

## A Revision of the Himalayan Dragonflies of the Genus *Neallogaster* (Odonata, Cordulegasteridae)<sup>1)</sup>

By

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(Communicated by Yoshihiko KUROSAWA)

A number of small-sized cordulegasterid dragonflies of the genus *Neallogaster* are mainly distributed at high altitude in the Himalayan Region. SELYS (1876) was the first who described "*Allogaster latifrons*" from "Phulloth, Bengale". FRASER included all the known species at that time in his Monograph of Fissilabioidea (1929), but there have been left much to be added or to be revised.

During recent thirty years, Japanese Himalayan climbers and entomologists have brought a considerable number of these dragonflies and afforded me the privilege of studying them. Lately, entomologists in the National Science Museum of Tokyo have also brought a good number of them, hence it appears to be almost the time to revise them at least Himalayan material is concerned.

Since 1953 I attempted to check the type material preserved in European and American museums, and accumulated necessary basic material at my hand. Recently Dr. M. A. LIEFTINCK kindly recommended me to revise this group promptly. I am, therefore, taking this opportunity to redescribe, in the first place, Nepalese and the other Himalayan material at hand.

In addition to the fine material now preserved in the National Science Museum, Tokyo, which was obtained during the 1979 and 1981 Nepal Surveys, the following collections were investigated.

Bruxelles Museum (Institut Royal des Sciences Naturelles de Belgique): SELYS' collection.

B.M.N.H. (British Museum of Natural History, London): FRASER's collection.

Paris Museum (Musée National d'Histoire Naturelle): LACROIX collection.

Am. Mus. Nat. Hist. (American Museum of Natural History, New York).

Kyushu University: 1971/72 Nepal Expedition material.

Hokkaido University: 1975 Nepal Expedition material.

LRE (1963 Japan Lepidopterological Research Expedition to Nepal): Now in Coll. ASAHINA.

E. SCHMIDT Collection (Material taken by F. SCHMID): Now in Coll. ASAHINA.

1) Supported in part by the Grant-in-aid for Overseas Scientific Survey Nos. 56041060 and 57043055 from the Ministry of Education, Science and Culture, Japan.

Coll. ASAHINA: Kathmandu Valley Survey in May 1980.

Before entering further, I should like to express my indebtedness to the authorities of these scientific institutions and individual entomologists for their generous help. I am also particularly grateful to Dr. M. A. LIEFTINCK who has given me very helpful suggestions from his observation memoranda.

### Genus *Neallogaster* COWLEY

*Allogaster* SELYS, 1878, p. 684, "Patrie Bengale."

*Allogaster* KIRBY, 1890, p. 79, "Bengal."

*Allogaster* WILLIAMSON, 1907, p. 276 (notes).

*Allogaster* FRASER, 1923, p. 37; FRASER, 1927, p. 76; FRASER, 1929, pp. 77-78; FRASER, 1936, pp. 37-39.

*Neallogaster* COWLEY, 1934, p. 201. "*Allogaster* SELYS (1878) is preoccupied by *Allogaster* THOMPSON (1864) (Syst. Ceramb., 251), in Coleoptera."

SELYS (1878) characterized the genus *Allogaster* stressing the difference from *Cordulegaster* mainly by the extraordinarily expanded structure of the frons, besides the other head characters, wing venation and abdominal features. FRASER (1929, 1936) described more characters in detail, but it seems rather difficult to separate the two genera definitely without surveying whole the representatives of both the genera. The following is a tentative definition based, in particular, on the comparison of the type-species *latifrons* (SELYS) with *Cordulegaster annulatus*, the type-species of *Cordulegaster*.

Small-sized cordulegasterid with strong pubescence all over the body.

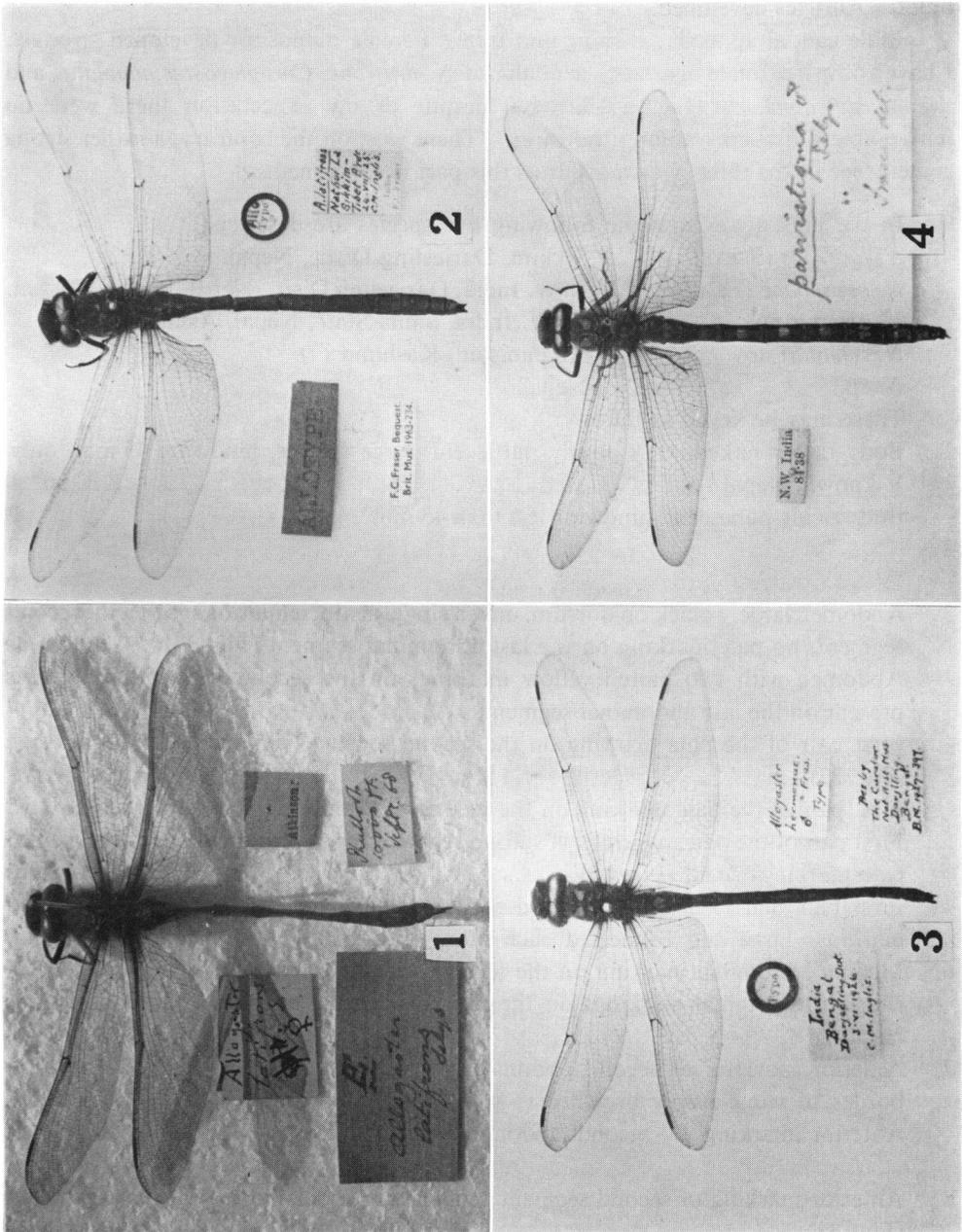
Head very broad, frons and postclypeus extremely transverse and much inflated (Figs. 23-25) with marginal tuft of long hairs, the front surface of frons with remarkable vertical wrinkles, and the lower portion of frons has a submarginal transverse ridge between the postoccipital suture. Labrum transverse, front side of head concolorous pale brown. Seen from above, the distance between the anterofrontal ridge and ocellar tubercle is very broad. Eyes barely touching with one point. Occipital triangle concolorous, slightly elevated with median small ridge, and is covered with long hairs, as is the case of postocciput in general. Labium transverse, pale brownish entirely, the median lobe shallowly bilobed.

