

Anisoptera of Cuc Phuong National Park, North Vietnam

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Abstract

During three field trips in 2006 and 2010 to Cuc Phuong National Park in northern Vietnam, a total of 19 anisopteran taxa was recorded. The most interesting records are documented here with field photographs of living specimens or collection material. Observations on their biology and behaviour are also noted.

Introduction

Established in 1962, Cuc Phuong is the oldest National Park in Vietnam. It is located 120km southwest of Hanoi and nestled between the provinces of Ninh Binh, Hoa Binh and Thanh Hoa. The National Park attracts people by its cultural and wildlife heritage and enchanting scenery: the rocky outcrops of Cuc Phuong contain valuable palaeontological relics (a fossilized sea reptile, dated at 200-230 million years ago) and evidence of prehistoric people, who lived in the forest some 7,500 years ago.

Covered in dense forest, the park offers habitat for many rare species. There are an estimated 2,000 different species of flora, and the 450 species of vertebrate fauna account for 38% of the national fauna. Studies on invertebrates are mostly lacking, with the exception of some research on butterflies.

Located among two limestone mountain ranges, the national park is one of the few remaining primary lowland forests in Vietnam. Many species found here would have been more common in the past, when the forest cover was much more extensive.

Asahina published a series of papers on the Odonata of North Vietnam, based on specimens collected by a team from Tokyo Science Museum. In his papers from 1995 and 1996, Asahina recorded six species of dragonfly from Cuc Phuong National Park:



three gomphids (*Ictinogomphus clavatus*, *I. pertinax*, *Asiagomphus xanthenatus* *acc* nov. ssp.), one cordulegastrid (*Chlorogomphus nakamurai*) and two libellulids (*Lyriothemis bivittata*, *Rhyothemis variegata*). Later Karube, another Japanese worker, conducted field explorations in Vietnam. In 1999, Karube found a new species of aeshnid within the boundaries of Cuc Phuong National Park, which he named *Planaeschna cucphuongensis*, and which is considered to be an endemic species for the National Park. Karube also described *Chlorogomphus nakamurai* based on specimens that were taken in Cuc Phuong and Ba Vi National Parks. Since Karube's and Asahina's publications, there have not been any detailed dragonfly research or reports on the oldest National Park in the country. This paper presents results from dragonfly surveys in Cuc Phuong in April 2006, and July and October 2010.

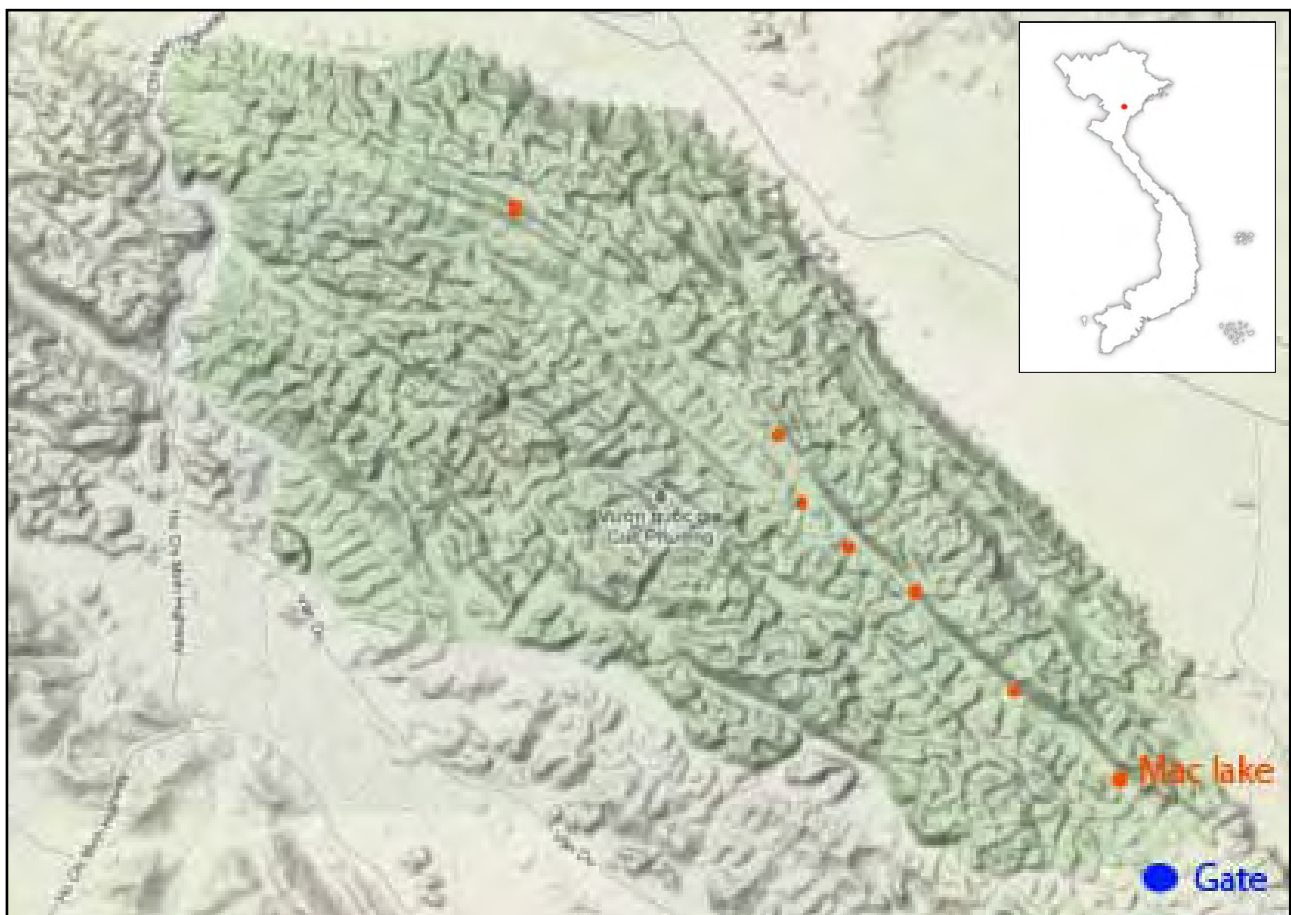


Figure 1. Terrain of Cuc Phuong National Park and study sites (red dots)

Study sites

Seven sites were studied for their odonate fauna. They were situated along the road from the gate to the centre of the park. Apart from the Mac Lake (near the gate), all study sites were forest streams or ponds in the forest. The elevation gradually increases from the gate to the centre of the park (from about 200 to 400m a.s.l.).



