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## REVISION OF THE JAPANESE BIBIONIDAE

(Diptera, Nematocera)<sup>1</sup>

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Our knowledge of the Japanese Bibionidae has been based largely upon the monograph of Dr. Ichiji Okada (1938). This is now badly out of date, many additional species have been collected and it has become obvious that a large share of the species treated in the Japanese literature has been misidentified. Okada's species concepts were rather broad and often contained two or more species. Following Duda's treatment of the Japanese species in his study of the Palaearctic Bibionidae (1930) various workers have recorded several European species from Japan. We are now convinced that with the exception of a Japanese subspecies of *Bibio pomonae* Linnaeus, all of these records were errors; the common bibionid species of Europe are obviously not so widely distributed as has been previously thought.

In Japan bibionids occur predominantly in the spring of the year from March to July. One species (*Penthetria velutina* Loew) apparently is not seasonal and the adults occur throughout most of the year. Four species (*Penthetria motschulskii* (Gimmerthal), *Bibio flavihalter* n. sp., *B. gracilipalpus* n. sp., and *B. metaclavipes* n. sp.) emerge during the fall and early winter months, and one species (*Bibio ryukyuensis* n. sp.) occurs from January to March. Very little is known of the biologies and habits of the bibionid flies in Japan. The only information which we have found in the literature is the brief account of Hori

1. Published with the approval of the Director of the Hawaii Agricultural Experiment Station as Technical Paper No. 499.

and Yamaguchi (1930: 422) of the habits of *Bibio japonicus* (Motschulsky). None of the species is known to be of economic importance.

This study has been based upon a study of all of the available collections of the Japanese Bibionidae. This has consisted of several thousand specimens from many museums and institutions throughout Japan as well as throughout Europe and the United States. We have received complete cooperation from all institutions and individuals which we have had occasion to contact during this study.

We are very grateful to the following individuals who have loaned the senior author the materials upon which this monograph is based; without their cooperation this study would not have been possible: Dr. S. Kato, National Institute of Agricultural Sciences, Nishigahara, Tokyo; Dr. K. Yasumatsu, Kyushu University, Fukuoka; Dr. Akira Nagatomi, Hyogo University of Agriculture, Sasayama; Dr. M. Tokunaga, Saikyo University, Kyoto; Dr. T. Okada, Tokyo Metropolitan University; Dr. E. L. Kessel and Paul H. Arnaud, California Academy of Sciences, San Francisco; and Dr. Alan Stone, United States National Museum, Washington, D. C. The extensive bibionid collection of the junior author has also been of much value in this study. We are also much indebted to C. N. Colyer, Upton-by-Chester, England, Harold Oldroyd and Paul Freeman, British Museum (Natural History), for presenting the senior author with specimens of European species to use for comparative purposes; and also Dr. Fritz Peus, Zoologisches Museum, Humboldt Universität, Berlin, for kindly lending the type of *Penthetria velutina* Loew so that the status of this species could be clarified. We are also very appreciative of the help which Dr. A. Stackelberg of the Zoological Institute, Academy of Sciences, Leningrad, U. S. S. R., has given in supplying information concerning the species described by Motschulsky and Gimmerthal.

The junior author has had an opportunity to restudy the Okada collection at Hokkaido University and has been able to clarify all of Okada's species concepts with the exception of the specimens which he determined as "*Bibio clavipes*." Only one male specimen of this was present in the collection and because of its poor condition, an exact determination could not be made, although it seems to fit *B. gracilipalpus* n. sp. and is probably that species. Unfortunately, some of the specimens mentioned in Okada's monograph were missing from the collection so it was not possible to make a complete study of his material.

We wish to express our sincere appreciation to Dr. Chihisa Watanabe of the Hokkaido University for allowing the junior author the privilege of studying their valuable collection.

The drawings of *Bibio flavihalter* n. sp., *B. hadrosoma* n. sp., *B. montanus* n. sp., *B. ruyukyensis* n. sp., *Plecia okadai* n. sp., and *Dilophus femoratus* Meigen were prepared by Mrs. Phyllis Habeck, University of Hawaii; we are very appreciative of this valuable assistance. The illustrations of the remaining species have been prepared by the junior author.

The manuscript has been written by the senior author and the latter accepts full responsibility for any errors which might occur in this paper.

Thirty-six species of Bibionidae are now known from Japan. These belong in five genera and three subfamilies. Twenty-seven species are described as new in this paper.

The specimens were collected by the following: A. Aoki, P. H. Arnaud, D. C. Blodgett, E. Fujita, D. T. Fullaway, N. Fukuhara, J. L. Gressitt, M. Hamada, H. Hasegawa, I. Hattori, K. Hidaka, M. Hirai, E. Hoshida, J. F. Illingworth, F. Isitani, S. Ito, K. Iwamoto,

## Distribution of Japanese Bibionidae and seasonal occurrence of the adults.

	Hokkaido	Honshu	Shikoku	Kyushu	Ryukyu & Amami	Other Localities	Seasonal Occurrence
1. <i>Hesperinus cuspidistylus</i> *	×						June
2. <i>H. nigratus</i> Okada	×	×				Kurile Islands	June-July
3. <i>Plecia adiastrata</i> *	×	×		×			May-July
4. <i>P. hadrosoma</i> *		×					April-May
5. <i>P. membranifera</i> *				×			May
6. <i>P. nagatomii</i> *		×					July
7. <i>P. okadai</i> *	×			×			May-June
8. <i>Penthetria japonica</i> Wied.	×	×	×	×		Throughout the Orient	March-June
9. <i>P. motschulskii</i> (Gimmerthal)						Sakhalin, N. China & Siberia	Sept.
10. <i>P. velutina</i> Loew		×		×			June-Oct.
11. <i>Bibio adjunctus</i> *	×	×					June-July
12. <i>B. ainoi</i> *	×						June
13. <i>B. amputonervis</i> *		×	×	×			April-May
14. <i>B. aneuretus</i> *	×	×	×	×			March-June
15. <i>B. deceptus</i> *	×	×		×	+		May-June
16. <i>B. flavihalter</i> *		×		×			Oct.-Nov.
17. <i>B. gracilipalpus</i> *	×	×		×			Oct.-Dec.
18. <i>B. holomaurus</i> *		×	×	×	×		Apr.-May
19. <i>B. japonicus</i> Motsch.	×	×	×	×	×		March-June
20. <i>B. matsumurai</i> Okada	×	×					May-July
21. <i>B. medianus</i> *	×			×	+		June
22. <i>B. metaclavipes</i> *		×					Nov.
23. <i>B. montanus</i> *		×					Sept.
24. <i>B. nigriclavipes</i> *		×					Apr.-June
25. <i>B. obuncus</i> *					×		March
26. <i>B. omani</i> *		×					April-May
27. <i>B. pomonae iwasugensis</i> Ouchi	×	×					Aug.-Sept.
28. <i>B. pseudoclavipes</i> Okada		×		×			March-May
29. <i>B. ryukyuensis</i> *					×		Jan.-March
30. <i>B. simulans</i> *		×		×			Apr.-May
31. <i>B. singularis</i> *	×						June
32. <i>B. tenebrosus</i> Coq.		×	×	×	×		April-May
33. <i>Dilophus aquilonia</i> *	×						June
34. <i>D. brevirostrum</i> *		×					April
35. <i>D. fulviventris</i> *	×		×				June-July
36. <i>D. kagoshimaensis</i> Okada				×			April

+ Determination in doubt

\* Described as new

K. Iwata, S. Kato, K. Koba, N. Kumazawa, R. Matsuda, K. Matsushima, M. Miki, J. Minamikawa, Y. Miyatake, T. Miyazaki, K. Morimoto, A. Nagatomi, M. Nakahara, I. Okada, T. Okazaki, P. W. Oman, M. Pitman, T. Saigusa, T. Shiraki, M. Takahashi, T. Takei, K. Takeuchi, T. Tanaka, J. C. Thompson, M. Tokunaga, C. Tsutsumi, and H. Yuasa.

The types and paratypes are deposited in the following institutions, as indicated by these abbreviations in the text:

- BISHOP—Bishop Museum, Honolulu.  
 BM—British Museum (Natural History), London.  
 HYOGO—Hyogo University of Agriculture, Sasayama, Hyogo, Japan.  
 KU—Kyushu University, Fukuoka.  
 METROP.—Tokyo Metropolitan University, Tokyo.  
 NIAS—National Institute of Agricultural Sciences, Nishigahara, Tokyo.  
 SAIKYO—Saikyo University, Shimogamo, Kyoto.  
 UH—University of Hawaii, Honolulu.  
 USNM—United States National Museum, Washington, D. C.  
 ZMB—Zoologische Museum der Humboldt Universität, Berlin.

#### KEY TO SUBFAMILIES AND GENERA

1. Radial sector furcate (fig. 2, b). Legs simple ..... 2  
 Radial sector unbranched (fig. 12, d). Anterior tibia with large apical spurs (fig. 12, b) or with two or more sets of spines (fig. 33, a).—*Bibioninae* ..... 4
2. Antennae robust (fig. 5, a), third segment not elongated. Eyes of male joined on the front.—*Pleciinae* ..... 3  
 Antennae very elongate (fig. 1, a), third segment as long or longer than the combined lengths of the next two segments. Eyes of male widely separated on the front. Male genitalia as in fig. 1, b.—*Hesperininae* ..... **Hesperinus**
3. Vein  $R_{2+3}$  short, oblique or vertical in position (fig. 5, c) ..... **Plecia**  
 Vein  $R_{2+3}$  elongate, almost horizontal in position (fig. 2, b)..... **Penthetria**
4. Front tibia with two or more sets of spines (figs. 33, a, 34, a)..... **Dilophus**  
 Front tibia produced at apex into a pair of spurs (figs. 10, b, 12, b)..... **Biblio**

#### Genus *Hesperinus* Walker

*Hesperinus* Walker, 1848, List Spec. Dipt. Ins. Brit. Mus. 1: 81.

*Spodius* Loew, 1858, Berl. Ent. Zeits. 2: 101.

We consider this as a primitive *Bibionidae* related to the genera *Plecia* and *Penthetria* but readily differentiated by the very elongate antennae (fig. 1, a).

Many authorities have treated this under a separate family, *Hesperinidae*, but we see no justification for removing this genus from the *Bibionidae*. There is, however, one striking difference and it probably does give justification for treating this as a distinct subfamily even though just one genus is included: the eyes of the male are dichoptic, widely separated on the front by a distance equal to more than the width of one eye.

The long slender antennae are very characteristic in the ♂, they extend the length of

the head, thorax, and about the first three abdominal segments; in the ♀ they are distinctly longer than the head and thorax combined. The first flagellar segment is nearly  $2\times$  longer than the head in the ♂ and distinctly longer than the head in the ♀, the other segments of the flagellum are  $3-5\times$  longer than wide in the ♂ and distinctly longer than wide in the ♀.

Type of the genus: *Hesperinus breviprons* Walker.

Two species are known from Japan. They are readily differentiated by the characteristics of the male genitalia as show in figs. 1, b and 1, d.

***Hesperinus cuspidistylus* Hardy and Takahashi, n. sp.** Figs. 1, b-c.

This species is readily differentiated from *H. nigratus* Okada by the details of the ♂ genitalia (figs. 1, b, 1, d). The claspers are more slender and each is attenuated to a moderately strong tooth-like point at the apex (fig. 1, b). Also sternum 9 has a broad median cleft on the hind margin and posterior margin of tergum 9 is straight or nearly so (fig. 1, b).

*Male*: Predominantly dark-colored species. *Head*: Eyes very sparsely pilose. Front-

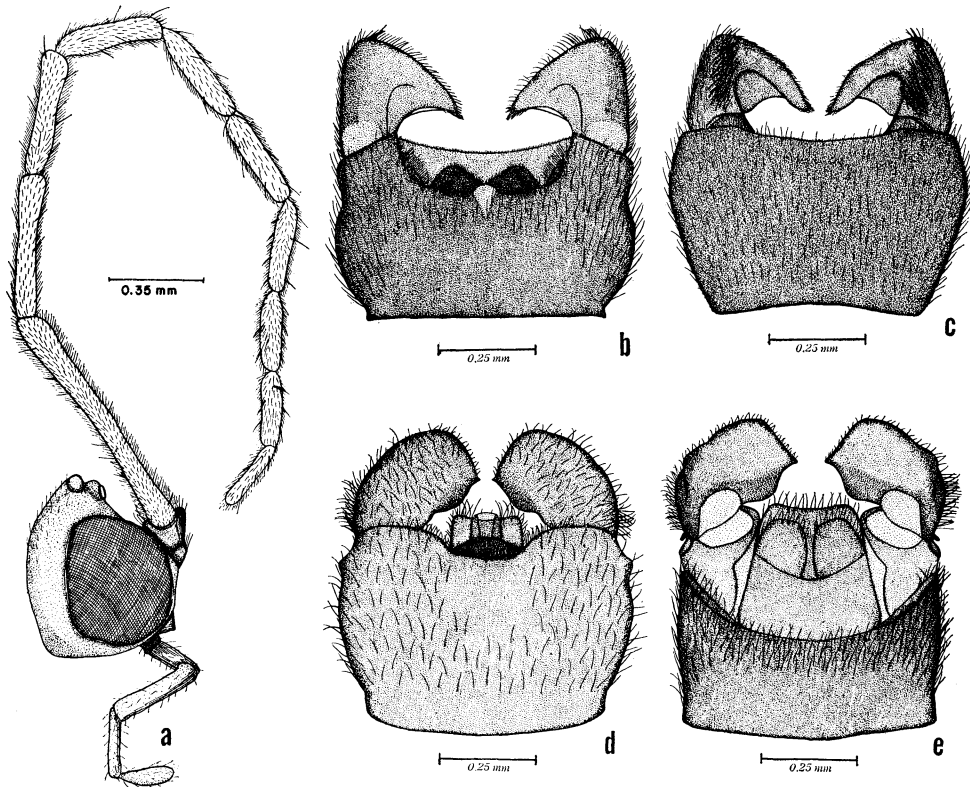


Fig. 1. a, *Hesperinus breviprons* Walker, head; b, *H. cuspidistylus* n. sp., ♂ genitalia, ventral view; c, *ibid.*, dorsal view; d, *H. nigratus* Okada, ♂ genitalia, ventral view; e, *ibid.*, dorsal view.

vertex, occiput, and face subopaque black, rather densely gray pollinose and sparsely setose. Base of flagellar segment 1 yellow. Scape and pedicel dark brown, tinged with yellow. Antenna otherwise black, densely covered with short yellow-gray pile. Flagellar segment 1 is  $4\times$  longer than scape and pedicel combined and nearly  $2\times$  longer than flagellar segment 2. Palpi yellow, tinged lightly with brown. Segments 2 and 3 each  $3\times$  longer than wide. *Thorax* predominantly brown to black, humeral ridges yellow and ground color distinctly tinged with yellow on hind portions of mesonotum, bases of scutellum, over metanotum, and onto sides of metapleura. Mesonotum predominantly dark gray, and depressed area in front of scutellum gray-white; 3 narrow vittae extend from depressed area anteriorly almost to humeri. Median line rather indistinct but lateral lines extend through dorsocentral areas and further accentuated by presence of short yellow setae. Halteres predominantly yellow. Knobs yellow-brown. *Legs* yellow, tinged with brown at apices of femora and tibiae and over tarsi. Nothing distinctive about proportions of leg segments; fore and hind basitarsi approximately  $2/5$  as long as tibiae. *Wings* subhyaline, faintly infuscated with yellow-brown; venation typical for all *Hesperinus* studied, no distinctive differences. Upper portion of base of vein  $M_{3+4}$  paler in color and slightly weaker than remainder of vein. The drawing of wing of *H. nigratus* published by Okada (1934: 25) would serve also for *cuspidistylus*, except that his drawing indicates brown fumosity in anterior portion of wing and along some of veins; this is not present. *Abdomen* dark brown to black, rather densely gray-brown pollinose and covered with short yellow pile. Abdomen nearly  $2\times$  longer than head and thorax combined. Sternum 9 about  $2/3$  wider than long and has a broad concavity in middle of hind margin extending about  $1/3$  length of segment. Claspers broadly arched dorsally, concave on ventral margin and each terminates in a stout, yellow tooth which arises on dorsal side of apex. Claspers densely black setose on basal  $1/2$  of dorsal surface (fig. 1, c). Tergum 9 about  $2/3$  wider than long and hind margin very gently concave, almost straight (fig. 1, b).

Holotype ♂ (KU) and one paratype (UH), Aizankei, Daisetsu National Park, Hokkaido, 26 June 1957 (Takahashi). Female unknown.

***Hesperinus nigratus* Okada** Figs. 1, d-e.

*Hesperinus nigratus* Okada, 1934, Ins. Matsumurana 9 (1-2): 24.

Okada allied this to *H. brevifrons* Walker but said that it differed by having the body entirely black or brownish black, by lacking vittae ("Strieme") on mesonotum, and by having the base of vein  $M_{3+4}$  (m-cu crossvein of Okada) incomplete ("Die obere Hälfte der m-cu Querader fast unmerkbar"). In his 1938 study, p. 200, he added that *nigratus* could also be differentiated by the long, slender second segment of the palpus. We find the above diagnosis of no value whatsoever. The body of *brevifrons* is typically brown to black. The vittae on the mesonotum, formed by the presence of pale pubescence and pollen extending down the dorsocentral lines, are just slightly less distinct in specimens of *nigratus* which we have studied than they are in *brevifrons*. The base of vein  $M_{3+4}$  is not incomplete or lacking in *nigratus*, although when viewed in direct light the upper portion of the basal section is pale in color and is slightly weakened but it is also this way in *brevifrons*. We see no differences at all in the palpi of these two species. The species differ strikingly, however, in the development of the ♂ genitalia, refer to the figures of *brevifrons* in Hardy (1945: 523, figs. 121, c-e). *H. nigratus* is related to *cuspidistylus* n. sp. and is dis-

tinguished by the short thick claspers, lacking setae on the dorsal surfaces, by having just a slight concavity on hind margin of sternum 9 and a moderately deep concavity on hind margin of tergum 9 (fig. 1, e). The other details of sternum 9 and tergum 9 are quite different in the two species (figs. 1, d and 1, b).

Except for the details of genitalia we see no need for a further description of this species. The long slender legs, antennae, palpi, and the coloration of the body and appendages seem to be of no diagnostic value in separating these species. Sternum 9 about 1/3 wider than long and has a very shallow concavity on posterior median margin (fig. 1, d). Claspers scarcely longer than wide, each terminates in a short blunt point on inner margin and rather thickly covered with short setae on ventral surface (fig. 1, d). Tergum 9 has a broad U-shaped concavity extending at least 2/3 length of segment. Cerci and anal region are very conspicuous from a dorsal view, they extend well beyond margin of tergum 9 (fig. 1, e). Length: Body 6–7 mm; wings 8. Okada measured the body as 8–10 mm, the specimens which the senior author has [studied measured just slightly over 6 mm.

Type locality: Sapporo, Hokkaido. Type in the University of Hokkaido collection.

Okada (1938: 199) has recorded it from Uriu, and Sounkyo, Hokkaido; and (1936: 102) from Shakotan, S. Kurile Is. One specimen (KU), Yachi-Onsen, Aomori Pref., Honshu, 4 July 1957 (Takahashi).

#### Genus *Penthetria* Meigen

*Penthetria* Meigen, 1803, Illiger's Mag. 2: 264.

*Threneste* Wiedemann, 1830, Aussereurop. Zweifl. Ins. 2: 618 (refer to Edwards, 1928: 683).