Thorax not robust, very hairy, black with some indication of brownish patterns on ventral side. Legs quite short as is the case of usual cordulegasterids, but the femora are mainly brownish.

Wings shorter and broader than those of usual cordulegasterids, females often with dark anterior stripe along the costal border of wings (Fig. 6).

Pterostigma short, triangles two-celled with the proximal side rather long, supertriangles usually crossed. Anal angle in the male angulated but not so strongly as that of a cordulegasterid. Female anal loop usually slightly broader than that of a cordulegasterid, made of 8-9 cells against 7 cells.

Abdomen black on dorsum, with distinct brownish nuance on the ventral side, dorsum with yellowish markings which are small spotted without making broad an-



Figs. 1-4. *Neallogaster* spp. — 1. "*Allogaster latifrons* SELYS," ♀ Holotype, Bruxelles Museum. — 2. "*Allogaster latifrons* SELYS," ♂ Allotype, British Museum (N. H.). — 3. "*Allogaster hermionae* FRASER," ♂ Holotype, British Museum (N. H.). — 4. "*Allogaster parvistigma* FRASER," ♂ (= *Neallogaster ornatus* nov.), British Museum (N.H.) collection.

nules. Auricles developed.

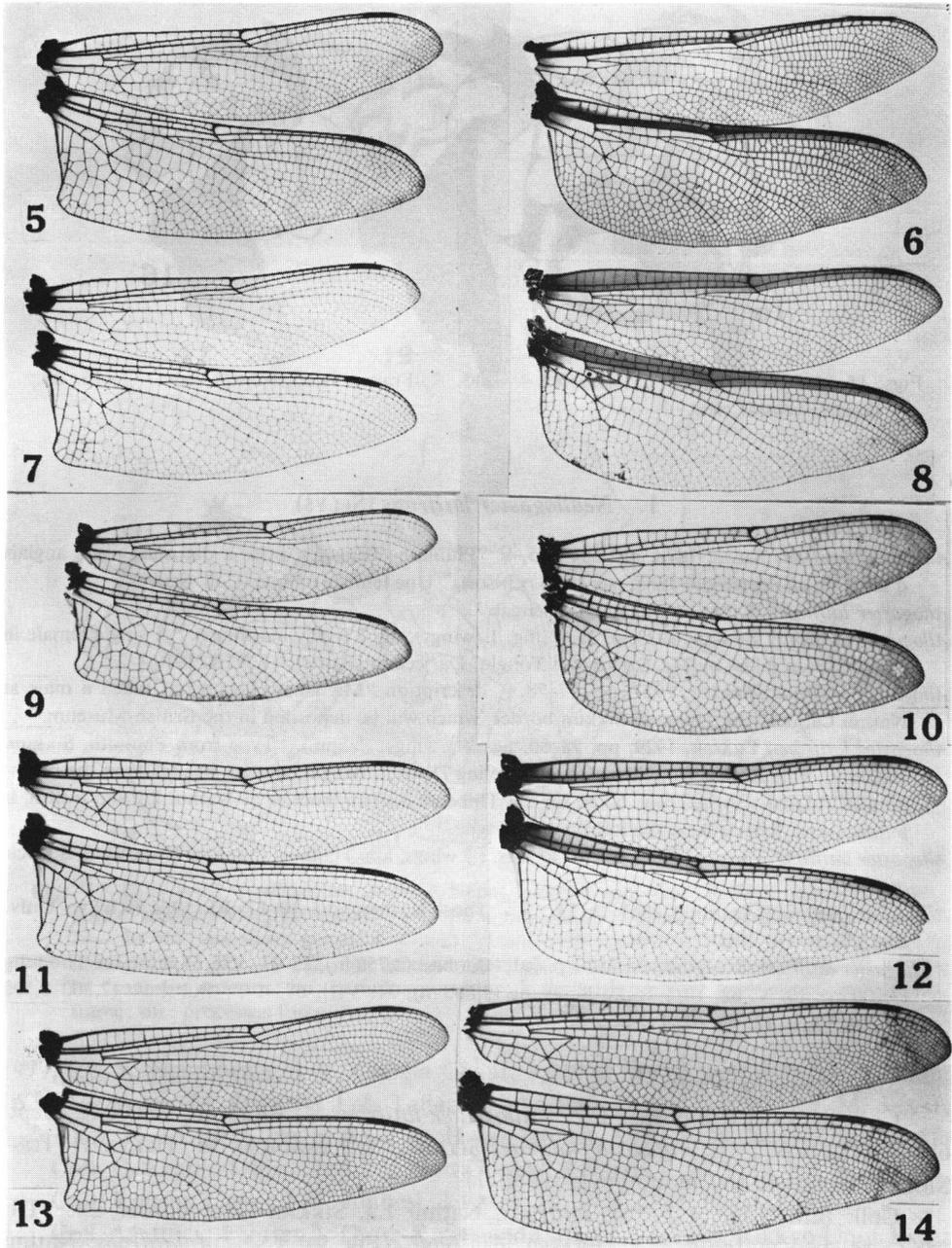
Male caudal appendages short and thin. Female ovipositor developed strongly. I have compared male accessory genitalia of *N. latifrons*, *Cordulegaster annulatus* and *Anotogaster nipalensis* (Figs. 17–22), but despite of my expectation there were no remarkable differences among the three. There was, on the contrary, a rather strong coincidence of the three genera as far as this part is concerned.

In the present revision the following five species are described:

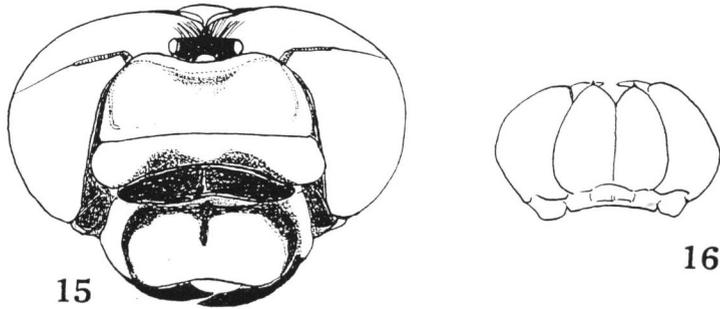
- N. latifrons* (SELYS) ♂ ♀ Sikkim, Darjeeling Distr., Nepal.  
*N. hermionae* (FRASER) ♂ ♀ N. W. India, Darjeeling Distr., Nepal, Bhutan, Assam.  
*N. ornatus* nov. ♂ ♀ N. W. India, Simla State, Nepal, Assam.  
*N. schmidtii* nov. ♂ ♀ Afghanistan, Kashmir (?).  
*N. sp.* ♀ Nepal.

