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Records of the Northern Vietnamese Odonata Taken by the Expedition Members from the National Science Museum, Tokyo

1. Cordulegasteridae[1)]

By

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Abstract Northern Vietnamese dragonflies of the family Cordulegasteridae are dealt with on the basis of the collection made by the National Science Museum Expeditions 1994 and 1995. Of the seven species examined, three *Chlorogomphus* are new to science and described under the names *C. uenoi*, *C. owadai* and *C. satoi*.

During the two field surveys made in September and October 1994 and in April and May 1995, a considerable number of the Odonata were obtained in northern Vietnam by the entomologists of the National Science Museum, Tokyo, and their collaborators. These will be recorded taxonomically hereinafter in a series of reports.

The members of these two surveys were: Dr. Shun-Ichi UÉNO, Department of Zoology, National Science Museum, Tokyo, the leader of the party, Dr. Mamoru OWADA, Dr. Masataka SATÔ, Dr. Yoshiaki NISHIKAWA, Dr. Akihiko SHINOHARA, and Dr. Akiko SAITO.

Before going further, I wish to thank all the survey members for their efforts paid in the tropical survey fields, and in particular, to Dr. Shun-Ichi UÉNO who helped me in preparing the present report.

A. Cordulegasterinae

1. ?*Anotogaster flaveola* LOHMANN, 1993

(Fig. 8)

Anotogaster flaveola LOHMANN, 1993, Odonatologica, 22: 278–279 (1♀), "Formosa, Tainan, V. Rolle leg."

Material studied. 1 ♀, Deo O Quy Ho, 1,750 m alt., Sa Pa, Lao Cai Prov., N. Vietnam, 14–V–1995, M. OWADA leg.

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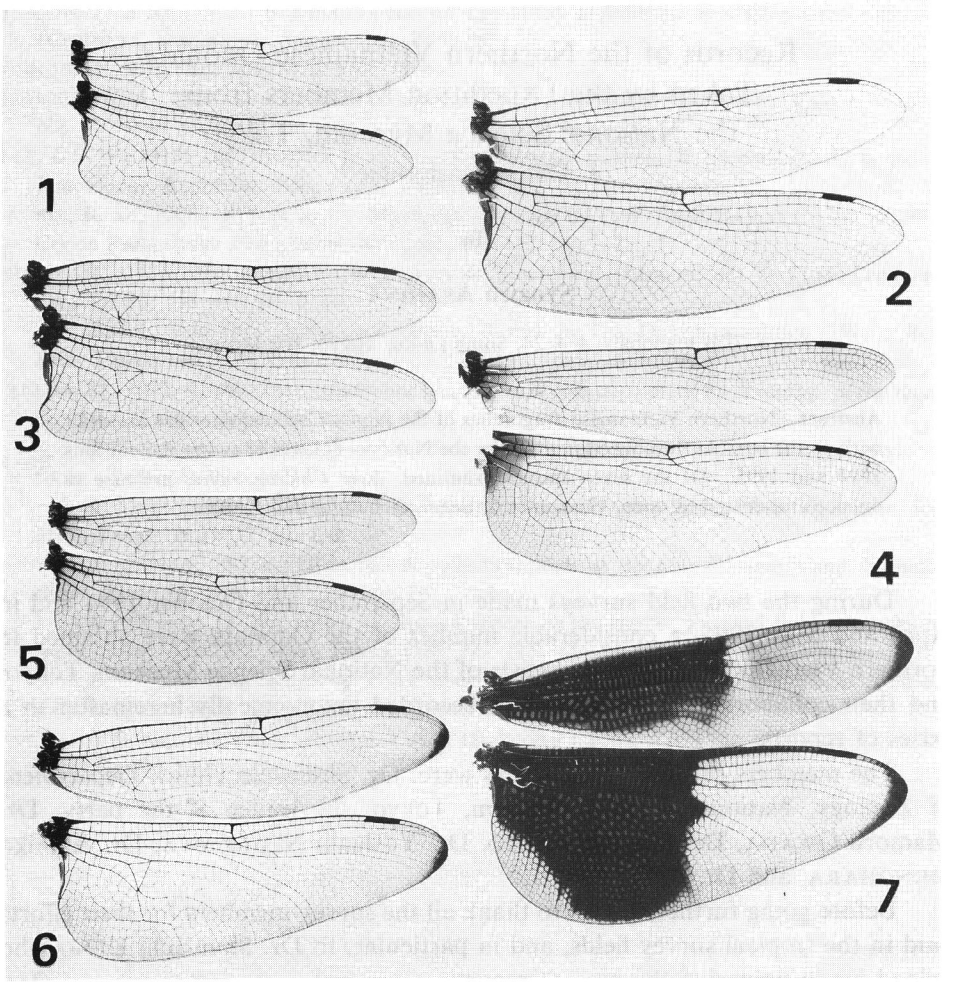