*Eupeitenus* Macquart, 1838, Dipt. Exot. Nouv. ou peu Connus 1: 85.

*Crapitula* Gimmerthal, 1845, Soc. Imp. Nat. Moscou, Bul. 18: 330.

*Pleciomyia* Brunetti, 1911, Ind. Mus., Rec. 4: 269.

*Parapleciomyia* Brunetti, 1912, Ind. Mus., Rec. 7: 446.

The members of this genus are similar to *Plecia* because of the simple legs and the furcate radial sector. *Penthetria* is differentiated by having vein  $R_{2+3}$  elongate and extending parallel to vein  $R_{4+5}$  (fig. 2, b). Also the ♂ genitalia are quite different in *Penthetria*, the claspers are lateral in position and are large and conspicuous (fig. 2, c).

Only one species (*Penthetria japonica* Wiedemann — as *P. melanaspis* Wiedemann) has been previously recorded from Japan proper. Okada in his monograph (1938) included *Penthetria motschulskii* (Gimmerthal) and *P. takeuchii* Okada. The former occurs in Northern China and Siberia, and his records were from Sakhalin which now belongs to the USSR; it is possible, however, that this species might occur on Hokkaido and we are including a discussion of it below. *P. takeuchii* is a Formosan species and will not be included in this paper. We are adding a second species *Penthetria velutina* Loew which has previously been treated as a *Plecia*.

Type of the genus: *Penthetria holosericea* Meigen.

#### KEY TO THE SPECIES OF PENTHETRIA

1. At least hind portion of mesonotum bright orange to rufous; hind basitarsi of ♂

- slightly swollen, 3-3.5× longer than wide (fig. 2, a)..... 2  
 Thorax entirely opaque black; hind tarsi slender, metatarsi of ♂ 4-5× longer than wide (fig. 4, a); ♂ genitalia as in fig. 4, e. Honshu and Kyushu..... **velutina**
2. Vein  $M_1$  joined directly to r-m crossvein and not joined with  $M_2$  beyond crossvein (fig. 2, b); ♂ genitalia as in fig. 2, d. Widespread throughout the orient, known from Japan, China and India ..... **japonica**
- Vein  $M_1$  not joined with r-m,  $M_{1+2}$  extending beyond the crossvein (fig. 3, c); ♂ genitalia as in fig. 3, b. Known from Northern China, Siberia and Sakhalin ...  
 ..... **motschulskii**

**Penthetria japonica** Wiedemann      Figs. 2, a-d.

*Penthetria japonica* Wiedemann, 1830, Aussereurop. Zweifl. Ins. 2: 618.

*Plecia ignicollis* Walker, 1848, List Dipt. Ins. Brit. Mus. 1: 116.

Okada (1930: 203) treated this as a synonym of *P. melanaspis* Wiedemann. Brunetti (1912: 161) and others, placed *P. japonica* Wied. as well as *Crapitula motschulskii* Gimmerthal, as synonyms of *melanaspis*. Ouchi (1940: 290) says *japonica* is probably distinct from *melanaspis*, yet he lists it as a synonym. Okada also listed it as a synonym in his 1938 b paper (p. 42). Edwards (1928: 682) indicated that he believed these were all dis-

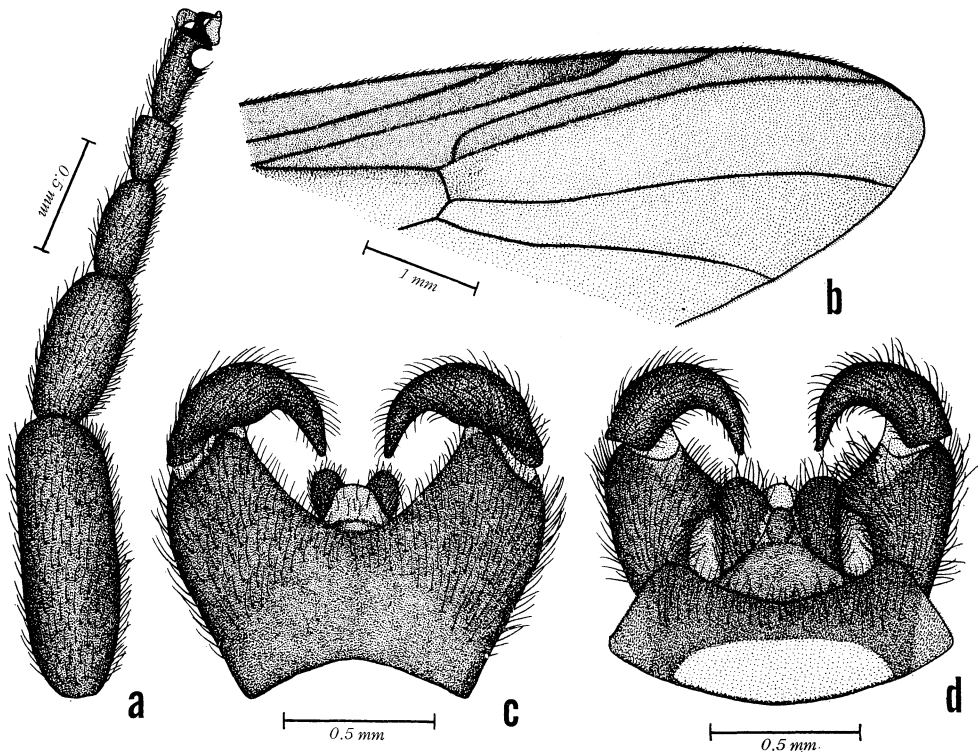


Fig. 2. *Penthetria japonica* Wiedemann: a, hind tarsus of ♂; b, wing of ♂; c, ♂ genitalia, ventral view; d, ♂ genitalia, dorsal view.



tinct species and he gave characters for separation of *japonica* from *motschulskii* and *melanaspis*. Duda (1930: 2) gave characteristics for separating these 3 species but we find that his characters for distinguishing *melanaspis* from *japonica* are not reliable. We see no significant differences in the legs of these. The only satisfactory characters which we have found for separating *melanaspis* from *japonica* are in the ♂ genitalia. In *melanaspis* the claspers are slender, straight sided and each is tapered to a sharp point at apices (fig. 3, a), in *japonica* claspers are curved downward and more blunt at apices (figs. 2, c-2, d).

Anterior portion of mesonotum velvety black, posterior portion orange to rufous; typically the black marking extends down the median portion to about the halfway point. In some specimens it may extend almost entire length of mesonotum. Antenna 12-segmented, last segment nearly 2 × longer than wide and probably made up of 2 fused segments. A distinct hole or pit is present in middle of face directly beneath antenna; this is smaller, however, than in *velutina*. Hind tibiae moderately swollen apically, slightly larger than femora. Tarsal segments also slightly swollen, basitarsi 3-3.5 × longer than wide (fig. 2, a). Wings evenly yellow-brown, darker along the anterior margin. Cell  $M_1$  broadly sessile. Vein  $R_{2+3}$  elongate and originates just beyond r-m crossvein (fig. 2, b). Tergum 9 about 2 × wider than long, hind margin very gently concave (fig. 2, d). Sternum 9 has a deep U-shaped cleft on hind margin extending 1/2 length of segment. Claspers are rather short and broad, about 2 × longer than wide, curved downward, and ending in a short point at lower apex (fig. 2, c).

The ♀ fits the description of the ♂ in most details. Anterior median portion of front is tuberculate and a rather broad raised area extends down the middle of front to ocelli. In the specimens at hand posterior 2/3 of mesonotum orange. Hind tibiae and tarsi more slender than in ♂, and the pit-like depression directly beneath the antennae is more shallow and not so enlarged. Length of ♂: Body and wings 9-10 mm. Body of ♀ 10-10.7 mm; wings of ♀ 7-12.

Type locality; "Japan". Location of type: ZMB.

The senior author has seen specimens of this species from a wide range of localities throughout Japan, China, India, and Formosa. The localities in Japan are as follows: Sapporo, Sept. 1910 (Thompson); Hokkaido, Oct. 1923 (Illingworth); Towada, Aomori Pref., May 1959 (Okada); Tokyo, 3 May 1931 (Gressitt); Tachikawa, May 1930 (Gressitt); Omogawa, Iwashiro, 12 Sept. 1946 (Kurosawa); Utiura, Izu, Sept. 1938 (Yuasa); Waka-sugiyama, Chikuzen, 16 May 1934 (Hori, Nomura & Fujino); Iki-jima, 1 Oct. 1910 (Thompson); and Kagoshima, 16 Apr. 1910 (Thompson) and 20 Apr. 1958 (Saigusa).

*Penthetria motschulskii* (Gimmerthal) Figs. 3, b-c.

*Crapitula motschulskii* Gimmerthal, 1845, Soc. Imp. Nat. Moscou, Bul. 18: 330.

This species rather closely resembles *P. japonica* in body coloration and in most other respects. It is readily differentiated by the differences in the wing venation, the ♂ genitalia, the antennae, and the more slender legs. The apical segment of the antenna is about as wide as long. Veins  $M_{1+2}$  is joined for a short distance beyond the r-m crossvein so that cell  $M_1$  is petiolate (fig. 3, c). The hind basitarsus is 4 × longer than wide. The ♂ genital characters differ as shown in figs. 2, d and 3, b. In *motschulskii* tergum 9 is very short compared to its width (fig. 3, b), sternum 9 has a comparatively shallow median

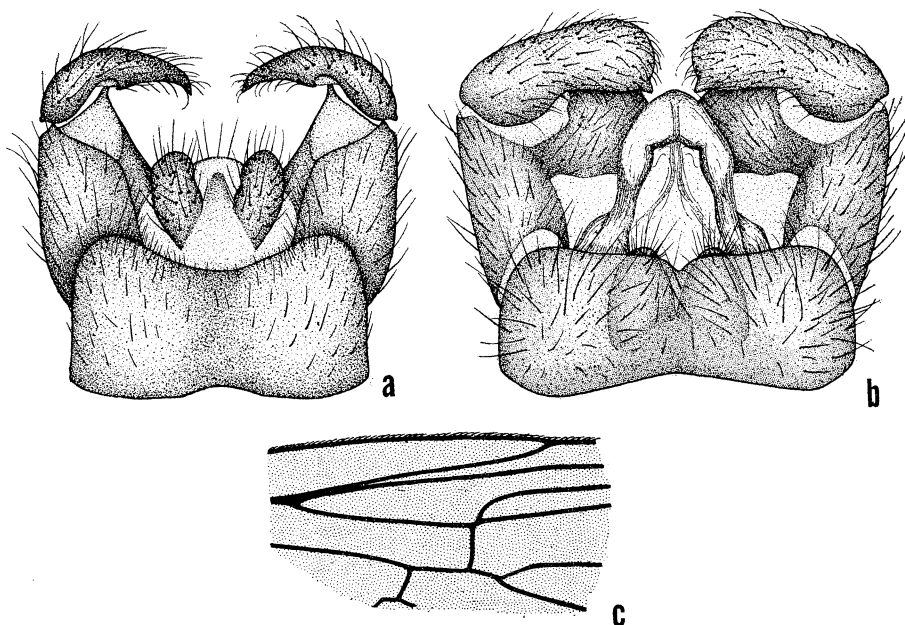


Fig. 3. a, *Penthetria melanaspis* Wiedemann, ♂ genitalia, dorsal view; b, *P. motschulskii* Gimmerthal, ♂ genitalia, dorsal view; c, *ibid.*, middle section of wing.

concavity and the claspers are distinctively shaped with a short, sharp point at their lower apices. Length, ♂: Body 6.5–7.3 mm; wings 7–7.7. ♀: Body 9–9.5 mm; wings 10–10.7.

Type locality: Eastern Siberia. The type should have been in the Gimmerthal collection at the Zoological Mus., Riga. Dr. A. Stackelberg at the Zoological Institute, Leningrad, has informed the senior author that the type is not present in Gimmerthal's collection. It probably has been lost.

This species has been recorded from N. China (Mongolia and Manchuria), Siberia, and Sakhalin. There is a good likelihood that it might occur on Hokkaido.

***Penthetria velutina* Loew** Figs. 4, a–e.

*Penthetria velutina* Loew, 1838, Wien. Ent. Monatschr. 2: 102.

This species has been confused in the literature and has been treated as a *Plecia*. Refer to discussion under *Plecia adiastrata* n. sp.

An opaque black species, rather closely related to *P. formosanus* Hardy. It is differentiated by the following characteristics: Antenna of ♂ 11-segmented (fig. 4, a), not 12; vein  $R_{2+3}$  nearly straight and  $2/3$  as long as  $R_{4+5}$  (fig. 4, b), rather than being undulated and about  $1/2$  as long as  $R_{4+5}$  (Hardy 1953: 104, fig. 10, a); sternum 9 of ♂ with a mound-like median gibbosity and claspers blunt at apices (fig. 4, d), not with a rather deep cleft and with claspers sharp pointed at apices (Hardy 1953: 104, fig. 10, c); and tergum 9 with a small convexity in middle of hind margin (fig. 4, e), not gently concave along the entire hind margin (Hardy loc cit. fig. 10, b).

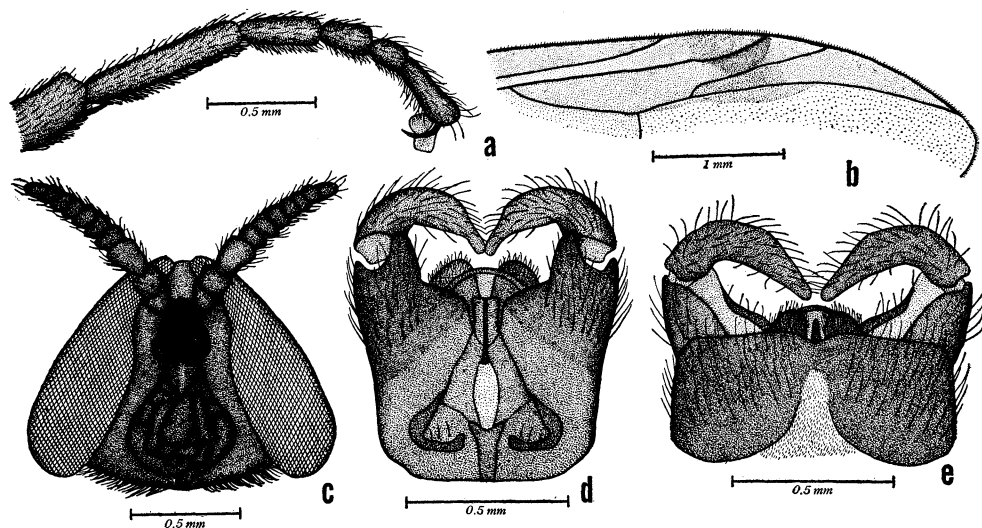


Fig. 4. *Penthetria velutina* Loew: a, hind tarsus and tip of tibia of ♂; b, anteroapical portion of ♂ wing; c, head of ♂, from beneath; d, ♂ genitalia, ventral view; e, ♂ genitalia, dorsal view.

*Male*: Apical 2/3 of pedicel and basal portion of flagellar segment 1 yellow; remainder of antenna dark brown to black. Flagellum made up of 9 distinct segments although apical 2 rather closely joined. Face with a large round pit, or deeply depressed area, in middle, immediately below antennae and above clypeus (fig. 4, c); this appears like a large hole in middle of face, it is much more developed than in any species of *Penthetria* previously studied. Palpi well developed, last 3 segments 3–4× longer than wide. *Thorax* predominantly opaque black, brown on sides of mesonotum, on lower 1/2 and hind portions of pleura and over metanotum. Mesonotum very sparsely pilose and faintly gray pollinose. Mesonotal furrows distinctly developed. Humeral ridges and ridges to sides of scutellum yellow, tinged with brown. Halteres dark brown to black with a tinge of yellow on their stems. *Legs* dark brown to black, tinged with red especially in ground color of femora; segments slender. Hind femora and tibiae just slightly enlarged at apices and basitarsi about 5× longer than wide (fig. 4, a). All tibiae and tarsi have short, erect hairs scattered along main surfaces. *Wings* evenly infuscated with yellow-brown, darker along anterior margin; stigma large and dark brown. Anteroapical portion of wing as in fig. 4, b. Costa ends slightly beyond apex of vein  $R_{4+5}$ . Section of vein  $M_{1+2}$  beyond r-m crossvein about equal in length to section of radial sector from r-m crossvein to fork. *Abdomen* with lateral margins of terga tinged slightly with yellow. Tergum 9 nearly 2× wider than long, posterior margin with a small concavity in median portion; on anterior 1/2 of sclerite, tergum membranous in median portion (fig. 4, e). Sternum 9 about as wide as long, with a semi-membranous development in middle of hind margin. Claspers large and conspicuous, strongly curved inward, and blunt at apices (fig. 4, d). Length: Body 6.5–7 mm; wings 7.3–8.

*Female*: Fitting description of ♂ in most respects. Antenna 12-segmented. Hole in middle of face smaller and not so deep as in ♂. Anterior median portion of front deve-

loped into a strong tubercle which is equal in height to ocellar triangle. Median portion of front flat. Eyes round; portion of head behind eyes about 4/5 as long as one eye. Length: Body 8.5 mm; wings 9.5.

Type locality: "Japan". Type in ZMB. The senior author has studied the type.

We have examined specimens from Tamba, Sasayama, Mt. Kogane, Honshu, 17 June 1954 (Nagatomi); Beppu, Kyushu, 21 June 1952 (Oman); Myokenzan, Tajima Prov. (Yabu-gun, Hyogo Pref.) 8 July 1952 (Nagatomi); Kamikochi, Nagano Pref., July 1949 (Kato & Hattori); Hakusan, Kanagawa Pref., Sept. 1949 (Fukuhara); Tokusawa, Japan Alps, Aug. 1955 (Fukuhara); Shimashimadani, Nagano Pref., Aug. 1955 (Hasegawa); Yokô, Japan Alps, Aug. 1955 (Fukuhara); Tazima, Fukusimaken, June 1954 (Tokunaga); Mt. Ôtaki, Japan Alps, Aug. 1955 (Hattori); Kamikôchi, Japan Alps, Aug. 1955 (Hasegawa); Tokugô Pass, Nagano Pref., Aug. 1955 (Hasegawa); Jinmuji, Kanagawa Pref., Oct. 1950 (Hattori); Nagano Pref., Sept. 1953 (Hasegawa); Mt. Takao, Tokyo, Sept. 1951 (Kato); Hyuga-shi, Miyazaki Pref., 1956 (Miyazaki); Osumi, Sata, June 1952 (Hasegawa); Nakanoyu, July 1937 (Yuasa); Takao-san, Tokyo, Sept. 1949 (Kato); Hakusan, Fukui Pref., Sept. 1949 (Fukuhara); and Mt. Chôgatake, Japan Alps, Aug. 1955 (Hattori).

### Genus *Plecia* Wiedemann

*Plecia* Wiedemann, 1828, Aussereurop. Zweifl. Ins. 1: 72.

Members of this genus are differentiated from other bibionids by the simple front legs, and by the short, almost vertical, vein  $R_{2+3}$ .

Only one Japanese species has been previously recorded; but this was under the incorrect name *Plecia velutina* (Loew). Four additional new species are present in the collections at hand.

Type of the genus: *Hirtea fulvicollis* Fabricius.