These may be keyed as follows:

1. Body rather naked, very poorly pubescent, large species, hindwing 45 mm, only ♀ known, Nepal ..... *N. sp.* ♀
- Body richly pubescent, hindwing less than 45 mm ..... 2
2. ♂ ..... 3
- ♀ ..... 6
3. Abdomen largely black on dorsum, only a single distinct anterior spot on the second segment, no pale marking on the last abdominal segment (Fig. 37).... *hermionae*
- Abdomen with two paired yellow markings on the second segment, pale spots present on the last abdominal segment..... 4
4. First pair of the pale marking on the second segment very small and streak-like (Fig. 27) ..... *latifrons*
- First pair of the pale marking on the second segment large and conspicuous.... 5
5. First pair of the pale markings of second segment separated, the other dorsal paired pale markings small (Fig. 45) ..... *ornatus*
- First pair markings of the second segment connected, the other dorsal paired markings large and connected each other (Fig. 52)..... *schmidtii*
6. Median abdominal marking on the second segment separated..... 7
- Median abdominal markings on the second segment united to one conspicuous marking ..... 8
7. Anterior marking of second abdominal segment streak-like (Fig. 28). anterior border of wing deeply browned (Fig. 6)..... *latifrons*
- Anterior marking of second abdominal segment larger, saddle-like (Fig. 46) ..... *ornatus*
8. Anterior marking of second segment smaller and squid-shaped with divided head (Fig. 38) ..... *hermionae*
- Anterior marking of second abdominal segment very large, saddle-like (or transverse ?) (Figs. 53, 54?)..... *schmidtii*



Figs. 5-14. Wing venation. — 5. *Neallogaster latifrons*, ♂, Nepal. — 6. Do., ♀ Nepal. — 7. *N. hermionae*, ♂, Nepal. — 8. do., ♀, Nepal. — 9. *N. ornatus*, ♂, Nepal. — 10. do., ♀, Nepal. — 11. *N. schmidtii*, ♂ Holotype, Afghanistan. — 12. *N. sp.*, ♀, Nepal. — 13. *Cordulegaster annulatus annulatus*, ♂, France. — 14. do., ♀ Germany.



Figs. 15–16. *Cordulegaster a. annulatus*. — 15. ♂, France, head, frontal view. — 16. do., labium, ventral view.

### 1. *Neallogaster latifrons* (SELYS)

*Allogaster latifrons* SELYS, 1878, pp. 684–685, ♀ “Phulloth (Bengale), prise à dix mille pieds anglais d’altitude, en Septembre 1865, par M. ATKINSON. Une femelle unique (Coll. SELYS).”

*Allogaster latifrons*: KIRBY, 1890, p. 79 “Bengal.”

*Allogaster latifrons*: FRASER, 1923, p. 37, ♀, fig. 1 (wings), fig. 2 (body markings). “A single female in my collection taken by Mr. STEVENS at Tonglu, Darjeeling District, 11. VIII. 1919.”

*Allogaster latifrons*: FRASER, 1927, pp. 77–78, ♂ description “Mr. Chas. INGLIS has taken a male at Nathui La, near the Thibetan-Sikkim border, which will be deposited in the British Museum.”

*Allogaster latifrons*: FRASER, 1929, pp. 78–80, figs. (♀ wings, ♂ app.). “Type from Phulloth, Sikkim, 10,000 ft. One male is from Tongloo, Darjeeling District, Bengal, and 1 ♀ was taken at the beginning of August. A pair was taken on the Thibetan-Sikkim frontier at Nathui La and a fifth, a female [male !] from the same locality as the type.”

*Allogaster latifrons*: FRASER, 1936, pp. 38–40, figs. (♂ wings, app.) [almost the same remarks as is given in 1929].

*Allogaster latifrons*: ASAHINA, 1965, p. 33, “1 ♀ Those-Kathmandu, 10–17. VI. 1964 (Rikkyo Univ. Exp).”

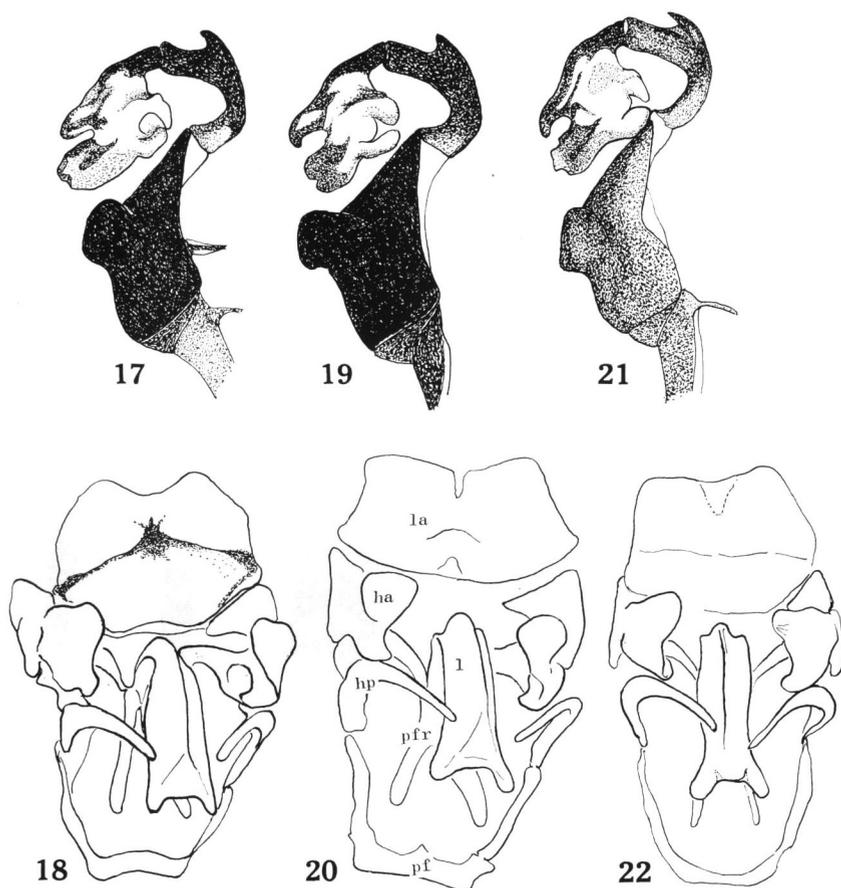
? *Allogaster latifrons*: ST. QUENTIN, 1970, p. 401, “Junbesi (2,750 m), 25–31. VII. 67, 1 ♀; Jiri-Thodung (3,200 m), 19. V. 62, 1 ♀; Tarke Banjyang (3,600 m), 31. VIII. 67, 1 ♀; Pultshuk (2,300–2,500 m), 19. VI. u. 12. VI. 67, 1 ♂ u. 1 ♀.”

#### *Specimens examined*:

Coll. SELYS (I.R.S.N.B.): 1 ♀, “*Allogaster latifrons* ♀, Phulloth, 10,000 ft., Sept. 68”, “ATKINSON”, “*E. Allogaster latifrons* SELYS”, “E 1 example. M. TILLYARD (TONNIOR).” Holotype [by monotypy]. (Fig. 1)

Coll. B.M.N.H.: 1 ♂, “*A. latifrons*, Nathui La, Sikkim-Tibet border, 24. VIII. 25; C. M. INGLIS, India, F. C. FRASER, Allotype” (Fig. 2); 1 ♀, “*A. latifrons*, Nathui La, Thibet-Sikkim border, 24. VIII. 25, C. M. INGLIS”, “F. C. FRASER Bequest.”

Coll. Natn. Sci. Mus. Tokyo: 1 ♀, Namche, 1. X. 1979, leg. Y. NISHIKAWA; 1 ♂ 1 ♀, Phurte, 3.X. 1979, leg. S. AE; 3 ♂, Lamjura, above Tragdobuk, 3,000 m, 12.X.