Figs. 1–7. Wing venation of treated species. —— 1, *Chlorogomphus uenoi* sp. nov., ♂; 2, *Ch. owadai* sp. nov., ♂; 3, *Ch. nasutus satoi* subsp. nov., ♂; 4, *Ch. takakuwai*, ♀; 5, *Ch. miyashitai*, ♀; 6, *Ch. nakamurai*, ♂; 7, *Ch. nakamurai*, ♀.

A large-sized *Anotogaster* species, allied to Japanese *A. sieboldii* (SELYS). From the adjacency of the locality, a possibility of conspecificity with *A. gregoryi* FRASER (1924), which was described from "near Chitsung (♂), Valley of Yangtse and Kakatang (♀)", has been suspected. However, I had the impression that the abdominal pattern of the present female specimen is very similar to that of a recently named Taiwanese dragonfly, *A. flaveola* LOHMANN.

The latter species was named on the basis of a single broken female specimen, but the author emphasized the large yellowish marking on the second abdominal

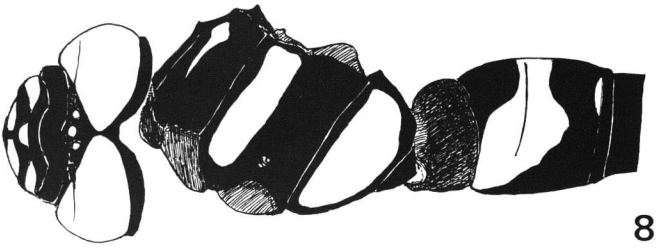


Fig. 8. ?*Anotogaster flaveola*, ♀; body pattern, from head to the second abdominal segment.

segment, the same as I illustrated herewith (Fig. 8).

I believe that further exact identification should be made on sufficient material obtained from the broad Far Eastern area.

B. Chlorogomphinae

2. *Chlorogomphus uenoi* sp. nov.

(Figs. 1, 9–15)

Material studied. 1♂, Ban Khoang, 1,450 m alt., Sa Pa, Lao Cai Prov., N. Vietnam, 14–V–1995, S. UÉNO leg. (Holotype).

♂: Hindwing length 45 mm, abdomen 63 mm; a middle-sized slender species. Ground colour deep black with distinct yellow stripes. The presence of a large yellow stripe on the metathoracic epimeron is characteristic of this group.

