

## Notes on the Philippine Odonata in the Collection of the National Science Museum, Tokyo

(Part I)<sup>1)</sup>

By

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(Communicated by Tadashige HABE)

### Introduction

Our knowledge of the odonate fauna of the Philippine Islands still remains insufficient, although, after the works of NEEDHAM and GYGER (1937, 1939, 1941), there appeared four important contributions by LIEFTINCK (1961, 1971, 1974, 1977) and a rather fragmentary record by myself (1968).

In 1977, the National Science Museum, Tokyo, sent several specialists to the Philippines under a project "Biogeographic Study of the Philippine Islands" in co-operation with Philippine entomologists. The collection of the Odonata taken by this survey and now mainly preserved in the Department of Zoology at the National Science Museum, Tokyo, was handed to me for identification. Besides, the present paper will also deal with some materials, though rather fragmentary, which have been brought to my hand since 1968 by a number of entomologists.

For these materials I have the pleasure to acknowledge my indebtedness to the following entomologists for their painstaking effort and kindness: Dr. Yoshihiko KUROSAWA and Dr. Shun-Ichi UENO (National Science Museum (Nat. Hist.), Tokyo), Prof. Shigeru AE (Nanzan University, Nagoya), Prof. C. PLATEROS (San Carlos University; for the collections made in 1966, 1968, 1970), Dr. Fr. E. SCHOENIG (San Carlos University, Cebu), Mr. M. MEDICIELO (Leyte; for the 1976 collection), Dr. Carl YOSHIMOTO (B. P. Bishop Museum, Honolulu; for the 1959 collection), Dr. Satoshi SHINONAGA (1967 collection), Dr. Hiromu KURAHASHI (1975 collection), Mr. Hideo KUWABARA (1975 collection), Mr. Nobuo KASHIWAI (1976 collection), Mr. T. ENDO (1976 collection), Mr. Hisakazu HAYASHI (1977 & 1978 collections), Mr. Kazuma KITAGAWA (1977-'78 collections made by three students of Hokkaido University), Mr. Kiyoshi OKUBO (1977 & 1978 collections), Mr. Kazufusa NARUMI (1978 collection), Messrs. Shuji OKAJIMA and Wataru SUZUKI (1979 collection).

In the first part of this work, the species of Gomphidae, Cordulegasteridae and Corduliidae will be treated. At the end of this part is added a description of a new

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subspecies of *Hemicordulia* which has hitherto been regarded as the same with a Mindanao species.

## I. Gomphidae

### 1. *Ictinogomphus tenax* SELYS

*Ictinus tenax*: SCHMIDT, 1934, p. 385 (key), p. 361, "Zool. Mus. Berlin, Manila, Meyen, 1 ♂ No. 2329 (Hagen's type)—Senckenbergianum (Coll. Ris): Najan, Mindoro, Philippines, 3 ♂ 1911, Rolle; Los Baños, Luzon, Philippine, 1 ♂ 24. VII. 1914, G. Boettcher."

*Ictinogomphus tenax*: ASAHINA, 1968, p. 371, "1 ♂ Gapan, Luzon, 1961, ex coll. Yamada."

*Material examined.* 1 ♂, Mt. Maquiling, Los Baños, 9. VI. 1975; leg. KUWABARA; 1 ♂, Gapan, Luzon, 1961, ex coll. YAMADA; 1 ♂, Vayon, Luzon, 30. IX. 1978, leg. NARUMI; 1 ♂, Bangan, Luzon, 3. X. 1978, leg. NARUMI.

The Southeast Asiatic species of *Ictinogomphus* were well revised by SCHMIDT (1934). Here will be presented a table for distinguishing *I. tenax* of Luzon from *I. pertinax* which ranges widely in Japan, the Ryukyus, Taiwan, South China, Hainan, Tonkin and Nepal.

|                    | ♂ inf. appendage                              | Fan-lobe<br>8 segm.             | Paired spots on<br>postclypeus     | Yellow markings<br>of abdomen                                        |
|--------------------|-----------------------------------------------|---------------------------------|------------------------------------|----------------------------------------------------------------------|
| <i>I. tenax</i>    | divided lobes<br>parallel<br>(Fig. 2)         | small and<br>narrow<br>(Fig. 1) | usually connected<br>at the center | generally reduced<br>but enlarged in<br>1 & 2 segments<br>(Fig. 3)   |
| <i>I. pertinax</i> | divided lobes<br>laterally opened<br>(Fig. 5) | broad<br>(Fig. 4)               | broadly separated<br>laterally     | generally developed,<br>but reduced in 1<br>& 2 segments<br>(Fig. 6) |

The description of female *tenax* was only briefly given by SELYS (1878) based on a broken insect from an uncertain locality, hence it is in need of a future redescription.

### 2. *Gomphidia kirschii* SELYS

*Gomphidia kirschii* SELYS, 1878, pp. 81–83 (=pp. 673–675), "Patrie: Luçon, Mindanao. Une male au Musée de Paris; une femelle, coll. Selys. Dédiée à M. Th. Kirsch, le savant entomologiste du Musée de Dresden."

*Gomphidia kirschii*: SELYS, 1882, p. 16, "Luçon (Semper)—Mindanao, Deux femelles."

*Gomphidia kirschii*: KIRBY, 1890, p. 76, "Philippines."

*Gomphidia kirschii*: MARTIN, 1904, p. 217, "Philippines, Bornéo(?), Tonkin(?)."

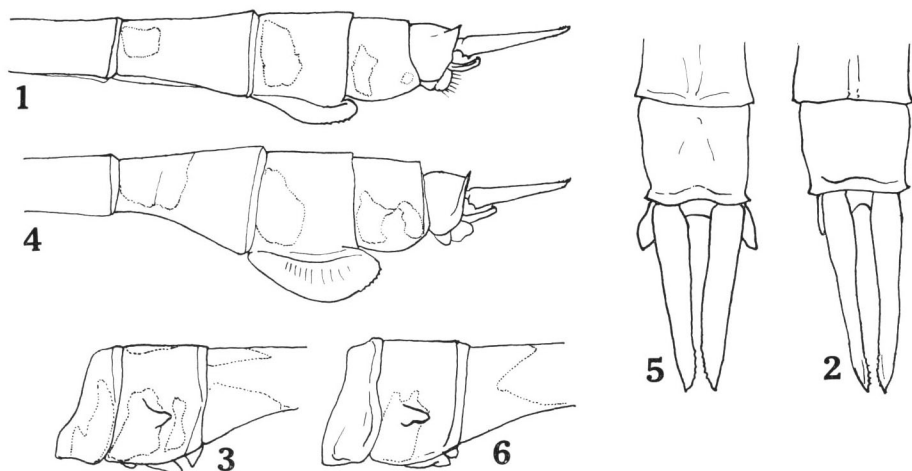
*Gomphidia kirschii*: WILLIAMSON, 1908, pp. 281, 284 (brief description and comparison).

*Gomphidia kirschii*: LAIDLAW, 1914, p. 53, "Recorded from the Philippine Is. (Selys), Borneo (Selys) and Tonkin (Martin)."

*Gomphidia karschii* (sic!): LAIDLAW, 1920, p. 317, "Philippine Is."

*Gomphidia kirschii*: LAIDLAW, 1930, p. 178, "Philippine Is."

*Gomphidia kirschii*: NEEDHAM & GYGER, 1937, pp. 30–32, pl. 1, figs. 4 & 5 (♂ app.); pl. 3, fig. 53 (thoracic pattern), "Luzon, Laguna Province, Los Baños, male, 7. II. 1919, male 3. VII. 1921, male, 25. VIII. 1926, female 23. II. 1930, female 19. VI. 1930, female 5. VII. 1930."



Figs. 1-6. *Ictinogomphus* spp. — 1-3. *I. tenax* (SELYS), Luzon. — 4-6. *I. pertinax* (SELYS), Japan. — 1, 4: ♂ Distal abdominal segments. 2, 5: ♂ Caudal appendages, dorsal. 3, 6: ♂ Basal abdominal segments.

*Gomphidia kirschii*: LIEFTINCK, 1974, p. 140, "Mindanao, 1 ♂ Sapamoro, 20. XII. 1911 (MC) (Zool. Mus. Copenhagen)", "Originally described from Luzon but apparently widely spread in the Philippines and known also from Basilan I."

*Coll. NSMT.* 1 ♂, Bislig, Mindanao, 3. VII. 1977, leg. KUROSAWA; 1 ♂, Ditto, 6. VII. 1977, leg. AE.

*Other material examined.* 1 ♂, Mt. Mackiling, Quezon, Luzon, 28. III. 1978, leg. OKUBO; 1 ♂, Quezon National Forest Park, Luzon, 17. VII. 1979, leg. OKAJIMA & SUZUKI.

Known from Luzon and Mindanao since 1878. Taxonomic characters will be compared with the most closely allied new species which is subsequently described.

### 3. *Gomphidia platerosi* sp. nov.

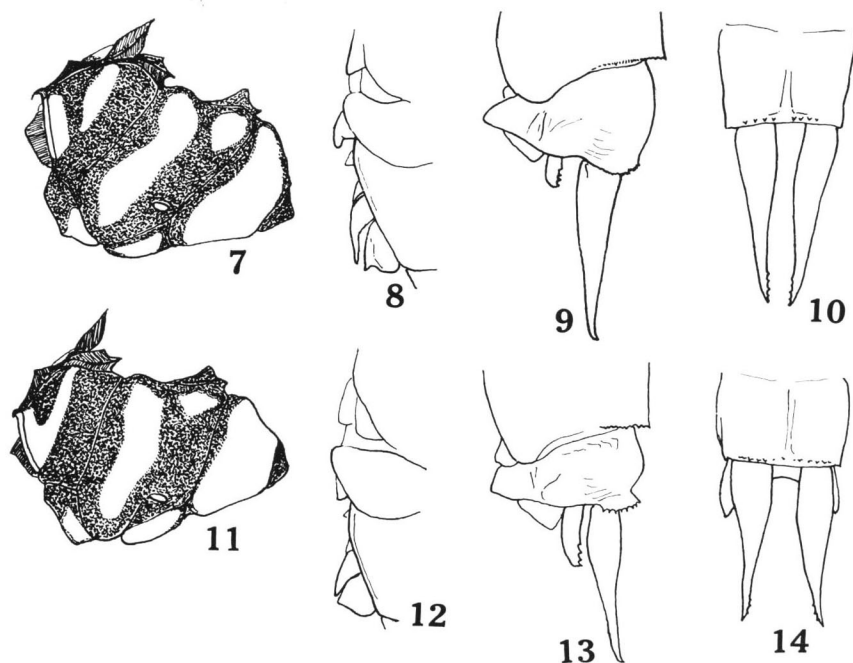
*Coll. NSMT.* 1 ♂, Bislig, Mindanao, 4. VII. 1977, leg. KUROSAWA (Paratype).