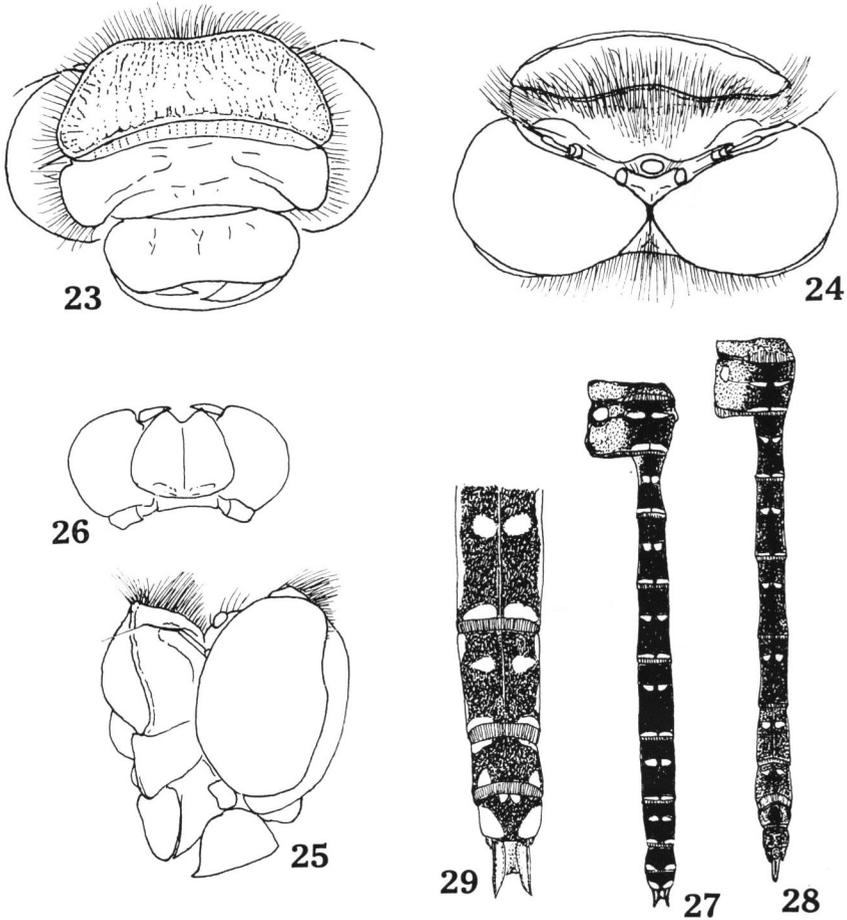


Figs. 17–22. — 17. *Neallogaster latifrons*, Nepal, penile organ. — 18. Do., accessory genitalia of second abdominal segment. — 19. *Cordulegaster a. annulatus*, France, penile organ. — 20. do., accessory genitalia. — 21. *Anotogaster nipalensis*, Nepal, immature specimen, penile organ. — 22. do., accessory genitalia of second abdominal segment.

ha: hamulus anterior; hp: hamulus posterior; l: ligula; la: lamina anterior; pf: posterior frame; pfr: processus furculiformis.

1979, leg. Y. NISHIKAWA; 1 ♀, Chhala Chaur, 3,010 m, leg. S. AE; 1 ♂ Jiri, 2,000 m, 16. X. 1979, leg. M. OWADA; 1 ♂, Taljara Khola Valley, 30. IX. 1981, leg. M. SAKAI; 1 ♂, Rara, 26. IX. 1981, leg. S. AE; 1 ♂, Hinku Doban, 2,480 m, 19. X. 1981, leg. S. AE. Coll. Hokkaido Univ.: 1 ♂ 2 ♀, Syn Gompa, 3,500 m, 2. X. 1975, leg. S. TAKAGI. Coll. Kyushu Univ.: 1 ♂, Junbesi, 3,100 m, 11. VIII. 1981, leg. J. EMOTO. Coll. ASAHINA: 1 ♀ (ten.), Thore-Kathmandu, 10–17. VI. 1964, Rikkyo Univ. Exp.; 1 ♀, Kambachen (3,950 m) to Lhonak (4,550 m), 16. VII. 1963, leg. T. FUJIOKA.

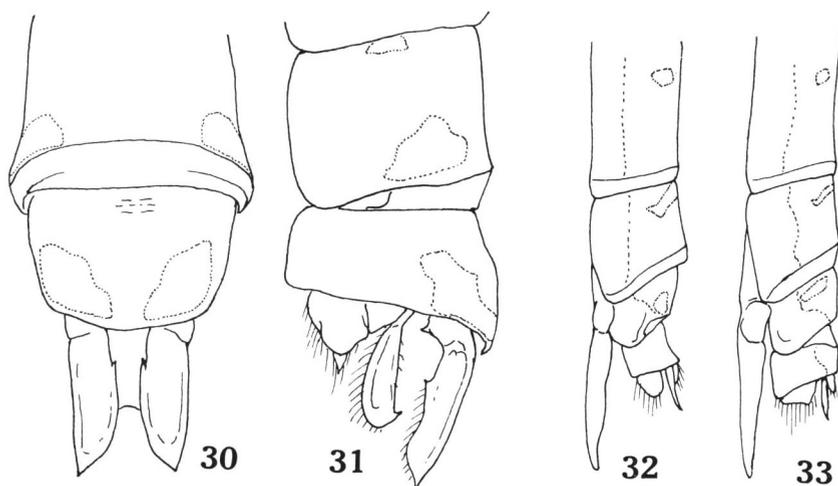
♂ (ad.) Abd. + app. 47–50 mm, hindwing 37–40 mm; middle-sized slender cordulegasterid.



Figs. 23–29. *Neallogaster latifrons* (SELYS), Nepal. — 23, Head, frontal; 24, head, dorsal; 25, head, lateral; 26, labium, ventral; 27, abdominal markings ♂; 28, do., ♀; 29, distal abdominal markings ♂, a specimen from Hinku Doban, Nepal.

Head broad and inflated enormously; seen from front the facial surface hides whole frontal outlines of the eyes; entirely pale brownish. Anterior surface of antefrons wrinkled vertically, the lower transverse ridge conspicuous; postclypeus shining, labrum short and broad, concolorous; labium paler, the median lobe shallowly divided anteriorly. Dorsal side of ante-frons broad, covered densely with long black hairs; in aged insects the greater part of the dorsal side of antefrons and postfrons (= ocellar tubercle) much darkened. Eyes touching at one point and margined posteriorly with long black hairs. The occipital triangle elevated with lateral ridges, posterior ridge of occiput shining brownish.

Prothorax small, hidden between head and pterothorax, deep brownish with the



Figs. 30–33. *Neallogaster latifrons* (SELYS), Nepal. — 30–31, ♂ Caudal appendages; 32–33, ♀ distal abdominal segments, lateral.

posterior lebe slightly projected tongue-like and yellow margined at the sides.

Pterothorax deepest brown in general, the three yellow stripes being outlined by black marginal border; the anteriormost ones small, rather comma-shaped, the two lateral ones on mesepimeron and metepimeron distinct, both surrounded with distinct black border. Pterothorax entirely covered with long black hairs.

Legs almost black, femora all brownish at their median portion.

Wings hyaline, antenodals ca. 16, pterostigma narrow, parallel-sided, covering about 5 cells. Supertriangle and triangle are usually divided by one cross-vein. Anal loop 4-celled, anal triangle 3-celled.