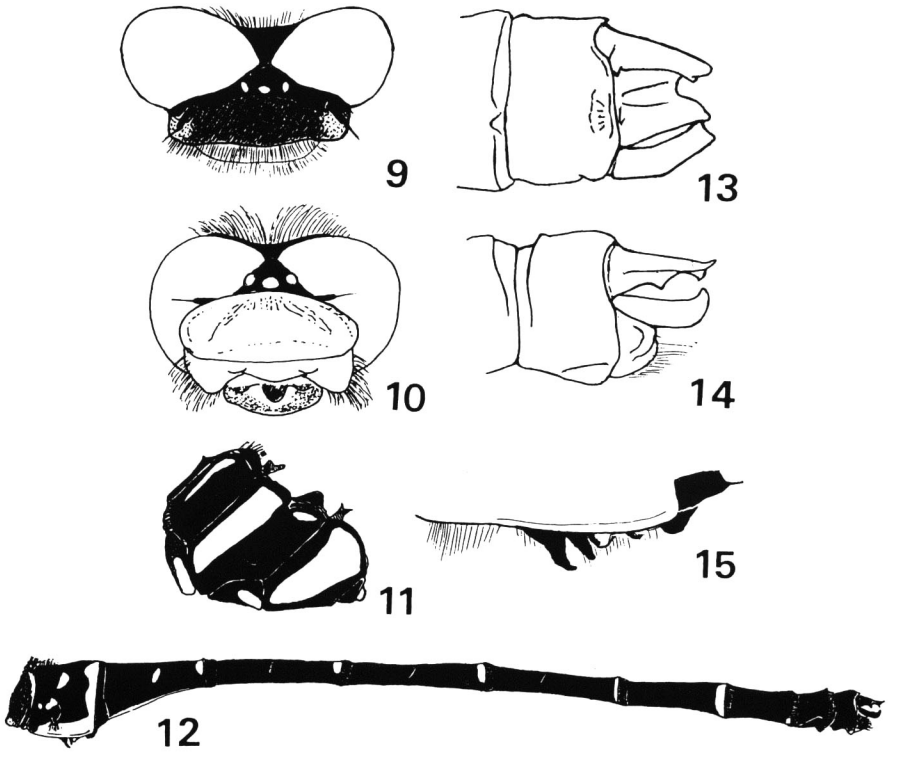
Head looks entirely black if seen from above (Fig. 9), but its anterior side is almost dark yellow (Fig. 10). The anterior side of the frons is flat and wholly wrinkled; postclypeus broad, ante- and postclypei slightly darkened; labrum much more darkened (Fig. 10).

Pterothorax black, striped with two yellowish bands, the anteriormost one on mesepisternum short and pointed downwards; metathoracic episternum covered with a broad band, metathoracic epimeron almost entirely yellowish. There is a very small yellowish spot at the top of metepisternum, and another one on the mesothoracic infraepisternum (Fig. 11).

Wings (Fig. 1) hyaline, hindwing length 45 mm, pterostigma 3 mm, triangle of both wings two-celled, the median space being provided with one cross-vein.

Abdomen slender and black; the yellowish pattern (Fig. 12) is characteristic. Segment 2 with a turn-out L-mark and two spots; segments 3–7 each with a terminal yellow spot; on segment 3 there is, in addition, a midway spot.

Caudal appendages (Figs. 13–14) short and all black-coloured. Superior one with divided apex and a median pointed process, but in dorsal view the whole appendage is not pointed.



Figs. 9–15. *Chlorogomphus uenoi* sp. nov., ♂. —— 9, Head, dorsal; 10, same, frontal; 11, pterothorax, lateral; 12, abdomen, lateral; 13, caudal appendages, dorsal; 14, same, lateral; 15, genital hamuli, lateral.

The processes of the genital hamuli are as shown in Fig. 15.

Remarks. This slender species is dedicated to Dr. Shun-Ichi UÉNO, the leader of the present survey group.

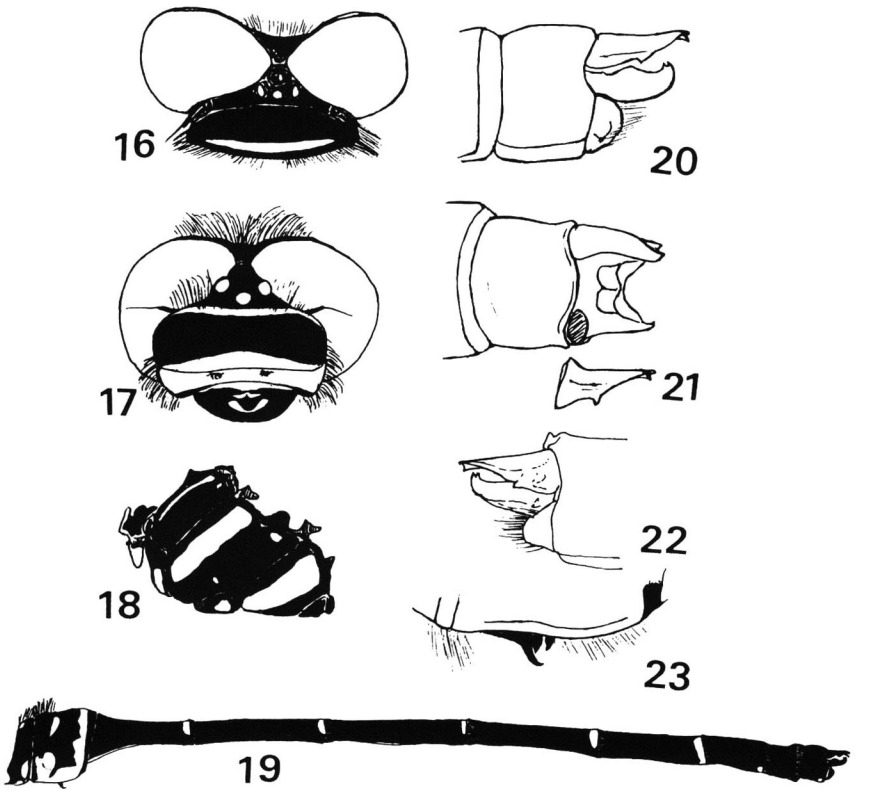
3. *Chlorogomphus owadai* sp. nov.