#### KEY TO KNOWN SPECIES OF *PLECIA* FROM JAPAN

1. Mesonotal furrows distinct; antenna with 9 segments in ♂ and 9 or 11 segments in ♀; vein  $R_{2+3}$  straight (fig. 2, c) ..... 2
- Mesonotal furrows indistinct; antenna with 11 segments in ♂ and 12 segments in ♀ or 11 segmented in both sexes; vein  $R_{2+3}$  curved (fig. 5, c) ..... 3
2. Mesonotum entirely opaque black; larger species, body 5.35–6.3 mm; wings, 5.7–7.0 mm; antenna of ♀ 11 segmented; tergum 9 of ♂ with a deep 'U' shaped concavity on hind margin, the sclerite largely membranous (fig. 7, a) ..... **membranifera**
- Hind portion of mesonotum brownish red; small species, body, 3.4–4.5 mm; wings, 3.8–5.0 mm; antenna 9 segmented in both sexes; tergum 9 of ♂ with a conspicuous projection in middle of the hind margin (fig. 8, d)..... **nagatomii**
3. Body and legs of normal thickness, moderately slender; hind basitarsus about 1/3 as long as tibia and abdomen not distinctly broader than thorax in ♂ and equal to slightly broader in ♀; abdomen at least 1.5 × longer than head and thorax combined; sternum 9 of ♂ with a pair of well developed submedian lobes (fig. 5, e); claspers as in figs. 5, f and 8, d, not strongly bent at right angles

- on apical portions..... 4
- Body and legs robust; hind basitarsus about 1/5 as long as tibia and abdomen very broad, much wider than thorax in both sexes and scarcely longer than head and thorax combined; sternum 9 lacking submedian lobes and each clasper is bent at a right angle on apical 1/2 (fig. 6, d); antenna 11 segmented in both sexes..... **hadrosoma**
4. Antenna 10 or 11 segmented in ♂ and 12 segmented in ♀; tergum 9 of ♂ 1.8× wider than long, hind margin slightly convex with a small 'V' shaped concavity in middle (fig. 5, g); sternum 9 just slightly wider than long, claspers slender (fig. 5, f) ..... **adiastola**
- Antenna 10 segmented in both sexes; tergum 9 3× wider than long (length measured through mid-line), with a broadly 'V' shaped concavity on hind margin and posterior lateral margins produced (fig. 9, b); sternum 9 about 2× wider than long (not counting submedian lobes), and claspers rather short (fig. 9, d) ..... **okadai**

**Plecia adiaastola** Hardy and Takahashi, n. sp. Figs. 5, a-g.

*Plecia velutina* Okada, 1938, Fac. Agric. Hokkaido Imp. Univ., Jour. 42 (2): 201, [in part]; and 1938, Tenthredo 2: 41. An erroneous combination for *Penthetria velutina* Loew, 1858, Wien. Ent. Monatschr. 2: 102.

Duda (1930: 12, 17-18) thought that *Penthetria velutina* Loew probably belonged in the genus *Plecia*. He treated the description of *velutina* under *Penthetria* (p. 17) although he did not include it in the key to the species of *Penthetria* but did include it in the key to the species of *Plecia* (p. 10). Okada, and others, have assumed that *velutina* Loew belongs in the genus *Plecia*. This is not correct, the senior author has examined Loew's type, in the Zoologisches Museum der Humboldt Universität zu Berlin, and found that it is a *Penthetria*. *Plecia velutina* Okada is a species without a type and the name *velutina* is preoccupied in the *Plecia* by *P. velutina* Macquart, 1846, Dipt. Exot., Suppl. 1: 21. It is necessary that the Japanese species be described as new.

Okada (1938: 201) treated *Plecia nigra* Lundström (1916: 457) as a synonym of *P. velutina*. This synonymy is not correct, *P. nigra* was described from Amur, and specimens which the senior author has studied from China which seemed to fit Lundström's species are strikingly different from *adiaastola*. These are both part of a complex of a dozen or so oriental species which look superficially alike because they are entirely dark colored; the characteristics of the ♂ genitalia, however, are very different.

*Male*: Entirely dark, opaque brown to black species. *Head* about 1.5× wider than long as seen in direct dorsal view. Antenna with 11 distinct segments (fig. 5, a). Mouthparts not produced; labella extend scarcely beyond the margins of clypeus; palpi moderately long and slender, about equal in length to antennae. *Thorax* entirely opaque, dull black on mesonotum, with a faint gray pubescence. Sides of mesonotum tinged with brown and a pair of narrow, submedian, velvety black vittae extend down dorsocentral lines. No distinct mesonotal furrows present. Humeral ridges and pleura tinged with brown in ground color. Knobs of halteres brown to black; stems brown, tinged with yellow. *Legs* entirely dark brown to black, we see no features which appear to be distinctive. *Wings* evenly

infuscated smoky brown; venation similar to that of most other *Plecia*, however, it differs rather distinctly from *nagatomii* n. sp. by having 2 sections of radial sector (before and after r-m crossvein) about equal in length and by having vein  $R_{2+3}$  distinctly curved (fig. 5, d). Tergum 9 nearly  $2 \times$  wider than long and posterior margin has a small V-shaped cleft in middle (fig. 5, g). A small point also developed from each side of posterior margin; this projects backwards into genital chamber. Sternum 9 has a pair of moderately developed, densely pilose, submedian lobes and a large median, semimembranous gibbosity (fig. 5, e). Claspers simple, strongly curved inward and sharp pointed (beak-like) at apices (fig. 5, f). Length: Body 5.5–7.3 mm; wings 6–8.

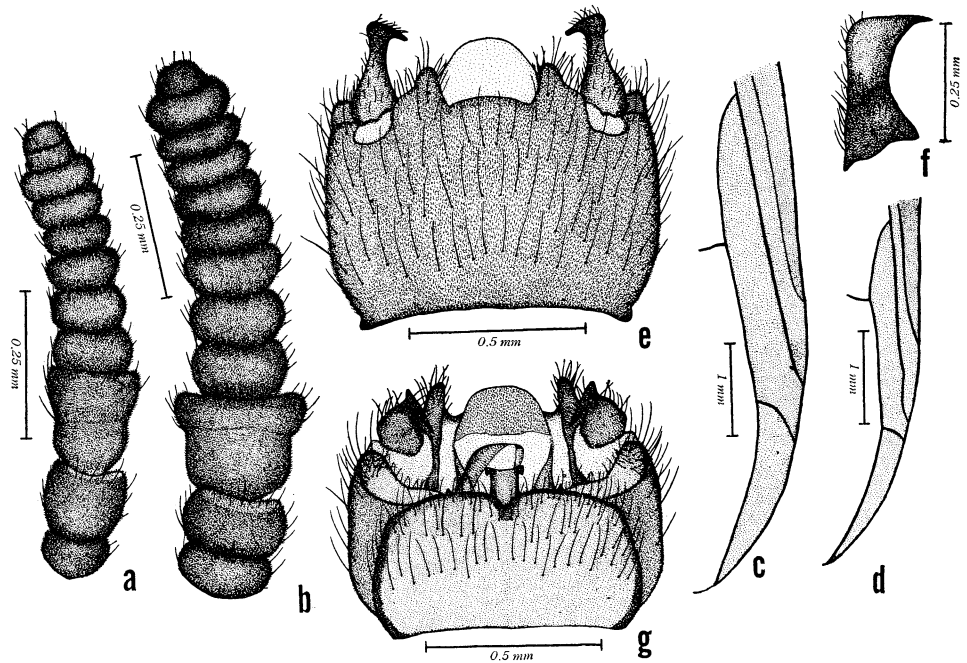


Fig. 5. *Plecia adiantola* n. sp.: a, antenna of ♂; b, antenna of ♀; c, anteroapical portion of ♂ wing; d, anteroapical portion of ♀ wing; e, ♂ genitalia, ventral view; f, clasper; g, ♂ genitalia, dorsal view.

*Female*: Similar to ♂ in most respects. Head about  $1.3 \times$  wider than long. Front has a moderately strong median carina on anterior portion and ocelli situated on a well developed prominence. Antenna 12 segmented (fig. 5, b). Anterior portion of wing as in fig. 5, c. Length: Body 6.5–7 mm; wings 7.5–8.6.

Holotype ♂ (KU) and allotype ♀ (KU), Sapporo City, Hokkaido, 1 July 1958 (Takahashi); 34 paratypes (KU, NIAS, USNM, BM, BISHOP, UH, HYOGO, METROP.), 12 ♂ and 22 ♀ from following localities: same data as type; same locality as type, 23 June–2 July 1951 (Hattori & Kato); Tamba, Sasayama, Honshu, June 1957 (Nagatomi); Korasan (Chikuzen), Kyushu, May 1930 (Esaki, Hori, Takeya, Yoshimoto, Fujino, Yasumatsu and Choh); Obonai, Akita Pref., 12 June 1949 (Kato); Usubetsu, Hokkaido, 1

July 1958 (Okada); Horonobe, Hokkaido, 11 July 1958 (Kato); and Arakai, Fukushima Pref., 24 June 1954 (Kato).

This species is probably widespread and fairly common throughout Japan during the spring months from May through July. Okada (1938: 202) recorded it as *velutina* on the islands of Hokkaido, Honshu, Shikoku, and Kyushu but his concept obviously included two or more species. He also recorded it from Korea but we are unable to confirm this latter distribution.

Following specimens recorded by Okada (1938: 202) belong to *adiastola*: 1 ♂, Sapporo, 27 June 1912 (Matsumura); 1 ♀, Sapporo, 28 June 1918 (Matsumura); 1 ♂, Sapporo, 21 July 1931 (Okada); 1 ♀, Sapporo, 5 July 1931 (Okada); and 3 ♂ and 2 ♀, Uriu, 4 July 1953 (Okada).

***Plecia hadrosoma* Hardy and Takahashi, n. sp.** Figs. 6, a-d.

*Plecia velutina* Okada, 1938, Fac. Agric. Hokkaido Imp. Univ., Jour. 42 (2): 201 [in Part]; and 1938, Tenthredo 2: 41. An erroneous combination for *Penthetria velutina* Loew, 1858, Wien. Ent. Monatschr. 2: 102.

Readily differentiated from all other known *Plecia* by very robust body and legs. Abdomen scarcely longer than head and thorax combined and broader than thorax. Middle and hind tarsi very short; basitarsus about 1/5 as long as tibia. Male genitalia also very different from those of other Japanese species as shown in figs. 6, b, 6, c, and 6, d.

*Male*: Entirely opaque black species. *Head* 1/3 wider than long; upper portion of

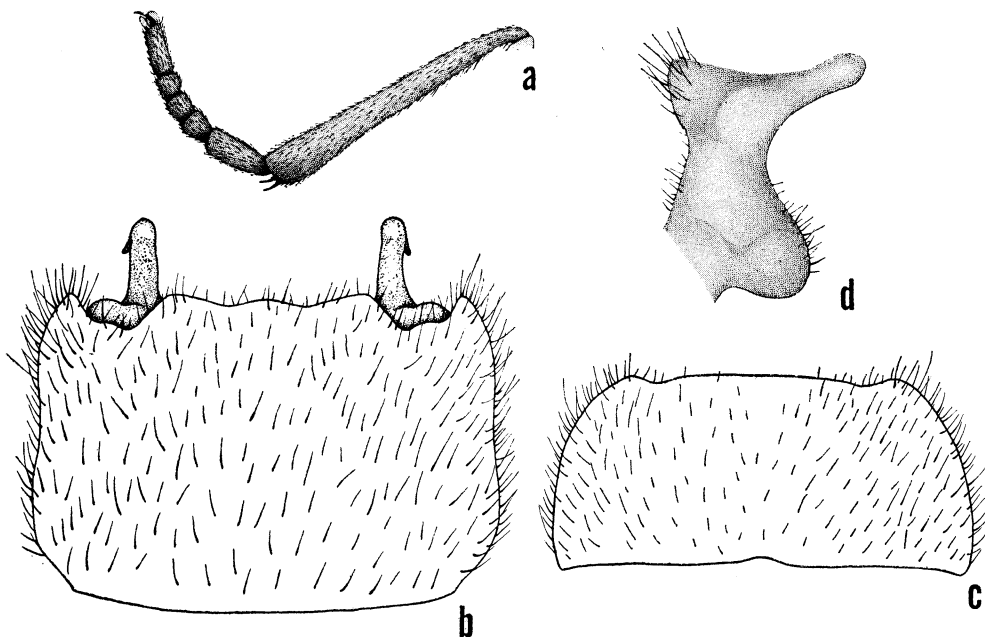


Fig. 6. *Plecia hadrosoma* n. sp.: a, hind tibia and tarsus; b, ♂ genitalia, ventral view; c, tergum 9 of ♂; d, clasper, lateral view.

each compound eye almost circular. Antenna entirely black, of 11 distinct segments. Rostrum not all produced. Last segment of palpus  $3 \times$  longer than wide; penultimate and antepenultimate segments each approximately  $2 \times$  longer than wide. *Thorax* entirely opaque, faintly gray-brown pollinose. Furrows very indistinct. Upper anterior portion of each sternopleuron thickly covered with short, dark colored pile. Halteres have black knobs and yellow-brown stems. *Legs* dark reddish brown, tinged with black. Segments short and rather thick. Femora slightly clavate; tibiae straight sided. Front basitarsus about  $1/3$  as long as tibia. Middle basitarsus about  $1/4$  as long as tibia and hind basitarsus about  $1/5$  as long as tibia (fig 6, a). *Wings* entirely infuscated with yellow-brown, darker on anterior portion. Vein  $R_{2+3}$  curved, and arises near the half-way point between apex of vein  $R_{4+5}$  and r-m crossvein. *Abdomen* dark brown to black, densely gray-brown pollinose, very short and robust, scarcely longer than thorax and abdomen combined. Tergum 9 nearly  $3 \times$  wider than long and hind margin straight or nearly so (fig. 6, c). Sternum 9 about  $2/3$  wider than long (fig. 6, b). Posterior median margin nearly straight, posterior lateral margins lobate. Claspers very strongly bent upward at right angles at their apices (fig. 6, d). Length: Body 6.4-7.4 mm; wings 8-9.

*Female*: Fitting description of ♂ in most respects, differing only in details of head and genitalia. Head about  $1/4$  wider than long. Front not noticeably carinate, and about  $1.5 \times$  wider than one eye. Length: Body 8.4-9.2 mm; wings 10.3-11.

Holotype ♂ (NIAS) and allotype ♀ (NIAS), Osima Farm, Mitumata, Maebashi, 13 May 1940 (N. Kumazawa). 33 paratypes (USNM, BISHOP, BM, UH, 20 in NIAS), 16 ♂ and 17 ♀, from the following localities: Same as type; Nagano Pref., 13 May 1955 (Yazawa); Seta Norin, Maebashi, 24 Apr. 1940 (Kumazawa); Shimoina, Nagano Pref., reared from root of bamboo, 13 May 1955 (Yazawa); Numata, Gunma Pref., 20 May 1949 (Takai); and Nakano, Tokyo, 6 May (no year given—Kumazawa).

Following specimens recorded by Okada (1938: 202) belong to *hadrosoma*: 1 ♂, Wakayama, no date given (Sakaguchi); 1 ♂ and 2 ♀, Kochi, 4 May 1935 (Okada).

***Plecia membranifera* Hardy and Takahashi, n. sp.      Figs. 7, a-b.**

This species differs strikingly from any other known *Plecia* because of the distinctive characters of the ♂ genitalia as shown in figs. 7, a and 7, b. In comparing with other Japanese species it would fit closest to *P. nagatomii* n. sp. but the two species are not related. *P. membranifera* is readily differentiated by its entirely opaque black mesonotum, by having 11 segments in the antenna of ♀, by its larger size, by the predominantly membranous tergum 9 of ♂ (fig. 7, a), and by the other genital characters as shown in fig 7, b.

*Male*: Entirely opaque black species. *Head*: Antennae black, except for narrow yellow apex of each pedicel and base of first flagellar segment. Rostrum not developed and does not protrude beyond oral margin. Last 2 segments of palpi approximately  $2 \times$  longer than wide, antepenultimate segment about  $3 \times$  longer than wide. Ocellar triangle prominent. *Thorax* opaque brown to black, gray pollinose on sides. Mesonotal furrows prominent. Halteres black. *Legs* entirely black, covered with black hairs. We see no distinctive features in leg characters. Front and hind basitarsi approximately  $1/3$  as long as tibiae. *Wings* rather evenly colored, gray-brown to smoky black. Costa extends about  $1/2$  distance between apices of veins  $R_{4+5}$  and  $M_1$ . Stigma concolorous with wing membrane.



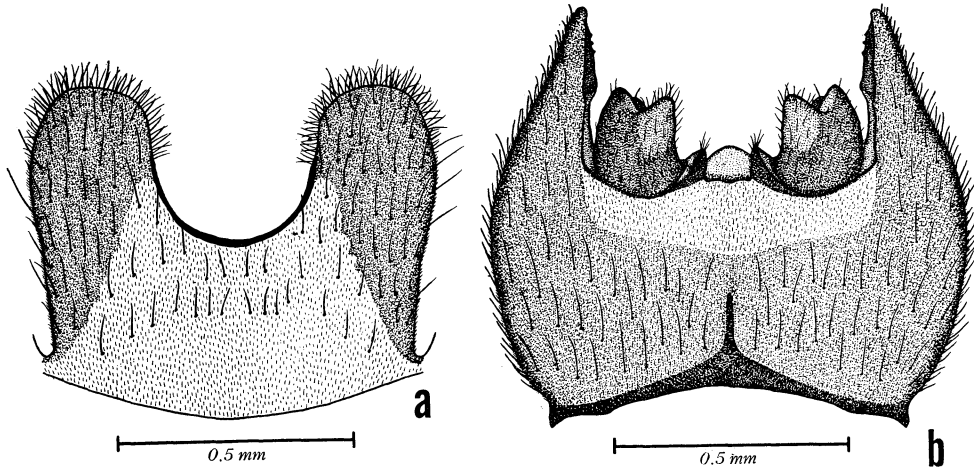


Fig. 7. *Plecia membranifera* n. sp.: a, tergum 9 of ♂; b, ♂ genitalia, ventral view.

Fork of radial sector situated about  $2/5$  distance between r-m crossvein and apex of vein  $R_{4+5}$ . Vein  $R_{2+3}$  straight and forms about a  $75^\circ$  angle with vein  $R_{4+5}$ . Abdomen entirely opaque black, rather densely brown pubescent and covered with short, black hairs. Tergum 9 has a deep U-shaped concavity on posterior margin. This extends  $1/2$  length of segment; sclerite largely membranous or semi-membranous as in fig. 7, a. Posterior lateral margins of sternum 9 rather strongly produced into sharp pointed lobes which are  $2 \times$  longer than claspers; a pair of short submedian lobes present on hind margin, one inside each clasper (fig. 7, b). Length: Body 5.4 mm; wings 6.5.

*Female*: Fitting description of ♂ except for sexual characters, and except that antenna 11 segmented. Head, as seen in direct dorsal view just slightly wider than long, a moderate carina extends down median portion of front. Front and occiput predominantly gray pubescent. Length: Body 6.3 mm; wings 7.

Holotype ♂ (KU), allotype ♀ (KU), and 7 paratypes (USNM, UH), 4 ♂ and 3 ♀, from Cape Sata, Kyushu, Kagoshima Pref., 2-5 May 1958 (Morimoto).

***Plecia nagatomii* Hardy and Takahashi n. sp. Figs. 8, a-f.**

Superficially, this species resembles *P. adistola* n. sp. and it has probably been confused with that species (as *P. velutina* (Loew)) in the past. The two are not related, however, and are readily separated by differences in wing venation (figs. 5, d and 8, c) and in ♂ genitalia (figs. 5, g and 8, d) as well as by other characteristics as pointed out in the key above.