Forest streams run on both sides of the main road and flow in most cases into the Mac Lake.



Figure 2. Mac Lake – habitat of many lake species - 20015'24.14"N, 105042'36.16"E, elevation 157m a.s.l.

Methods

The odonate fauna of Cuc Phuong National Park was studied in early summer in April 2006, and the middle of summer (July) and end of summer (October) 2010. The specimens were photographed in nature if possible, collected and photographed alive to preserve colour patterns for further study before preserving them in acetone or alcohol.

The list of the National Park species includes own and literature records.





Figure 3. A forest pond in streambed, habitat of *Tetracanthagyna waterhousei* – 20°15'508"N, 105°42'00.6"E, elevation 158m a.s.l.

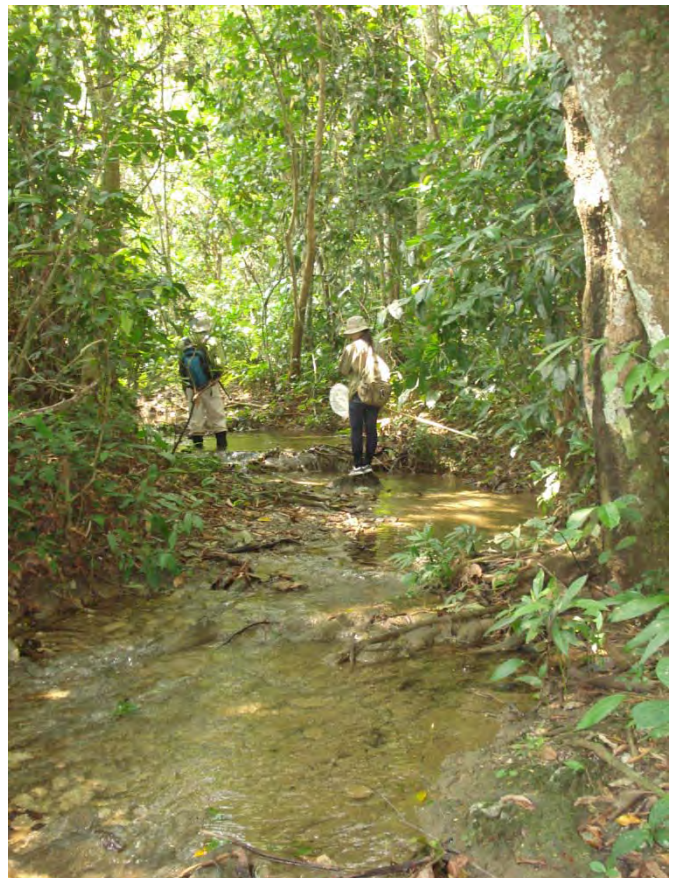


Figure 4. A forest stream, habitat of *Chlorogomphus nakamurai*, *Chlorogomphus auratus*, *Asiagomphus acco* and *Gynacantha subinterruta*. Pictured are Do Manh Cuong (left) and his student Nguyen Thi Hoai



Results

In 2010, a total of 16 anisopteran species was recorded by the authors in Cuc Phuong National Park. Additional species from the same region were recorded by Asahina (1996a, b) (*Ictinogomphus pertinax*, *Rhyothemis variegata*) and Karube (1995) (*Planaeschna cucphuongensis*). Thus, the present knowledge on the regional fauna of Anisoptera totals to 19 species.

AESHNIDAE

1. ? *Gynacantha subinterrupta* Rambur, 1842

Specimen: 1♂ Cuc Phuong, 7.VII.2010, 20° 17' 10.9" N, 105° 40' 20.2" E, 235m a.s.l.