*Other material examined.* 1 ♂, St. Bernard, South Leyte, 2. I. 1970, leg. PLATEROS (Paratype); 1 ♂, Ditto, 20. V. 1976, leg. MEDICIELO (Holotype).

Closely allied to *Gomphidia kirschii*, and not easily separable from it excepting the confluent antehumeral stripe with the collar stripe. Since this kind of pattern is not always reliable in many of the gomphids, more exact distinguishing characters should be mentioned.

♂(ad.): Abd.+app. 46-49 mm, hindwing 37-38 mm.

In the head, no good characteristics are available. The labrum is black, the paired yellow spots on it are smaller than those of *kirschii*; anteclypeus yellow, lateral produced portion of postclypeus also yellowish, but these are the same as those of



Figs. 7-14. *Gomphidia* spp. — 7-10. *G. kirschii* SELYS, Mindanao ♂. — 11-14. *G. platerosi* sp. nov., S. Leyte ♂. — 7, 11: Pterothoracic colour pattern. 8, 12: Accessory genitalia, lateral. 9, 13: Caudal appendages, lateral. 10, 14: Ditto, dorsal.

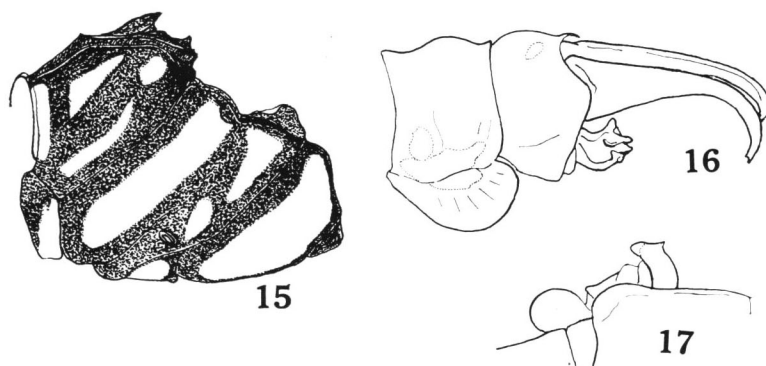
*kirschii*; the transverse yellow stripe on the ridge of antefrons is not interrupted at the center (interrupted in *kirschii*); postfrons and occiput entirely black; the shape of paired conical processes behind lateral ocelli is almost same in both the congeners; posterior border of occiput only shallowly depressed at the center, while it has a low central process in *kirschii*.

Pterothoracic features are shown in Fig. 11; no specimen shows any tendency of vestigial antehumeral stripe. Legs similar in both species, i.e., wholly black excepting the yellow portion on the inner side of profemur.

Wings hyaline with a trace of brown at the extreme bases. Antenodals 18, pterostigma long, 5-6 mm, same as those of *kirschii*; in the hindwing triangle the anterior side and proximal side are almost of equal length (in *kirschii* the anterior side is slightly longer).

Abdomen black, 3-8 segments with a basal yellow spot, enlarging on 8, narrowed on 9 but these do not give any reliable difference between the two species. The sternite of the first abdominal segment is simple, without any remarkable ventral process if seen from the side (Fig. 12). The superior caudal appendages are shorter and open laterally when compared with those of *kirschii* (Fig. 14). The inferior appendage is about 1/3 length of the superior, divided and opened laterally when seen from above.





Figs. 15–17. *Paragomphus balneorum* (NEEDHAM et GYGER), Mindanao, ♂. — 15: Pterothoracic colour pattern. 16: Caudal appendages, oblique lateral. 17: Accessory genitalia, lateral.

In *kirschii*, the inferior is almost 1/4 of the superior, divided but not opened laterally, not recognizable from above (Figs. 9 & 10).

Female is not known; even the female of *kirschii* has not been described in detail.

The fact that the localities of both the species are rather overlapping in the Philippines should be checked upon plentiful material in future.

The known distribution:

*Gomphidia kirschii* Luzon, Mindanao

*Gomphidia platerosi* Leyte, Mindanao

The specific name of this new species is dedicated to Prof. C. PLATEROS.

#### 4. *Paragomphus balneorum* (NEEDHAM et GYGER)

*Mesogomphus balneorum* NEEDHAM et GYGER, 1937, pp. 33–34, pl. 1, figs. 8, 11, 12, pl. 3, figs. 46, 55, “Luzon, Laguna Province, Los Baños, 2 males, 6. XI. 1923.”

*Paragomphus balneorum*: ASAHINA, 1968, pp. 351–352, “1 ♂ Asin hot springs, 30 km west of Baguio, Luzon, 3. V. 1966, leg. S. Igarashi.”

*Coll. NSMT.* 1 ♂, Mt. Malambo, Davao, Mindanao, 1. VII. 1977, leg. AE; 1 ♂ Bislig, Mindanao, 5. VII. 1977, leg. KUROSAWA.

*Other material examined.* 1 ♂, Buda, Davao, 1. VII. 1977, leg. SCHOENIG; 1 ♂, Los Baños, 18. IX. 1978, leg. NARUMI; 1 ♂, Ilomavis, Mindanao, 28. VII. 1979, leg. OKAJIMA & SUZUKI.

As far as the present materials are concerned, the body size varies considerably, the hindwing length being: 24 mm (Davao), 25 (Luzon), 27 (Mindanao), 28 (Mindoro), 29 (Luzon), 30 (Luzon). The male inferior appendage is not so simple as given in NEEDHAM’s drawing; it is shaped as that of usual *Paragomphus* species (Fig. 16). The broad yellowish stripe on the metathoracic episternum varies from a complete broad stripe (Bislig) to a trisected stripe (Davao), or to three spots (Luzon, Davao; Fig. 15).

### 5. *Heliogomphus bakeri* LAIDLAW

*Heliogomphus bakeri* LAIDLAW, 1925, pp. 560–562, fig. 1 (♂ app.), “Luzon, Laguna Prov., Mt. Maquiling (C. F. Baker), one male, autotype.”

*Heliogomphus bakeri*: LAIDLAW, 1930, p. 182, “Philippine Is.”

*Heliogomphus bakeri*: NEEDHAM & GYGER, 1937, pp. 36–39, pl. 1, figs. 9 & 10 (♂ app.), 14 (♀ v.v.), pl. 3, fig. 47 (♂ wing), 54 (♂ thoracic pattern), “Luzon, Laguna Prov., Los Baños, 1 male, V. 1915, 1 ♀ 29. II. 1932; Negros, Saravia, 1 male 4. XII. 1929.”

*Heliogomphus bakeri*: NEEDHAM & GYGER, 1941, p. 141, “A single pair from Mindanao.”

*Heliogomphus bakeri*: FRASER, 1942, pp. 355 (key), 339, fig. 3–3 (thoracic pattern).

*Coll. NSMT.* 1 ♂, Mt. Maquiling, Mud Spring 370 m, Laguna Prov., Luzon, 18. VI. 1977, leg. AE.

*Other material examined.* 1 ♂, Ayahag, St. Bernard, South Leyte, 30. V. 1970, leg. PLATEROS; 1 ♂, Mt. Maquiling, Quezon, Luzon, 28. III. 1978, leg. OKUBO; 1 ♀, Masara-Mainit, Davao del Norte, Mindanao, 20. III. 1978, leg. OKUBO; 1 ♀, Quezon National Forest Park, Luzon, 17. VII. 1979, leg. OKAJIMA & SUZUKI.

The male specimen from Mt. Maquiling, Luzon, is large-sized (hw. 34 mm) and coincides well with the description by LAIDLAW; another male from the same locality has the hindwing length 30 mm, whereas the Leyte male is much smaller, hindwing being 26 mm, but no specific difference is recognized. The head pattern of the male is as shown in Fig. 18, on the front side generally tinted with zinc white or greyish.

The female was described by NEEDHAM and GYGER. A single female from Davao at hand is teneral and the body pattern is not yet fully developed, the head is generally zinc greyish without any distinct pattern, but is provided with a minute black process laterally to each lateral ocellus. The pterothoracic black stripes are not fully developed leaving broad yellowish areas (Fig. 26) though it is essentially the same as that of the male insect.

Hind femora is long, armed with 12–13 strong spines on the external side. The abdomen is artificially depressed laterally, but the feature of valvula vulvae agrees with the figure given by NEEDHAM and GYGER (1937, pl. 1, fig. 14).

### 6. *Heliogomphus olivaceus* LIEFTINCK

*Heliogomphus olivaceus* LIEFTINCK, 1961, pp. 143–145, fig. 50 (♂ app., Acc. gen.), “An adult male from Dimaniang, Busuanga Island, Palawan Prov., collected near sea-level, III. 1947, by Hoogstraal, Coll. Chicago N.H.M.”