(Figs. 2, 16–23)

Material studied. 1♂, Ban Khoang, 1,400 m alt., Sa Pa, Lao Cai Prov., N. Vietnam, 12–V–1995, M. OWADA leg. (Holotype).

♂: Hindwing length 41 mm, abdomen 59 mm; a slender species like the preceding one. Body entirely deep black striped with yellowish, metepimeron entirely yellow.

In dorsal view, the head is almost entirely black with a narrow pale-coloured frontal ridge (Fig. 16); ante- and postclypei also pale-coloured, labrum black with two small median yellowish spots (Fig. 17).



Figs. 16–23. *Chlorogomphus owadai* sp. nov., ♂. —— 16, Head, dorsal; 17, same, frontal; 18, thorax, lateral; 19, abdomen, lateral; 20 & 22, caudal appendages, lateral; 21, same, dorsal, showing the depression on the lower appendage; 23, genital hamuli, lateral.

Pterothorax black, striped like that of the preceding species; the yellowish metepimeron is also a common character (Fig. 18).

Wings (Fig. 2) hyaline, pterostigma 2.7 mm, triangles of both wings three-celled, the median space with a single cross-vein.

Caudal appendages (Figs. 20–22) similar to those of the preceding species, but the apical part of the superior appendage is more attenuated and sharply pointed.

The processes of genital hamuli are as illustrated in Fig. 23, in lateral view.

Remarks. This slender species is dedicated to the collector, Dr. Mamoru OWADA, a survey member and a lepidopterist.

4. *Chlorogomphus nasutus satoi* subsp. nov.

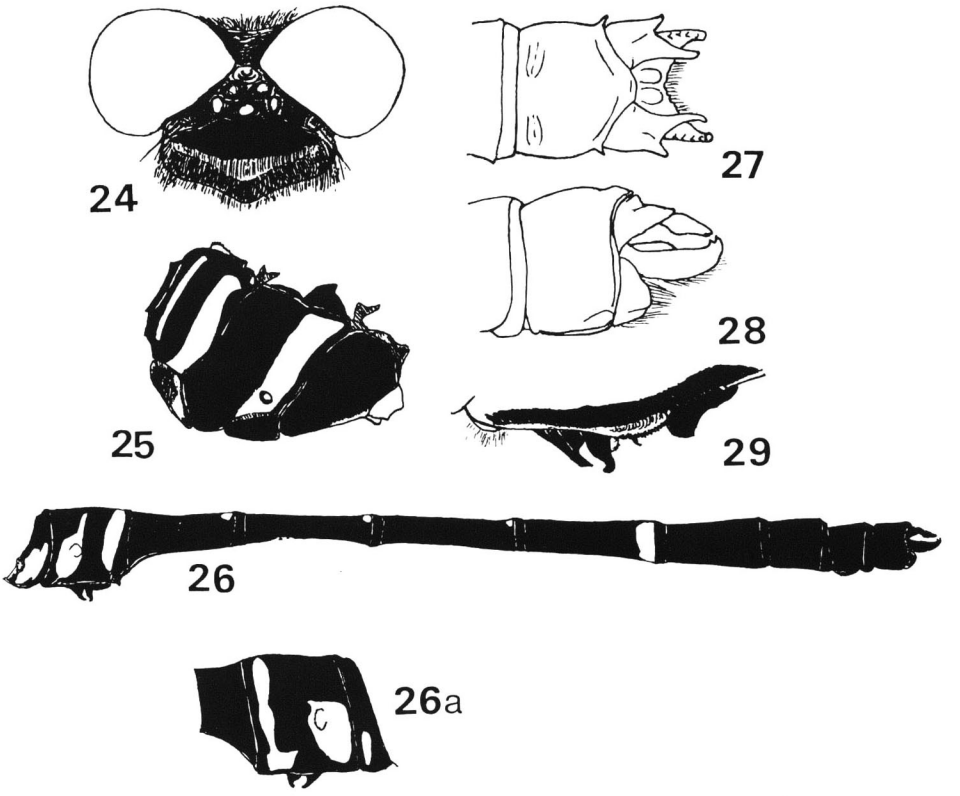
(Figs. 3, 24–29)