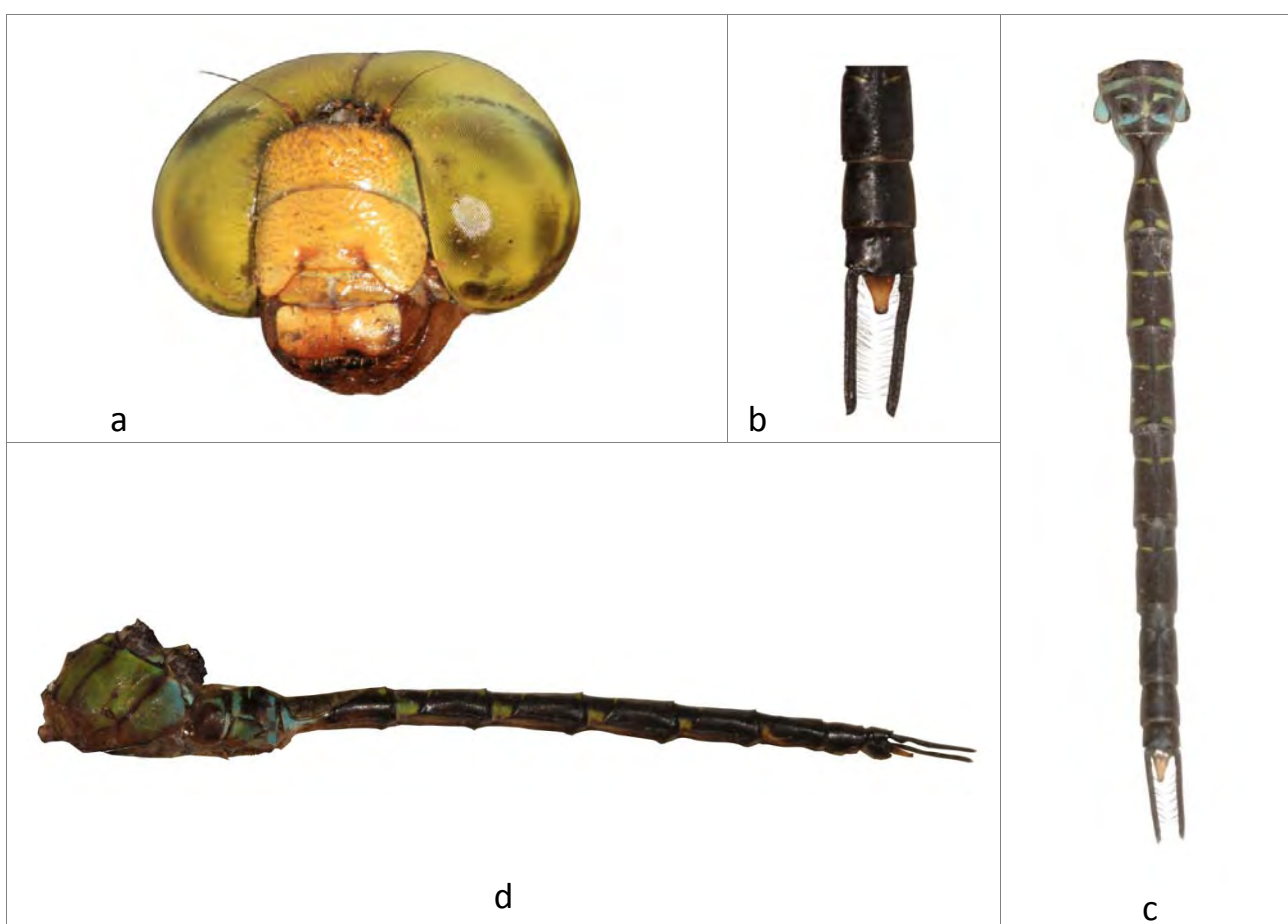


Figure 5. *Gynacantha subinterrupta*: a. head - male, b. anal appendages - dorsal view, c. abdomen – dorsal view of male, d. body – lateral view of male

This is a common species, widespread in South East Asia, and known to science for more than 150 years since its description by Rambur in 1842. It is a medium-to-large sized dragonfly (hind wing measure about 50mm) with dark yellow-green and black markings at its abdomen (Fig. 5d). The superior appendages are long and slim, black



in colour, while the inferior appendages are white and short (Fig. 5b, c). There is a T-shape black marking on front of the species on dorsal view (Fig. 5a). The wings are hyaline.

The colour of the specimens is similar to that of Malaysian specimens, but a little bit different from the light brown coloured specimens found in Hong Kong and Thailand. In southern China, both forms are recorded. The specimen from Cuc Phuong National Park differs from true *G. subinterrupta* in the genitalia structures. The apex of the superior appendage of "*subinterrupta*" is pointed and divaricated but this is not the case with Cuc Phuong material. An advanced study of the taxonomic position of the species is necessary.

They are found in undisturbed lowland forest, where they hide in bushes above streams. As crepuscular insects, they are quite inactive in the day, spending most of the time hanging under leaves in shady forest.

2. *Planaeschna cucphuongensis* Karube, 1999

[Karube 1999]

There has been only a single record of this taxon, dating from 2-VI-1998 (Karube, 1999). The species seems to be extremely rare. The morphological structures of the female are unknown; we have never seen it in nature.

3. *Polycanthagyna erythromelas* (McLachlan, 1896)

Specimens: 1 ♂, 1 ♀ Cuc Phuong, 23.X.2010, 20°15'508"N, 105°42'00.6"E, 158m a.s.l.

This large species is widespread but not common in South East Asia, and can be met at variable elevations, from 200 to more than 1000m a.s.l. Living specimens are characterised by green eyes (Fig 6 a, d) and black markings on the vertex and upper frons. Male and female colouration differ: the male's black abdomen has light green and blue markings (Fig 6b, c), while the female's abdomen is marked red, yellow-brown and black (Fig. 6d). The male of this species is easily recognised by its broad superior anal appendages (Fig 6b).



