromia katae: WILSON, 1993: 237-240, figs 11-17, "type-loc. Hong Kong"; – WILSON & THEISCHINGER, 1996: 277-279, figs 8-14, "larvae, Hong Kong"; – WILSON, 1995a: 130-131, 143, 145, "photo ♂, ♀, larva, Hong Kong"; – SAITO & OGATA, 1995: 40, figs 90-94, "Hong Kong".

Material. – 1 ♀, Tongtielin, Xinglong, 22-V-1999, coll. K.D.P. Wilson; – 1 ♀, Diaoluoshan, 27-V-1999, coll. G.T. Reels.

DESCRIPTION. – FEMALE: Large slight bodied *Macromia* with bright orange wing bases and brown tipped wings. The female head, labium and valvula vulvae are illustrated in Figures 151-153. Labium dark brownish black with central lobe and a large triangular shaped spot on each lateral lobe creamy yellow. Labrum blackish brown with a small bright yellow triangular spot at base of sides. Mandibles brown with prominent creamy yellow spot basally. Anteclypeus brownish yellow. Postclypeus bright yellow with sides brownish yellow and two blackish spots at base centrally. Face of frons blackish above with bright bluish green metallic reflections. Lower part of frons brownish yellow. Upper frons blackish with low relatively rounded pyramidal processes. The processes have bluish green metallic reflections but the central groove is matt black without reflections. Vertex blackish. Occiput black and raised with sparse fringe of black hairs. Prothorax matt black. Synthorax black with bluish green metallic reflections. Yellow dorsal stripe covering two-thirds of the dorsum, falling short of the wing bases. Metepisternum



Figs 151-159. [151-153] *Macromia katae*, ♀, Hainan: (151) caudal abdomen and valvula vulvae; (152) labium; - (153) head, frontal; - [154-157] *Macromia* sp. ♀, Hainan: (154) synthorax and base of abdomen, lateral; - (155) head, frontal; - (156-157) caudal abdomen; - [158-159] *Idionyx victor*, Hainan: (158) superior and inferior appendage, 'yolanda' form; - (159) inferior appendage 'victor' form.

Measurements (mm). - Female abd. + app. 45.0-51.5, hw. 50.5-55.0.

DISTRIBUTION. - China (Hainan and Hong Kong).

REMARKS. - The huge leaf-like valvula vulvae (Fig. 136) are extraordinary and unlike most other *Macromia*. In WILSON & THEISCHINGER (1996) the close similarity of *katae* and *M. arachnomima* LIEFTINCK (1953) was discussed. The female of *M. cincta* Rambur, 1842 also possesses leaf-like valvula vulvae (cf. LIEFTINCK, 1929: 96, fig. 17), as does *M. berlandi* (Fig. 135).

MACROMIA MOOREI MALAYANA LAIDLAW, 1928

Macromia moorei moorei: ASAHINA, 1978a: 246, figs 27-30, "Sichuan"; - ZHOU et al., 1994: 155, "Sichuan".

Macromia moorei malayana: ASAHINA, 1987b: 358-361, figs 18-20, "Thailand"; - WILSON, 1998: 471, "Guangxi".

Material. - 2 ♂, 1 ♀, Jiangfengling, 9-IV-1998, coll. G.T. Reels; - 1 ♀, Diaoluoshan, 24-V-1999, coll. K.D.P. Wilson; - 1 ♂, 2 ♀ do., 25-V-1999; - 1 ♀, do., 26-V-1999, coll. G.T.

with broad yellow stripe covering the spiracle. Hind corner of metepimeron and metaposternum bright yellow. Wings with bright orange amber bases extending to triangles and tips extensively smoked brown below the black pterostigma. Legs long and black. Abdomen black with prominent yellow orange markings. Segment 1 black. Segment 2 ringed yellow basal half. Segment 3 with large dorsal triangle at base. Ventrum of segment 3 with L-shaped yellow spot. Segments 4-6 with pair of yellow triangles at centre of dorsum. Segment 7 with basal two-fifths of dorsum yellow. This spot extends distally at centre. Dorsum of segments 8-10 black with ventral base of segment 8 with pair of triangular yellow spots. Sternite of segment 9 with pair of bright yellow spots as shown in Figure 151.