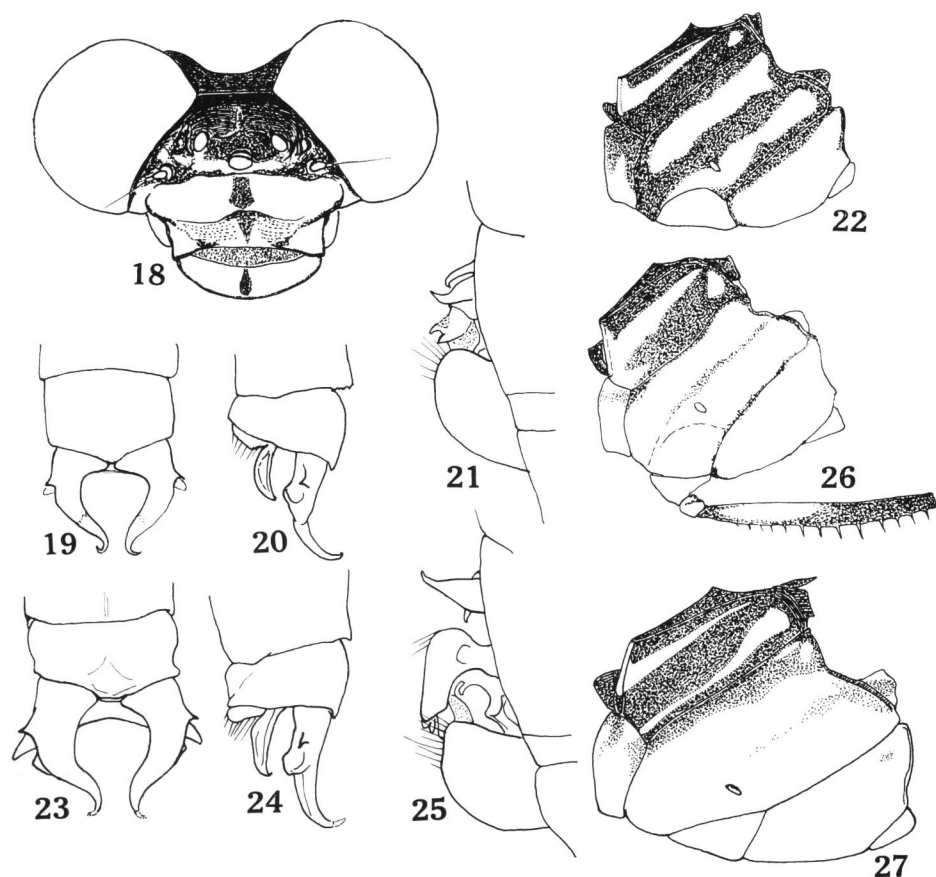
*Heliogomphus olivaceus*: LIEFTINCK, 1974, p. 140, “No further material.”

*Material examined.* 1 ♂, Langan, Palawan, 28. XII. 1977, leg. KITAGAWA.

Based on the structure of caudal appendages and accessory genitalia, our present single specimen apparently belongs to *olivaceus* LIEFTINCK, but it has a complete antehumeral yellow stripe (Fig. 27) which has been mentioned neither in the original description nor in any of the 18 *Heliogomphus* species illustrated by FRASER (1942).

### 7. *Leptogomphus palawanus* ASAHINA

*Leptogomphus palawanus* ASAHINA, 1968, pp. 364–365, figs. 36–41, “1 ♂ Palawan near Puerto Princessa, VI. 1945, H. H. Blackmore (Holotype); 1 ♀ the same (Allotype).”



Figs. 18–27. *Heliogomphus* spp. — 18–26. *H. bakeri* LAIDLAW (18–25, Mt. Maquiling, Luzon; 26, Davao, Mindanao). — 27. *H. olivaceus* LIEFTINCK, Palawan ♂. — 18: ♂ Head, oblique dorsal. 19, 23: ♂ Caudal appendages, dorsal. 20, 24: ♂ Ditto, lateral. 21, 25: Accessory genitalia, lateral. 22, 27: ♂ Pterothoracic colour pattern. 26: ♀ Pterothoracic pattern.

*Leptogomphus palawanus*: LIEFTINCK, 1974, pp. 140–141, “Palawan, 1 ♀ (ad. incomplete, Mantalingajan, Pinigisan, 600 m, 10. IX. 1961 (Mus. Copenhagen).”

*Coll. NSMT.* 1 ♂, Penascosa, Palawan, 15. VII. 1977, leg. AE; ?? 1 ♀ Davao Buda, 1. VII. 1977, leg. SCHOENIG.

This supposed, but problematical, female specimen of *palawanus* from Davao Province is a large-sized insect, hindwing being 36 mm (29 mm in the Allotype), and is provided with a clear yellowish antehumeral stripe, and with almost complete yellow stripe on the metathoracic episternum making it as a quite distinct species from *palawanus*. The head structure, however, reminds us of that of *palawanus*, a paired

ridge behind the lateral ocelli (but the ridge is not pointed), and the paired spines on the occipital margin are present (but rather inclined forwards). The shape of valvula vulvae is almost the same as that of *palawanus*.

This might be a geographical race of *palawanus*, but since the material is only a single female insect, further specimens will be needed for elucidation.

## 8. *Microgomphus chelifera thelyphonus* LIEFTINCK

*Material examined.* 1 ♀ (teneral), Luanguan, Palawan, 24. XII. 1977, ex KITAGAWA; 1 ♀ (teneral), Montabile, 100 m, Palawan, 29. X. 1975, leg. KURAHASHI.

The species *chelifera* seems to be new to Palawan. Both the specimens at hand are crushed teneral females, but since they show a broad black band covering second lateral suture, I placed them in *thelyphonus*.

## II. Cordulegasteridae

### 9. *Chlorogomphus dyak* (LAIDLAW)

*Orogomphus dyak* LAIDLAW, 1911, p. 121 (♂♀), Sarawak (N. W. Borneo).

*Orogomphus dyak*: LAIDLAW, 1914, pp. 59–60, pl. 1, fig. 4 (♂ wings), fig. 5 (♀ wings), fig. 6 (♂ app. lateral), fig. 7 (♂ penis, lateral), "Type ♂ & ♀ will be deposited in BMNH."

*Orogomphus dyak*: FRASER, 1929, pp. 162–164, fig. 35 (♂ app. Borneo) (♂♀ N. W. Borneo).

*Orogomphus dyak*: LAIDLAW, 1931, pp. 202–203, "I have seen a single male of this species, from Johore, in the collection of Raffles Museum."

*Orogomphus dyak*: LAIDLAW, 1934, p. 551, "Kinabalu, 3300 ft."

*Chlorogomphus dyak*: LIEFTINCK, 1954, pp. 111–112, "Malaya (Johore), Borneo (West and northwest)."

*Coll. NSMT.* 1 ♂, Balacatan, 1,200–1,500 m, Mindanao, 28. VI. 1977, leg. AE.

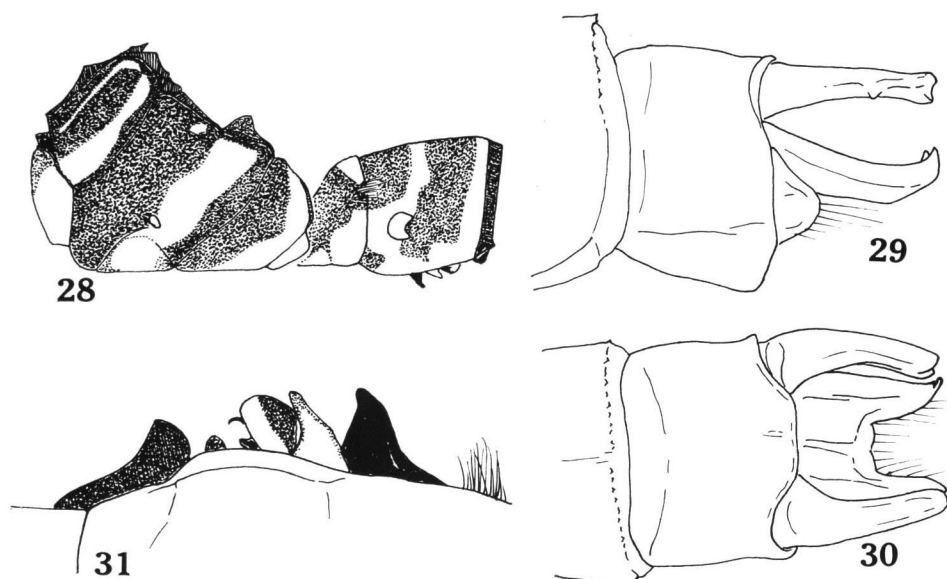
As regards the Philippine *Chlorogomphus*, there has been an old record of "*Ch. splendidus* (SELYS) 1878" taken in Luzon, known by a single female specimen. CHEN (1950) corrected Ris' "*splendens* from Taiwan", naming a new species *risi*, but CHEN himself considered a female taken in Botel-Tobago Island, situated close to South Taiwan, to be *splendidus* with some doubt. Therefore, the discovery of the male of *splendidus* RIS has long been waited.

The present male insect from Mindanao is, unfortunately, not *splendidus*, but it belongs very probably to *dyak* LAIDLAW, known from Sarawak, Johol, and the Kinabalu Area. A description and illustration of this Philippine specimen will be given below.

♂ (ad.): Abd.+app. 55 mm, hindwing 43 mm. Middle-sized, slender insect among chlorogomphines, body black, spotted with yellow, the wings hyaline.

Head black, labrum lustrous black, external side of mandible black, anteclypeus black with a dull yellowish I-mark; postclypeus entirely yellow, ante- and postfrons black, the ridge of the former narrowly yellow. There is a distinct transverse ridge behind the ocelli, compound eyes almost touching each other, and thus making an occipital triangle, the center of which is somewhat raised with long black bristles on the posterior border.

Pterothorax small and black, covered with long hairs, the yellow patterns are as



Figs. 28-31. *Chlorogomphus dyak* (LAIDLAW), Mindanao ♂. — 28: Body coloration of pterothorax and two basal abdominal segments. 29, 30: Caudal appendages. 31: Accessory genitalia.

in Fig. 28; antelar sinus black, the narrow posterior area behind the posterior ridge is yellowish.

Legs black, coxae and trochanters of forelegs yellowish, external side of the base of femur yellow; tibial keels present on the distal half of foretibia, distal 1/3 of mesotibia, and distal half of hindtibia. Distal ends of the keels slightly project beyond the tarsal end.

Wings hyaline, palely enfumed with the age, veins black, venation open. Pterostigma of forewing 3 mm, 3.5 mm in the hind. Right wing nodal-index 19: 14/15: 17. Basal space crossed with three veinlets; triangles short, made of two cells in both wings. Anal loop made of 9 cells, its posterior border not quite straight.

