Description of Aristocypha aino sp. nov. from Hainan, with notes on the related species (Zygoptera: Chlorocyphidae)

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Abstract: A new chlorocyphid damselfly species, Aristocypha aino sp. nov. (holotype male from Jianfengling National Nature Reserve, Hainan Island, China) is described and illustrated for both sexes. Its systematic relationship with other taxa in the genus is discussed. Rhinocypha bifenestrata Fraser, 1922 is ranked as a synonym of Aristocypha cuneata (Selys, 1853), not as a synonym of A. quadrimaculata (Selys, 1853). Rhinocypha chaoi Wilson, 2004 is transferred to the genus Aristocypha.

Key words: Chlorocyphidae, Aristocypha aino, new species, Hainan, China

Introduction

Laidlaw (1950) erected the genus Aristocypha with the type species Rhinocypha quadrimaculata Selys, 1853. Presently Aristocypha is ranked either as a full genus (eg Bridges, 1994; Orr, 2005; van Tol, 2006) or a subgenus (eg Tsuda, 2000; Wilson et al., 2008) of Rhinocypha Rambur, 1842. As is the case with many other chlorocyphid genera, which present few structural characters for analysis, species delimitation in Aristocypha remains somewhat unsettled. About 10 species are currently recognized.

Previously two Aristocypha species have been reported from Hainan Island in China. Zeng (1995) listed both Aristocypha fenestrella (Rambur, 1842) and A. spuria (Selys, 1879) from Jianfengling National Nature Reserve without any collection data. Consequently, Hainan was included in the range of these taxa in ‘List of Chinese Insects’ by Hua (2000). In their synopsis of Hainan Odonata, Wilson & Reels (2001) listed specimens of Rhinocypha f. fenestrella of both sexes collected from five sites, including Jianfengling, in 1998-1999. Wilson et al. (2008) included Rhinocypha (Aristocypha) fenestrella in their revised checklist of Hainan dragonflies, but regarded Hua’s (2000) listing of Aristocypha spuria, an Assamese and North Burmese taxon, as a doubtful or questionable record from Hainan.

While the second author (GTR) was working on the manuscript for his forthcoming guide book of Hainan dragonflies (Reels, in press), the third author (HZ) informed him of having found A. spuria in Hainan in March 2008. This led GTR to doubt the identity of the Hainan Aristocypha taxon listed previously as A. fenestrella, which occasioned him to contact the first author (MH) for an opinion. MH had himself earlier studied a series of Aristocypha collected in Jianfengling in 1993 and had done preliminary work for a revision of the whole Aristocypha quadrimaculata-group (sensu Laidlaw, 1950). He had already concluded that the Hainan specimens differed to such an extent from A. fenestrella that it is necessary to establish a new taxon.

We acknowledge that it is somewhat undesirable to introduce a new name into the Aristocypha nomenclature, without providing a thorough revision of this difficult species group. However, since a correct name for this very distinctive and conspicuous insect is urgently needed for the regional guide book of the Hainan dragonflies, it is here formally named as a new species, Aristocypha aino spec. nov.
**Aristocypha aino** sp. nov.  
(Figs. 1-3, 5-6,10,14,16)


*Type specimens* (all from Hainan Island, China). – **Holotype** ♂, Jian Feng Ling (alt. 850 m), 29-30. VI. 1993, C. G. Treadaway leg., [Ex coll. R. A. Müller]. Deposited at National Natural History Museum Naturalis, Leiden, The Netherlands (RMNH). **Paratypes**: 4♂1♀, same collecting data as in the holotype; 2♂, Yinggeling (alt. 500 m), 31. VIII. 2005, G. T. Reels leg.; 1♂, Hui Shan (alt. 300 m), 19. VI. 2007, G. T. Reels leg.; 1♀, Hui Shan (alt. 170 m), 19. VI. 2007 G. T. Reels leg.; 2♂, Wuzhishan (alt. 800 m), 21. IV. 2008, M. Lau leg.; 2♂2♀, Wuzhishan, 30. III. 2008, H. Zhang leg. Paratypes collected by Treadaway are in the collection of M. Hämäläinen, those collected by Zhang in the collections of Aquatic Insects and Soil Animal, South China Agricultural University, Guangzou, and those collected by Reels and Lau will be deposited in a Hainan collection once such a collection has been established.

**Other specimens**: 1♂(very poor condition), Yinggeling (alt. 1,015 m), 13. V. 2005, M. Lau leg. – A total of 19 male and 4 female specimens from Jiangfengling, Niujialin, Diaoluoshan, Wuzhishan and Limushan listed as *Rhinocypha f. fenestrella* by Wilson & Reels (2001) also undoubtedly belong to this
new species. However, since these specimens are temporarily unavailable for study, they are not listed as paratypes.