Reels; - 2 ♂, Jiaxi, 14-VI-1999, coll. G.T. Reels; - 1 ♂, Limushan, coll. G.T. Reels.

DISTRIBUTION. - Burma, China (Guangxi, Hainan, and Sichuan), India, Peninsular Malaysia, Thailand and Vietnam?

REMARKS. - The Hainan material differs slightly from Guangxi material. The central groove on the top of the frons is coloured orange brown without metallic reflections. ASAHINA (1996b) considered his material from north Vietnam had characteristics of both *m. moorei* Selys, 1874 and *moorei malayana*. It was reported in WILSON (1998) that ASAHINA (1996b) had identified this as *moorei malayana* but in truth he was undecided.

MACROMIA SP.

Figures 154-157

M a t e r i a l. - 1 ♀, Lumuwan, 17-VI-1999, coll. G.T. Reels.

DESCRIPTION. - Small *Macromia*, with all brownish face and no dorsal stripe. Labium dark brown, paler towards base. Labrum dark reddish brown with a pair of small creamy reddish yellow spots at central base. Mandibles reddish brown with creamy reddish yellow spot towards base. Anteclypeus dark brown. Postclypeus dark yellowish brown. Face of frons bright creamy reddish brown. Top of frons blackish brown with no metallic reflections. Vertex blackish brown. Occiput black and raised but not extending onto the margin of the eye as is the case with *calliope*. The face is illustrated in Figure 155. Prothorax matt black. Synthorax black with metallic green reflections. Basal half of dorsum dull yellowish brown, black with metallic green reflections above. Metepisternum with fairly broad yellow stripe covering the spiracle. Mesokatepisternum and coxae yellowish brown. Metakatepisternum black without metallic reflections. Hind margin of metepimeron with pale yellow border adjacent to the yellow metaposternum. Legs black without keels. Wings with faint amber yellow colouration extending to triangles. Segment 1 of abdomen and segments 9-10 entirely black. Segment 2 ringed yellow towards the base (Fig. 154). Segment 3 with yellow latero-ventral spot at base and a pair of central yellow spots on dorsum. Segments 4-6 with pair of yellow spots on the centre of the dorsum, which become progressively smaller from segment 4 to segment 6. Segment 7 with basal third of dorsum broadly yellow. Ventrums of segment 8 with large rectangular-shaped yellow spots at base. Caudal appendages and segments 8-10 illustrated in Figures 156-157.

M e a s u r e m e n t s (mm). - Female abd. + app. 48.0, hw. 42.0.

REMARKS. - There is a distinct possibility that this species may be the undescribed female of *M. ictERICA* LIEFTINCK (1929), which is known from a single male at Canton, Guangdong. Both species are of similar size, lack a dorsal stripe and have dull yellowish- brownish faces. However, there are a number of discrepancies in the abdominal pattern and head colouration.

MACROMIDIA RAPIDA MARTIN, 1907

Macromia cantonensis: TINKHAM, 1936: 457-459, "♂, Canton, ♀, Hong Kong".

Macromidia rapida: MARTIN, 1907: 79-80, fig. 92-93, pl. 3 (fig. 18), "type-loc. Tonkin"; — ASAHINA, 1965: 500, "Hong Kong"; — ASAHINA, 1988a: 696-697, figs 23-29, "Hong Kong"; — WILSON, 1993: 233-235, "Hong Kong"; — WILSON, 1995a: 136-137, 147, 149, "photo ♂, ♀, Hong Kong"; — SAITO & OGATA, 1995: 40-41, figs 97-100, "Hong Kong"; — WILSON, 1996: 361-363, "Hong Kong"; — MURAKI et al, 1996: 4, fig. 5, "Hong Kong"; — WILSON, 1999: 41, "Guangdong".