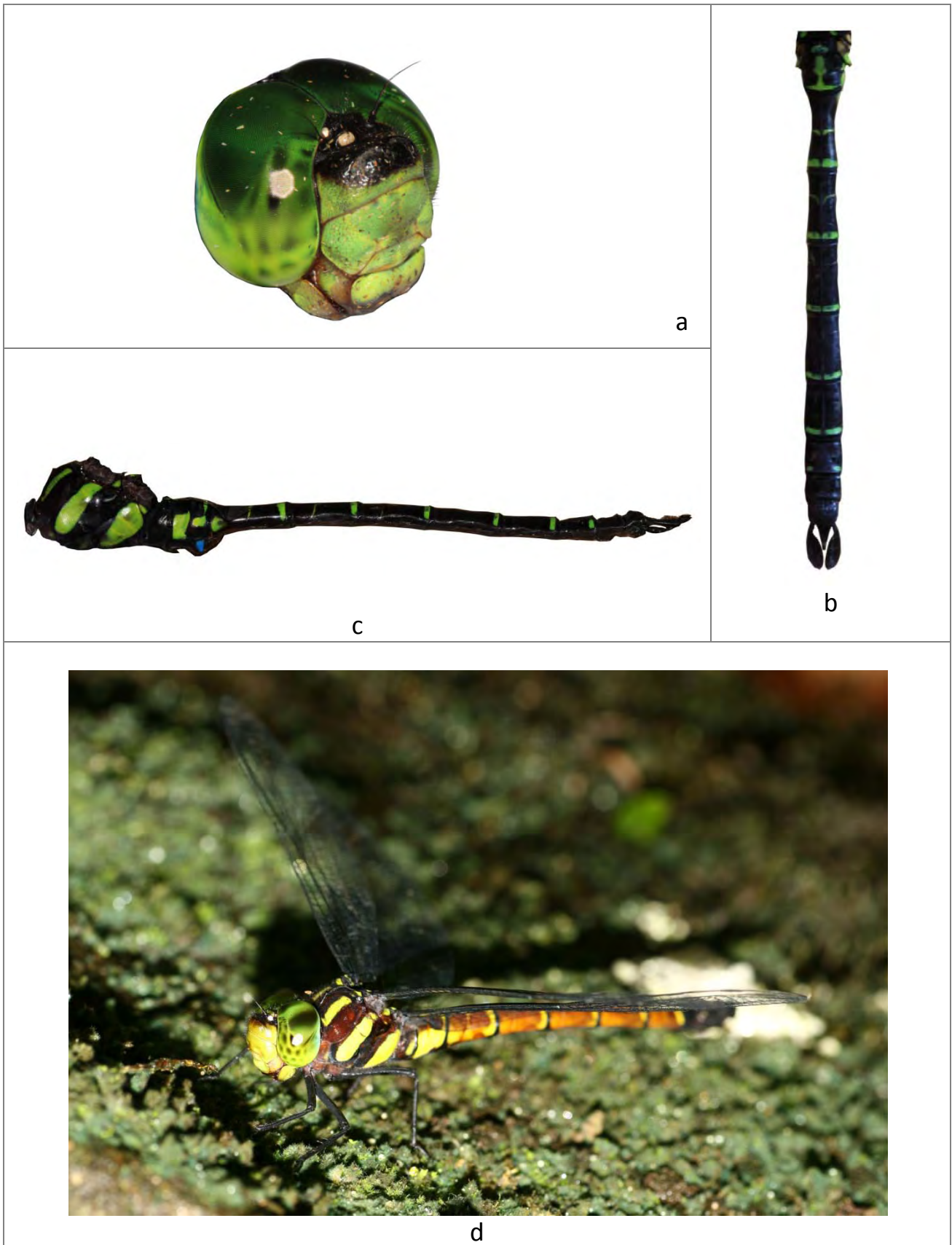


Figure 6. *Polycanthagyna erythromelas*: a. head - male, b. abdomen – dorsal view of male, c. body – lateral view of male; d – female



They live in pristine forests, and the female is observed more easily than the male, because it usually flies slowly near wet moss areas close to the ground, whereas the males perch high up in the canopy of the forest. The female of the species oviposits into mosses on tree trunks or rocks.

4. *Tetracanthagyna waterhousei* McLachlan, 1898

Specimens: 1 ♂, 1 ♀ Cuc Phuong, 7.VII.2010, 20°15'508"N, 105°42'00.6"E, 158m a.s.l.

This is a widespread species, found in good forest in South East Asia. Males and females of this large species are quite similar, both with reddish brown body colour. The thorax is marked by light yellow stripes (Fig. 7b). Wings are red pale brown.

They inhabit small ponds or streams in forest.



Figure 7. *Tetracanthagyna waterhousei*: a. head - male, b. body – lateral view of male

GOMPHIDAE

5. *Asiagomphus acco* (Asahina, 1996)

Specimens: 3 ♂♂ Cuc Phuong, 7.VII.2010, 20°17'10.9"N, 105°40'20.2"E, 235m a.s.l.

[Asahina 1996a]

This taxon was treated as a subspecies of *Asiagomphus xanthenatus* by Asahina (1996) and Wilson (2005). However, I take it to be a separate species due to the difference in the anal appendages. The structure of the superior appendages, with the ventral teeth in lateral view, is the typical morphological structure to separate *A. acco* from *A. xanthenatus* (compare Fig. 33 in Williamson 1907; see Fig. 9). The infer-