Material studied. 1♂, Mt. Tam Dao, 960 m alt., Vinh Phu Prov., N. Vietnam, 21–V–1995, M. SATÔ leg. (Holotype); 1♂, Mt. Tam Dao, 960 m alt., Vinh Phu Prov., N. Vietnam, 20–V–1995, M. OWADA leg. (Paratype).

♂: Hindwing length 50–51 mm, abdomen 65 mm. A large-sized species. Body deep black striped, rather feebly marked with yellow.

Head predominantly shining black-coloured, frons striped narrowly with a dark yellow transverse line (Fig. 24); on the frontal side of the head, only the postclypeus remains yellowish.

Three pterothoracic yellow stripes are present on the episternum, two on mesothoracic episternum, and a broad one on metathoracic episternum; minute



Figs. 24–29. *Chlorogomphus nasutus satoi* subsp. nov., ♂. —— 24, Head, dorsal; 25, thorax, lateral; 26, abdomen, lateral; 27, caudal appendages, dorsal; 28, same, lateral; 29, genital hamuli, lateral. —— 26a. Two proximal segments of abdomen in the holotype of the nominotypical subspecies of *Ch. nasutus*.

metapostepimeron also yellowish.

Wings (Fig. 3) hyaline, pterostigma 4 mm, triangles 3–4 celled, median space with two cross-veinlets.

Abdomen also heavily dark-coloured, only the basal three stripes on the first and second segments yellowish. Then, minute spots present on the 3–5 segments and a large spot at the end of the 6th segment.

Caudal appendages black, superior one broadly divided, and the inferior appendage widely opened with apical double spines and a series of serration on its lateral ridge (Fig. 27).

Genital hamuli on the second segment conspicuous (Fig. 29).

Remarks. The yellow pattern on the basal two segments of abdomen (Fig. 26) is characteristic of this subspecies. For comparison, a sketch of the pattern on the corresponding part in the nominotypical subspecies (Fig. 26a) is shown herewith. It was drawn many years ago from the type specimen preserved in the Cornell University collection.

This subspecies is dedicated to one of the survey members, Dr. Masataka SATÔ of Nagoya Women's University.

5. *Chlorogomphus takakuwai* KARUBE, 1995

(Figs. 4, 30–34)

Chlorogomphus takakuwai KARUBE, 1995, Bull. Kanagawa pref. Mus., (Nat. Sci.), (24): 59–62, figs. 74–84, "♂ Holotype, Mt. Tamdao, near Hanoi, N. Vietnum [sic], 19. V.–2. VI. 1993; 1♀ (Allotype), same as the holotype, 31. V. 199l; 2♂2♀ (Paratypes)."