*Male*: A small, dark colored species. Head about  $1/3$  wider than long as seen in direct dorsal view. Ocellar tubercle is prominent. Antenna brown to black, tinged with yellow, of 9 distinct segments; apical portion obviously consists of 2, closely fused, segments (fig. 8, a). Mouthparts not produced and inconspicuous and hidden beneath the head. Palpi normal in length. Thorax typically opaque black on anterior  $1/2$  of mesono-

tum and over most of pleura and brown, tinged with red, on posterior 1/2 of mesonotum. In some specimens the reddish tinge covers most of mesonotum and pleura are sometimes tinged with rufous in ground color. Mesonotal furrows very distinctly developed, these extend almost full length of sclerite. Halteres brown to black, tinged with yellow on stems. *Legs* entirely brown to black, rather thickly haired. Tibiae and tarsi of all legs with erect hairs scattered over the 4 main surfaces and standing out from the recumbent vestiture, as viewed in reflected light (fig. 8, b). These erect hairs also present on *adiast. la* n. sp. but shorter, less conspicuous. Legs slender, basitarsi not swollen; hind basitarsus about 1/5 longer than the combined length of next 2 tarsal segments and just slightly less than 1/3 as long as tibia. *Wings* pale brownish to gray infuscated; stigma pale brown and just

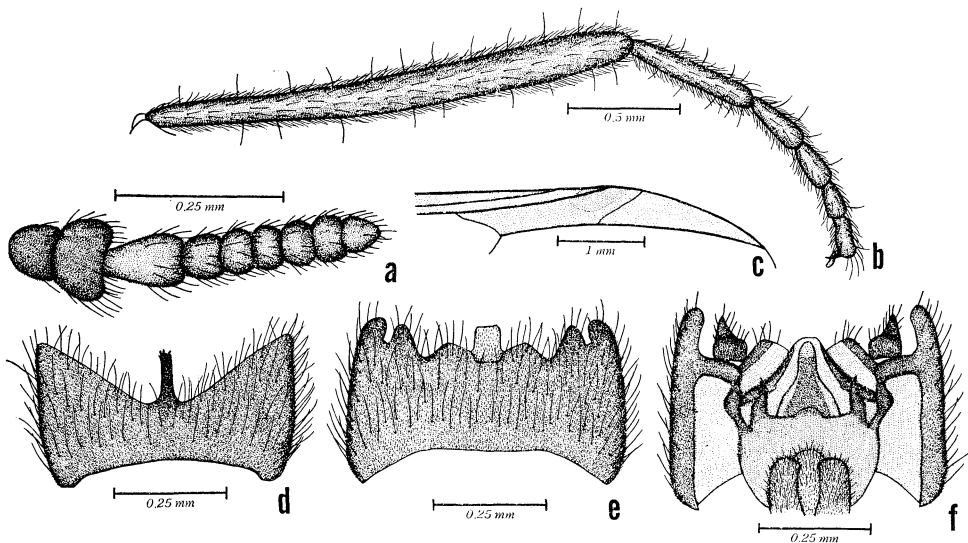


Fig. 8. *Plecia nagatomii* n. sp.: a, antenna of ♂; b, front tibia and tarsus of ♂; c, antero-apical portion of ♂ wing; d, tergum 9 of ♂; e, sternum 9 of ♂; f, ♂ genitalia, internal structure.

slightly darker than wing membrane. Vein  $R_{2+3}$  almost straight, oblique in position and forms about a  $50^\circ$  angle with vein  $R_{4+5}$ . Second section of radial sector 2/3 to 3/4 longer than first section (fig. 8, c). *Abdomen* predominantly subshining black in ground color, tinged with brown at bases of segments. Vestiture black, subshining ground color somewhat obscured by a dense covering of gray pubescence. Tergum 9 of ♂ nearly 2× wider than long, rather strongly concave on posterior margin and has a strong median projection which is minutely tuberculate at apex (fig. 8, d). Sternum 9 is 2× wider than long, has moderately developed lateral lobes and a pair of blunt submedian lobes on posterior margin in addition to a semi-membranous, gibbose, median development (fig. 8, e). Claspers small, rather poorly developed, from a direct ventral view rather sharp pointed and extend to about apices of lateral lobes of sternum (fig. 8, f). Internal structures of genitalia are developed as in fig. 8, f. Length: Body 3.4–3.9 mm; wings 3.8–4.3.

*Female*: Fitting description of ♂ in most respects. Antenna also has just 9 distinct segments. Median portion of front flat, no distinct carina present. Ocelli not situated on a strong tubercle. Eyes oval in shape; front between eyes slightly greater in width than one eye, and section of head behind eyes about 2/3 as long as one eye. Hind portion of mesonotum more distinctly rufous than in ♂ and vein  $R_{2+3}$  slightly longer. Length: Body 4.5 mm; wings 5.

Holotype ♂ (KU), allotype ♀ (KU), and 16 paratypes (KU, HYOGO, USNM, BM, BISHOP, UH), 1 ♀ and 15 ♂, from Tamba, Sasayama, Honshu, July 1954 and July 1957 (Nagatomi).

Type, allotype, and 2 paratypes presented to Kyushu University, Fukuoka, by Akira Nagatomi.

It is a pleasure to name this species after Akira Nagatomi, who has made such outstanding contributions to our knowledge of the Diptera of Japan.

***Plecia okadai* Hardy and Takahashi, n. sp.** Figs. 9, a-d.

*P. okadai* very closely resembles *adiastola* but is differentiated by having 10 segments in the antennae of both sexes and by the genital characters of ♂. Tergum 9 is much broader, and has a wide V-shaped concavity on the hind margin (fig. 9, b). Sternum 9 is also broader and the claspers have a much shorter point at their apices as in fig. 9, c.

*Male*: Entirely opaque dark brown to black species. *Head*: From a direct dorsal view head  $1.6 \times$  wider than long. Each compound eye almost circular. Antenna dark brown; flagellum has 8 clearly defined segments (fig. 9, a). Palpi rather slender, last segment approximately  $4 \times$  longer than wide. Ocelli situated on a strong protuberance.

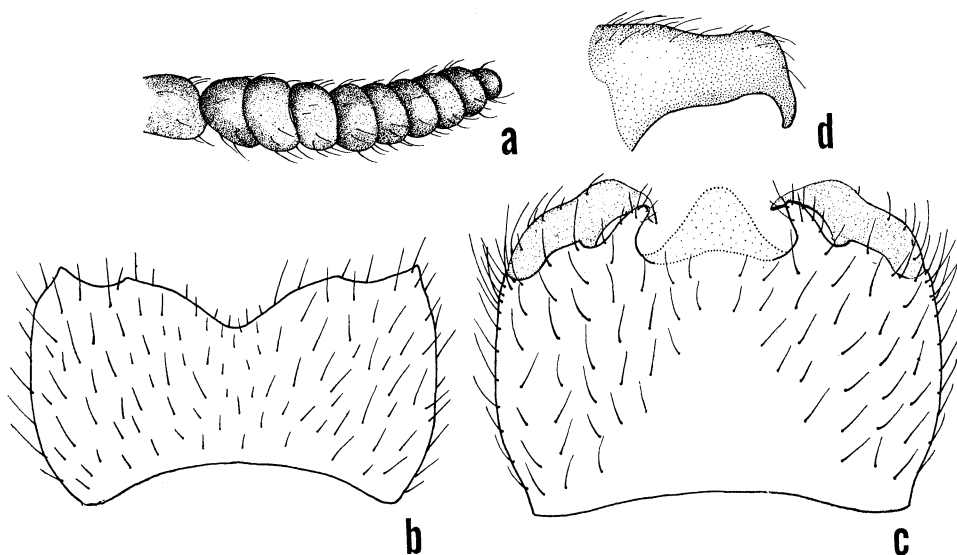


Fig. 9. *Plecia okadai* n. sp.: a, antenna of ♂; b, tergum 9 of ♂; c, ♂ genitalia, ventral view; d, clasper.

*Thorax* dark brown to black in ground color, faintly gray pollinose and with 3 faint, dark brown to black vittae extending down median portion. Upper 1/2 of each sternopleuron rather thickly covered with short, dark colored pile. Knobs of halteres brown. Stems yellow, tinged with brown. Mesonotal furrows not developed. *Legs* dark reddish brown in ground color, tinged with black. Front basitarsus about 2/5 as long as tibia. Hind basitarsus approximately 1/3 as long as tibia. *Wings* faintly infuscated yellow-brown, darker along anterior portion. Stigma just slightly darker than surrounding membrane. Vein  $R_{2+3}$  distinctly curved, situated just beyond middle of portion from r-m crossvein to wing apex, vein  $R_{4+5}$  about equal in length to that portion of radial sector from r-m crossvein to fork. Costal vein extends slightly beyond apex of vein  $R_{4+5}$ . *Abdomen* about equal in width to thorax, entirely dark brown to black in ground color, rather densely gray-brown pollinose and sparsely black pilose. Tergum 9 distinctly broader than long, when the length measured down middle line width would be 3 × greater; hind margin of tergum has a broadly U-shaped concavity (fig. 9, b). Sternum 9 nearly 2 × wider than long, has a pair of small submedian lobes and a rather broad mound-like gibbosity in middle of hind margin (fig. 9, c). Claspers rather small and each terminates in a sharp point at apex (fig. 9, d). Length: Body 6–6.75 mm; wings 6.75–7.75.

*Female*: Fitting description of ♂ except for sexual differences. Very similar to *adistola* but differing by having only 10 segments in antenna. Head nearly 2 × wider than long as seen from direct dorsal view. Front broad, twice as wide as one eye. Median portion of front gently carinate. Abdomen slightly broader than thorax. Length: Body 6 mm; wings 8.

Holotype ♂ (NIAS) and allotype ♀ (NIAS), Hokkaido, 2 July 1951 (Hattori and Kato); 6 paratypes (KU, USNM, BISHOP, UH, 2 in NIAS), all ♂, from the following localities: Same as type; Korasan (Chikuzen), Kyushu, 11 May 1930 (Esaki, Hori, Takeya, Hashimoto, Fujino, Yasumatsu, and Choh).

#### Genus *Bibio* Geoffroy

*Bibio* Geoffroy, 1764, Hist. Nat. des Ins. 2: 571.

*Pullata* Harris, 1776, Expos. Eng. Ins., 76.

*Hirtea* Fabricius, 1798, Ent. Syst., Suppl., 551 (*nec* Scopoli, 1763).

*Bibiophus* Bollow, 1954, Zeits. für Pflanzenbau und Pflanzenschutz 5 (5): 209 and 211.

#### New synonymy.

*Bibiophus* was described as a new subgenus of *Bibio* differentiated by having 6 segments in the palpi and by having the costa extended beyond the apex of the radial sector. The larval stage of *Bibiophus* is differentiated by having the mandible 3 pointed and the labium with a median development. The subgenus is monotypic, based upon *Bibio clavipes* Meigen, and we suspect that the above characters may be of not more than specific importance. Certainly the extension of the costa beyond the apex of  $R_s$  is not a significant character, and we have not made a thorough enough study of the segmentation of the palpi or of the larval characters to know how important these might be. We are treating *Bibiophus* as a synonym.

This genus is characterized by the development of strong apical spurs on the front tibiae (fig. 10, b). The radial sector is simple, the basal section is equal or longer than

the r-m crossvein. *Bibio* are rather conspicuously hairy flies, the antennae are short, the segments are thick and closely compressed.

This is the predominant genus in the temperate regions of the world, and comprises the great bulk of the Japanese Bibionidae.

Type of genus: *Tipula hortulana* Linnaeus.

#### KEY TO KNOWN SPECIES OF BIBIO FROM JAPAN

1. Spurs of front tibia sharp pointed ..... 2  
Outer spur of front tibia rounded, blunt at apex (best seen from lateral view)  
(fig. 31, b). Large, subopaque black species in both sexes..... **tenebrosus**
- 2 (1). Crossvein r-m at least 1/2 as long as basal section of radial sector, usually  
equal or longer than base of Rs ..... 3  
Crossvein r-m very short, about 1/4 as long as basal section of radial sector  
(fig. 18, d). Wings infuscated gray-brown, dark brown along anterior margin.  
Body of ♂ entirely black, mesonotum and abdomen of ♀ rufous. Legs  
entirely black in both sexes..... **japonicus**
- 3 (2). Inner spur of front tibia elongate, approximately as long as outer spur (figs.  
12, b and 13, a) ..... 4  
Inner spur distinctly shorter than outer (figs. 10, b, 11, a, and 15, b) ..... 29
- 4 (3). Wings hyaline or faintly tinged with yellow or yellow-brown, if anterior margin  
is pale brownish costal cell and basal cells hyaline ..... 6  
Anterior portion of wings dark brown, including costal cell and also basal  
cells in ♀ ..... 5
- 5 (4). Body of ♀ entirely black. Median veins complete. Inner spur of front tibia  
distinctly subequal to outer (only ♀ known, some specimens may run here)  
..... **singularis**  
Mesonotum of ♀ rufous. Veins M<sub>2</sub> and M<sub>3+4</sub> evanesce before reaching wing  
margin. Inner spur just slightly shorter than outer ..... **matsumurai**
- 6 (4). Males ..... 7  
Females ..... 18
- 7 (6). Hind basitarsi swollen, nearly equal in width to apex of tibia (fig. 14, b).  
Claspers bilobed, with a dense basal clump of long black hairs (fig. 14, d)  
..... 8  
Hind basitarsi rather slender (figs. 10, c and 12, c). Claspers simple (figs. 10,  
d and 12, g) ..... 11
- 8 (7). Legs predominantly yellow to rufous. Cardo stipites short, so bases of palpi  
situated before or directly below bases of antennae..... 10  
Legs polished black, except for narrow yellow bases of tibiae and base of  
hind femur. Rostrum prominent and cardo stipites produced beyond bases  
of antennae ..... 9
- 9 (8). Apical segment of palpus 1.35× longer than wide. Hind basitarsus 4× longer  
than wide. Claspers with a strong basal lobe as in fig. 14, d ..... **deceptus**  
Apical segment of palpus 3 × longer than wide. Hind basitarsus 3 × longer  
than wide. No distinct basal lobe on clasper (fig. 23, b) ..... **nigriclavipes**

- 10 (8). Halteres black. Last segment of palpus 1.5–2 × longer than wide. Posterior margin of wing with a narrow area free of microtrichia (fig. 27, c). Hind basitarsus as in fig. 27, b and genitalia as in fig. 27, e ..... **pseudoclavipes**  
 Halteres yellow. Last segments of palpus 5–6 × longer than wide. Posterior margin of wing lacking an area free of microtrichia. Hind basitarsus as in fig. 21, d and genitalia as in fig. 21, b..... **metaclavipes**
- 11 (7). Legs conspicuously marked with yellow, at least on middle tibiae. Cardio stipites not produced beyond bases of antennae. Body and legs usually yellow pilose ..... 12  
 Legs shining black. Body and legs densely black pilose. Cardio stipites strongly developed, extending beyond bases of antennae and plainly visible from a lateral view. Veins  $M_2$  and  $M_{3+4}$  incomplete. Last segment of palpus not over 1/2 longer than wide ..... **holomaurus**
- 12 (11). Veins  $M_2$  and  $M_{3+4}$  extend to or very near wing margin (fig. 18, d). Posterior veins hyaline, concolorous with wing membrane ..... 13  
 Veins  $M_2$  and  $M_{3+4}$  incomplete, ending distinctly before wing margin (fig. 12, d). Posterior veins yellow to yellow-brown ..... 16
- 13 (12). Tergum 9 with a V- or U-shaped cleft in middle of hind margin, posterior lateral margins of tergum broadly rounded at apices (fig. 10, d)..... 14  
 Tergum 9 with a deep cleft on hind margin which is expanded basally and narrowed apically (by inwardly curved inner edges of posterolateral lobes of tergum—this is readily visible in situ); posterolateral lobes truncate at apices (fig. 13, d) ..... 15
- 14 (13). Legs predominantly black, only middle, front, and narrow bases of hind tibiae rufous. Hind basitarsus over 4 × longer than wide, straight sided (fig. 29, a) ..... **simulans**  
 Tibiae and tarsi yellow. Hind basitarsi swollen, about 3 × longer than wide (fig. 20, c) ..... **medianus**
- 15 (13). Femora black, except for narrow bases of hind pair. Inner spur of hind tibia 1/3 as long as basitarsus. Hind legs as in fig. 13, c; base of tibia rather strongly attenuated ..... **aneuretus**  
 Femora yellow. Inner spur of hind tibia about 1/2 as long as basitarsus. Hind legs as in fig. 25, b; tibiae evenly tapered..... **omani**
- 16 (12). Antennae strongly clavate (fig. 12, a). Costa extending slightly beyond apex of  $R_s$  and base of  $R_s$  shorter than r-m crossvein (fig. 12, d). Last segment of palpus about as wide as long ..... **amputonervis**  
 Antennae not clavate, straight sided. Costa ending at apex of  $R_s$  and base of  $R_s$  equal or slightly longer than r-m crossvein. Last segment of palpus distinctly longer than wide, usually 2 × longer than wide ..... 17
- 17 (16). Smaller species, body and wings about 5 mm in length. Sclerotized portion of head beyond eyes short, about equal in length to pedicel of antenna. Tergum 9 with a narrow V-shaped cleft on hind margin. Claspers bent at right angles apically (fig. 28, d)..... **ryukyuensis**  
 Larger species, body and wings 7.5–7.75 mm. Sclerotized portion of face equal in length to scape plus pedicel or to the first 2 segments of flagellum. Tergum 9 with a broad V-shaped cleft. Claspers more gently bent (fig. 24, c)

- ..... **obuncus**
- 18 (6). Thorax entirely yellow to rufous ..... 19  
 Thorax at least predominantly black or with broad brown to black vittae down  
 mesonotum ..... 22
- 19 (18). Head scarcely longer than wide. Cardo stipites not produced, scarcely visible  
 from a lateral view; bases of palpi situated slightly before or just below  
 bases of antennae ..... 21  
 Head elongate, nearly 2× longer than wide. Cardo stipites strongly develop-  
 ed, bases of palpi situated well beyond bases of antennae (fig. 24, a) ..... 20
- 20 (19). Larger species, wings about 9.5 mm in length. Sclerotized portion of head  
 beyond eyes nearly 1/2 as long as eye and 2/3 as long as portion of head  
 behind eyes..... **obuncus**  
 Smaller species, wings about 7 mm. Sclerotized portion beyond eye about 1/3  
 as long as eye and less than 1/2 as long as portion of head behind eyes...  
 ..... **ryukyensis**
- 21 (19). Tibiae and tarsi dark brown to black..... **simulans**  
 Tibiae and tarsi predominantly rufous (notation: it may not be possible to  
 differentiate ♀ of 2 species in this couplet) ..... **omani**
- 22 (18). Veins M<sub>2</sub> and M<sub>3+4</sub> extend to or very near wing margin. Posterior veins usual-  
 ly concolorous with membrane ..... 23  
 Veins M<sub>2</sub> and M<sub>3+4</sub> end distinctly before the margin (fig. 12, d). Posterior  
 veins yellow to yellow-brown ..... 27
- 23 (22). Anterior veins brown, posterior veins yellow-brown. Wings distinctly infus-  
 cated yellow-brown. Front femora lacking ventral spines..... 24  
 Anterior veins yellow, posterior veins colorless. Wings faintly yellow. Front  
 femora with anteroventral spines (fig. 13, b)..... **aneuretus**
- 24 (23). Legs conspicuously marked with yellow. Head not narrowed behind..... 25  
 Legs entirely black. Head narrowed behind ..... **nigriclavipes**
- 25 (24). Coxae and halteres black. Head short, scarcely longer than wide. Wings  
 lacking brown markings on crossveins, base of Rs, and on base of M<sub>3+4</sub>..... 26  
 Coxae and halteres yellow. Head nearly 2 × longer than wide (fig. 14, e).  
 Wings marked with brown at bases of Rs, M<sub>3+4</sub>, and on crossveins ..... **deceptus**
- 26 (25). Inner spur of front tibia nearly as long as outer (fig. 27, a). Front densely  
 black setose, entirely opaque to subshining, with a faint longitudinal furrow  
 on anterior median portion ..... **pseudoclavipes**  
 Inner spur 2/3 to 3/4 as long as outer (see also couplet 14). Front sparsely  
 yellow setose, lower median portion smooth, polished, lacking a furrow  
 ..... **medianus**
- 27 (22). Thorax entirely rufous, except for 3 black vittae down mesonotum ... **ryukyensis**  
 Not as above. Thorax predominantly black ..... 28
- 28 (27). All femora rufous. Head short, about as wide as long. Antenna strongly  
 clavate (fig. 12, a). Mesonotum black, pleura brown. Small species, wings  
 5.5 mm in length ..... **amputonervis**  
 Femora brown to black, tinged with red. Head nearly 2× longer than wide.  
 Antennae not as above. Mesonotum narrowly yellow around margins, pleura  
 largely yellow. Larger species, wings 7.6 mm..... **holomaurus**