Material. — 2 ♂, 1 ♀, Tongtielin, Xinglong, 22-V-1999, coll. K.D.P. Wilson; — 1 ♂, 1 ♀, Diaoluoshan, 24-V-1999, coll. K.D.P. Wilson; — 1 ♂, 1 ♀, Lumuwan, 17-VI-1999, coll. G.T. Reels.

DISTRIBUTION. — China (Guangdong, Hainan and Hong Kong), Thailand and Vietnam.

IDIONYX VICTOR HÄMÄLÄINEN, 1991

Figures 158-159

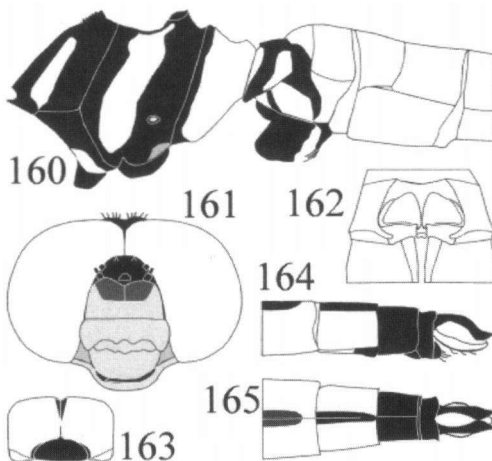
Idionyx yolanda (nec Selys, 1871): ASAHINA, 1965: 499, 501, figs 18-20, "Hong Kong".

Idionyx victor HÄMÄLÄINEN, 1991: 343-347, figs 1-4, "Hong Kong"; — WILSON, 1995a: 140-141 151, 153, "photo ♂, ♀, Hong Kong"; — SAITO & OGATA, 1995: 38-39, figs 73-77, "Hong Kong"; — WILSON, 1996: 364, "Hong Kong"; — MURAKI et al, 1996: 4, "Hong Kong"; — WILSON, 1999: 41, "Guangdong".

Material. — 2 ♂, Wuzhishan, 9-VI-1999, coll. G.T. Reels; — 1 ♀, do., 11-V-1999; 1 ♀, Jiaxi, 14-VI-1999, coll. G.T. Reels; — 1 ♀, Lumuwan, 17-VI-1999, coll. G.T. Reels.

DISTRIBUTION. — China (Guangdong, Hainan and Hong Kong).

REMARKS. — Three males from Guangdong, two males from Hainan together with seven males from Hong Kong have been examined. Most have outward pointing lateral teeth on the inferior appendage, similar to



Figs 160-165. *Lyriothemis tricolor*, ♂, Hainan: (160) synthorax and base of abdomen, lateral; — (161) head, frontal; — (162) secondary genitalia; — (163) labium; — (164-165) caudal abdomen.

HÄMÄLÄINEN's (1991: 345, fig. 3) image, provided from the type male *victor* from Hong Kong. The two males from Hainan are illustrated here (Figs 158-159). Figure 158 is closest to *yolanda* and Figure 159 is similar to *victor*. In ASAHINA's (1988a: 698, figs 31-32) drawings of *yolanda*, from Hong Kong, the lateral teeth also point outwards i.e. '*victor*' form. The only other feature to separate *victor* from *yolanda* is a yellow band on the metepimeron which turns up towards the metepisternum in the upper end in *victor*. Both Hainan males have yellow bands on the metepimeron which turns up towards the metepisternum. The Hainan material belongs to *victor*. However, the separation of *victor* from *yolanda* relies heavily on a minor structural character which has been shown to be inconsistent. It is likely that *victor* is a Chinese form of *yolanda*.