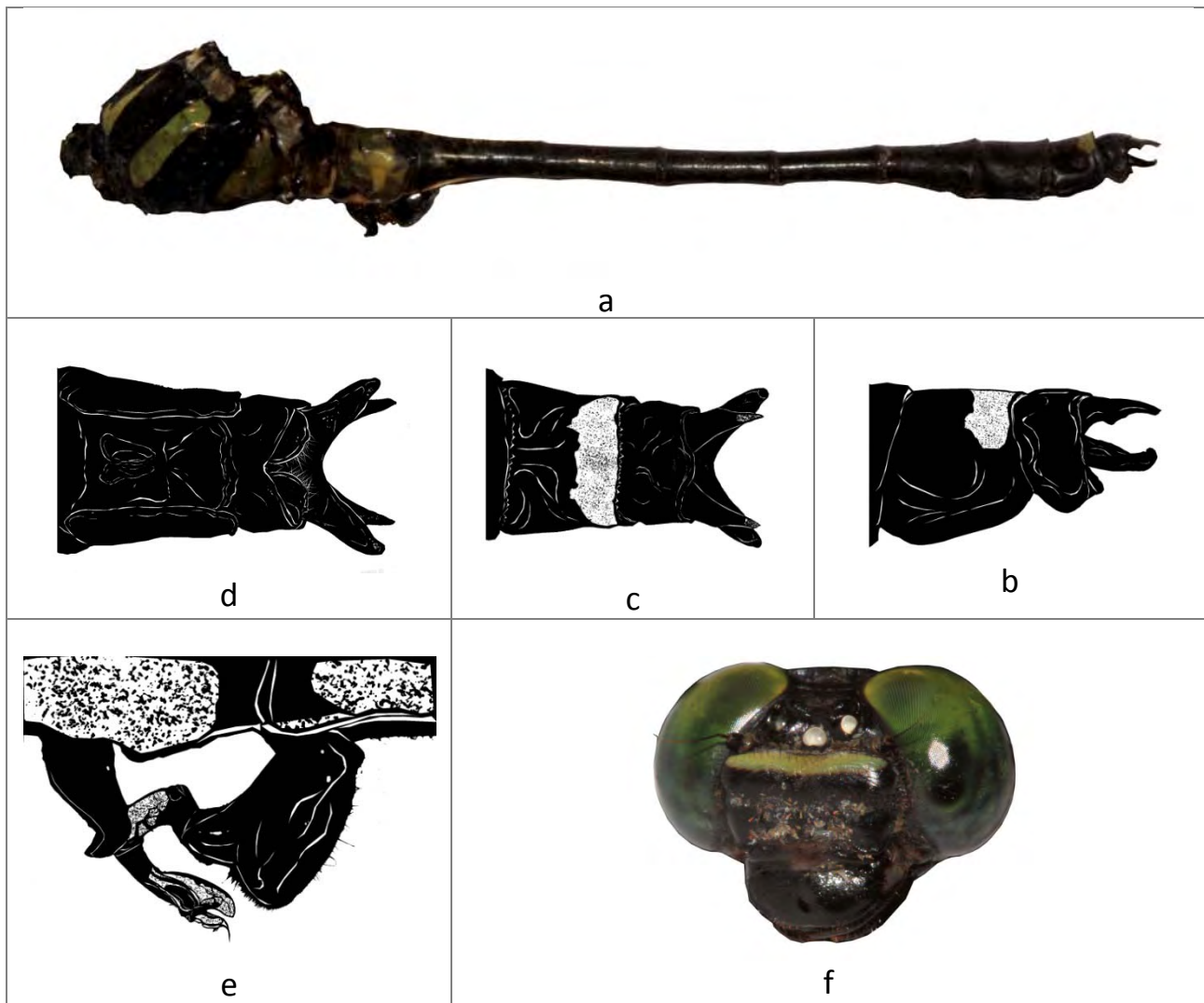


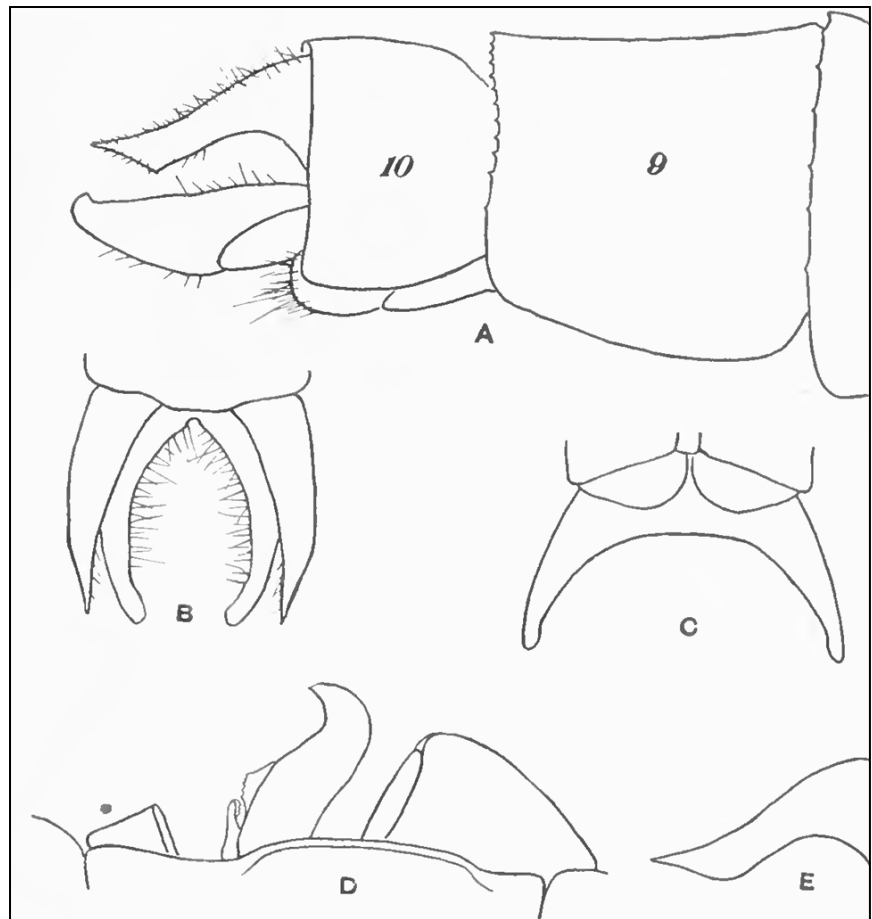
Figure 8. a. *Asiagomphus acco*: body – lateral view of male, b. Anal appendages -lateral view, c. Anal appendages - ventral view, d. Anal appendages dorsal - view, e. Penis and hamulus – lateral view, f. head – male

rior appendages of *A. xanthenatus* are more divaricate, slender apically; inner margin makes a “U” shape (Fig. 9c – Figure 33c in Williamson, 1907) whereas in *A. acco* the inferiors are more stout; inner margin makes a “V” shape (Fig. 8 c, d). The characteristic of the inferiors of *A. acco* also matches very well with that of Wilson’s figure (2005, Figure 15d). Indeed, in the Williamson’s Figure 33b, in the dorsal view of the anal appendages, the inferiors also look “V” shaped but that is because the specimen was compressed by envelope as he mentioned in the note of the figure (Fig. 9b). The natural shape of the inferior of *A. xanthenatus* was presented in ventral view (Fig. 9c).