- 29 (3). Base of radial sector about  $2 \times$  longer than r-m crossvein. Femora rufous, remainder of legs black. Inner spur of front tibia about  $1/2$  as long as outer. Wings evenly infuscated with pale brown. Large species, wings 8.75–10.7 mm in length..... **pomonae iwasingensis**  
 Base of radial sector equal to or slightly shorter than r-m crossvein. Legs not colored as above. Wings brown fumose only in *singularis*. Smaller species ..... 30
- 30 (29). Wings evenly dark brown, including costal cells and wing base. Inner spur of front tibia about  $2/3$  as long as outer (fig. 30, a). Entirely black species. Last segment of palpus short,  $2 \times$  longer than wide (only ♀ known) ..... **singularis**  
 Wings usually hyaline or subhyaline, never entirely brown. If posterior margin is yellow-brown costal cells and wing base are pale, not brown. Inner spur usually less than  $1/2$  as long as outer, except in *medianus*. If wings infuscated legs of ♀ brownish red..... 31
- 31 (30). Males ..... 32  
 Females ..... 37
- 32 (31). Hind basitarsus slender, straight sided, over  $4 \times$  longer than wide (fig. 10, c) ..... 33  
 Hind basitarsus distinctly swollen, about  $3 \times$  longer than wide (figs. 15, c and 16, b). Basitarsus nearly equal in width to apex of tibia (fig. 15, c)..... 34
- 33 (32). Veins  $M_2$  and  $M_{3+4}$  incomplete, not reaching wing margin. Last segment of palpus  $4-5 \times$  longer than wide ..... **adjunctus**  
 Veins  $M_2$  and  $M_{3+4}$  extending to margin. Last segment of palpus  $2.5-3 \times$  longer than wide..... **ainoi**
- 34 (32). Knobs of halteres brown to black. Pile of thorax black. Femora entirely black ..... 35  
 Halteres yellow. Legs almost entirely rufous. Pile of thorax chiefly yellow ..... **flavihalter**
- 35 (34). Middle and hind tibiae rufous. Last segment of palpus  $2-2.5 \times$  longer than wide. Hind legs less slender, as in fig. 20, c..... 36  
 Legs entirely polished black. Last segment of palpus  $5-6 \times$  longer than wide. Hind legs long and slender, as in fig. 16, b..... **gracilipalpus**
- 36 (35). Inner spur of front tibia rather elongate,  $2/3-3/4$  as long as outer (fig. 20, b). Wings hyaline, posterior veins colorless. Vein  $M_2$  extending to wing margin ..... **medianus**  
 Inner spur about  $1/4$  as long as outer (fig. 22, b). Wings tinged with yellow-brown. Anterior margin and posterior veins brownish yellow. Vein  $M_2$  abbreviated, ending well before margin ..... **montanus**
- 37 (31). Palpi long and slender, last segment equal in length to first 4-5 segments of flagellum of antenna ..... 38  
 Palpi moderate in length, last segment about equal in length to first 2 flagellar segments ..... 40
- 38 (37). Thorax with broad black vittae on mesonotum or entirely black. Halteres brown to black on knobs ..... 39  
 Thorax rufous. Halteres yellow ..... **flavihalter**



- 39 (38). Veins  $M_2$  and  $M_{3+4}$  ending well before wing margin. Hind femora attenuated only at bases ..... **adjunctus**  
 Veins  $M_2$  and  $M_{3+4}$  extending to wing margin. Basal 1/2 of hind femur attenuated ..... **gracilipalpus**
- 40 (37). Inner spur of front tibia over 1/2 as long as outer. Vein  $M_2$  complete ..... 41  
 Inner spur small, about 1/4 as long as outer. Vein  $M_2$  ending before wing margin ( $\varnothing$  not described but will probably run here) ..... **montanus**
- 41 (40). Tibiae and tarsi yellow. Inner spur of front tibia 2/3-3/4 as long as outer...  
 ..... **medianus**  
 Tibia and tarsus black or at least tinged with black. Inner spur slightly over 1/3 as long as outer ..... **ainoi**

**Bibio adjunctus** Hardy and Takahashi, n. sp.      Figs. 10, a-d.

This species is similar to *B. aioni* n. sp. in many respects. It is differentiated by the elongate palpi (fig. 10, a), by the shorter antennae, by having veins  $M_2$  and  $M_{3+4}$  incomplete, and by having the anterior margin of the wing infuscated with brown.

*Male*: Predominantly shining black species. *Head* about 1/4 wider than long as seen in direct dorsal view. Face densely black pilose. Eyes thickly covered with short black hairs. Antennae contain only 8 distinct segments, apex of flagellum obviously made up of 3 closely fused segments, so antenna actually should contain 9 segments. Cardio stipites not produced, scarcely visible in lateral view. Bases of palpi situated before bases of antennae. Palpi rather long and slender, last segment at least 7× longer than wide and almost equal in length to flagellum of antenna. Penultimate segment about 4× longer than wide and antepenultimate segment about 3× longer than wide (fig. 10, a). *Thorax* entirely shining black except for yellow humeri and entirely black pilose. Halteres black, except for bases which are yellow, tinged with brown. *Legs* dark brown to black, tinged with red in ground color of tibiae and femora. Inner spur of front tibia about 1/2 as long as outer (fig. 10, b). Hind tibia moderately swollen, slightly thicker than femur. Hind basitarsus not thickened, each about 4× longer than wide and approximately 1/3 as long as tibia (fig. 10, c). *Wings*: Anterior portion lightly infuscated with brown, posterior portion subhyaline, faintly infuscated. Stigma and anterior veins dark brown. Posterior veins pale yellow, tinged faintly with brown. Veins  $M_2$  and  $M_{3+4}$  end well before wing margin and a narrow band free of microchaetae is present around wing margin. Costa ends at or near apex of radial sector. The r-m crossvein about equal in length to basal section of Rs. *Abdomen* shining black in ground color, rather densely gray-brown pollinose on dorsum and entirely black pilose. Sternum 9 about 1/3 wider than long and cleft on hind margin extends about 1/4 length of segment. Claspers slender and gently curved downward. Tergum 9 about 2/3 wider than long and has a deep U-shaped concavity on hind margin extending about 2/3 length of segment (fig. 10, d). Length: Body and wings 6 mm.

*Female*: Fitting description of ♂ except that wings darker infuscated on anterior portion. Head just slightly longer than wide, predominantly polished black. Front smooth and flat, about 1.5× wider than one eye. Sclerotized portion of head in front of eyes scarcely developed and cardio stipites scarcely visible from direct lateral view. Portion of head behind eyes almost equal in length to compound eyes. Abdomen dark brown, tinged

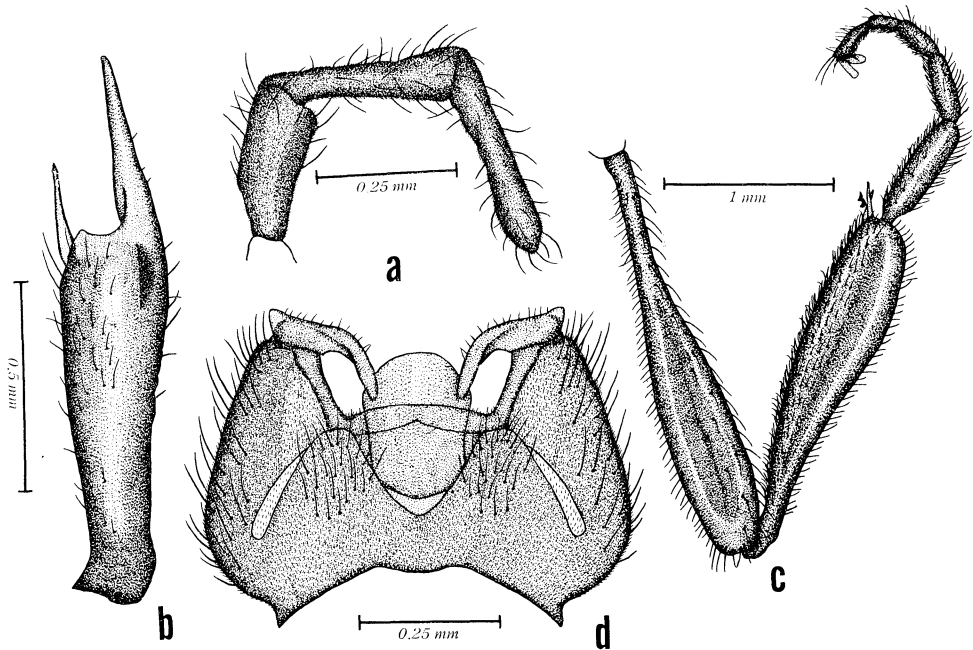


Fig. 10. *Bibio adjunctus* n. sp.: a, last 3 segments of palpus; b, front tibia; c, hind leg; d, ♂ genitalia, dorsal view.

with red in ground color and slightly broader than thorax. Length: Body and wings 6.5–7 mm.

Holotype ♂ (NIAS) and allotype ♀ (NIAS), Komaba, Tokyo, 7 June 1930, No. 1215 (Kumazawa); 13 paratypes (KU, USNM, BISHOP, UH, NIAS), 11 ♀ and 2 ♂, from the following localities: Same data as type; Kanayama, Yamanashi Pref., 27 July 1957 (Miyatake); Daitabashi, Tokyo, May 1938 (Ishitani); Meguro, Tokyo, 4 June 1950 (Hattori); Hokkaido, 2 July 1951 (Kato); Nakabusa, Nippon Alps, 1460 m, 28–30 July 1947 (Aoki); Nishiashoro-Mura (Tokachi), Hokkaido, 28 July 1949 (Matsuda); Ashoromura (Tokachi), Hokkaido, 29 July 1949 (Matsuda); and Machida, Tokyo, no date given (Okada). 2 ♂ are also on hand from Naziri, 7 July 1937 (Yuasa) which apparently belong here. They differ from the typical specimens, however, in having the posterior veins hyaline or nearly so and the m crossvein completely obliterated. These are not being designated as paratypes (one in NIAS).

***Bibio ainoi* Hardy and Takahashi, n. sp.** Figs. 11, a–b.

This species is related to *B. adjunctus* n. sp. but is differentiated by having veins  $M_2$  and  $M_{3+4}$  extended to or near the wing margin, the anterior margin of the wing not colored with brown, and the segments of the palpi not elongated.

*Male*: *Head* densely black pilose. From dorsal view head about  $1/4$  wider than long. Antennae entirely black, made up of 10 distinct segments. Last 4 segments of palpi  $2\frac{1}{2}$ –

3× longer than wide; basal segment about as long as wide. Cardio stipites not strongly produced, scarcely visible in lateral view. *Thorax* entirely shining black, except for yellow humeral ridges. Pile of thorax predominantly gray-brown to black, with some pale colored pile on side margins of mesonotum. Halteres entirely black with a faint tinge of yellow at bases. *Legs* black except for yellow to rufous tibial spurs, also a faint tinge of red present in ground color on bases of hind tibia and femur. Legs predominantly yellow to gray pilose. Inner spur of front tibia about 1/2 as long as outer (fig. 11, a). Hind basitarsus not swollen, nearly 4× longer than wide and slightly more than 1/3 as long as tibia. *Wings* hyaline or nearly so, very faintly infuscated. Stigma dark brown. Costal cell ends at about apex of radial sector. Posterior veins pale yellow. Veins  $M_2$  and  $M_{3+4}$  extend to or very near wing margin. Vein  $M_1$  incomplete basally, obliterated before junction with  $M_2$ . Basal section of radial sector equal to or slightly shorter than r-m crossvein. *Abdomen* subshining black, faintly grayish pollinose on dorsum; thickly black pilose especially on sides and with some scattered yellow pile on venter. Sternum 9 about 1/3 wider than long and cleft on hind margin extends about 1/3 length of segment. Claspers strongly bent downward at apices. Tergum 9 1/3–2/5 longer than wide and a deep concavity extends about 1/2 length of hind margin, this is strongly narrowed in median portion (fig. 11, b). Length: Body 7.4–8 mm; wings 7–7.4.

*Female*: Head about as wide as long. Portion of front between eyes nearly 2× greater than width of one eye. Portion of head behind eyes, as seen in lateral view, scarcely over 1/2 as long as one eye. All of pile of head, thorax and abdomen yellow. Mesonotum black, pleura yellow to rufous. Coxae, trochanters, and femora predominantly rufous. Tibiae and tarsi dark reddish brown to black. Wings faintly infuscated yellow-brown and posterior veins more distinctly yellowish and tinged with brown than in ♂. Abdomen shining black, tinged with red in ground color of sternum. Cerci yellow. Length: Body and wings 7.5–8.1 mm.

Holotype ♂ (KU), Nibushi, Lake Kuccharo, Hokkaido, 7 June 1957 (Takahashi); allotype ♀ (KU), Osappe, Lake Kuccharo, Hokkaido, 5 June 1957 (Takahashi); 22 paratypes (KU, USNM, BISHOP, UH), 9 ♂ and 13 ♀, from the following localities: Same data as allotype; same data as type; and also Ashorobuto, Ashoro Gun, 24 May 1957 (Takahashi).

***Bibio amputonervis* Hardy and Takahashi, n. sp.**

Figs. 12, a–g.

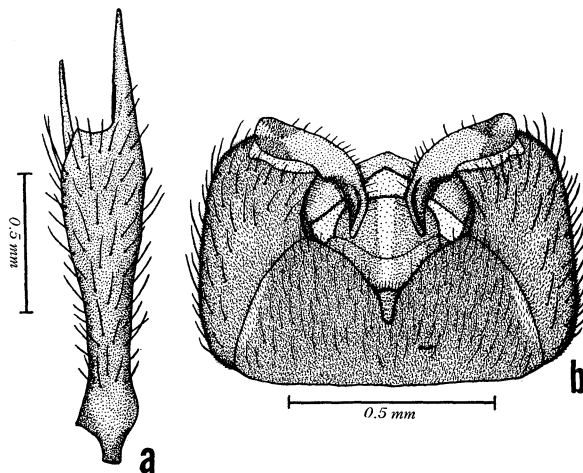


Fig. 11. *Bibio ainoi* n. sp.: a, front tibia; b, ♂ genitalia, dorsal view.

This species fits near the *pseudoclavipes* complex because of the long inner spur on the front tibia, the faintly infuscated wings, the black body coloration, and the pale colored pile. As demonstrated by the ♂ genitalia, however, the two are not related (compare figs. 12, f and 27, e). Besides the striking differences in the ♂ claspers as shown in the above figures, *amputonervis* differs from *pseudoclavipes* Okada and *nigriclavipes* n. sp. by the incomplete veins  $M_{1+2}$  and  $M_{3+4}$  (fig. 12, d), by the slender hind basitarsus (fig. 12, c) and by the small size.

*Male*: Small black-bodied species. *Head*: From a direct dorsal view head about 1/3–1/4 wider than long. Antennae short and thick, club-shaped; flagellum apparently made up of 8 segments although last 4–5 are so closely joined that segmentation is not clearly differentiated (fig. 12, a). Sclerotized portion of head not produced beyond bases of antennae. Cardo stipites extend a short distance beyond antennae. First segment of palpus tiny, scarcely differentiated; second segment rather long and slender, 4 or 5× longer than wide; apical 3 segments short and thick, scarcely longer than wide. *Thorax* en-

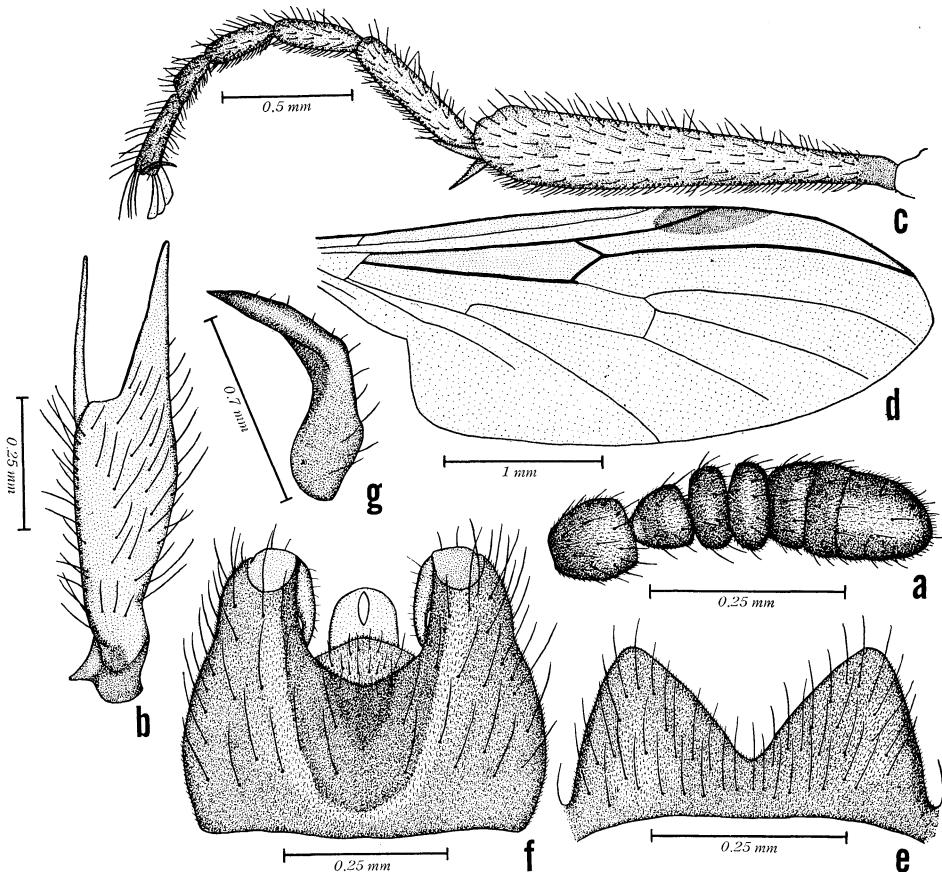


Fig. 12. *Bibio amputonervis* n. sp.: a, antenna of ♂; b, front tibia; c, hind tibia and tarsus; d, wing of ♂; e, tergum 9 of ♂; f, ♂ genitalia, ventral view; g, clasper.

tirely yellow pilose; shining black, except for yellow humeral ridges. Halteres black, tinged with yellow-brown on stems. *Legs*: Coxae and trochanters black. Femora predominantly yellow to rufous, with extreme apices and bases tinged with brown; attenuated portion of each hind femur reddish-brown. Tibiae yellow to rufous, tinged with brown and tarsi dark brown to black with a faint rufous tinge in ground color of basal segments. Inner spur of front tibia almost as long as outer (fig. 12, b). Hind femur rather strongly attenuated on basal 1/2 and swollen on apical 1/2. Hind tibia club-shaped, slightly thicker than femur. Tibial claws slender and sharp pointed. Hind tarsus not swollen. Basitarsus about  $3.5 \times$  longer than wide and about equal in length to next 2 tarsal segments (fig. 12, c). *Wings* almost hyaline, faintly infuscated with yellow. Stigma dark brown. Costal vein ends slightly beyond apex of radial sector. Basal section of radial sector about  $2/3$  as long as r-m crossvein. Posterior veins faintly tinged with yellow, just slightly darker than wing membrane. Forking of veins  $M_1$  and  $M_2$  opposite or very near m crossvein. Veins  $M_2$  and  $M_{3+4}$  evanesce before reaching wing margin (fig. 12, d). *Abdomen* subshining black, with ground color obscured by a dense covering of gray pubescence. Pile on basal 3 segments yellow and rather dense, especially on sides; remainder of pile yellow-brown. Male genitalia similar to those of most *Bibio*; tergum 9 has a deep V-shaped cleft on hind margin (fig. 12, e). Claspers simple and curved downward at apices (fig. 12, g), also sternum 9 has a semi-membranous development in middle of posterior margin (fig. 12, f). Length: Body 4.3–4.5 mm; wings 4.5–5.