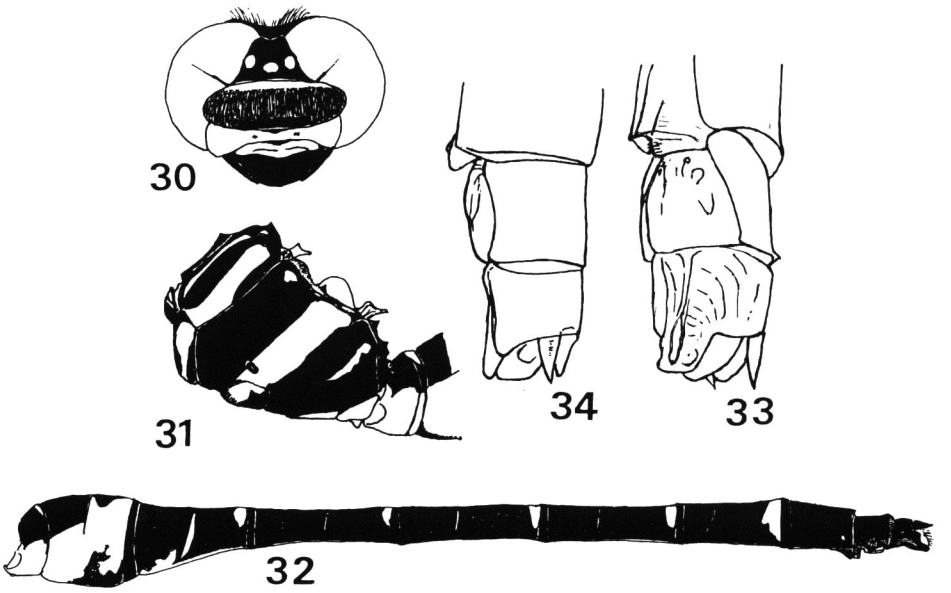
Material studied. 1♀, Ban Khoang, 1,400 m alt., Sa Pa, Lao Cai Prov., N. Vietnam, 12–V–1995, Akiko SAITO leg.

♀: A large-sized, rather yellowish-coloured species, with the wing-bases bright brownish tinted. Hindwing length 56 mm, abdomen 66 mm.

Head shining black, the narrow frontal ridge yellow, ante- and postclypei also yellowish, labrum entirely darkened (Fig. 30).

Pterothorax (Fig. 31) striped with bright yellowish bands, the first narrow one on mesepisternum, then a distinct one along the mesopleural suture which is connected with the yellowish infraepisternum. Then, a small spot at the antero-dorsal corner of mesothoracic epimeron. The broad band of yellow covers the whole metepisternum and extends into the anterior half area of meta-infraepisternum. There is a small cobra-shaped patch in the black of metepimeron (Fig. 31).

The wings (Fig. 4) of our present female specimen is broad enough with a long pterostigma measuring 4 mm (f.w.) and 4.5 mm (h.w.). The wing bases are brightly tinted with orange colour, and the costal area of forewing palely enfumed on the costal side.



Figs. 30–34. *Chlorogomphus takakuwai*, ♀. —— 30, Head, frontal; 31, thorax, lateral; 32, abdomen, lateral; 33, abdominal end, oblique lateral; 34, same, lateral.

Abdominal segments well spotted by yellow; basal two segments with broad yellow pattern; on the third segment a middle side-stripe and terminal spot present; a yellowish end-spot present on each of 4–7 segments, the last one being the largest.

Valvula vulvae very short but bilobed (Fig. 33). Cerci blackish-coloured.

Remarks. Unfortunately, the male insect was not available, but according to KARUBE's figures, the male caudal appendages are very simply shaped.

6. *Chlorogomphus miyashitai* KARUBE, 1995

(Figs. 5, 35–39)

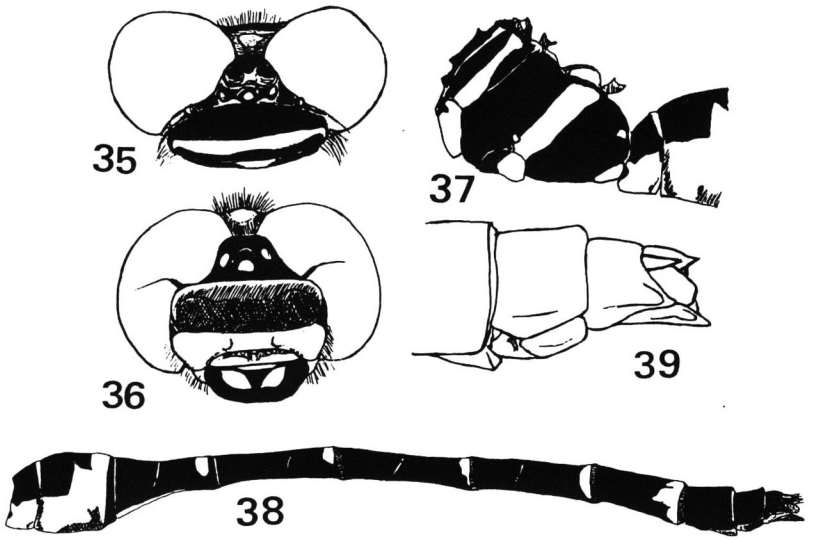
Chlorogomphus miyashitai KARUBE, 1995, Bull. Kanagawa pref. Mus., (Nat. Sci.), (24): 57–59, figs. 63–73, "♂, Xien Kuang, NE. Laos, 4. IV. 1993, T. MIYASHITA leg.; ♀, same loc., 22. VI. 1993, T. MIYASHITA leg."