**Diagnosis.** – A dark *Aristocypha* species; males (Figs. 1-2) with colourful, partly opaque wings with iridescent vitreous fenestrae in hindwing; thoracic triangle conspicuously large and broad, caerulean blue.

**Male.**

**Head.** – Velvety black with a small ochreous spot beside the lateral ocelli and a similar, smaller spot on each side of occiput. Labium largely black, with lateral lobes yellow in the basal half (wholly black

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**Figs. 5-9.** Dorsal triangles of males. 5-6. *Aristocypha aino* sp.n.; 7. *A. fenestrella* from Peninsular Malaysia; 8. *A. fenestrella* from Guizhou; 9. *A. spuria* lectotype from Meghalaya. Not in scale.

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Synthorax. – Black with thin yellow lines (Figs. 1-2), arranged quite similarly to those of *fenestrella*, but line on metepimeron longer than in most *fenestrella* specimens. Dorsal triangle broader and distinctly more gradually narrowed than in *fenestrella*, vertex rounded rather than acute (Figs. 5-6 and 7-8). Colour of triangle caerulean blue. Legs black, middle and hind femora with heavy white pruinescence on flexor surface.

Wings. – Colour pattern superficially quite similar to *fenestrella* (Figs. 10 and 11-12), but opaque area in the forewing less extensive. The broad hyaline area in the lower half of the forewing reflects a strong iridescent violet (bluish green in *fenestrella*). In the hindwing the median fenestrae form a more or less continuous open area, usually with only the upper row being disconnected (partly or completely) from the rest by a thin black band (whereas in *fenestrella* there are 3-4 separate fenestrae in the median area). Apical rounded fenestra below the pterostigma as in *fenestrella*. Pterostigma in both wings dark on the upper surface, on the hindwing underside pale blue except around margins, which are dark.

Abdomen. – Black, with tiny yellow, apical spots on sides of 1st and 2nd segments. Narrow and short pale stripes ventrolaterally on segments 2-4. Appendages black, inferiors proportionally somewhat longer than in *fenestrella* (Figs. 14-15).

Measurements (in mm). – Hindwing 23.0-25.5; abdomen (incl. appendages) 20.5-22.5.

Female.

Colour pattern quite similar to *fenestrella* (Fig. 3). The dorsal thoracic triangle somewhat broader and more gradually tapering than in *fenestrella* (Figs. 16-17). Abdominal segments 8-9 somewhat less robust than in *fenestrella*. The tips of hindwings are opaque white in older specimens.

Measurements (in mm). – Hindwing 27-28; abdomen (incl. appendages) 19-21.

Etymology. Aino, a noun in apposition. *Aino* is a forest-nymph from the Finnish national epic, the Kalevala. W. F. Kirby, who translated the Kalevala into English (Kalevala: The Land of Heroes, 1907; last reprinted in 2007), in 1890 named a new dragonfly genus and species *Aino puella* ['Aino girl’], undoubtedly inspired by this charming and tragic Kalevala character. Sadly, Kirby’s name was later synonymised with *Nannothemis bella* (Uhler, 1857), thus disqualifying *Aino* as a genus group name. Therefore this delightful name is here reintroduced to odonatology as a species name, largely as a tribute
to Kirby who was first to list the known odonate fauna of Hainan in 1900.

Remarks. *Aristocypha fenestrella* (Rambur, 1842) (Fig. 4) is the most widespread species in the genus. Its range covers Peninsular Malaysia, Thailand, Burma, Laos, Vietnam, and southern China (Yunnan, Guizhou, and Guangxi). The body size shows considerable variation. The smallest individuals occur in Peninsular Malaysia (type locality) with size increasing northward; whereas the largest individuals occur in northern Thailand, northern Vietnam and southern China. Wing pattern is basically similar within the whole range of the species, although the opaque area in the forewing is a little smaller in Peninsular Malaysian specimens than elsewhere. The proportional size and shape of the dorsal thoracic triangle are also quite uniform throughout the range, although some differences can be seen (Figs. 7-8). In *fenestrella* the colour of the triangle is variable, usually pale pink, lilac or darker purplish blue. This is partly age related variability, but lilac triangles can also be seen in fully mature males. The Hainan specimens differ from continental *fenestrella* especially in possessing a very differently shaped triangle of caerulean blue. This feature, coupled with the differently patterned wings and proportionally slightly longer inferior appendages, indicates that it should be best treated as a separate species, rather than a subspecies. The species may be endemic to Hainan. The size and shape of the triangle in *aino* most closely resemble those of *Aristocypha trifasciata* (Selys, 1853) and *A. immaculata* (Selys, 1879).