In the proximal two segments, the yellowish markings are as shown in Fig. 28. There are, on the third segment, a narrow middle band and a broad terminal band, 4-6 segments each with a distal yellow band, 7-10 entirely black,

Caudal appendages black, the superiors slender with the end slightly divided, and with a small lateral process at its proximal 2/3. Inferior appendage large, almost the same length with the superiors, deeply divided, each process ending in two pointed apices (Figs. 29, 30).

Hamulus anterioris large and black, opened laterally. Hamulus posterioris slender and yellowish, ligula large, appearing next to hamulus posterioris with round head. The shape of penis is not seen in this specimen, but its shape does not con-

tradict LAIDLAW's figure (1914, fig. 7).

### III. Corduliidae

#### 10. *Epophthalmia vittigera vittigera* (RAMBUR)

*Macromia vittigera* RAMBUR, 1842, p. 140, "De la collection de M. Serville; sans indication de partie, mais probablement de l'Amérique septentrionale" (♀).

*Epophthalmia vittigera*: SELYS, 1871 [partim?], pp. 532–533, (96–97, sep.), ♂ ♀, "Java (coll. Selys)."

*Epophthalmia vittigera*: MARTIN, 1904 (partim), p. 211, "Java, Tonkin, Assam."

*Epophthalmia vittigera*: MARTIN, 1906, pp. 62–63, 3 ♂ 5 ♀ (partim), "Java Assam, Borneo."

*Epophthalmia australis*: RIS, 1911, pp. 248, 251, fig. 14 (♂ wing, Perak), fig. 15a, b (anal app. O. W. Borneo), fig. 16a, b (♀ gen. W. Borneo), "C. W. Borneo; Perak."

*Epophthalmia vittigera*: MARTIN, 1914 (partim), p. 26, pl. 2, fig. 15 (♂ colour, from "Timor"), "Java, Borneo, Assam."

*Azuma australis* et *vittigera*: LAIDLAW, 1920, p. 317 (*australis*), p. 318 (*vittigera*), "Borneo."

*Azuma vittigera*: FRASER, 1926 (partim), p. 472, "(Java)", "A single male not differing from Type."

*Epophthalmia vittigera*: FRASER, 1921 (partim), pp. 680–681, "Hab. Java, Martin mentions Assam, Borneo."

*Epophthalmia vittigera*: LIEFTINCK, 1931, pp. 30, 39–41, 43, 65–68, 73, 79–80 (larva), figs. 1, 10–11, 13, 14, 23, 28–29 (Malay, Sumatra, Java, Borneo), "2 ♂ ad. Palawan, TayTay, 1910 & La Laguna, 12. V. 1913, Janson vend. in coll. K. J. Morton."

*Epophthalmia vittigera*: LIEFTINCK, 1934, p. 435 (Java, notes).

*Epophthalmia vittigera*: LIEFTINCK, 1936, pp. 149–150, "Ist das Van der Hoffensche Material aus Timor wohl ganz zuverlässig?"

*Epophthalmia vittigera*: FRASER, 1936, pp. 202–204, fig. 63 (app.), "Extends from (Burma) to Sumatra, Java, Borneo and Timor."

*Epophthalmia vittigera vittigera*: LIEFTINCK, 1948, pp. 19–21 (diagnosis from *vittigera bellicosa* nov. from Burma, Margui, Tenasserim).

*Epophthalmia vittigera vittigera*: LIEFTINCK, 1953, pp. 196–197, "♂ Bali, an (incomplete) water colour painting by the late artist Walter Spies, after a specimen taken by him at Ubud (Bali), in the author's collection."

*Epophthalmia vittigera vittigera*: LIEFTINCK, 1954, p. 115, "Malaya & Singapore, Sumatra, Banka, Billiton, Java, Bali, Borneo" (Palawan).

*Epophthalmia vittigera vittigera*: LIEFTINCK, 1974, pp. 113–141, "Previously reported from Palawan (♂ N. Palawan, TayTay and La Laguna) by Lieftinck (1931, 41 & 66)."

*Coll. NSMT.* 2 ♂, Bislig, Mindanao, 6. VII. 1977, leg. AE.

For this broadly ranging species, LIEFTINCK (1948) recognized two geographical races, Malaysian nominate subspecies and continental Asiatic subspecies *bellicosa*, which is: "distinguished from the typical race by the much lighter ground-colour of the body, the greater extent of the dark brown spots at the wingbases, the wider and almost complete undulated yellow line traversing the postclypeus, and by the very conspicuous yellow rings at the base of segments 2–7 of the abdomen."

The nominate subspecies is recorded from the Malay Peninsula, Java, Sumatra, Borneo, Banka, Billiton, Bali, Palawan, Timor(?). The present record from Mindanao is the first from there.

I have at hand one male from Sabah (Sepilok, leg. R. YOSU) which is almost

identical with the present Mindanao specimen, but the dark spot in the costal field at the base of hindwings is diminished to a mere trace. In the Erich SCHMIDT collection, I found a female (Ronghong Kung, 200 ft, Unit. Khasi & Taintia Hills, Assam, 9. XII. 1959, leg. F. SCHMID), which seems to belong to the subspecies *bellicosa* LIEFTINCK though the yellow spot on the postclypeus is not clear. This justifies the record from Assam once mentioned by MARTIN (1904).

#### 11. *Macromia cincta* RAMBUR

*Coll. NSMT.* 1 ♂, Sabang, Palawan, 12. VII. 1977, leg. AE.

This is a widely ranging species known from Malaya, Sumatra, Java, Borneo, Banka, Billiton, and has already been recorded from Palawan (LIEFTINCK, 1929, p. 92, "1 ♂ N. Palawan, TaiTai, 18. IV. 1913, leg. JANSON (Coll. MARTIN)").

The present male specimen is a mature insect, and when compared with one rather juvenile male (West Borneo, Singhawng, 22. I. 1933, leg. L.C. d R. in Erich SCHMIDT Collection), its body coloration is generally strongly darkened, the bronze tint of the body is strong, the brownish spots at the wing bases are fairly large, extending beyond the first antenodals in both wings, but no difference is recognized in caudal appendages and accessory genitalia.

#### 12. *Macromidia asahinai* LIEFTINCK

*Idionyx philippa*: ASAHINA, 1968 (nec RIS, 1912), pp. 357–358, figs. 5–10, pl. 2, fig. 11, "1 ♂ Palawan, 5–8 miles east of Tarumpitao Pf., 28. V. 1958, HEM."

*Macromidia asahinai* LIEFTINCK, 1971, p. 21.

*Macromidia asahinai*: LIEFTINCK, 1974, p. 141, "No new material."

*Coll. NSMT.* 1 ♂, Penascosa, Palawan, 15. VII. 1977, leg. AE.

*Other material examined.* 1 ♂, Antibolo beach, Palawan, 1. XI. 1975, leg. KURAHASHI.

Having been known from a single male specimen, LIEFTINCK correctly placed this species in *Macromidia*. Here I added two more males from the same island.

#### 13. *Macromidia samal* NEEDHAM et GYGER

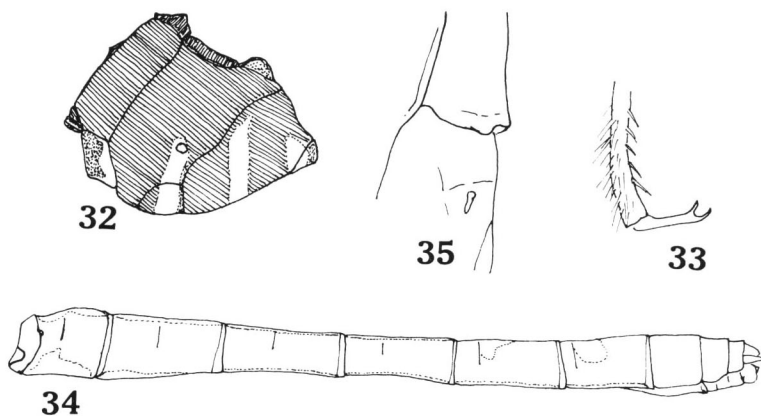
*Macromidia samal* NEEDHAM et GYGER, 1937, pp. 56–57, ♀, pl. 1, fig. 18 (abdominal sternites 8, 9), pl. 3, fig. 52 (tarsal claw), pl. 3, fig. 57 (venation), "Mindanao, Zamboanga Prov., Kabasalan, 1 ♀ VII. 1932 (H. C. Muzzall)."

*Material examined.* 1 ♀, Dulangan, Puerto Gaiera Oriental, Mindoro, 9. IX. 1976, leg. KASHIWAI.

In the pattern of pterothorax, this Mindoro female resembles *M. asahinai* but is slightly larger in size and has very much close venation. Though this female is not quite identical with the type female from Zamboanga, I now place this specimen in *samal* in view of the similarity of the valvula vulvae.

♀(juv.): Abd.+app. 33 mm, hindwing 31 mm. Ground colour of the body metallic greenish blue, abdomen blackish.

Head dark metallic blue, labium brownish, paler in the external half, sides of



Figs. 32–35. *Macromidia samal* NEEDHAM et GYGER, Mindoro ♀. — 32: Pterothoracic colour pattern. 33: Tarsal claw. 34: Abdominal pattern. 35: Valvula vulvae, oblique lateral.

clypeus and frons entirely brilliant bronze and roughly punctured, postfrons roundly inflated without any process and minutely punctured. Occiput small, covered with long black hairs.

Prothorax almost pale yellow, the posterior lobe of tergite covered with fine long hairs. Pterothorax brilliant bronze (Fig. 32), the four yellow spots similar to those of *M. asahinai* being recognizable. Legs pale blackish brown, each coxa and pro-trochanter pale yellowish.

Wings hyaline, veins black (Fig. 77), at the bases of both wings conspicuous brownish patches are present, deeper in colour in the cells *sc* and *cu*, extending up to 5th antenodals.