*Female*: Fitting description of ♂ in general characteristics. Hind femora, however, entirely yellow, not so attenuated basally; hind tibiae not enlarged; and wings pale infuscated yellow-brown. From a direct dorsal view head almost as wide as long. Front flat, without a median carina. Front between eyes measures less than width of one eye. Section of head behind compound eyes about equal in length to one eye. Ocellar tubercle moderately developed.

Holotype ♂ (KU), Tamba, Sasayama, Okano, 4 May 1957 (Nagatomi); allotype ♀ (KU), same data except that no data was given on the label; 30 paratypes (HYOGO, KU, NIAS, USNM, BM, BISHOP, UH), 26 ♂ and 4 ♀, from the following localities: Same as type, collected 6, 9, 19, and 21 May 1957; Mt. Takao, Tokyo, 7 May 1937 (Isitani); Kariyoseyama, Okutama, 16 May 1949 (Hattori); Hikosan, Fukuoka Pref., Kyushu, 16 May 1958 (Takahashi); Mt. Zōzu, Sanuki, Shikoku, 1–2 May 1958 (Miyatake); and Mt. Wakasugi, Fukuoka Pref., 21 May 1957 (Morimoto). Type and allotype presented to Kyushu University by Akira Nagatomi.

*Bibio aneuretus* Hardy and Takahashi, n. sp. Figs. 13, a–e.

*Bibio johannis* Matsumura (*nec* Linnaeus), 1911, Coll. Agr. Tohoku Imp. Univ., Jour. 4: 62; Okada, 1937, Sapporo Nat. Hist. Soc., Trans. 15: 39; Okada, 1938, Coll. Agr. Hokkaido Imp. Univ., Jour. 42 (2): 211.

This species runs to *B. johannis* (Linnaeus) in Okada's key (1938: 207), and is apparently the species which he considered to be *johannis*. The two are very different species in spite of the superficial resemblance: the small size, black pile, and bicolored legs. *B. johannis* differs distinctly by having the inner spur of the front tibia very short, the hind basitarsus short and thick, the wing veins darker in color, and tergum 9 of the ♂ with a rather deep V-shaped cleft in the middle of the hind margin. *B. aneuretus* is rather close-

ly related to *B. simulans* n. sp. but is differentiated by the predominantly yellow to rufous tibiae and tarsi, by the striking differences in the ♂ genitalia as shown in figs. 13, e and 29, c, and by the all black thorax of the ♀.

*Male*: Predominantly black, densely black pilose species. *Head*: Antennae entirely black, of 10 segments, with last 2 rather closely joined. Palpi 5 segmented, segments beyond first about  $2.5 \times$  longer than wide. Apical segment about equal in length to combined length of first 2 antennal segments. Cardio stipites not produced, scarcely visible from a lateral view. *Thorax* shining black, except for yellow humeral ridges. Knobs of halteres dark brown to black. Stems brown, tinged with yellow. *Legs*: Coxae and trochanters black. Femora brown to black, tinged with red, attenuated portion of hind femur yellow, tinged lightly with brown and anterior surface of front femur often yellow. Front femur short and thick, and 5 or 6 moderately strong anteroventral spines present at apical 1/3 of segment. Hind femur rather long and slender, attenuated portion about  $2/5$  as long as swollen portion. Tibiae and tarsi yellow, except for brown discolorations on apices of former and on apical subsegments on latter. Inner spur of front tibia just slightly shorter than outer (fig. 13, a). Hind tibia rather slender, just slightly thicker than femur at apex. Hind basitarsus slender, about  $4 \times$  longer than wide. Inner spur of hind tibia about  $1/3$  as long as basitarsus (fig. 13, c). *Wings* hyaline, except for pale brown stigma. Anterior veins yellow, tinged very lightly with brown; posterior veins hyaline,

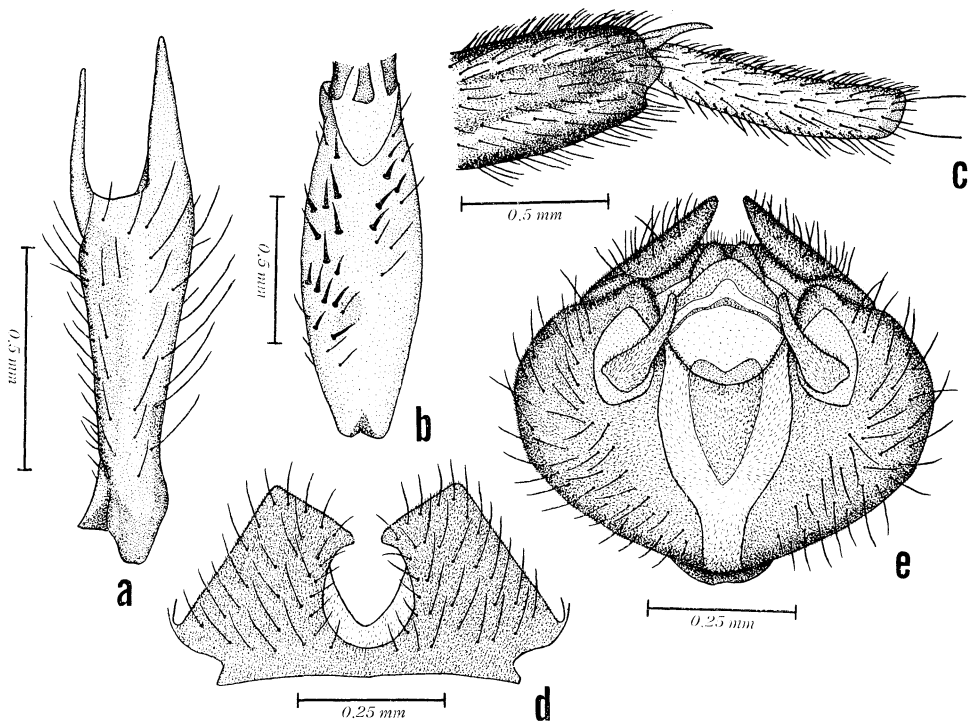


Fig. 13. *Bibio aneuretus* n. sp.: a, front tibia; b, hind femur of ♀, from beneath; c, hind tarsus and tip of tibia; d, tergum 9 of ♂; e, ♂ genitalia, caudo-ventral view.

concolorous with wing membrane. Costa ends at or near apex of radial sector. Basal section of radial sector about  $2/3$  as long as r-m crossvein. Fork of  $M_{1+2}$  opposite m crossvein. *Abdomen* subshining black, with gray pubescence, and with long black pile along sides of terga. Tergum 9 cleft almost to its base, and posterior lobes convergent on their inner margins (fig. 13, d). Sternum 9 about  $2/3$  wider than long, cleft on hind margin rather shallow and a membranous gibbosity occurs in median portion. A rather thin membranous area extends longitudinally, almost full length of sclerite. Claspers rather small, basal portion extended laterally, and apical portion not curved inwardly (fig. 13, e). Length: Body 5.4–6 mm; wings 5–5.6.

*Female*: Body entirely subshining black except for humeral ridges. From a direct dorsal view, head about  $1/4$  longer than wide. Middle portion of front raised just behind antennae and front between eyes about  $1/4$ – $1/3$  wider than one eye. Head behind eyes about equal in length to one eye. Sclerotized portion of head in front of eye short, about equal in length to first 2 antennal segments. Ocellar tubercle not strongly developed, raised only height of ocelli. Legs predominantly yellow to rufous, middle and hind coxae dark brown to black. Femora tinged with brown at apices and extreme bases and apices of tibiae brown. Front femur  $2.4\times$  longer than wide and a series of stout spines are present along each anteroventral surface (fig. 13, b). Each middle tibia has several irregular rows of short, spine-like setae extending down dorsal surface. Hind basitarsus nearly  $6\times$  longer than wide and extends slightly less than  $1/3$  length of tibia. Length: Body 4–6 mm; wings 5.5–6.4.

Holotype ♂ (KU) and allotype ♀ (KU) from Tamba, Sasayama, 16 Apr. 1954 (Nagatomi). About 75 paratypes (KU, HYOGO, USNM, BISHOP, NIAS, UH), predominantly ♂, from the following localities: Same as type, 16, 19, and 24, Apr. 1954 and 17 Apr. and 23 June 1951; Tokyo, 20 Apr. 1931 (Gressitt); Nokogiriyama, Okutama, May 1951 (Kato); Mogusaen, Tokyo, Apr. 1951 (Fukuhara); Nikko, Tochigi Pref., 1950 (Hattori); Hakusan, Kanagawa Pref., Apr. 1949 (Hattori); Suginami, Tokyo, Apr. 1950 (Fukuhara); Mt. Takao, Tokyo, Apr. 1949 (Fukuhara); Kariyoseyama, Okutama, 16 May 1949 (Hattori); Kashii, Fukuoka, Kyushu, 10 March 1957 (Takahashi); Nibushi, Lake Kuccharo, Hokkaido, 4 June 1957 (Takahashi); Osappe, Lake Kuccharo, Hokkaido, 5 June 1957 (Takahashi); Mt. Tachibana, Fukuoka Pref., 12 Mar. 1959 (Miyatake); Jinzenji, Kochi City, 5 Apr. 1958 (Morimoto); Nikko, 7 May 1950 (Fukuhara); and Hirayama Hill, near Tokyo, 7 Apr. 1959 (Fukuhara). Type and allotype have been presented to Kyushu University by Akira Nagatomi.

***Bibio deceptus*** Hardy and Tahahashi, n. sp. Figs. 14, a–e.

*Bibio pseudoclavipes* Okada, 1938, Coll. Agr. Hokkaido Imp. Univ., Jour. 42 (2): 214 [in part].

This species is closely related to *B. nigriclavipes* n. sp. The ♂ is differentiated by the short palpi, with the apical segment being only about 1.35 times longer than wide, rather than  $3\times$  longer than wide as in *nigriclavipes*; by the hind basitarsus being  $4\times$  longer than wide, rather than  $3\times$  longer than wide; and by having a strong basal lobe on the male clasper as in fig. 14, d. The ♀ differs by having the head nearly  $2\times$  longer than wide, rather than  $1/3$  longer; by the sclerotized portion of the head in front of the eyes being  $1/2$  as long as the eye, rather than  $1/3$  as long; and by the hind portion of the

head being rather broad, quadrate in shape (fig. 14, e) not narrowed. Also the more pale colored legs and yellow halteres will differentiate *deceptus*.

This species was evidently included in Okada's concept of *B. pseudoclavipes* and the darker colored specimens which he mentioned from Hokkaido belong here. The ♀ of *deceptus* is also rather similar to that of *pseudoclavipes* Okada but is readily differentiated by the more elongate head, by the yellow coxae and trochanters and the yellow halteres.

*Male*: Predominantly black, yellow pilose species. *Head* black pilose except for dense yellow pile down median portion of face. As seen from direct dorsal view each eye almost a perfect semi-circle, the 2 together just slightly longer than wide. Antennae 11 segmented, last 2 segments closely fused. Cardio stipites moderately developed so that bases of palpi situated just beyond bases of antennae. Palpal segments short; last segment 1.35× longer than wide, and penultimate segment about as wide as long. First 2 segments of palpus about as wide as long, third segment 2× longer than wide. *Thorax* entirely shining black, except for yellow humeral ridges; pile entirely yellow. Knobs of halteres black; stems yellow, tinged faintly with brown. *Legs*: Coxae, trochanters, and tarsi, except for extreme bases of latter, black. Front and middle femora black, except for extreme apices yellow. Hind femur predominantly polished black, attenuated base and extreme apex yellow. Tibiae yellow at bases and on spurs, and otherwise black. Inner spur of each front tibia almost as long as outer (fig. 14, a). Hind basitarsus swollen but not strongly so, almost as thick as apex of tibia; basitarsus 4× longer than wide and about 1/3 as long

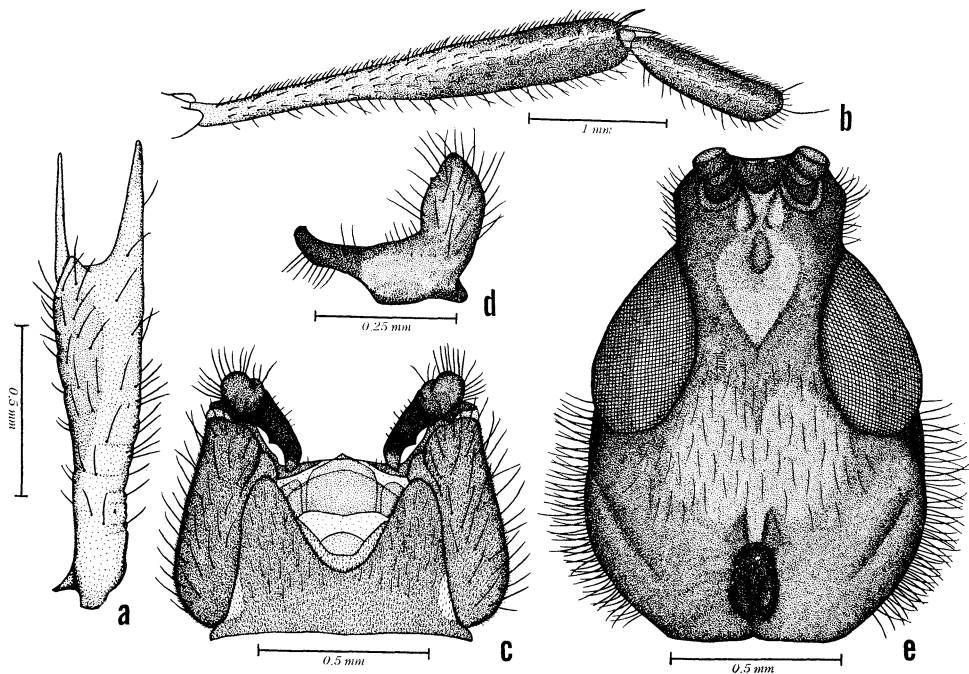


Fig. 14. *Bibio deceptus* n. sp.: a, front tibia; b, hind tibia and basitarsus of ♂; c, ♂ genitalia, dorsal view; d, clasper, ventral view; e, head of ♀.



as tibia (fig. 14, b). Basal  $2/5-1/2$  of each hind femur attenuated. *Wings* faintly yellow, tinged with brown, with rather distinct brown spots at crossveins. Anterior veins and stigma dark brown. Posterior veins yellow, tinged lightly with brown. Veins  $M_2$  and  $M_{3+4}$  extend to wing margin. The r-m crossvein equal in length to basal portion of radial sector. *Abdomen* subshining black, yellow pilose. Sternum 9 is  $1.6\times$  wider than long, median portion semi-membranous and slightly gibbose. Claspers bilobate, basal portion densely haired and developed into a moderately strong lobe; apical portion strongly curved downward (fig. 14, d). Tergum 9 has a rather deep cleft extending about  $2/3$  length of segment (fig. 14, c). Length: Body 7.4–8 mm; wings 7–7.3.

*Female*: Head nearly  $2\times$  longer than wide as seen in direct dorsal view (fig. 14, e); sclerotized portion of head in front of the eyes about  $1/2$  as long as one eye and portion of head behind eyes about equal in length to eye. Pleura yellow, tinged with brown through median portions; lateral margins of mesonotum also yellow, tinged with brown. Halteres entirely yellow. Coxae and trochanters yellow, tinged faintly with brown on latter. Femora predominantly yellow, tinged with brown on dorsal and apical portions. Front and middle tibiae yellow. Hind tibia predominantly brown, tinged with yellow. Wings slightly more infuscated than in ♂. Venter of abdomen brown, tinged lightly with yellow. Cerci and ovipositor plates yellow. Length: Body 7.4 mm; wings 8.4.

Holotype ♂ (KU), Osappe, Lake Kuccharo, Hokkaido, 5 June 1957 (Takahashi); allotype ♀ (KU), Nibushi, Lake Kuccharo, Hokkaido, 4 June 1957 (Takahashi); 44 paratypes (KU, USNM, BISHOP, NIAS, UH), 28 ♂ and 16 ♀, from the following localities: Same as allotype; Minomo, 18 Apr. 1913, "A1737", no collector given; Nikko, Tochigi Pref., 7 May 1950 (Hattori & Hoshida); Ashorobuto, Ashoro Gun, Hokkaido, 22 May 1957 (Takahashi); Maruyama, Sapporo, Hokkaido, 18 May 1957 (Takahashi); Hikosan, Kyushu, 11 Apr. 1955 (Takahashi).

***Biblio flavihalter* Hardy and Takahashi, n. sp.** Figs. 15, a–d.

The males of this species would run to *B. clavipes* in Okada's key but these two species are not related. *B. flavihalter* is apparently more closely allied to *B. gracilipalpus* n. sp. than any other known species. It is differentiated by the yellow halteres, the predominantly rufous legs, the all yellow pile of the thorax, the differences in the ♂ genitalia as shown in figs. 15, d and 16, c, and by the all rufous thorax of the ♀.