In addition, the wing venation of our topotype of *A. acco* (antenodals: 19 in forewing, 15 in hindwing; postnodals: 17 in forewing, 14 in hindwing) differs from that of the holotype of *A. xanthenatus* (antenodal: forewing 16, hindwing 10-12; postnodals, front and hind wings 11-12).



Fig. 9 *Gomphus xanthenatus* from Burma by Williamson 1907: Fig 33: A. lateral and B. Dorsal view of male abdominal appendages, in this specimen unnaturally compressed by the envelope in which the specimen was preserved, in C. ventral view of inferior appendages, another specimen is figured, and the inferior appendages is not distorted, in this specimen the apices of the superior appendages are separated by $1 \frac{3}{5}$ the distance represented in B and the inferior appendages is equally divaricate; D. profile of accessory genitalia of abdominal segment 2. E lateral view of superior abdominal appendages of a specimen difference from A. in having the lower subapical edge rounded, not angulate, and minutely toothed. 9 and 10, abdominal segments.



The species is found along primary or secondary forest streams in lowland areas. Males of the species usually patrol the breeding site, which usually is an open part of a forest stream, and seek the females as they come to mate and oviposit.

6. *Sieboldius gigas* (Martin, 1904)

Specimens: 2 ♂♂ Cuc Phuong, 7.VII.2010, 20°17'10.9"N, 105°40'20.2"E, 235m a.s.l.

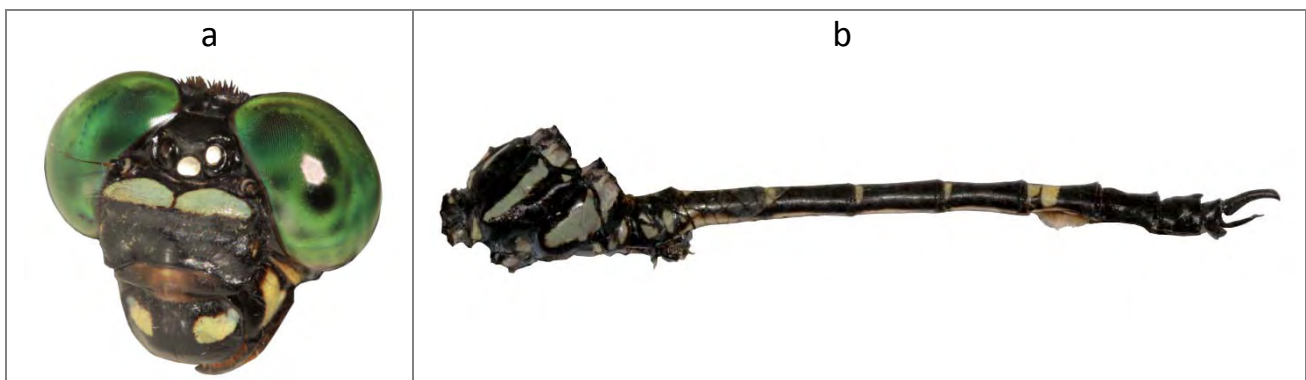


Figure 10. *Sieboldius gigas*: a. head - male, b. body – lateral view of male



This species was described by Martin in 1904 and treated under the genus *Hagenius* based on a male that was collected in Tonkin (North Vietnam). It is a large-sized dragonfly as implied in its name – *gigas*. It is distributed in primary and secondary forests in lowlands of North Vietnam. The body is black with green and yellow markings (Fig. 10b). Remarkably, the base of the 7th abdominal segment has a thick yellow ring with a tuft of yellow hair on the ventral side. The males usually fly along the breeding site (shady or open forest streams) or perch above the water surface.

7. *Ictinogomphus pertinax* (Fabricius, 1775)

[Asahina 1996a]

We have not collected this species during our surveys.

8. *Sinictinogomphus clavatus* (Fabricius, 1775)

Specimens: 2 ♂♂ Mac Lake, Cuc Phuong, 7.VII.2010, 20°15'24.14" N, 105°42'36.16" E, 157m a.s.l.

[Asahina 1996a]



Figure 11. *Sinictinogomphus clavatus*: a teneral female



This is a common species in Indo-china and East Asia.



CORDULEGASTRIDAE

9. *Chlorogomphus auratus* Martin, 1910

Specimen: 1 ♂ Cuc Phuong, 7.VII.2010, 20° 17' 10.9" N, 105° 40' 20.2" E, 235m a.s.l.