Material studied. 1♀, Ban Him Bon, 440 m alt., Xa Pa Ha, Muong Lay, Lai Chau Prov., N. Vietnam, 8–V–1995, S. UÉNO leg.

♀: Rather small-sized species, wings hyaline, hindwing length 45 mm, abdomen 56 mm.

Head coloured like that of *C. takakuwai*, but the occiput is slightly produced and pale-coloured; there are paired yellow spots on the labrum (Fig. 36).

Pterothoracic pattern (Fig. 37) similar to that of *C. takakuwai*, the pale



Figs. 35–39. *Chlorogomphus miyashitai*, ♀. —— 35, Head, dorsal; 36, same, frontal; 37, thorax, lateral; 38, abdomen, lateral; 39, abdominal end, lateral.

stripe on metathoracic epimeron minimized to a small spot (Fig. 37).

Wings (Fig. 5) hyaline; both triangles three-celled, with two cross-veins in the median space.

Abdominal pattern very similar to that of *C. takakuwai*, the median transverse stripe on the third segment being absent. The ovipositor processes of the tenth sternite are protruded longer than those of *C. takakuwai* (Fig. 39).

7. *Chlorogomphus nakamurai* KARUBE, 1995

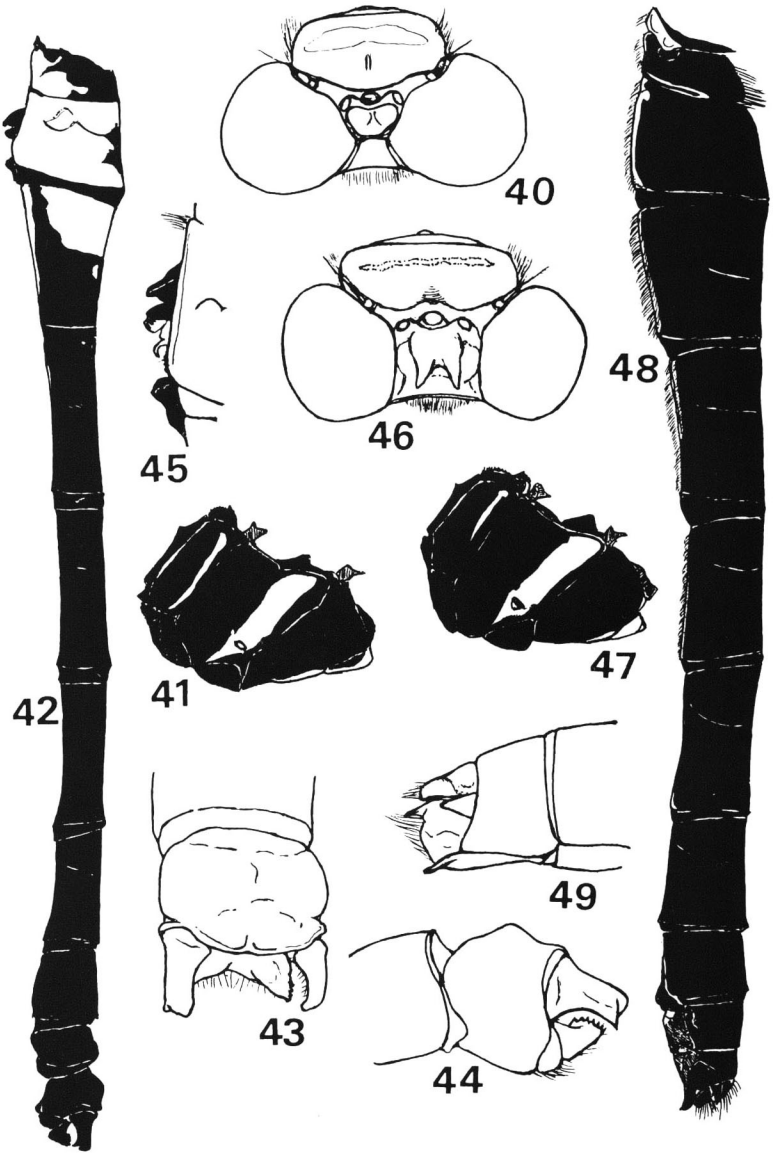
(Figs. 6–7, 40–49)