*Male*: Fitting many of the characteristics of *gracilipalpus*. *Head*: Pile on eyes and upper portion of head dark brown to black and that of face and lower portion pale yellow. Antennae black, flagellum made up of only 7 distinct segments. Palpi long and slender, approximately  $2/3$  longer than antennae; basal segment tiny and inconspicuous; segments 2 and 3 about  $3\times$  longer than wide and about  $3/5$  as long as segment 4, segment 5 slender, about equal in length to first 4 flagellar segments and about  $5\times$  longer than wide (fig. 15, a). *Thorax* black, except for yellow humeral ridges, predominantly yellow pilose with some brown to black pile intermixed on mesonotum. Halteres pale yellow. *Legs* predominantly rufous, dark brown on bases of femora and on apical segments of tarsi. Inner spur of front tibia very short,  $1/3-1/4$  as long as outer (fig. 15, b). Basal  $1/2$  of each hind femur rather strongly attenuated and apical  $1/2$  swollen. Hind tibia strongly swollen apically, thicker than femur. Hind tarsus swollen, basitarsus about  $3\times$  longer than wide and

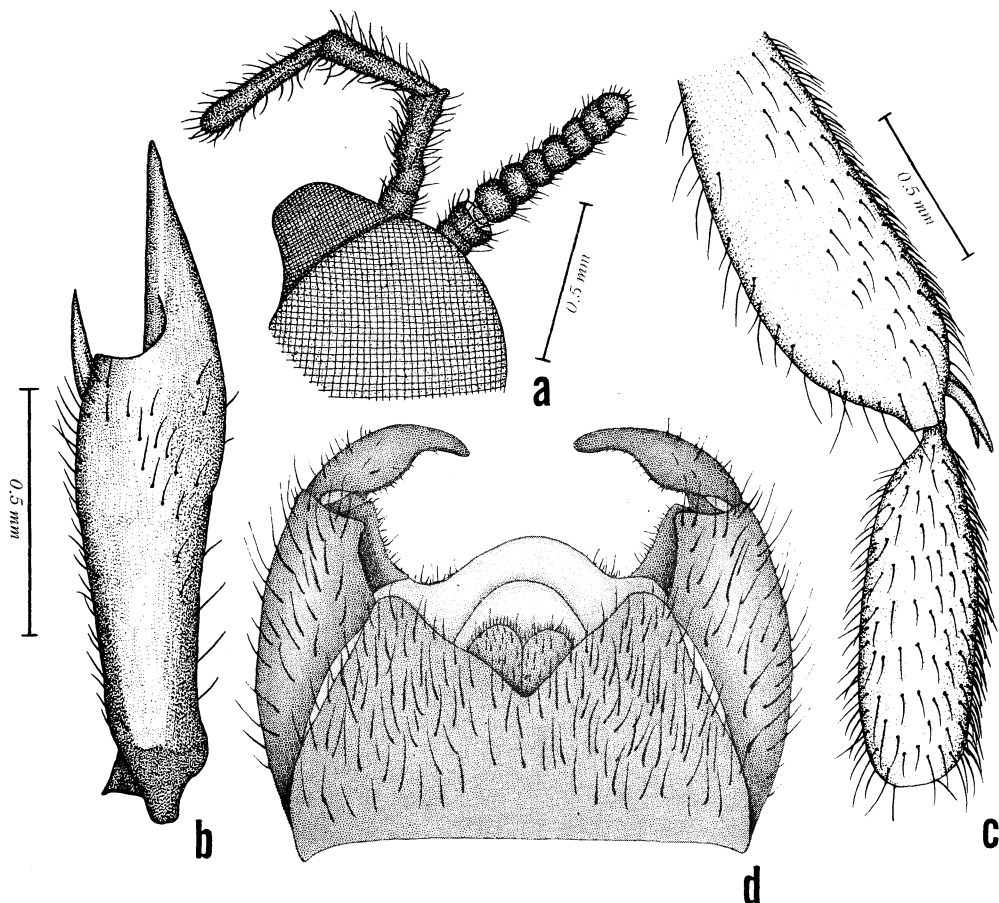


Fig. 15. *Bibio flavihalter* n. sp.: a, tip of ♂ head, lateral view; b, front tibia of ♂; c, hind basitarsus and tip of tibia; d, ♂ genitalia, dorsal view.

not as thick as apex of tibia (fig. 15, c). *Wings* infuscated with yellow-brown, anterior veins and stigma dark brown and posterior veins yellow-brown. Anterior portion of wing more intensely yellow colored. Costa extends slightly beyond tip of radial sector and base of Rs approximately equal in length to r-m crossvein. *Abdomen* black, covered with gray pubescence and rather densely yellow pilose along side of terga. Tergum 9 has a broadly V-shaped cleft in middle of hind margin and claspers short, not so long pointed as in most *Bibio* (fig. 15, d). Length: Body 7.5–8 mm; wings 8–8.4.

*Female*: Thorax entirely rufous and legs predominantly so. Hind tibia and tarsus not swollen. Abdomen dark brown, tinged with red. Head subopaque black, lightly gray pollinose; from a direct dorsal view, eyes slightly protuberant and head just slightly longer than wide. Length: Body 7.4 mm; wings 9.

Holotype ♂ (KU), Kujusan (Bungo), Kyushu, Nov. 1932 (Hamada); allotype ♀

(KU), Wakasugiyama (Chikuzen), Kyushu, 15–16 Nov. 1930 (Esaki, Takeya, Hori, Fujino, Hashimoto, & Choh); 38 paratypes (HYOGO, CAS, NIAS, BISHOP, USNM, UH), sexes about evenly distributed, from the following localities: One same as type; Tamba, Sasayama, Okano, 13 Nov. 1954 (Nagatomi); Kyoto, Kibune, 7 Nov. 1954 (Arnaud); Takao-san, Tokyo, 1 Nov. 1948 (Kato and Hattori); Shiga-Kogen, Nagano Pref., 25 Oct. 1954 (Hattori); Nobeyama, Nagano Pref., 12 Oct. 1953 (Hattori); Hatakeyama, Kanagawa Pref., 19 Nov. 1950 (Hattori); Mt. Tengu, Gunma Pref., 11 Oct. 1951 (Matsushima); Numata, Gunma Pref., 1 Oct. 1949 (Takei); Mt. Mitake, Tokyo, 3 Nov. 1949 (Hattori); and Saku-umino-kuchi, Nagano Pref., 13 Oct. 1953 (Hattori).

***Bibio gracilipalpus*** Hardy and Takahashi, n. sp.      Figs. 16, a–c.

This is apparently the species which Okada (1938: 208) recorded as *B. clavipes* Meigen (considering *lepidus* as a synonym of *clavipes*). In Duda (1930: 45) *gracilipalpus* runs to *clavipes* var. *lepidus* Loew. Bollow (1954: 211–216) has given a redescription and reevaluation of *B. clavipes*, and on the bases of his findings has designated it as the type of his new subgenus *Bibiophus*, distinguished from other *Bibio* (which Bollow studied) by having 6 segments in the palpi and by having the costa extending distinctly beyond the apex of the radial sector. The specimens of *lepidus* which the senior author has studied, from England, have only 5 segments in the palpi and the costa ends near the apex of the radial sector. As discussed above under the genus *Bibio*, we do not consider these characters of subgeneric importance.

*B. gracilipalpus* resembles *lepidus* in most respects but is readily differentiated by the long, slender palpi; by tergum 9 having a rather deep U-shaped cleft, over 1/2 length of segment; and by having the posterior veins yellowish brown. In typical *lepidus* the palpi are not so elongate, the apical segment is equal to about the first 3 flagellar segments, rather than being equal in length to the first 4 segments; the posterior veins are hyaline and tergum 9 is just slightly concave on the hind margin. The species is most closely related to *flavihalter* n. sp. but is differentiated by having the halteres dark brown to black, the legs predominantly black, the pile of mesonotum black and thorax of ♀ extensively black.

*Male*: Almost entirely black, predominantly pale pilose species. *Head*: As seen from direct dorsal view head almost circular, just slightly wider than long. Entirely black pilose, pile of under portion of head very long and dense. Antenna black, of 9 distinct segments, apical portion obviously made up of 2 fused segments. Palpi rather long and slender and with only 4 visible segments, basal segment obviously tiny and conspicuous; segments 2 and 3 about 2/3 as long as segments 4 and 5; latter 2 equal to combined lengths of first 4 flagellar segments; last segment 5 or 6× longer than wide. Palpus similar to that of *flavihalter*. *Thorax* shining black except for yellow humeral ridges. Pile on mesonotum black, pile of remainder of thorax yellow, or brownish-yellow. Halteres brown except extreme bases which are yellow, tinged with brown. *Legs* almost entirely black, tinged with red in ground color of tibiae and basal segments of tarsi. Inner spur of front tibia short, scarcely 1/3 as long as outer (fig. 16, a). Hind femur very long and slender with basal 3/5 strongly attenuated. Hind tibia rather strongly swollen at apice, much thicker than femur, apical spurs moderately slender and sharp pointed. Posterior tarsi swollen, basitarsus as thick as apex of tibia, about 2.5× longer than wide and almost as

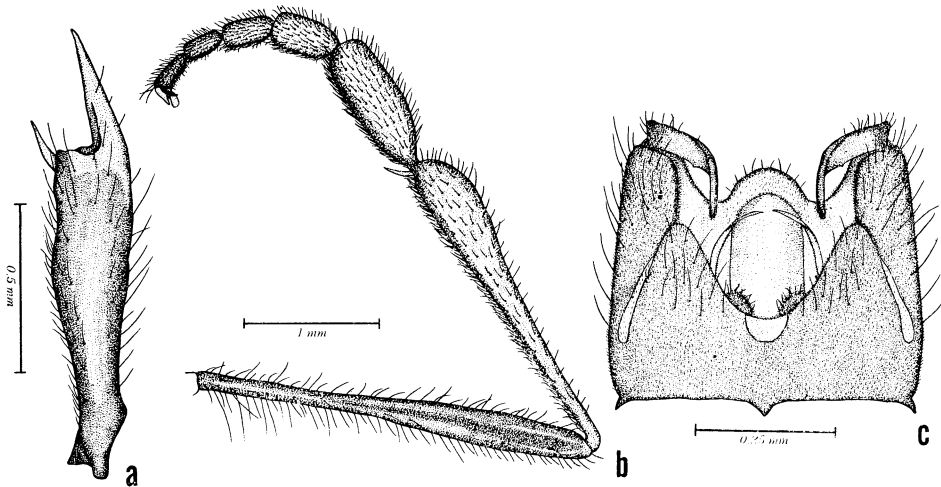


Fig. 16. *Bibio gracilipalpus* n. sp.: a, front tibia of ♂; b, hind leg of ♂; c, ♂ genitalia, dorsal view.

long as next 3 tarsal segments combined (fig. 16, b). *Wings* faintly infuscated with yellow. Anterior veins and stigma dark brown, and posterior veins yellow-brown, distinctly darker than wing membrane. Basal section of radial sector about 2/3 as long as r-m crossvein. Vein  $M_{1+2}$  forks slightly before m crossvein. *Abdomen* shining black, densely gray pubescent and yellow pilose. Tergum 9 very deeply cleft in middle of hind margin, and claspers are slender, curved downward as in fig. 16, c. Sternum 9 about as wide as long and convex on posterior median margin. Length: Body 5.8–6.7 mm; wings 6–7.

*Female*: Rather similar to ♀ of *flavihalter* n. sp. but mesonotum extensively black, allotype, and one ♀ paratype, have 3 broad black vittae extending almost entire length of sclerite, also lower 1/2 of each sternopleuron polished black and metanotum shining black. Stems of halteres yellow, knobs brown. Other specimens have varying amounts of red on thorax, some have mesonotum entirely black. Legs predominantly yellow, with tibiae and tarsi tinged lightly with brown. Head just slightly longer than wide and distinctly tapered on back portion so that from direct dorsal view head somewhat triangular in shape. Portion of head behind compound eyes about equal in length to one eye. Wing slightly more yellow than in ♂. Body vestiture entirely yellow. Abdomen shining brown to black. Length: Body 6.5 mm; wings 7.7.

Holotype ♂ (HYOGO) and allotype ♀ (HYOGO) from Tamba, Sasayama, 29 Nov. 1958 (Nagatomi); 38 paratypes (HYOGO, KU, BISHOP, NIAS, UH), 31 ♂ and 7 ♀, from the following localities: Same as type, all collected in November, 1954 and 1958; Mt. Sefuri, Fukuoka Pref., Kyushu, 24 Dec. 1957 (Miyatake); Mt. Nyukasa, Nagano Pref., 18 Oct. 1953 (Hattori); Mt. Yatsu, Nagano Pref., Sept. 1950 (Hattori); and Mt. Takao, Tokyo, 29 Oct. 1955 (Takahashi).

One ♂ (Jozankei, 14 Oct. 1914, Matsumura) recorded by Okada (1938: 208) should belong to this species.

**Bibio holomaurus** Hardy and Takahashi, n. sp. Figs. 17, a-f.

This species is apparently related to *B. simulans* n. sp. but is differentiated by the all black legs; by the strongly developed cardo stipites and shorter palpi; by the shallow cleft on the hind margin on tergum 9 (fig. 17, d); by a rather deep cleft on the hind margin on sternum 9; and by the slender pointed claspers (fig. 17, f). Also the species is differentiated from other known *Bibio* by having the basal segment of each palpus tiny, poorly developed (fig. 17, a).

*Male*: Almost entirely shining black, with black pile on body and legs. *Head*: Antenna entirely black, and composed of 10 segments, although last 3 closely joined. Palpi have only 4 distinctly visible segments, the first tiny and the second long and slender, slightly longer than the other remaining segments and about  $4 \times$  longer than wide; segments 3 and 5 about  $1/2$  longer than wide and segment 4 about  $1/4$  longer than wide (fig. 17, a). Cardio stipites well developed and extend beyond bases of antennae, from lateral view looking almost like an extension of rostrum. *Thorax*: Humeral ridges yellow and often a tinge of yellow to rufous present in ground color on upper  $1/2$  of each pteropleuron. *Legs* shining black, with faint tinge of red in ground color. Claws of front tibia rufous and inner spur about equal in length to outer (fig. 17, b). Hind leg similar in shape to that of *simulans* but differs slightly as shown in fig. 17, c. *Wings* subhyaline, faintly tinged with yellow; stigma rather large and brown in color. Anterior veins yellow, tinged very faintly with brown, and posterior veins colorless; or faintly tinged yellow-

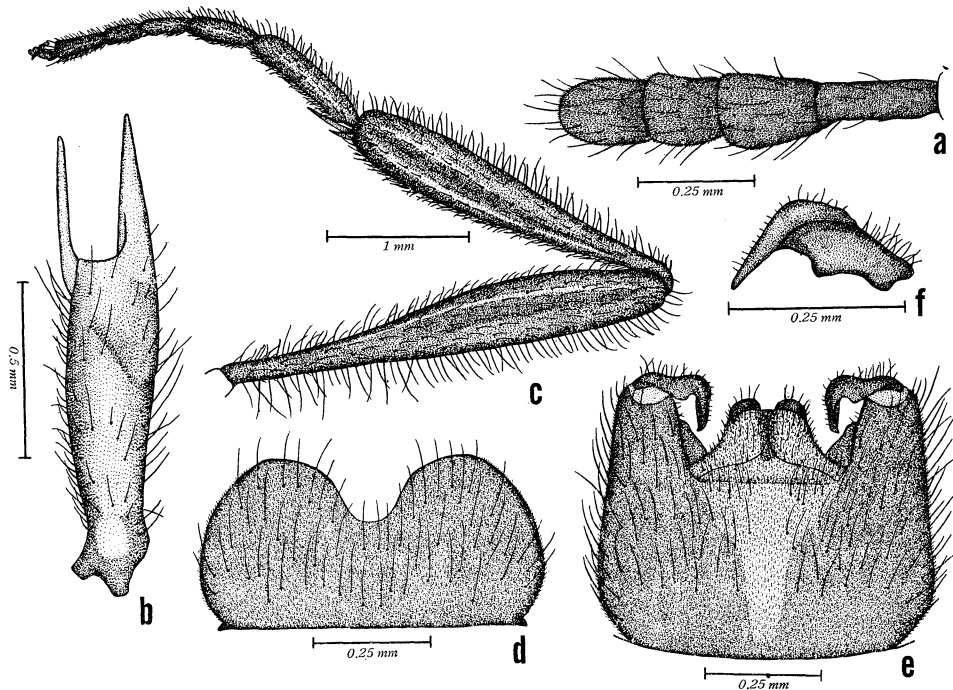


Fig. 17. *Bibio holomaurus* n. sp.: a, palpus of ♂; b, front tibia of ♂; c, hind leg of ♂; d, tergum 9 of ♂; e, ♂ genitalia, ventral view; f, clasper, dorsal view.

brown in specimens from southern Japan. Costa ends at apex of radial sector and basal section of Rs just slightly shorter than r-m crossvein. Veins  $M_2$  and  $M_{3+4}$  incomplete, ending before wing margin. *Abdomen* shining black, with moderately long black pile on sides of terga. Tergum 9 has a rather shallow U-shaped cleft extending about 1/3 length on hind margin (fig. 17, d). Sternum 9 cleft about 1/3 its length on hind margin (fig. 17, e). Claspers rather long pointed and curved sharply downwards at apices (fig. 17, f). Length: Body 6.3–7 mm; wings 5.75–6.2.

*Female*: Fitting near *amputonervis* n. sp. but differing by having darker colored legs; much more elongate head; antenna not clavate; and body coloration different. Females at hand differ from ♂ by having head 2 × longer than wide as seen from dorsal view, with rostrum 1/2 as long as one eye and cardo stipites extending a considerable distance beyond bases of antennae. Mesonotum predominantly black but margins yellow and a narrow, yellow vitta extends down each dorsocentral row. Legs chiefly dark reddish brown, hind femur brown to black, tinged with red.

Holotype ♂ (KU), Tamba, Sasayama, 29 Apr. 1958 (Nagatomi); allotype ♀ (KU), Yuwan, Amami-Oshima, Amami Isles, 5 Apr. 1958 (Takahashi); 34 paratypes (KU, HYOGO, NIAS, USNM, BM, BISHOP, UH), predominantly males, from the following: Same data as type, collected in April and May, 1954, 1957, and 1958; Tajima, Oginosen, 26 May 1955 (Fujita); same data as allotype; Koniya, Amami-Oshima, Amami Isles, 31 Mar. 1958 (Takahashi); Shinmura, Amami-Oshima, Amami Isles, 2 Apr. 1958 (Takahashi); Hikosan, Fukuoka Pref., Kyushu, 9–10 May 1959 (Morimoto); Kibune Kyoto Pref., 10 May 1958 (Oman); Yamaguchi Pref., 10 May 1926 (Miyoshi); Hikosan (Buzen), Kyushu, 9 June 1937 (Esaka & Hori); Ryukyu Is., 1 May 1953 (Shiraki); Hikosan, Fukuoka Pref., May 1958 (Miyatake); Mishima, Shizuoka, 22 Apr. 1959 (Takahashi); Kobotoke-Toge, near Tokyo, 2 May 1959 (Tsutsumi); Omogokei, Iyo, Shikoku, 3–4 May 1958 (Miyatake); and Mt. Kuroson, Kochi Pref., Shikoku, 28 Apr. 1956 (Morimoto).

It should be noted that the specimens from Amami Is. and Okinawa differ slightly from the typical form in that the posterior veins of the wing are faintly brownish yellow rather than hyaline and the anterior portion is slightly infuscated with brown.

***Bibio japonicus* (Motschulsky)** Figs. 18, a–e.

*Crapitula japonica* Motschulsky, 1866, Soc. Imp. Nat. Moscou, Bul. 39: 183.

*Penthetria rufiventris* Duda, 1930, In Lindner, Die Flieg. der Palaeark. Reg. 4, Bibionidae, p. 14. New name for *Crapitula japonica* Motschulsky, nec *Penthetria japonica* Wiedemann.