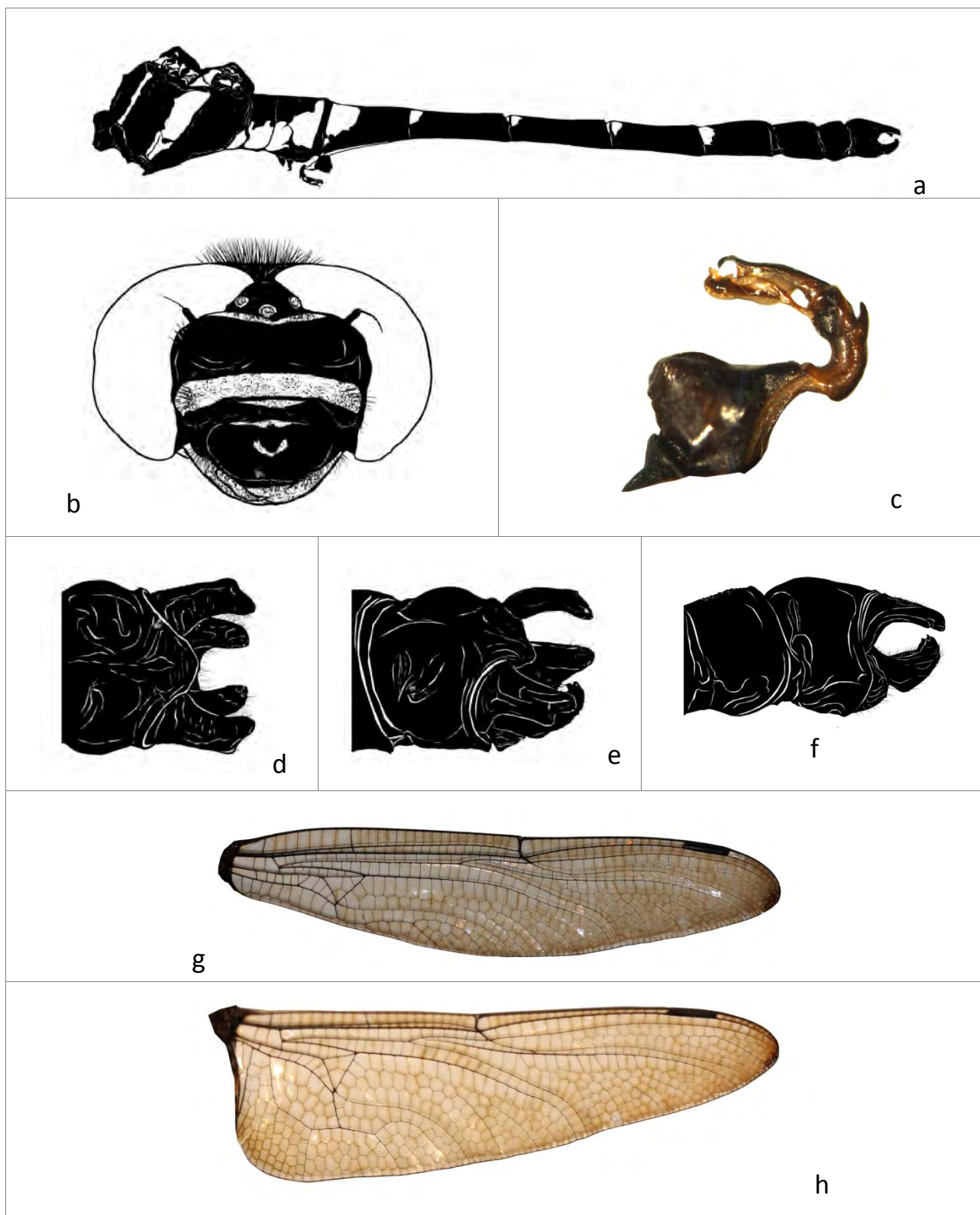


Figure 12. *Chlorogomphus auratus*: a. Body in lateral view, b. head, c. penis, anal appendages in dorsal view d, in dorsal-lateral view e, in lateral view f, g. Forewing, h. hindwing



This species was described by Martin (1910) based on a single female specimen collected in Tonkin (North Vietnam). Martin (1910) noted the close relationship of this species to *C. magnificus*. Latterly, Karube (1995) published the description of the male and re-described the female of this species based on specimens collected in Tam Dao National Park, Vinh Phuc province, North Vietnam. Karube (1995) followed Asahina (1981), grouping that species in the “*arooni*” group comprising of the taxa *C. fraseri*, *C. vietnamensis* and *C. auratus*. This species is a new record for the National Park. Details of our Cuc Phuong specimen are presented in Fig. 12.

There is only one male specimen in our collection; they share the same habitat with *Chlorogomphus nakamurai*.

10. *Chlorogomphus nakamurai* Karube, 1995



Specimens: 5 ♂♂, 1 ♀ Cuc Phuong, 23.IV.2006, 2 ♂♂, 1 ♀ Cuc Phuong, 7.VII.2010 20°21'00.6"N, 105°36'09.6"E, 430m a.s.l.

[Asahina 1995], [Karube 1995]



Figure 13. *Chlorogomphus nakamurai*: a. female is flying and preparing for oviposition, b. male



This rare species has only been found in Cuc Phuong and Ba Vi National Parks, Vietnam, from where Karube described it in 1995. It is a beautiful and large-sized dragonfly; the male being deep black with bright yellow markings on the thorax and abdomen (Fig. 13b). The wings of the males are hyaline with the exception on the tips (Fig. 13b), while females have remarkable dark marking on their wings (Fig. 13a).

They are found at shaded, clear streams in the forest. The male usually patrols along the forest stream, looking for females, which only descend from the tree-canopies for mating and oviposition. Once the female has found a suitable breeding side, the eggs are released directly to the surface of slow-flowing water.

CORDULIIDAE

11. *Macromia* sp.

Specimen: 1♀ Cuc Phuong, 7.VII.2010, 20°17'10.9"N, 105°40'20.2"E, 235m a.s.l.

Only one female was collected. Females of this genus are frequently not readily identifiable from the literature descriptions.

12. *Macromidia* sp.

Specimen: 1♂ Cuc Phuong, 7.VII.2010, 20°17'10.9"N, 105°40'20.2"E, 235m a.s.l.

A teneral damaged male specimen was collected.

Figure 14.
Crocothemis
servilia:
male



LIBELLULIDAE**13. *Crocothemis servilia* (Drury, 1773)**

Specimen: 5♂♂ Mac Lake, Cuc Phuong, 7.VII.2010, 20°15'24.14" N, 105°42'36.16" E, 157m a.s.l.

This is a common species of lowland areas. In general appearance, the male is red while the female is yellow.

14. *Lyriothemis bivittata* (Rambur, 1842)

Specimens: 1♂, 1♀ Cuc Phuong, 7.VII.2010, 20°17'10.9" N, 105°40'20.2" E, 235m a.s.l.