Abdomen slender, proximal two segments densely pubescent; dorsal side very dark brownish or almost blackish, but the black is changing into reddish brown on the ventral side. The yellowish markings are as shown in Fig. 27. A specimen taken at Hinku Doban 2,480 m, on Oct. 19, 1981, shows fairly developed yellow markings on the three terminal segments (Fig. 29).

Caudal appendages as Figs. 30–31, superiors rather brownish and thin, of nearly equal length with the last abdominal segment. In lateral view the basal and subbasal spines are conspicuous; the inferior appendage thick and squarley out, with a sharp subapical thorn on both sides.

♀ (ad.): Abd. + oviposit. 49–54 mm, hindwing 41–45 mm.

Head of similar structure and coloration with those of the male, but it gives a larger impression than that of the male.

Pterothorax more strongly reddish brown especially on the front side, the yellow bands on the sides are less strongly black bordered. Legs as those of the male insects.

Wings much browned when teneral, gradually fading out with age, usually the costal side, i.e., antenodal subcostal space and postnodal costal space, brownish striped. Antenodals of forewing ca. 18, pterostigma covering 4-cell length. Anal loop 6–10 celled.

Abdomen cylindrical, basal two segments inflated, and in aged insects terminal two segments much degenerated. The colour pattern is shown in Fig. 28, lateral side more strongly browned than that of the male. Cerci short and sharply pointed. The remnants of the larval epiproct and paraprocts are often recognizable as whitish pointed vestiges.

*Distribution.* Sikkim, Darjeeling District, Nepal (East and Central).

## 2. *Neallogaster hermionae* (FRASER)

*Allogaster hermionae* FRASER, 1927, pp. 76–77, ♂, “A single male from the Darjeeling District, on the wing in July.”

*Allogaster hermionae*: FRASER, 1929, pp. 80–81, ♂ fig. (♂ accessory genitalia), “Darjeeling District, near Mungpoo, in July, about 4,000 ft.”

*Allogaster hermionae*: FRASER, 1936, pp. 43–44, ♂, “Darjeeling District, near Mungpoo, in July, about 4,000 ft.”, “Type in the Darjeeling Museum Collection; cotype in the author’s collection.”

*Neallogaster hermionae*: KIMMINS, 1966, p. 195, “Holotype ♂, India Bengal, Darjeeling District (Senchal 8,000 ft), 3. VI. 1926, C. M. INGLIS. *Allogaster hermione* [!] FRASER ♂ Type. The date of capture is given as July in original description. Now *Neallogaster hermionae* (FRASER).”

? *Neallogaster* sp. (aff. *hermionae* FRASER): KIAUTA & KIAUTA, 1976, pp. 352–353, figs. 6–7 (p. 349) (chromosome).

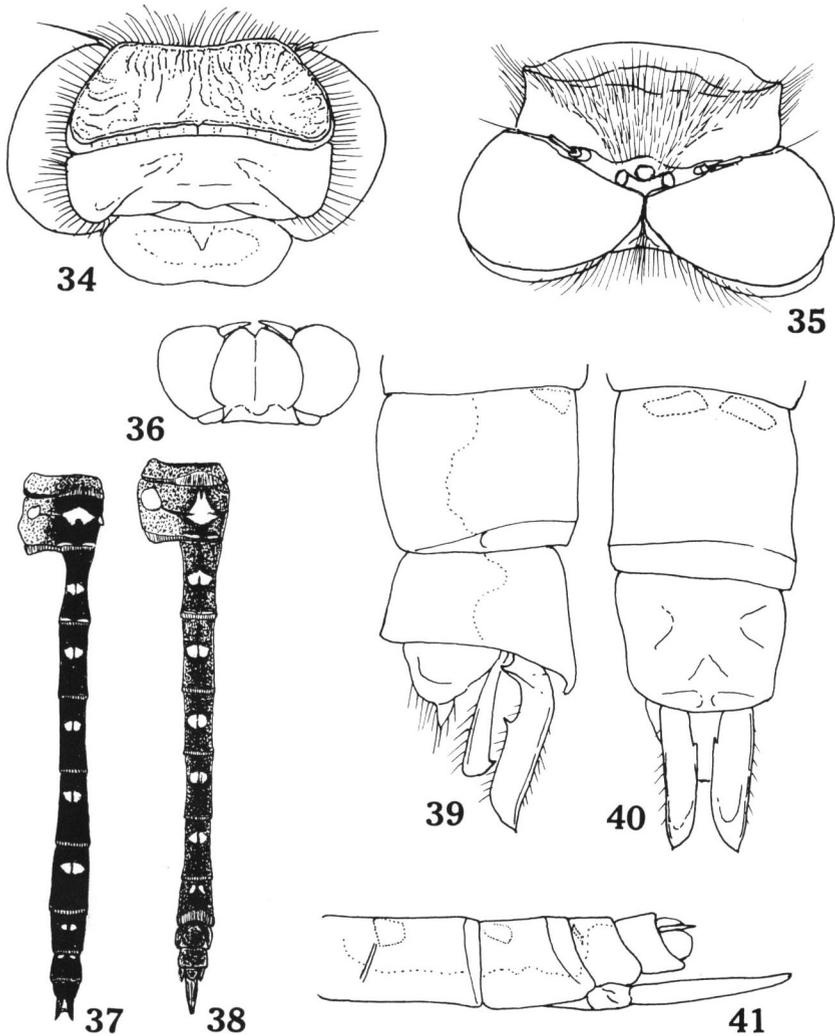
### *Specimens examined:*

Coll. B.M.N.H.: 1 ♂, “Type”, “*Allogaster hermionae* FRASER ♂ Type”, “Senchal 8,000 ft, Darjeeling District, Bengal, 3. VI. 1926 (Fig. 3); “Pres. by the Curator Nat. Hist. Mus. Darjeeling, Bengal, BM 1927–397”, “India, Bengal, Darjeeling Distr., 3. VI. 1926, C. M. INGLIS”; 1 ♂, “8821, Ghum, 7,500 ft, Darjeeling Distr., E. Himalaya, V. 1918 (A. S. KEMP leg.)”; 1 ♂, “*A. hermionae*, Goom, Darjeeling Distr., 10. V. 1915, C. M. INGLIS, India, F. C. FRASER”, “S. KEMP, 7,500 ft”, “F. C. FRASER, Bequest, 1963–234”; 1 ♂, “*A. hermionae*, Darjeeling Distr., 14. VII. 1924, C. M. INGLIS, India, F. C. FRASER”, “FRASER Bequest.”

Coll. E. SCHMIDT: 1 ♀, Sirohi Kashong, 6,000–7 500 ft, Manipur Staat, Assam, 6. VI. 1960; 4 ♂ 5 ♀ (all teneral), Kameng, Assam, NO-Grenze Talung Dzong 7,000 ft., 12. V. 1961; 1 ♂, Do., 3. VI. 1961; 1 ♂, Do., 21. VI. 1961, all leg. F. SCHMID.

Coll. Kyushu Univ.: 1 ♂, 9. V. 1972, leg. H. SHIMA; 1 ♂, Papun-Thurukpa (2,600 m), 11. VI. 1972, leg. J. EMOTO; 1 ♀, Basantopur-Hile, 14. VI. 1972, leg. H. MAKIHARA; 1 ♂, Basantopur, 2,300 m, 16. VI. 1972, leg. H. MAKIHARA; 1 ♂, Do., 18. VI. 1972, leg. Pempa Norbu; 1 ♂, Basantopur, 2,300 m, 20. VI. 1972, leg. H. MAKIHARA.