Chlorogomphus nakamurai KARUBE, 1995, Bull. Kanagawa pref. Mus., (Nat. Sci.), (24): 53–55, figs. 31–41, "Holotype ♂, Cuc Phuong, near Hanoi, N. Vietnum [sic], 29. V. 1993, H. KARUBE leg. Allotype ♀, same loc. as holotype, 28. V. 1991, S. NAKAMURA leg. Paratypes 12♂2♀, same loc."

Material studied. 1♂, Mt. Tan Vien, 250 m alt., Ba Vi, Ha Tay Prov., N. Vietnam, 27–IV–1995, Y. NISHIKAWA leg.; 4♂1♀, Cuc Phuong, 440 m alt., Gia Vien, Ninh Binh Prov., N. Vietnam, 27–V–1995, S. UÉNO leg.; 1♀, same loc., 27–V–1995, A. SAITO leg.

♂: A robust dark-coloured species, with wing apices narrowly darkened. Hindwing length 50–52 mm, abdomen 54–57 mm.

Ground colour of the body deep black. Head glabrous, entirely shining black with a pale yellowish dorsal stripe on the top (Fig. 40). Behind ocelli a shining



Figs. 40–49. *Chlorogomphus nakamurai*, ♂♀. —— 40, ♂ head, dorsal; 41, ♂ pterothorax, lateral; 42, ♂ abdomen, lateral; 43, ♂ caudal appendages, dorsal; 44, ♂ same, lateral; 45, ♂ accessory genitalia; 46, ♀ head, lateral; 47, ♀ pterothorax, lateral; 48, ♀ abdomen, lateral; 49, ♀ abdominal end, lateral.

black swelling present.

Pterothorax deep black tinted with three yellowish narrow stripes, the hindermost one on metathoracic episternum being broadest; metapostepimeron

dark yellowish. Legs all black-coloured.

Wings hyaline, all the apices tipped with black. For venation refer to Figs. 6 (♂) and 7 (♀).

Abdomen entirely deep black except for three proximal segments as shown in Fig. 42.

Caudal appendages (Figs. 43–44) short and robust, the superior widely separated, each ending in two pointed apices. Inferior appendage broadly divaricate, lateral margins of their apices serrated. Genital hamuli short and black-coloured (Fig. 45).

♀: A very dark-coloured robust insect. Abdomen 56–59 mm.

Head black with palely tinted top ridge. The divided flat occipital process behind the ocelli is conspicuous (Fig. 46).

Pterothorax patterned like that of the male insect, but the pale stripes are less developed, the anterior two almost disappearing (Fig. 47).

Wings (Fig. 7) very broad, length 56–60 mm, broadest width 22–24 mm. Both wings deeply darkened from base nearly towards the nodal level with the anterior coast of forewing and posterior border of both wings remaining hyaline. There is whitish shading around the nodus of both wings. Legs all black.

Abdomen very thick and robust, entirely deep brownish black, basal six segments each with remnant of very narrow yellowish ventral ridge.

Valvula vulvae on the 8th segment short, but not bilobed. Sternum of the last abdominal segment extending posteriorly, reaching almost equal to or slightly beyond the end of abdomen (Fig. 49).

References

All the references will be listed at the end of this series of papers.