LIBELLULIDAE

NANNOPHYOPSIS CLARA (NEEDHAM, 1930)

Nannodiplax clara: NEEDHAM, 1930: 120, pl. 12 (fig. 1), "♀, type-loc. Zhejiang; - ♀ Soochow, Kiangsu; - ♀, Kachek, Hainan".

Nannophiopsis clara: ASAHINA, 1978b: 10-12, figs. 32-36, 43, "♂, Foochow, Fujian, C.R. Kellogg leg."

Nannophiopsis clara: LIEFTINCK, 1935: 183-188, "Zhejiang, Hainan"; - LIEFTINCK et al, 1984: 50-51, "Taiwan"; - WILSON, 1995a: 145, 157, "photo ♂, Hong Kong"; - YEH & LIEN, 1995: 24-26, figs 1-5, "photo ♂ & larva, Taiwan"; - WILSON, 1997a: 21: 38, "Hong Kong".

M a t e r i a l. - 3 ♂, Xinglong Botanical Gardens, 23-V-1999, coll. G.T. Reels.

DISTRIBUTION. - China (Fujian, Hainan, Hong Kong, Jiangsu, Taiwan and Zhejiang) and Japan (single sight record)?

TETRATHEMIS PLATYPTERA SELYS, 1878

Tetrathemis platyptera: ASAHINA, 1988b: 9-10, figs 1-4, "Thailand"; - WILSON, 1999: 42, 50, fig. 26 E, "Guangdong".

M a t e r i a l. - 1 ♂, Diaoluoshan, 25-V-1999, coll. K.D.P. Wilson; - 1 ♂, Lumuwan, 17-VI-1999, coll. G.T. Reels.

DISTRIBUTION. - Burma, China (Guangdong and Hainan), India, Indonesia, Peninsular Malaysia and Thailand.

LYRIOTHEMIS TRICOLOR RIS, 1919

Figures 158-163

Lyriothemis flava: LIEFTINCK et al: 1984: 43-44, "Taiwan".*Lyriothemis tricolor*: FRASER, 1936: 266, 270-272, fig. 81 (b), "Bengal & Assam".**M a t e r i a l.** — 1 ♂, Niujialin, 21-V-1999, coll. G.T. Reels.**DISTRIBUTION.** — Bangladesh, Burma, China (Hainan and Taiwan), India and Japan.**REMARKS.** — The male is illustrated in Figures 158-163. A male was observed holding territory adjacent to a tree hole filled with water. CORBET (1999) lists four species, including *L. tricolor*, whose larvae live in tree holes.*ONYCHOTHEMIS TESTACEUM TONKINENSIS* MARTIN, 1904*Onychothemis tonkinensis*: MARTIN, 1904: 208, "type-loc. Tonkin".*Onychothemis tonkinensis tonkinensis*: LIEFTINCK et al, 1984: 58, "Taiwan".*Onychothemis testacea tonkinensis*: TSUDA, 1991: 167, "Taiwan, Vietnam"; — WILSON, 1995b: 179, 187, "photo ♂, Hong Kong"; — WILSON, 1999: 42, "Guangdong".**M a t e r i a l.** — 1 ♀, Niujialin, 21-V-1999, coll. K.D.P. Wilson; — 1 ♂, 4 ♀, Diaoluoshan, 27-V-1999, coll. K.D.P. Wilson & G.T. Reels; — 1 ♂, 1 ♀, do., 28-V-1999, coll. K.D.P. Wilson.**DISTRIBUTION.** — China (Guangdong, Hong Kong and Taiwan), and Vietnam.*ZYGONYX IRIS INSIGNIS* (KIRBY, 1900)