Coll. ASAHINA: 1 ♀, Chitrei, 2,700 m, 30. VI. 1963, leg. T. FUJIOKA (Allotype !); 1 ♀, Chitrei, 2,800 m, 1. VII. 1963, leg. T. FUJIOKA; 1 ♂, Lelep, 1,550 m, 8. VII. 1963, leg. T. FUJIOKA; 1 ♂, Tapche, 2,400 m, 10. VII. 1963, leg. S. AE; 1 ♀ (broken), Chaura,



Figs. 34–41. *Neallogaster hermionae* (FRASER), Nepal. — 34, Head, frontal; 35, head, dorsal; 36, labium, ventral; 37, ♂ abdominal markings; 38, ♀ abdominal markings; 39–40, ♂ caudal appendages; 41, ♀ distal abdominal segments, lateral.

Nepal, 2,100 m, 10. VI. 1971, leg. KANO; 1 ♂, Siwapuri Summit, 2,732 m, 14. V. 1980, leg. S. ASAHINA; 1 ♂ (broken), Do., 25. V. 1981, leg. J. EMOTO.

♂ (ad.): Abd.+app. 44–50 mm, hindwing 34–38 mm. Only slightly smaller than the preceding species, the ground colour more blackish with entirely different abdominal pattern.

Head structure and coloration very similar to those of *latifrons*, but the vertical wrinkles on the front side of antefrons run more or less laterad.

Prothoracic tergite hidden under head has a small posterior bisor which is entirely dark margined. Pterothorax deep blackish brown and very hairy, the frontal yellow spots comma-shaped but clearly shorter than those of the preceding species. Yellow side stripes on mesepimeron and metepimeron similar to the ones of the preceding species; however, the ground colour is deeper, and only the infraepisterna are brownish.

Legs brownish from coxa to subapical part of femora, then entirely black.

Wings hyaline, sometimes extreme bases very palely suffronated. A teneral male from Assam shows palely suffronated streak along the costal margin. Forewing antenodals ca. 17, pterostigma dark brownish, covering three-cell length; triangle and supertriangle usually crossed by one veinlet, anal triangle three-celled, anal loop 5-celled.

Abdomen rather cylindrical, only slightly swollen at the second segment, deep black on dorsum, browned at the lateroventral sides. The dorsal yellowish markings as shown in Fig. 37.

Caudal appendages as in Figs. 39–40, brownish; superiors thinly built, but slightly narrower than those of *latifrons*. Inferior with subapical paired side thorns as those of the preceding species.

♀ (ad.) Abd. + oviposit. 49–52 mm, hindwing 37–42 mm.

Head structure shows no difference from that of the male insect. Pterothorax generally much browned, only deep brownish margined along the lateral yellow stripes which are broader in Assamese specimens and often with a vestige of fine yellow stria on metepisternum. Legs coloured as those of the male.

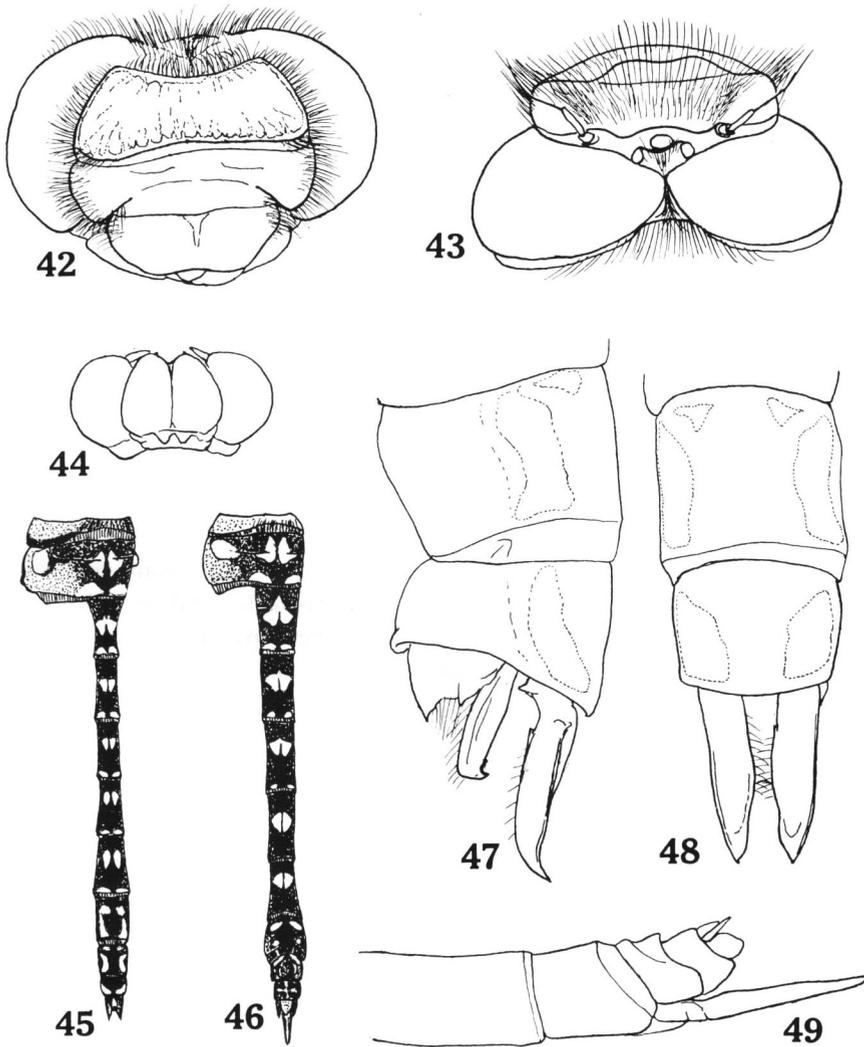
Wings distinctly suffronated along the costal margin including costal and subcostal spaces, or even protruded rearwards; in a very aged female, this stripe disappear altogether and entire wings are enfumed. Forewing antenodals 20 or less, supertriangle and triangle crossed, the anal loop made of 6–10 cells.

Abdomen broad and cylindrical, marked as Fig. 38, ground colour rather deepest brown.

*Distribution.* NW. India, Darjeeling District, Nepal, Assam. I have two specimens taken from Bhutan, the details are as follows: 1 ♂ (teneral), Bhutan, 2,600 m, 14. V. 1967, leg. OHASHI, Botanical Exp. Tokyo Univ.; 1 ♂ (broken), Tongsa, 2,150 m, Bhutan, 19. V. 1970, leg. OGATA.

### 3. *Neallogaster ornatus* sp. nov.

*Allogaster parvistigma*: FRASER, 1929 (nec SELYS, 1873), pp. 81–83, fig. 5 (♂ caudal app.), "From type in the British Museum Collection" [!] ♂; Pl. XI, fig. 12 (♂ abd. markings) "From the type in B. M. collection"; Pl. XII, fig. 4 (♂ abd. markings) "From a specimen from Rhaji, Simula State, Indian Museum, fig. 5 (♂ abd. markings) "Another specimen from the same locality, Indian Museum collection."



Figs. 42–49. *Neallogaster ornatus* nov., Nepal. — 42, Head, frontal; 43, head, dorsal; 44, labium, ventral; 45, ♂ abdominal markings; 46, ♀ abdominal markings; 47, 48, ♂ caudal appendages; 49, ♀ distal abdominal segments, lateral.

*Allogaster parvistigma*: FRASER 1936, (nec SELYS, 1873), pp. 41–43, ♂ (no fig.).