Abdomen jet black, a narrow middorsal stripe runs from 2 to 5, while the ventral yellow stripe runs from 2 to 8, bordering the lower margin of tergites (Fig. 34).

Caudal appendage a little longer than the length of 9th segment. In the original description, it is said: "Twice as long as segment 9 (!)." As the abdomen of this specimen is strongly depressed from the side, the valvula vulvae was checked with difficulties, but when enlarged the shape (Fig. 35) does not conflict with that given by NEEDHAM and GYGER (pl. 1, fig. 18).

#### 14. *Idionyx philippa* RIS

*Idionyx philippa* RIS, 1912, p. 81, text-fig. 16 (wing), "1 ♀ Naujau, Mindoro, Philippinen durch Rolle Berlin 1910, coll. Ris."

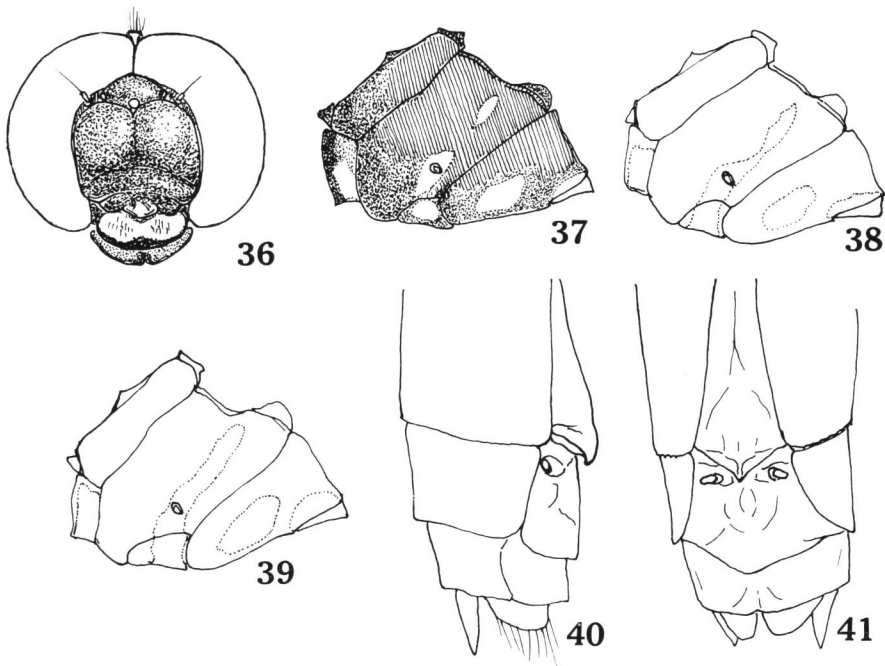
*Idionyx philippa*: NEEDHAM & GYGER, 1937, p. 58, "Luzon, Laguna Prov., Los Baños, 3 females, no date."

*Idionyx philippa*: LIEFTINCK, 1939, p. 203, "Mindoro (terra typica) and Luzon."

*Idionyx philippa*: NEEDHAM & GYGER, 1941, p. 141, "one female from Mt. Apo."

*Idionyx philippa*: LIEFTINCK, 1971, pp. 8–11, ♂♀, fig. 1–2 (♂ acc. gen.; caudal app.), "Philippine Is.





Figs. 36–41. *Idionyx philippa* Ris, Mindanao ♀. — 36: Head, frontal. 37–39: Pterothoracic colour pattern. 40, 41: Valvula vulvae, lateral and ventral.

1 ♀ (ad), Naujau (recte Naujan), Mindoro, Phil. Rolle 1910, (SMF); 1 ♂ 1 ♀ Mindanao Is., Misamis Or., Bal-ason, 2. IV. 1960 (♂) and Mt. Emgagatao, 13. IV. 1961 (♀), H. Torrevillas; 1 ♀ (ad) Mindanao I., Cotabato, Parang, 23. III. 1953, Henry Towns; 1 ♂ 1 ♀ (ad), Leyte I., So. Leyte, Anahawan, Mainit Spring, 31. V. 1970, C. Plateros."

*Coll. NSMT.* 2 ♀, Bislig, Mindanao, 3. VII. 1977, leg. KUROSAWA; 1 ♀, Ditto, 6. VII. 1977, leg. AE; 2 ♀, Ditto, 7. VII. 1977, leg. KUROSAWA.

*Other material examined.* 1 ♀, St. Bernard, S. Leyte, 3. IV. 1967, leg. PLATEROS; 1 ♀, Ayahag, St. Bernard, S. Leyte, 30. V. 1970, leg. PLATEROS; 1 ♀, Twantwan-Lowland, Mindanao, 6. I. 1978, ex KITAGAWA; 1 ♀, Agko, Mindanao, 1. VIII. 1979, leg. OKAJIMA & SUZUKI.

Ris (1912) first described a female of this insect from Mindoro; NEEDHAM and GYGER (1937) also recorded three females from Luzon. Recently, LIEFTINCK (1971) examined materials from Mindoro (♀), Mindanao (♂ ♀) and Leyte (♂ ♀), and gave a description of the male sex, leaving some doubt if NEEDHAM's specimens from Luzon correctly belongs to the same species.

Our materials which are unfortunately all females, came from Mindanao and Leyte, and consist of the individuals of various ages, but they seem to belong to this species. An additional description is prepared as follows:

♀(ad.): Bislig, Mindanao. Abd.+app. 28–31 mm, hindwing 30–32 mm; Davao Prov. 30–32.5 mm, 32–35 mm; Leyte 29–30 mm, 31–32 mm.

Head brilliant deep bluish green, labium pale brown, labrum pale yellowish white with black anterior border, base also with some black; the bristles on the whitish area conspicuous; anteclypeus whitish spotted at the center; postclypeus jet black; antefrons inflated into two round lobes, brilliant bluish green, postfrons with a transverse elliptical swelling which is scarcely divided at the center. Occipital triangle black, slightly but evidently raised from the level of the eyes and slopes down to the behind, as LIEFTINCK stressed (1971, p. 8).

Prothorax brownish dorsally, paler laterally down to the trochanter. Pterothorax brilliant bluish green, patterns as shown in Fig. 37, i.e., the greater part of mesinfraepisternum, one spot on the metathoracic episternum above, and the area including the metathoracic spiracle, confluent with the yellow of the metinfraepisternum, an elliptical spot on metepimeron, and another spot at the hindermost of metepimeron including metapostepimeron. There seem some individual or local variations in these spots, in younger stage these yellows on metathoracic episterna usually makes a single straight stripe (Figs. 38, 39), and there is even an indication of yellow at the lower part of mesothoracic episternum.

Meso- and metalegs brownish excepting the base, leg segments are armed with long spines especially on the tibiae. Claws widely divided at the tip, the inferior branch a bit stronger.

Wings hyaline, but in immature stage, the basal part proximally to the triangle is broadly orange yellow. When mature all the wings become smoked. Forewing triangle usually made of three sides, but as shown here (Figs. 75, 76) the anterior side is in some cases broken and made of two sides. These exceptional cases may suggest NEEDHAM's "*Idiophya salva*." The other characters stressed by NEEDHAM *et al.* are, I believe, merely individual variation or misunderstanding of a venational character. Pterostigma brownish black, ca. 2 mm long. The anal loop is usually made of 9 cells.

Abdomen cylindrical, entirely deep bronze. The lower edges of 2–8 tergites are narrowly margined with yellow, at the second segment this yellow is much broadened. Cercus short, as long as the 10th segment.

Valvula vulvae is shown in Figs. 40–41, its short median process pointing and incurved. This feature is the same as illustrated by LIEFTINCK (1939, p. 202, fig. 2) in the case of *I. yolanda*. If much depressed dorsoventrally, it may represent the very state of "*Idiophya salva*" as illustrated by NEEDHAM and GYGER (1937, pl. 1, fig. 16).

# 15. *Heteronaias heterodoxa* (SELYS)

*Epitheca heterodoxa* SELYS, 1978a, pp. 14–15 (192–193), ♂, "Patrie: Luçon, par le Dr. Semper (Collect. Selys)," [*Somatochlora heterodoxa* on page 59!].

*Somatochlora heterodoxa*: SELYS, 1882, p. 16, "Luçon (Semper). La femelle est inconnu."

*Somatochlora heterodoxa*: MARTIN, 1906, pp. 20–21, fig. 16 (♂ wing), "Luçon."

*Somatochlora heterodoxa*: MARTIN, 1914, p. 19, "Luçon."

*Somatochlora heterodoxa*: WALKER, 1925, p. 16 (discussion).

*Procordulia heterodoxa*: CAMPION & LAIDLAW, 1928, pp. 132–133, “1♂1♀ Mt. Makiling Luzon (Baker)” (taxonomic discussion).

*Heteronaias heterodoxa*: NEEDHAM & GYGER, 1937, pp. 62–64, fig. 2 (♀ wings, ♂ abd. end, ♀ abd. end, larva, larval labium), “Luzon, Laguna Prov. Los Baños, 7 males and 3 females, no date, 1 male, Feb. 23, 1930, 1 male Feb. 7, 1932; Mt. Maquiling, 2 males and 1 female, no date; Mt. Banahao 2 males May 22, 1933; Tayabas Prov., Quezon Park, 1 female, May 1931.”

*Heteronaias heterodoxa*: NEEDHAM & GYGER, 1941, p. 141, “a fine series from Mount Apo in Mindanao, collected in September and November at an altitude of 6000 feet.”