According to preliminary studies both by A. G. Orr and the first author, the Assamese and North Burmese *A. spuria* (Selys, 1879) (type locality: Khasia Hills, Meghalaya) appears to be closely related to *fenestrella*, their mutual taxonomic status being uncertain. The thoracic triangle of the male is similar in shape and colour to that of *fenestrella* (Fig. 9). The only difference in wing pattern seems to be the size and location of the apical spot in the hindwing (Fig. 13); it is somewhat larger and placed partly before the level of the pterostigma. In the female of *spuria* the underside of the synthorax bears distinct yellow stripes, similar to *fenestrella*. Fraser (1924) reported a male specimen from ‘Yung-Chang’ in Yunnan identified as *spuria*, but it may be *fenestrella*.

Three other *Aristocypha* species have a quite similar wing pattern in males to that *fenestrella* and *aino*.

A. *cuneata* (Selys, 1853), the type specimen of which bears the label ‘Thibet’, ranges throughout Nepal, Sikkim, West Bengal and Assam (in the old broad sense). Needham’s (1930) record of *Rhinocypha cuneata* from Guangxi probably refers to *A. fenestrella* (see Laidlaw, 1950). An older *R. cuneata* record by Moore (1878) from Western Yunnan, near the Burma border east from Bhamo [either from Ponsee in the Kakhyen Hills or from a nearby locality close to the border], most likely also refers to *A. fenestrella*. The thoracic triangle of *A. cuneata* is quite similar to that of *fenestrella*. The opaque area in the forewing is variable, but is usually as restricted as in *aino*. The median fenestrae in the hindwing are also variable, in some specimens being as connected as in *aino*. However, *cuneata* differs consistently from the other species by the large apical fenestra in the hindwing being separated from the costal border by only 1-2 rows of cells, whereas in other species there are at least 3-4 rows cells. Preliminary studies by the first author confirm the conclusion by Lahiri & Sinha (1985) that *A. bifenestrata* (Fraser, 1922) is a synonym of *A. cuneata* and not of *A. quadririmaculata* as proposed by Laidlaw (1950). The latter synonymy is presented in all catalogues of the world Odonata, including Bridges (1994), Tsuda (2000) and van Tol (2006). The synonymy of *Rhinocypha adamantina* Förster, 1903 with *A. cuneata* was also confirmed by the first author by checking the primary type specimens of both taxa.

*A. quadririmaculata* (Selys, 1853) (the type specimen labelled ‘Inde’) occurs along the foothills of the southern Himalaya from Kashmir to Arunachal Pradesh and throughout Assam and northern Burma, ranging along the Tenessarim range southwards at least to the level of 16° 40’ N. It has also been recorded from Orissa in India. The male wings are similarly patterned to those of *fenestrella*, but the thoracic triangle is much narrower. The female differs from *fenestrella* by having the ventral side of the synthorax either black or at most with 3 pairs of small yellow spots.

*A. baibarana* (Matsumura, 1931), a rare Taiwan endemic was long treated either as a synonym or subspecies of *fenestrella*, but was reinstated to its original status as a full species by Hämäläinen & Yeh (1998). This species differs strikingly from the others in the *quadrimaculata*-group by having large blue dorsal patches on the abdomen. The thoracic triangle is of a similar shape to that of *fenestrella*, but pale blue in colour.

The original definition of *Aristocypha* by Laidlaw (1950) was as follows: “Wings of males broad, ratio, length to breadth from about 4:1 to almost 3:1. Reticulation dense. Cells often much elongated transversely in the distal part of the wing. Mesothoracic triangle extending the whole length of the middorsal carina”. The last character seems to be the most important in defining the genus. Although in most species the male sex has brilliantly coloured wings with vitreous iridescent fenestrae (“windows”) within the dark hindwing, in one species, *A. immaculata*, both wings are completely hyaline. The recently described southern Chinese (Guangdong) species *Rhinocypha chaoi* (Wilson, 2004), with hyaline forewings and the apical third of the hindwing partly opaque and including iridescent fenestrae, sits well within the genus *Aristocypha* as defined by Laidlaw. A new combination *Aristocypha chaoi* (Wilson, 2004) is introduced here.

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M. Hämäläinen, G. T. Reels and H. Zhang：中国・海南島からハナダカトンボ科の新種 *Aristocypha aino* sp. nov. を記載し、同属の他種との系統的関係を検討した。また、 *Rhinocypha bifenestrata* Fraser, 1922 を、*A. quadrirmaculata* (Selys, 1853) ではなく、 *Aristocypha cuneata* (Selys, 1853) のシノニムとして位置づけた。加えて *Rhinocypha chaoi* Wilson, 2004 を新たに *Aristocypha* 属へと移動させた。