*Specimens examined:*

Coll. B.M.N.H.: 1 ♂, “*parvistigma* SELYS ♂, FRASER det.,” “N. W. India, 84–38” (Fig. 4); 1 ♂, “*A. parvistigma*, Mashbra Hill, Simula, 25. VI. 1927, India, F. C. FRASER”  
Coll. Hokkaido Univ.: 3 ♂, Lukuche Kholo, 1,600 m, 9. V. 1968, leg. T. MATSU-

MURA; 1 ♂, Ghara, 1,820 m, 10.V. 1968, leg. T. MATSUMURA, 1 ♂, Rhamche, 1,670 m, 29. V. 1968, leg. T. MATSUMURA; 1 ♂, Dunche, 2,000 m, 31. V. 1968, leg. T. MATSUMURA.

Coll. E. SCHMIDT: 1 ♀, Tarsali (Pauri Garhwa, Kumaon.), 6,000–7,000 ft, 6. V. 1958, leg. F. SCHMID.

Coll. ASAHINA: 1 ♂, Anna Purna Exp., 15. VI. 1969, leg. T. MIYASHITA; 1 ♂, Do., 22. VI. 1969, leg. MIYASHITA; 2 ♀, Khiling, 1,800 m, 8. VI. 1971, leg. KANO; 1 ♂, Lete, Pokhara, 9. VII. 1972, leg. K. MATSUMOTO (ex KUWABARA).

This is the species known as “*Allogaster parvistigma*” in FRASER’s works (1929, 1936). However, this does not coincide at all with “*Thecagaster* (= *Cordulegaster*) *parvistigma* SELYS (1873, p. 508), described by a female from Himalaya (Coll. de M. F. MOORE).

The location of the type-specimen is not mentioned; it does not exist in the BMNH collection (KIMMINS, 1969). On my visit to the Bruxelles Museum, Oct. 2, 1973, I found only a label “*Cordulegaster parvistigma*” in No. 4 box. There remained a label “1 exempl. TILLYARD, 20. fevr. 1922”, so I am afraid that the real type of *parvistigma* female has been lost by the sea accident on the way to Australia!

FRASER said (1929, p. 83), “The type in the British Museum, described by SELYS, turns out to be a male. It certainly looks a female when casually examined, which may account for SELYS’ error.” I think this is really unreasonable and impolite dogmatism of FRASER against the “Father of Odonatology”! Perhaps FRASER forced to use the name “*parvistigma* SELYS” to an unnamed *Neallogaster* specimen he found in the BMNH collection.

♂ (ad.): Abd.+app. 45–47 mm, hindwing 36–37 mm. Smaller and paler insect than the preceding two.

Head of similar structure to the preceding two species. The wrinkles and lower ridge on the front surface of frons are less developed, labrum and labium light yellowish.

Posterior lobe of prothoracic tergite brownish, making a small visor behind, the lateral ridge of it yellow.

Pterothorax mainly pale brownish, with usual three yellow stripes, the anterior-most one long and cuneiform. Lateral stripes are outlined with deep brown. Legs. entirely light brownish, darker in tarsi.

Wings hyaline, very palely enfumed in aged individuals. Forewing antenodals ca. 14, postnodals ca. 13; pterostigma small, covering 3.0–3.5 cell-length; supertriangle usually entire. Anal triangle three-celled, anal loop 4–5 celled.

Abdomen slender, not much inflated in distal segments, pale brownish, deeper on dorsum; yellowish spots as shown in Fig. 45. Two pairs of spots on each segment, those on 8 and 9 much developed.

Caudal appendages as Figs. 47–48, pale brownish, inferior with an usual subapical black thorn on each side.

♀ (ad.): Abd.+oviposit. 50–51 mm, hindwing 39 mm.

Head structure as that of the male insect, pale brownish with paler labrum and labium.

Pterothorax brownish, striped as the males; there is, in addition to a narrow lateral stripe on metepisternum, a yellow spot below the metathoracic spiracle. Legs as that of the male.

Wings in mature insects palely enfumed with a stronger tone along costal margin. Supertriangles all crossed. Five to nine cells present in the anal loop.

Abdomen brownish, deeper on dorsal side, the yellow maculation is evident as shown in Fig. 46. Ovipositor long and sharply pointed.

*Distribution.* This species seems to be a West Himalayan insect, found from Central Nepal to Kumaon and Simla.

#### 4. *Neallogaster schmidti* sp. nov.

*Cordulegaster insignis coronatus* SCHMIDT, 1961 (nec MORTON, 1916), partim, p. 419, Abb. 10 (p. 420 total insect ♂). “—Achmede Dewane 2,700 m, 23. VII. 1952, 1 ♂ 1 ♀ (♂ abd. 54.3; Hfl. 42.6 (Abb. 10); ♀ Abd. 58.3; Hfl. 45.5).”

##### *Specimens examined:*

Coll. E. SCHMIDT: 1 ♂ (Holotype) 1 ♀ (Allotype), 23. VII. 1952, Achmede Dewane 2,700 m, Nuristan, O-Afghanistan, leg. J. KAPPERICH.

Coll. ASAHINA: ? 1 ♀ (alcoholic), Lateral Moraine of Kalahor Glacier, Kashmir., India, 5,000 m, IX. 1976, leg. D. COLEMAN.

In his record of Afghan Odonata, SCHMIDT (1961) included this pair with the other specimens (= ? real *Cordulegaster* species) to be *Cordulegaster insignis coronatus*.” However, his pair gives typical characteristics of *Neallogaster* now revised.

♂ (ad.): Abd.+app. 52 mm, hindwing 43 mm. A large species with enlarged yellow markings of the body.

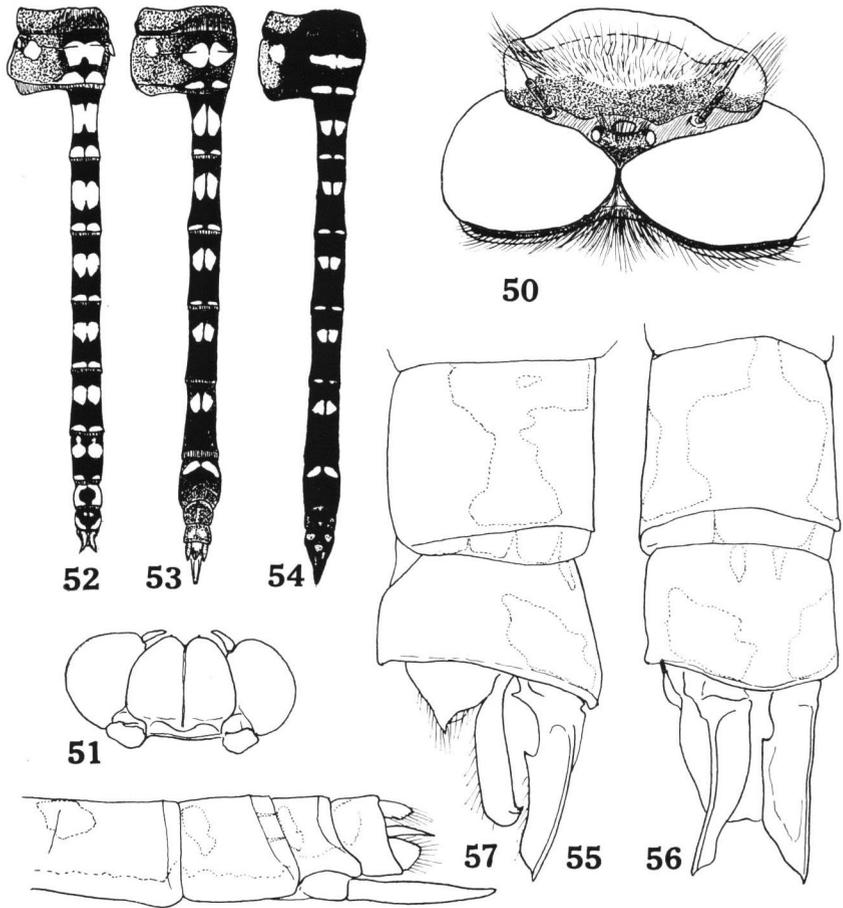
Head structure agreeing in the fundamental characteristics of *Neallogaster*. Pale yellowish on front side, with usual wrinkles on the frons. Postfrontal area becoming darker in this specimen, with black posterior margin of the eyes (Fig. 50).