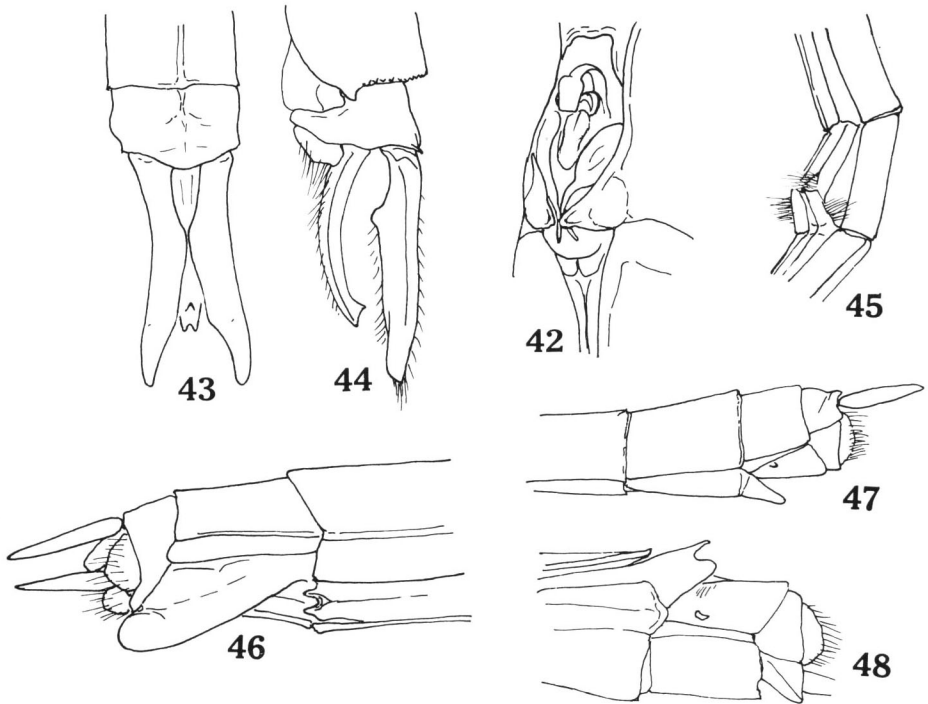
*Heteronaias heterodoxa*: ASAHINA, 1968, p. 357, “1♂ Buknow, Prov. Katamglid, 1840 m, 27. X. 1959, Yoshimoto; 1♂ Mt. Kibungol, Misamis Orientale, Mindanao, 10. IV. 1960, H. Torevillas; 1♂ Minalwang, Misamis Orientale, Mindanao, 20. III. 1961.”

*Coll. NSMT*. Luzon:— 1♂1♀, Mt. Polis, E. slope 1,730 m, Ifgao Prov., 2. VI. 1977, leg. UÉNO; 2♂, Ditto, NW. slope 1,630 m, Bontoc Prov., 2. VI. 1977, leg. AE; 5♂, Ditto, E. slope 1,730 m, Ifgao Prov., 4. VI. 1977, leg. UÉNO & SATÔ; 9♂1♀, Mt. Puguis 1,800 m, Bontoc Prov., 5. VI. 1977, leg. UÉNO, AE, KUROSAWA, SOLON, MEDICIELLO; 3♂, Ditto, 1,900 m, 6. VI. 1977, leg. UÉNO & MEDICIELLO. Leyte:— 2♀ (ten.), Catmon, St. Bernard, 250 m, S. Leyte, 20. IV. 1977, leg. MEDICIELLO; 1♂, Ditto, 30. IV. 1977, leg. MEDICIELLO. Mindanao:— 1♂1♀, Balacatan, Mindanao, 1,100 m, 28. VI. 1977, leg. AE; 6♂, Mt. Talembo 1,300 m, Mindanao, 29. VI. 1977, leg. KUROSAWA.

*Other materials examined*. Luzon:— 1♀, Mt. Maquiling, 7. I. 1967, leg. SHINONAGA; 2♂, Baguio, Luzon, 1. IV. 1978, leg. OKUBO; 1♀, Bicol National Park, Luzon, 13. VIII. 1979, leg. OKAJIMA & SUZUKI. Samar:— 1♂, Malaga, Samar, 16. V. 1970, leg. PLATEROS. Leyte:— 5♂2♀, Ormoc, Leyte, 9–23. XI. 1966, leg. PLATEROS; 1♀, Ayahag, St. Bernard, S. Leyte, 30. V. 1970, leg. PLATEROS; 2♂, S. Leyte, 21. II. 1974, leg. MEDICIELLO; 3♂, S. Leyte, 4–9. VII. 1975, leg. MEDICIELLO; 2♂2♀, Catmon, St. Bernard, S. Leyte, 29. II., 14. IV., 5. VI. 1976, leg. MEDICIELLO. Mindanao:— 1♂, Katamglid 1,840 m, Bukidnon Prov., 27. X. 1957, leg. YOSHIMOTO; 1♂1♀, Agko, Mt. Apo, N. Cotabato, Mindanao, 2. IX. 1976, leg. KASHIWAI; 1♂1♀, Mt. Apo, Mindanao, 2. VI. 1977, leg. HAYASHI; 1♂1♀, Twantawan lowland, Mindanao, 5. 7. I. 1976, ex coll. KITAGAWA; 1♂, Tuba, Mindanao, 11. III. 1977, leg. OKUBO; 1♀, Mt. Apo, Mindanao, 7. III. 1978, leg. OKUBO; 1♂, Ditto, 10. III. 1978, leg. OKUBO; 11♂2♀, Agko, Mindanao, 29. VII.–5. VIII. 1979, leg. OKAJIMA & SUZUKI.

This is a large-sized cordulinine represented by a single species endemic to the Philippine Islands. The peculiar flat-bodied larvae were described by NEEDHAM and GYGER (1937).

Some supplementary notes will be given here upon a rather large collection at hand. The male caudal appendages are long and the paired superiors are opened each other from the distal half, apices not pointing, entirely covered with long, soft hairs. The inferior appendage is slightly divided at the apex, with a subapical sharp spine directed upward (Figs. 43, 44).



Figs. 42-48. — 42-46. *Heteronaias heterodoxa* (SELYS), Luzon. — 47-48. *Procordulia moroensis* LIEFTINCK, Mindanao ♀. — 42: ♂ Accessory genitalia, oblique ventral. 43, 44: ♂ Caudal appendages. 45: ♂ Sternite 8. 46: ♀ Abdominal end, oblique ventral. 47: ♀ Abdominal end, lateral. 48: Valvula vulvae, oblique lateral.

In the males the sternite 8 is specialized, viz., its distal 2/3 may flexed and there are three bushes of hairs on the sternite (Fig. 45). These structure may be of copulatory purpose, but no observation has been made yet.

Male accessory genitalia is illustrated here for the first time (Fig. 42), the apices of hamulus posterioris being very long.

Valvula vulvae is a divided small piece, but the 9th sternum much protruded posteriorly, its median ridge changes into a strongly keeled process, a feature that is unique among the cordulids. This may be a device for oviposition, but the meaning of this process (Fig. 46) has not been confirmed.

*Distribution.* Past records are from Luzon, Mindoro and Mindanao; now we can add Samar, Leyte and Palawan. The material from the last island is a female (Palawan, Puerto Princessa, 10-15. X. 1965, Mrs. Dionisia B. MAGALONA, Coll. Th. W. DAVIES) now preserved in the collection of the California Academy of Sciences.

I cannot find any geographical diversity, though the pterostigma is ca. 1.5 mm in Luzon specimens, while it is ca. 2.0 mm in Leyte ones. In the figure (Fig. 73) here

given of male wing venation, the triangle is formed by two cells. It is, however, made of three cells in the majority of our material.

16. *Procordulia moroensis* LIEFTINCK

*Procordulia moroensis* LIEFTINCK, 1977, pp. 164–167, fig. 4 (♂ acc. gen), 5 (♂ caudal app.), “Holotype ♂ ad. Philip. (S): Mindanao I., Upper Eden, 1000 m, 2. XI. 1965, D. R. Davis, in Nat. Mus. Nat. Hist. Washington.”

*Coll. NSMT.* 2 ♂, Namegpagan Creek, 2,420 m, Linglangdad Ridge, Benguet Prov., Luzon, 11. VI. 1977, leg. AE & UENO; 1 ♂, Balacatan, Mindanao, 28. VI. 1977, leg. AE; 1♂1♀, Ditto, 29. VI. 1977, leg. AE (♀ Allotype).

*Other material examined.* 1 ♀, Mt. Apo, Mindanao, 5. II. 1978, leg. HAYASHI; 1♂1♀, Ditto, 17. I. 1978, leg. KITAGAWA; 5 ♂, Agko, Mindanao, 29. VII–I. VIII. 1979, leg. OKAJIMA & SUZUKI.

This is a quite recently described species from Mindanao; now we have specimens from Mindanao and Luzon. The males from Luzon is slightly smaller in size (hindwings 35–36 mm); otherwise no recognizable difference is found. The following is the description of the female from Mindanao.

♀(Allotype, ad.): Abd.+app. 41 mm, hindwing 41 mm. Ground colour of the body deep reddish brown with some metallic lustre.

Head entirely reddish brown, labium paler; antefrons roundly inflated, and shallowly divided, with metallic reflection on the dorsum. Postfrons transversally swollen, slightly divided at the middle and with faint reflection. Occipital triangle reddish brown, flat on the dorsum and produced backward as bilobed swelling. Dark hairs cover all over the dorsal side of the head.

Pro- and pterothorax entirely dark reddish brown, covered with long hairs of light brown. On the lateral side the antehumeral stripe, almost all part of mesothoracic epimeron, metathoracic epimeron and dorsal half of metathoracic episternum are metallic green.