Figures 166-167

Zygonidia insignis: KIRBY, 1900: 533-534, pl. 12, (fig. 1), "Type-loc. Hainan Island".*Zygonyx iris*: NEEDHAM, 1931a: 224, "Hainan"; — Needham, 1931b: 6, "Hainan".*Zygonyx iris insignis*: ASAHINA, 1965: 503-504, figs 21-27, "Hong Kong"; — ASAHINA, 1988a: 700-703, figs 34-42, "Hong Kong"; — MATSUKI, 1988b: 24-25, figs 1-2, 4, "larva desc; Hong Kong"; — WILSON, 1995a: 198-201, "photos, Hong Kong".**M a t e r i a l.** — 1 ♂, Mingwanghe, nr Bawangling, 5-IV-1998, coll. G.T. Reels; — 2 ♂, Jiangfengling, 9-IV-1998, coll. G.T. Reels; — 2 ♂, Niujialin, 21-V-1999, coll. K.D.P. Wilson; — 3 ♂, Tongtielin, Xinglong, 22-V-1999, coll. K.D.P. Wilson; 2 ♂, 1 ♀, Xinglong Botanical Gardens, 23-V-1999, coll. K.D.P. Wilson; — 3 ♂, Diaoluoshan, 25-V-1999, coll. K.D.P. Wilson; — 1 ♂, do., 27-V-1999; — 2 ♂, do., 28-V-1999.**DISTRIBUTION.** — China (Hainan and Hong Kong).

ZYGONYX TAKASAGO ASAHINA, 1966

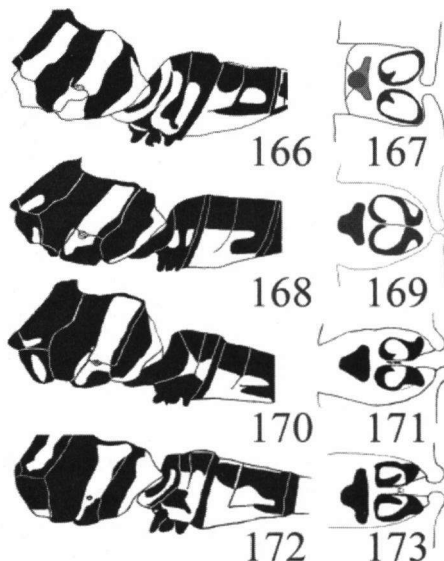
Figures 168-171

Zygonyx takasago: ASAHINA, 1966a: 118-120, figs 43-44, "Taiwan"; - LIEFTINCK et al., 1984: 58, "Taiwan"; - WILSON, 1999: 43-44, "Guangdong".

M a t e r i a l. - 2 ♂, Jiangfengling, 9-IV-1998, coll. G.T. Reels.

DISTRIBUTION. - China (Guangdong, Hainan and Taiwan).

REMARKS. - The Hainan form of *takasago* (Figs 168-169) is slightly smaller and less robust than the Guangdong and Taiwanese forms (Figs 170-171). In addition the Hainan specimens lack the distinctive black wing tips and heavily black marked wing bases of the Guangdong and Taiwanese forms. There are slight structural differences in the secondary genitalia but perhaps insufficient for the naming of a new taxon. All forms share similar body markings, colouration and the characteristic broadened distal half of the inferior appendage. For comparison figures are provided of the thorax and secondary genitalia of the other known Chinese species of *Zygonyx*, which comprise *Z. iris insignis* Kirby (Figs 166-167) and *Z. asahinai* MATSUKI & SAITO (1995) known from Hong Kong and Fujian (Figs 172-173).



Figs 166-173. [166-167] *Zygonyx iris insignis*, Hainan, ♂: (166) thorax and basal abdomen, lateral; - (167) secondary genitalia, ventral; - [168-169] *Zygonyx takasago*, Hainan, ♂: (168) thorax and basal abdomen, lateral; - (169) secondary genitalia, ventral; - [170-171] *Zygonyx takasago*, Guangdong, ♂: (170) thorax and basal abdomen, lateral; - (171) secondary genitalia, ventral; - [172-173] *Zygonyx asahinai*, Hong Kong, ♂: (172) thorax and basal abdomen, lateral; - (173) secondary genitalia, ventral.

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