Pterothorax black, paler beneath, covered by pale yellowish pubescence. The yellow bands are very broad, the frontal one occupies the greater part of the mesothoracic episternum, two lateral bands also broad; a small triangular stripe present above the metepisternum, and a minute yellow spot below the spiracle. Legs brownish from coxa to the subapical portion of femora, then black.

Wings hyaline, forewing antenodals 20, postnodals 17; pterostigma pale brownish, covering 3.5–4.5 cell-length; supertriangles and triangles crossed. The anal triangle 4-celled, anal loop 7-celled.

Abdomen maculated as shown in Fig. 52, ground colour black on dorsum, but with brownish tint on ventral side.

Caudal appendages as shown in Figs. 55–56, superiors pale yellowish, the inferior



Figs. 50–57. *Neallogaster schmidti* nov., Afghanistan. — 50, Head, dorsal; 51, labium, ventral; 52, ♂ abdominal markings; 53, ♀ abdominal markings; 54, do., Kashmir specimen; 55–56, ♂ caudal appendages; 57, ♀ distal abdominal segments, lateral.

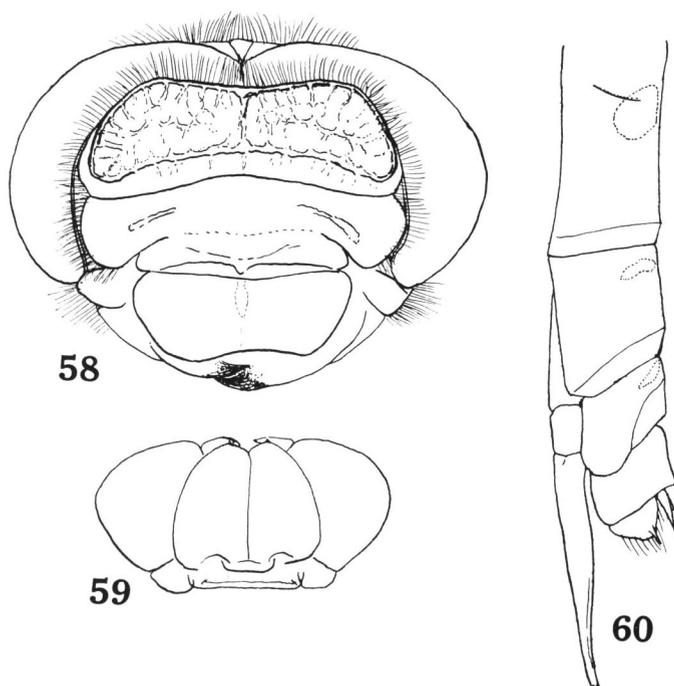
darker with usual subapical thorns.

♀ (teneral): Abd.+oviposit. 57 mm, hindwing 45 mm. A rather large insect, more or less of *Cordulegaster* type.

Head of *Neallogaster* type, but the frontal wrinkled area is narrower dorsoventrally than those of typical *Neallogaster*; postfrontal area and posterior eye-margin darkened as those of the male.

Pterothorax densely pubescent; the yellow bands are broad with a small cuneiform stria on the metepisternum above. Legs as those of the male.

Wings enfumed over costal 2/3, extreme base brownish tinted. Forewing anteno-



Figs. 58–60. *Neallogaster* sp., Nepal. — 58, Head, frontal; 59, labium, ventral; 60, ♀ distal abdominal segments, lateral.

dals 18, postnodals 16, pterostigma narrow and pale brownish. Supertriangles and triangles crossed; in the right hindwing the triangle is divided into three cells. Cells of anal loop 8 (left) or 9 (right).

Abdomen maculated as shown in Fig. 53, ground colour of dorsal side almost deep brownish, changing pale brownish on ventral side. Ovipositors long and shining pale brown.

*Distribution.* Afghanistan, Kashmir (?).

A Kashmir specimen taken by Mr. D. COLEMAN is somewhat differently maculated on abdomen (Fig. 54). However, it is still doubtful if this belongs to true *schmidtii*, because the frontal thoracic marking (mesepisternal) and abdominal patterns here illustrated show affinity to those of *N. luniferus* (SELYS, 1878) known from “Thibet.”

##### 5. *Neallogaster* sp.

*Specimen examined:*

Coll. Kyushu Univ.: 1 ♀, Pontak-Samda, 1,900 m, 14. V. 1972, leg. Y. NISHIDA.

Though only a single female specimen was available, it may yet be advisable to record briefly this specimen.

♀ (ad.) Abd.+oviposit. 60 mm, hindwing 45 mm. A rather huge and shiny insect.

Head character is of typical *Neallogaster* although the width of the frons and postclypeus is smaller, showing barely the outline of the compound eyes when seen from front. Postfrontal tubercle and postoccipital triangle darker with long black hairs.

Pterothorax deep brownish, very poorly pubescent and even shining on lateral sides. This feature does not coincide with any other *Neallogaster* species. Frontal cuneiform yellow stripe very short, rather comma-shaped. Two lateral bands are broad, with narrow yellowish stria on metepisternum. Legs brownish, much darker in tibia and tarsi.

Wings as shown in Fig. 12, hyaline but pale brownish striated along costal side, deeper at the base. Forewing antenodals 18, postnodals 13, pterostigma narrow and pale brownish, covering 3.5 cell-length. Forewing triangle 4-celled, but supertriangles and discoidal triangles only divided into two cells. Anal loop 9-celled.

Abdomen enormously elongate, very shining entirely; poorly pubescent on 1 and 2 segments. Unfortunately, the yellow coloration almost disappeared by decomposition, but paired median yellow spots may be present on 4–7 segments. Ovipositor very long, about 9 mm as measured from the end of the 8th segment.

*Distribution.* East Nepal.

### Field Observations of the Adults

My own observation on this group of dragonflies is very brief. In the beginning of May, perhaps in its early season, males of *N. hermionae* were observed rapidly flying over the summit of Mt. Siwapuri 2,723 m, north of Kathmandu Valley. The flight is so quick that few of them can be netted.

KIAUTA and KIAUTA (1976) recorded some observations on *N. sp* (aff. *hermionae*) that they fly over the cascades in numerous numbers in April and May (1976) in the Central Nepal, at Langtang Valley 2,150 m, 24. IV. 1976, Syabru-Mangsen 2,670 m, 6. V. 1976, and at Grang 1,930 m, 10. V. 1976.

Excluding occasional cases of passive dispersal of migratory insects, the species of *Neallogaster* may represent a remarkable dragonfly group reaching very high altitude among the Odonata. Checking our present material the following values were obtained: *latifrons* 2,000–4,550 m; *hermionae* 1,550 (?)–2,800 m; *ornatus* 1,600–1820 m; *schmidti* 2,700–(?) 5,000 m; “sp.” 1,900 m.

Further evidence is very much needed; in particular, the breeding site of the larvae should be clarified.

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