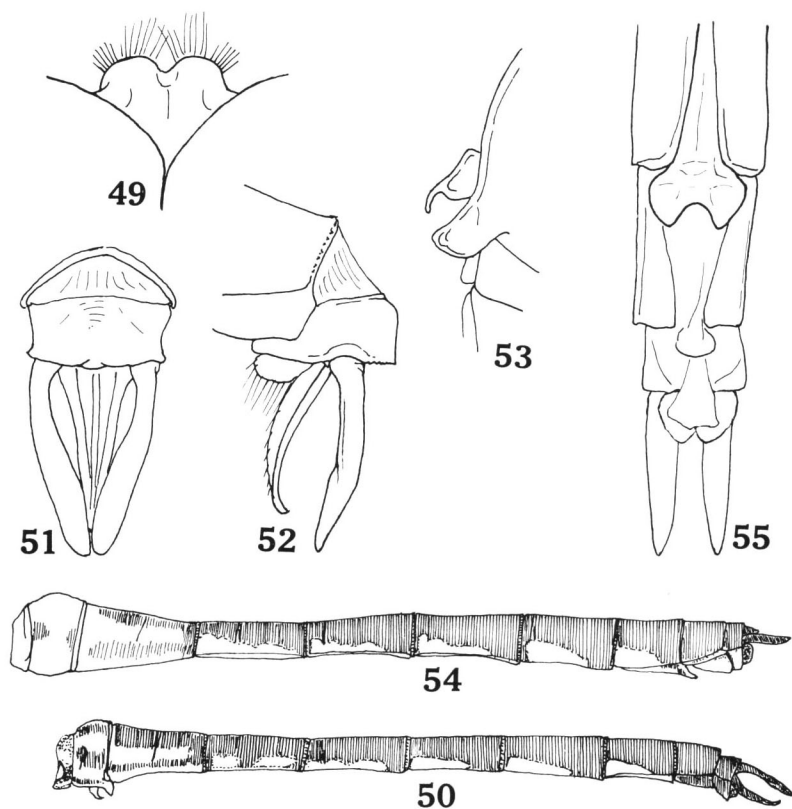
Legs brownish black distad to tibia, the inner spine of the claw being short.

Wings hyaline, palely enfumed distal to the nodus while immature, but entirely smoked when mature. Pterostigma 2.0–2.5 mm, the distal side of it slanting, nodal index of right wing 9: 6/6: 7.

Abdomen cylindrical, slightly swollen at 2 and 3 segments, entirely bronze greenish, not lustrous excepting 2. Caudal appendages about twice as long as the last abdominal segment (Fig. 47). Valvula vulvae attaining half the length of 9, clearly, but not deeply, divided (Fig. 48).

17. *Hemicordulia apoensis* sp. nov.

*Material examined.* 1 ♀, Mt. Apo, Agko, Mindanao, 3. I. 1978 (Allotype); 1 ♀, Ditto, Maloboro, 13. I. 1978; 2 ♂, Ditto, Lake Benado, 14. I. 1978 (Paratype); 4 ♂, Ditto, 15. I. 1978 (Holotype and three Paratypes); 1 ♂, Ditto, Maloboro, 16. I. 1978 (Paratype). All brought through Mr. K. KITAGAWA.



Figs. 49–55. *Hemicordulia apoensis* sp. nov., Mindanao. — 49: ♀ Occipital processes. 50: ♂ Abdominal colour pattern. 51, 52: ♂ Caudal appendages. 53: ♂ Accessory genitalia. 54: ♀ Abdominal colour pattern. 55: ♀ Distal abdominal segments, ventral.

This species seems to be very closely allied to *Procordulia fusiformis* LIEFTINCK recently described from Sabah, but differs from it in the slightly small size, in the caudal appendages being longer and slender, in the cell of discoidal field of forewing beginning with two cell-rows, and in the larger pterostigma. Since the anal angle of male wings is rounded and the anal triangle is made of one single cell, I placed this species in *Hemicordulia*.

♂(ad.): Abd.+app. 31–33 mm, hindwing 29–30 mm.

Head dark reddish brown, front of antefrons yellowish brown, above tinted slightly metallic greenish; postfrontal tubercle transverse and slightly depressed at the middle. Occipital triangle flat, broadly bilobed behind, and covered with brownish hairs posteriorly. The hair-bundles directed oblique laterally are made of short and slightly strong hairs.

Thorax entirely dark bronze, covered entirely with pale brownish hairs. The pterothoracic pleurites are metallic greenish tinted, but metathoracic episternum and the posterior portion of metathoracic epimeron are devoid of such metallic lustre.

Legs brownish black, only coxae brownish, tarsal claws as usual, the lower spine minute.

Wings hyaline, entirely smoked with the age, nodal-index in right wing 7: 6/5: 9, in discoidal field of forewing begins with two cell-rows, pterostigma 1.5–2.0 mm (fw.), 1.2–1.5 mm (hw.). Anal angle of hindwing rounded, anal triangle without any cross-vein.

Abdomen not much fusiform, colour pattern as in Fig. 50, the yellow areas of lateral margin of tergites conspicuous. Caudal appendages and accessory genitalia as in Figs. 51–52 and Fig. 53.

♀ Abd.+app.: 34.5–35 mm, hindwing 30–33 mm.

Head structure and coloration almost the same as those of the male (Fig. 49), thorax also similar to that of the male. Abdominal colour patterns as in Fig. 54, the yellowish side markings conspicuous.

Caudal appendages as long as the length of 9th segment. Valvula vulvae short, well divided and dark brownish as in the sternites (Fig. 55).

#### 18. *Hemicordulia mindana mindana* NEEDHAM et GYGER

*Hemicordulia mindana* NEEDHAM et GYGER, 1937, pp. 64–65, pl. 1, figs. 19, 20 (♀ occiput, ♂ hamulus, laterel), “Mindanao, Kabasalan, 1 ♀ (Type), July 1932; Cotabato Prov., Kidapauan, a damaged male (Allotype), US Nat. Mus.”

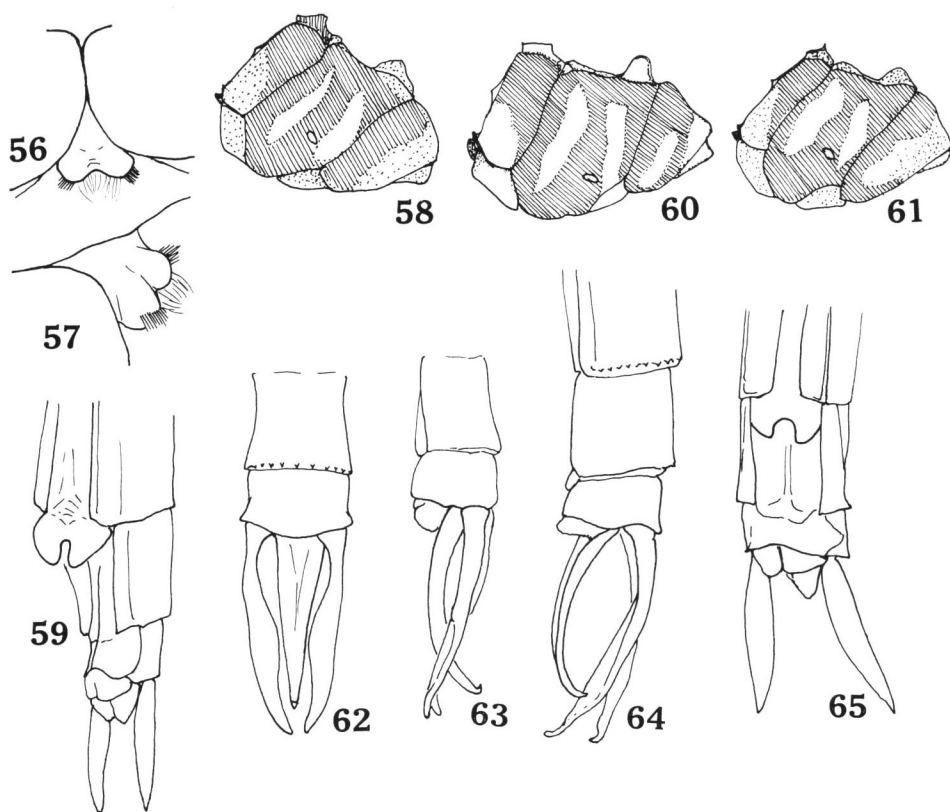
*Hemicordulia mindana*: LIEFTINCK, 1962, pp. 51–53, fig. 15, a–e (Basilan), f, g (Guam), “S. Marianna Is. Guam: Male and two females, Umatac, May 1936, Usinger; male Piti, May 1936, Usinger; male Jan. 1945, Grether; male Mt. Manell, near Merizo, May 1945, Bohart & Gressitt.”

*Coll. NSMT.* 1 ♀, Bislig, Mindanao, 3. VII. 1977, leg. AE.

*Other materials examined.* 1 ♂ (Allotype), broken pieces of the body and broken wings on two slides), Mindanao, Kotabato Prov., Kidapauan, B. P. CLARKE from coll. U.S. Natn. Mus.; 1 ♂, Marianna Is., Guam, 22. I. 1945, Coll. D. F. GRETHER, coll. U.S. Natn. Mus.; 1 ♂, Umatac, Guam, 14. V. 1936, R. J. USINGER.

Although only one female specimen was obtained during the 1977 survey, this is really the third specimen of *H. mindana* taken from its type-locality, Mindanao Island. I was unable to examine the holotype female, but up to now the allotype male specimen which is broken to pieces, accompanied with two wing slides (Figs. 79, 80), as well as two males taken in Guam Island treated as *mindana* (LIEFTINCK, 1962) were studied.

I now treat these four specimens to be true *mindana*, and those which I once described from Taiwan and the Ryukyus and later from South Japan will be separated from the nominate subspecies. A description of the new subspecies of *mindana* is added at the end of this article. The original description of *mindana* given by NEEDHAM and GYGER is a mixture of that of the female (Holotype) and male (Allotype), the



Figs. 56–65. *Hemicordulia* spp. — 56–63. *H. mindana mindana* NEEDHAM et GYGER. — 64–65. *H. tenera* LIEFTINCK, Malay Peninsula. — 56–57: ♀ Occipital tubercle, Mindanao. 58, 60, 61: Pterothoracic colour pattern (58, Mindanao ♀, 60, 61, Guam ♂). 59: ♀ Valvula vulvae, Mindanao. 62–63: ♂ Caudal appendages, Guam. 64: ♂ Caudal appendages, lateral. 65: ♀ Abdominal end, ventral.

measurements merely given as “length 57 mm; abdomen 43; hindwing 37” are unbelievable.