[Asahina 1996b]



Figure 15. *Lyriothemis bivittata*: male

A female specimen caught in Cuc Phuong National Park coincides with Asahina's (1996b) description. The male has a remarkably bright red abdomen in dorsal view (Fig. 15).



15. *Orthetrum pruinosum* (Burmeister, 1839)

Specimen: 1♂ Mac Lake, Cuc Phuong, 7.VII.2010, 20°15'24.14"N, 105°42'36.16"E, 157m a.s.l.

A common species all over the Vietnamese and East Asian regions.

16. *Orthetrum sabina* (Drury, 1770)

Specimens: 3♂♂ Mac Lake, Cuc Phuong, 7.VII.2010, 20°15'24.14"N, 105°42'36.16"E, 157m a.s.l.

A common and widespread Asian species.

17. *Orthetrum triangulare* (Selys, 1878)

Specimens: 2♂♂ Mac Lake, Cuc Phuong, 7.VII.2010, 20°15'24.14"N, 105°42'36.16"E, 157m a.s.l.

A common libelulid with black body and white marking; widely distributed all over the Vietnamese and East Asian regions.

18. *Rhyothemis variegata variegata* (Linne, 1763)

[Asahina 1996b]

This species was not recorded during our surveys.

19. *Tetrathemis platyptera* Selys, 1878

Specimens: 2♂♂ Cuc Phuong, 7.VII.2010, 20°17'10.9"N, 105°40'20.2"E, 235m a.s.l.



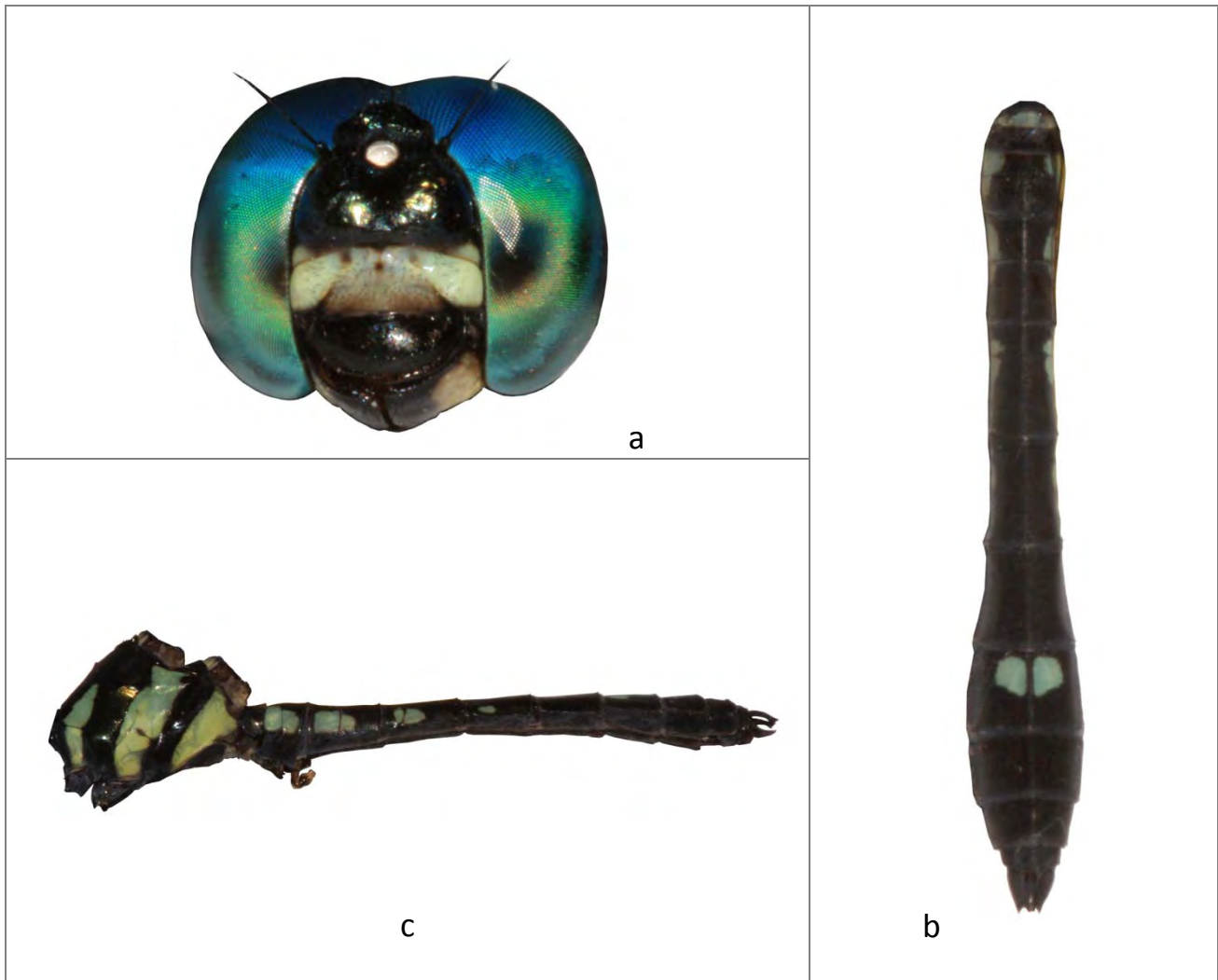


Figure 16. *Tetrathemis platyptera*: a. head - male, b. abdomen – dorsal view of male, c. body – lateral view of male (teneral)

This is a small dragonfly (hind wing measure only 17mm), found only in forest areas. Its habitat is small ponds or stream pools in shady forests. Males and females of the species are similar. The body is black with light green markings in teneral, or bright yellow markings in mature adults.

Acknowledgements

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