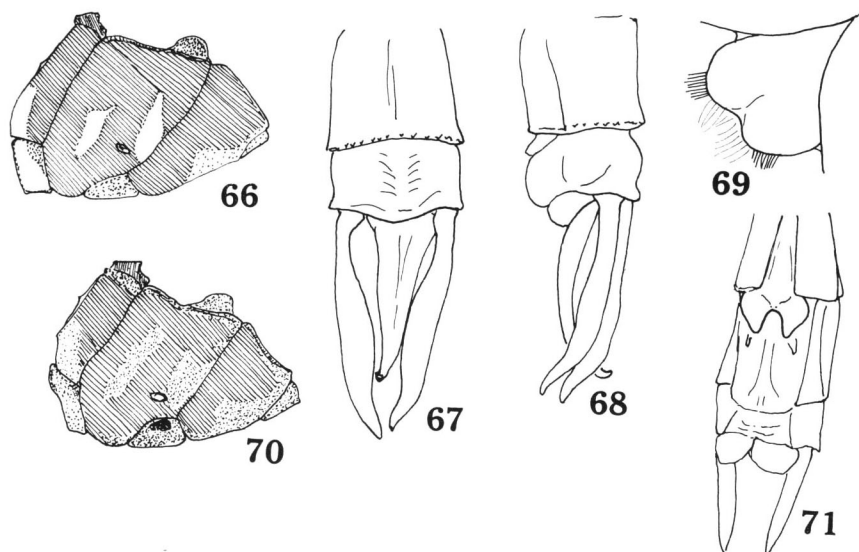
Mindanao ♀(ad.): Abd.+app. 32 mm, hindwing 28.5 mm.

Head brownish orange, labium pale yellow, a greater part of antefrons brilliant metallic green, postfrontal tubercle entirely metallic green, occipital triangle shining brown, sloping down behind and well bilobed; there is a tuft of short bristles on each lobe (Figs. 56, 57).

Pterothorax dark brownish, the area of humeral suture, lower half of metathoracic episternum, and metathoracic epimeron are shining bronze. The yellow markings are as shown in Fig. 58.

Legs brownish black excepting the coxae and trochanters.





Figs. 66–71. *Hemicordulia mindana nipponica* subsp. nov., Japan. — 66(♂), 70(♀): Pterothoracic colour pattern, Kawanami, Kyushu. 67: ♂ Caudal appendages, Tanegashima. 68: ♂ Ditto, Kawanami. 69: ♀ Occipital tubercle, Nakanoshima. 71: ♀ Abdominal end, lateral, Tanegashima.

Wings enfumed all over, the cell *sc* and *cu* somewhat dark tinted in all wings, nodal index in right wings 7: 4/5: 5, pterostigma 2 mm (fw.), 1.8 mm (hw.).

Abdomen cylindrical, a greater part of 1 and 2 segments and lateral side of 3 being brownish, other segments bronze black, with metallic reflection on 4–8, 9 and 10 black. Cercus longer than the length of 9+10; valvula vulvae as shown in Fig. 59, well divided, but the slit is rather narrow.

**Remarks.** The pterothoracic pattern of the two males from Guam, one of which is immature, is also compared (Figs. 60, 61); the male caudal appendages of the Guam specimens are again illustrated (Fig. 62). I have at hand one pair of probable *H. tenera* taken in the Malay Peninsula (♂) and Peninsular Thailand (♀); the male caudal appendages and female abdominal end are also figured here (Figs. 63–65). This female has the tuft of bristles on the rear of the occiput.

[19. *Hemicordulia mindana nipponica* subsp. nov.]

*Hemicordulia mindana*: ASAHINA, 1947 (nec NEEDHAM & GYGER, 1937), pp. 83–87 (Formosa, Ishigaki Island, Nakanoshima).

*Hemicordulia mindana*: ASAHINA, 1956, p. 25. pl. 4, figs. 2(♀), 3(♀) (Nakanoshima).

*Hemicordulia mindana*: ASAHINA, 1961, p. 134 (Tanegashima, 4♂2♀).

*Hemicordulia mindana*: NAITO, 1974, pp. 17–20, figs. 2, 3 (Kawanami, Miyazaki Pref., Kyushu).

*Hemicordulia mindana*: WATANABE, 1977, p. 28, ♂ fig. (Ishigaki Is.).

I have hesitated for some thirty years to separate a *Hemicordulia* species found

in Taiwan, the Ryukyu Islands and, recently, in South Kyushu from the true *mindana* of Mindanao Island. But upon examining the topotypical specimen from Mindanao as well as a part of the type-series and Marianna material, I now decided to recognize the populations of northern localities as a distinct geographical race.

The northern race *nipponica* may be differentiated from the nominate subspecies by the following respects:

1. Body robust, size larger, hindwing length being 30–35 mm (in the nominate subspecies 28.5–31.0 (Mindanao), 29.0–31.0 (Basilan), 27–30 (Guam)).
2. The yellow patches on pterothorax are distinctly reduced (cf. Figs. 66, 70).
3. The divided valvula vulvae is slightly wider forked (Fig. 71).

In the structure of male caudal appendages (Figs. 67, 68), female occiput, length of female appendages, and the accessory genitalia, however, it is difficult to recognize reliable differences.

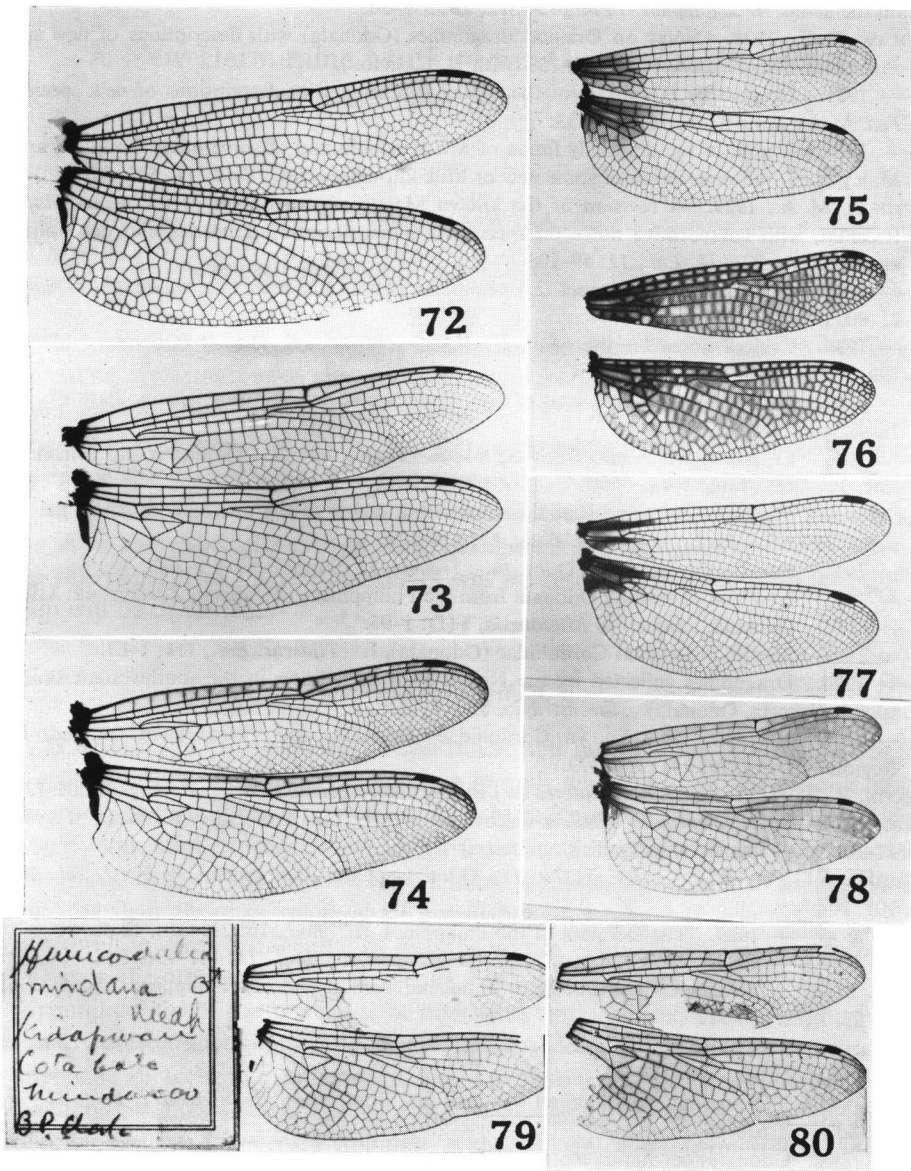
The distributional range covers South Kyushu (Miyazaki Pref.), Tanegashima Island (south of Kagoshima), Nakanoshima in the Tokara Group, Ishigaki Island in the Yayeyama Group, and South Taiwan. On the other hand, the nominate subspecies is found in Mindanao and Basilan of the Philippines and Guam Island in the Marianna Group.

The type-series is selected as follows: Holotype ♂, Shogayama, Tanegashima, 3. VI. 1960, leg. ASAHINA, in coll. ASAHINA. Allotype ♀, Ditto, 31. V. 1960, leg. ASAHINA in coll. ASAHINA. Paratypes 3 ♂, Ditto, 30, 31. V. 1960, in coll. ASAHINA.

Other specimens compared are: 2 ♂, Botansha, Taiwan, 25. VII. 1936, leg. ASAHINA; 1 ♂, Nakanoshima, 13. VII. 1960, leg. M. SATÔ; 3 ♂ 2 ♀, Nakanoshima, 24–28. VII. 1964, leg. A. TANAKA; 1 ♂, Kawanami Bog, Miyazaki Pref., 29. VI. 1975, leg. YOKOYAMA; 1 ♀, Ditto, 20. VI. 1978, leg. ASAHINA.

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Figs. 72-80. Wing venation. — 72. *Chlorogomphus dyak* (LAIDLAW), Mindanao ♂. — 73. *Heteronaias heterodoxa* (SELYS), Luzon ♂. — 74. Ditto, Leyte ♂. — 75. *Idionyx philippa* RIS, Bislig, Mindanao ♀. — 76. Ditto, Bislig, Mindanao ♀. — 77. *Macromidia samal* NEEDHAM et GYGER, Mindoro ♀. — 78. *Hemicordulia mindana mindana* NEEDHAM et GYGER, Mindanao ♀. — 79. Ditto, ♂ Allotype, right wings, coll. U.S. Natn. Mus. — 80. Ditto, left wings.

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