*Bibio hortulanus* var. *japonicus* Duda, 1930, In Lindner, Die Flieg. der Palaeark. Reg. 4, Bibionidae, p. 59. **New synonymy.**

*Bibio hortulanus* (Linnaeus), Okada, 1938, Fac. Agr. Hokkaido Imp. Univ., Jour. 42 (2): 210; *et al.*

Okada (1938: 210) did not list *B. hortulanus* var. *japonicus* Duda as a synonym although in his text (page 211) he does state that Duda considered the Japanese form as a var. of the European *hortulanus*. *B. japonicus* is a distinct species differentiated from *hortulanus* by its larger size; more darkly brown colored wings and brownish colored posterior veins; the all black body pile; and by the longer head of the ♀: the ♀ head is about

1/4 longer than wide, the front is subopaque and the sclerotized portion beyond the eyes is about equal in length to the first 3 antennal segments (fig. 18, a). The specimens *B. hortulanus* on hand measure as follows: ♂, body 6–9 mm; wings 5.5–8; ♀ body 5.5–9; wings 7.5–10. In *hortulanus* the body pile is chiefly yellow, black only on the mesonotum. The wings are hyaline, or but slightly tinged with yellow in the ♀ and the posterior veins are concolorous with the membrane; the head of the ♀ as seen from direct dorsal view is as wide as long, the front is polished and the portion of the head in front of the eye is about equal in length to the width of the basal antennal segments.

Hori and Yamaguchi (1930) gave a discussion of the biology of this species.

*Male*: Entirely shining black, densely black pilose species. Inner spur of front tibia short, scarcely 1/3 as long as outer (fig. 18, b). Hind tibia moderately swollen, dorsal surface evenly convex. Basitarsus rather slender, about 4.5× longer than wide (fig. 18, c). Anterior portion of wing dark brown, posterior portion pale brown; all veins brown. Costa ends at apex of Rs. Basal portion of radial sector about 4× longer than r-m cross-

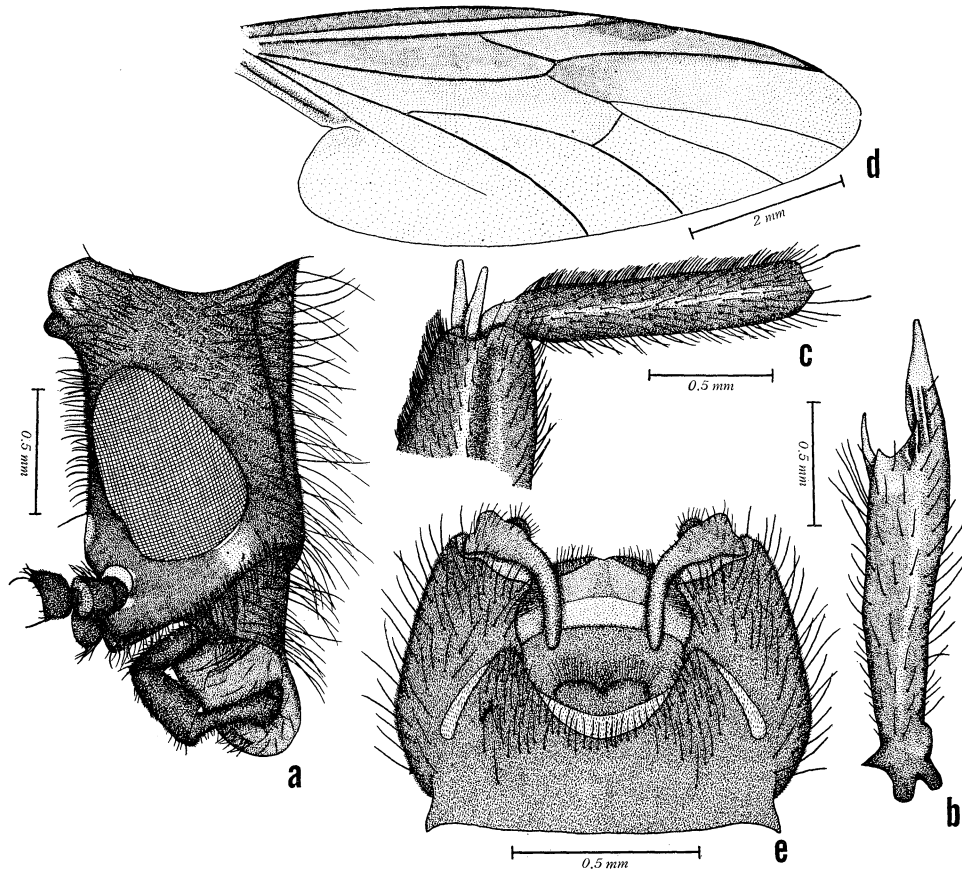


Fig. 18. *Bibio japonicus* Motschulsky: a, head of ♀; b, front tibia of ♂; c, hind basitarsus and tip of tibia of ♂; d, wing of ♂; e, ♂ genitalia, dorsal view.

vein (fig. 18, d). Genitalia as in fig. 18, e. Tergum 9 has a broadly V-shaped concavity on hind margin. Length: Body and wings 9.8–11 mm.

*Female*: Mesonotum and abdomen entirely rufous, except for a dark brown to black spot on each side of tergum 1. Head as described above and as in fig. 18, a. Length of wing 10–14.5 mm.

Type locality: "Japan". The type should have been in Motschulsky's collection at the Zoological Museum in Moscow. Dr. A. Stackelberg has informed the senior author that the type is not present in that collection. It has probably been lost.

This species is widely distributed throughout Japan, China, and Korea. The senior author has seen specimens from several localities in Manchuria and Foochow, China, and the following Japanese records are represented in the collections at hand: Saitama, Omiya, Apr. 1953 (Sicay & Brown); Tokyo, May 1931 (Gressitt); Tachikawa, Tokyo, May 1931 (Gressitt); 45 km NW of Tokyo, summer 1947 (Pitman); Fukuoka, Kyushu, Apr. 1930 (Hori & Choh); Nibushi, Lake Kuccharo, Hokkaido, June 1957 (Takahashi); Hakozaki, Fukuoka, Apr. 1955 (Takahashi); Suginami, Tokyo, June 1950 (Fukuhara); Hatano, Kanagawa Pref., June 1950 (Hattori); Nishigahara, Tokyo, June 1951 (Hattori); Mogusaen, Tokyo, June 1951 (Hasegawa); Kikyogahara, Nagano Pref., May 1957 (Tanaka); Seta Norin, Maebashi, Apr. 1940 (Kumazawa); Oshima Farm, Maebashi, Apr. 1940 (Kumazawa); Nakamurabashi, Apr. 1940; Yoro, Yoro Jima, Amami Is., 9 Mar. 1958 (Takahashi); Osappe, Lake Kuccharo, Hokkaido, 5 June 1957 (Takahashi); Ikeji, Uke-Jima, Amami Isles, 14 Mar. 1958 (Takahashi); and Tateyama, Chiba, no date given (Okada).

***Bibio matsumurai* Okada** Figs. 19, a-b.

*Bibio matsumurai* Okada, 1938, Fac. Agric. Hokkaido Imp. Univ., Jour. **42** (2): 212.

This species is readily differentiated from most other Japanese *Bibio* by evenly brown infuscated wings. It fits closest to *B. singularis* n. sp. but differs by having the inner spur almost equal in length to the outer and by having the mesonotum of the ♀ rufous.

The ♂ entirely black, except for the yellow humeral ridges, body and legs densely black pilose. Mesonotum of ♀ entirely rufous. Scutellum, prothorax, and pleura black, except for a tinge of rufous on upper portions of the latter. Head of ♂ about 1/4 wider than long, that of ♀ just slightly longer than wide. Cardo stipites not protuberant beyond the front margins of head, bases of palpi directly below antennae. Palpi moderately slender, slightly more so in ♂ than in ♀; the first segment short but not inconspicuous; the second about 2× longer than wide; and segments 3–5 approximately 3× longer than wide. Antenna 11 segmented with last 2 segments closely joined. Legs black, sometimes tinged with red in ground color of femora and tibiae, especially in ♀. Apical spurs on hind tibia moderately slender and sharp pointed, inner spur almost 1/2 as long as basitarsus; hind basitarsus approximately 1/3 as long as tibia. Entire anterior margin of wings, including first costal cell, colored rather dark brown. In ♀ entire wing brownish fumose; in ♂ posterior portion of wing faintly infuscated with brown. Alulae brown in both sexes and basal cells tinged with brown. Posterior veins brown, slightly darker than surrounding membrane. Costa ends at apex of radial sector. The r-m crossvein slightly shorter than basal section of radial sector. Veins  $M_2$  and  $M_{3+4}$  evanesce just before reaching wing margin. Sternum 9 of ♂ about 1/3 wider than long, a semi-membranous gibbosity present in middle of U-shaped cleft on hind margin of sternum. Claspers moderately



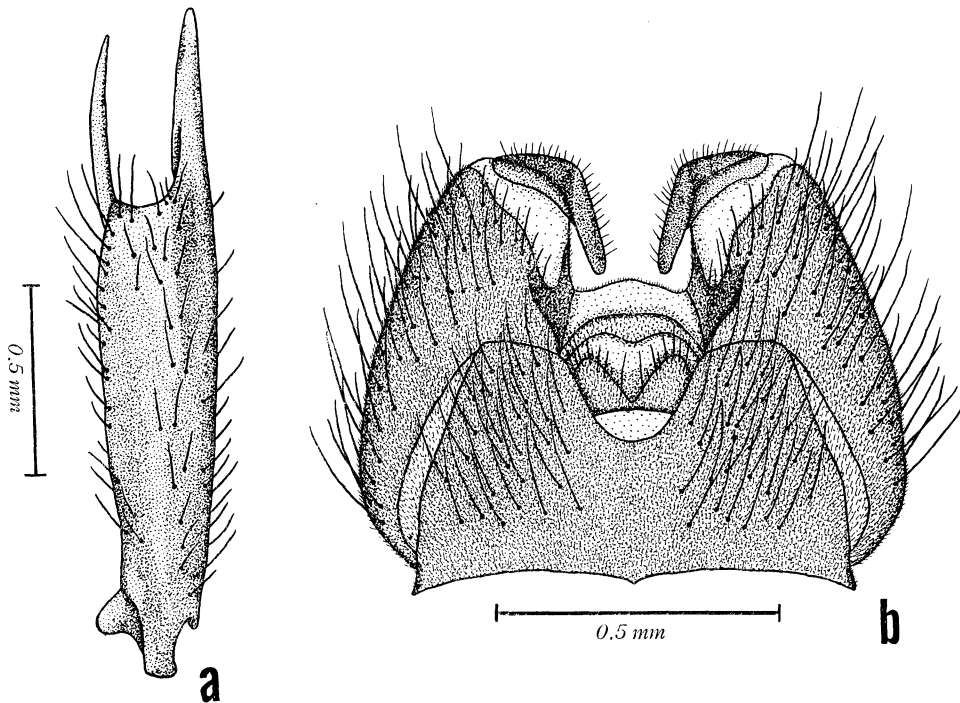


Fig. 19. *Bibio matsumurai* Okada: a, front tibia of ♂; b, ♂ genitalia, dorsal view.

slender and curved downward. Tergum 9 nearly  $2\times$  wider than long and has a U-shaped concavity on hind margin as in fig. 19, b. Length of ♂: Body 7.5–8.5 mm; wings 7.3–8. Length of ♀: Body 8.5–9.2 mm; wings 10–10.5.

Type locality, Sapporo, Hokkaido. Type in the University of Hokkaido, at Sapporo.

Okada also recorded this species from Honshu and from south Kuriles, on the island of Shikotan. We have examined specimens from Nibushi, Lake Kuccharo, Hokkaido, 4 June 1957 (Takahashi); Shizu, Yamagata Pref., June 1955 (Hasegawa); Tajima, Oginosen, 26 May 1955 (Fujita); and Nikko, May 1959 (Okazaki).

***Bibio medianus* Hardy and Takahashi n. sp.** Figs. 20, a–d.

This species is intermediate between those which have a long inner spur on the front tibia and those which have a shortened inner spur and in order to avoid confusion it is being keyed with both of these groups. It seems most closely related to *B. montanus* n. sp. but is differentiated by the more elongate inner tibial spur,  $2/3$ – $3/4$  as long as the outer rather than about  $1/4$  as long as the outer; by the hyaline wings with the posterior veins concolorous with the membrane and vein  $M_2$  complete, rather than the wings tinged with yellow brown and the posterior veins brownish yellow, with vein  $M_2$  abbreviated as in *montanus*. When compared with species which have an elongate inner spur the ♂ fits closest to *simulans* n. sp. but is readily differentiated by the yellow tibiae and tarsi and

by the swollen hind metatarsi (fig. 20, c). Comparing with the group which have elongate inner spurs the ♀ closest to *pseudoclavipes* Okada but is differentiated by having the front rather sparsely yellow setose, with the lower portion polished and lacking a median furrow. Comparing with species which have a shortened inner spur the ♀ fits close to *ainoi* n. sp. but is differentiated by the yellow tibiae and tarsi and by having the inner spur of the front tibia  $2/3-3/4$  as long as the outer, rather than having the tibiae and tarsi black or at least strongly tinged with black and the inner spur just slightly over one-half as long as the outer as in *ainoi*.

**Male:** Predominantly shining black species, pile of body and legs black. **Head:** Antenna 8 segmented, last 2 segments of flagellum closely joined. Palpi rather short, last 3 segments approximately  $2 \times$  as long as wide (fig. 20, a). Cardio stipites not produced, scarcely visible from lateral view; bases of palpi situated slightly before bases of antennae. **Thorax** entirely shining black except for yellow humeral ridges; slight tinge of rufous present in ground color of pleura. Halteres entirely black. **Legs:** Coxae, trochanters, and femora black except for a tinge of rufous on attenuated portion of hind femur. Basal  $2/5-1/2$  of hind femur attenuated, apical portion swollen. Hind tibia clavate, slightly broader than femur. All tibiae and basal 2-3 segments of tarsi yellow to rufous. Apical segments of tarsi black. Hind basitarsus distinctly swollen but not greatly thickened, slightly over  $3 \times$

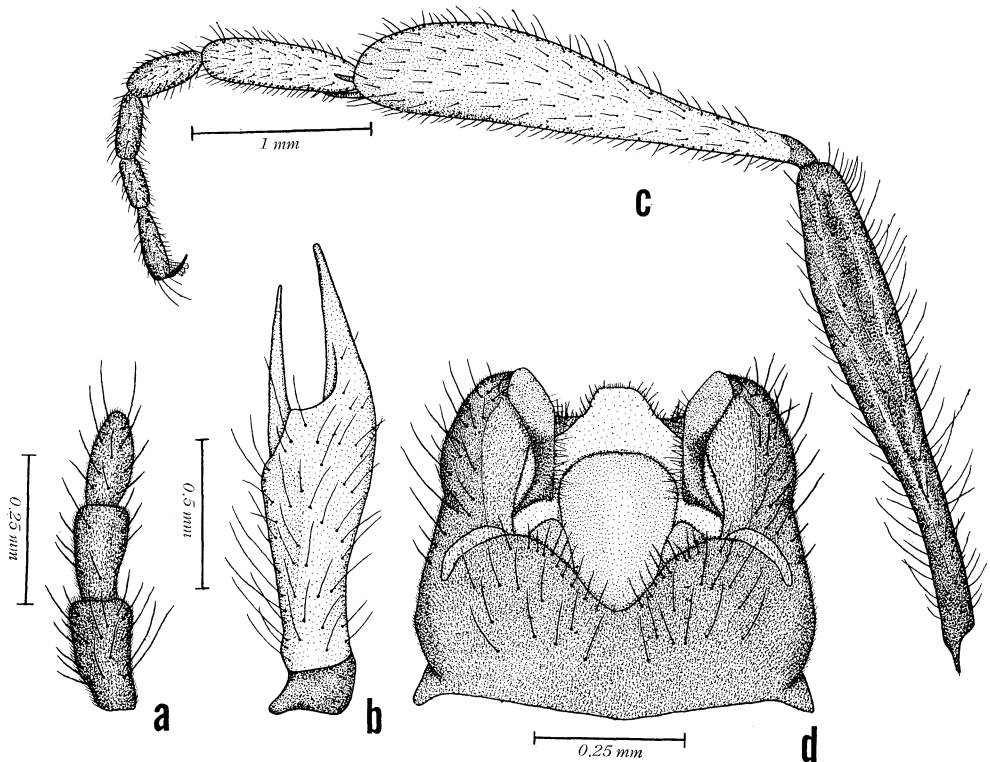


Fig. 20. *Bibio medianus* n. sp.: a, last 3 segments of ♂ palpus; b, front tibia of ♂; c, hind leg of ♂; d, ♂ genitalia, dorsal view.

longer than wide and thickest portion of tibia about  $1.65\times$  width of basitarsus (fig. 20, c). Inner spur of front tibia about  $2/3$  as long as outer (fig. 20, b). Wings hyaline, anterior veins yellow-brown, posterior veins concolorous with membrane. Costa ends at apex of radial sector and median veins extend to wing margin. Basal section of radial sector approximately equal in length to r-m crossvein. Abdomen entirely subshining black in ground color, rather densely gray-brown pollinose, lateral margins of terga thickly black pilose. Tergum 9 about  $2\times$  wider than long, and has a V-shaped cleft at middle of hind margin extending almost  $1/2$  length of segment (fig. 20, d). Cleft in middle of hind margin of sternum 9 extends about  $1/3$  length of segment. Claspers strongly bent downward into a narrow beak-like point at apices (fig. 20, d). Length: Body 6–6.3 mm; wings 5.5–6.

*Female*: Similar to ♂ in most respects. Pile, however, predominantly yellow and legs entirely yellow to rufous except for discolorations of black on coxae and apical segments of tarsi. Head almost as wide as long, almost quadrate in shape as seen in direct dorsal view. Portion behind eyes slightly rugose, subshining. Sclerotized portion of head in front of eyes very short, about equal in length to pedicel of antenna. Portion of head behind eyes about  $3/4$  as long as eye. Thorax black except for a distinct tinge of rufous on pleura. Front femur short and thick, scarcely more than  $2\times$  longer than wide, no ventral spines present. Hind basitarsus slender. Wing faintly tinged with yellow. Length: Body and wings 6 mm.

Holotype ♂ (KU) and allotype ♀ (KU) Aizankei, Daisetsu, Hokkaido, 26 June 1957 (Takahashi); 16 paratypes (USNM, BM, BISHOP, UH; 8 in KU), all ♂, one same data as type, the remainder from Osappe, Lake Kuccharo, Hokkaido, 5 June 1957 (Takahashi). One ♀ is on hand which seems to belong here from Hikosan, Fukuoka Pref., 8 May 1957 (Morimoto). The inner spur is longer than in other specimens, however, and it is not being designated as a paratype.

**Bibio metaclavipes** Hardy and Takahashi, n. sp. Fig. 21, a–c.

This species fits near *B. pseudoclavipes* Okada but is differentiated by the yellow halteres; by the elongate apical segment of the palpus; by the differences in the ♂ genitalia as shown in figs. 21, b and 27, e; and in the hind basitarsus of the ♂ as shown in figs. 21, d and 27, b; also the posterior margin of the wing is not free of microtrichia.

*Male*: Head with under portions densely covered with yellow to pale brown pile, eyes densely gray-brown pilose. Antennae 10 segmented, entirely black. Cardio stipites not produced, scarcely visible from lateral view. Bases of palpi situated posterior to bases of antennae. Last segments of palpus  $5\text{--}6\times$  longer than wide, remaining segments, beyond 1st, about  $2\times$  longer than wide; 1st about as long as wide. Thorax shining black except for yellow humeral ridges, pile entirely yellow. Mesonotum has 3 broad, shagreened areas extending longitudinally over most of sclerite; median roughened area extends from anterior margin to about opposite wing bases. Halteres yellow, tinged faintly with brown at apices. Legs: Coxae, trochanters, and most of tarsi shining black. Femora and tibiae predominantly yellow to rufous, brown to black at apices; middle femur tinged with brown along dorsal surface and front femur brown along ventral surfaces. Front tibia straight sided, rather slender, inner spur about  $4/5$  as long as outer (fig. 21, a). Hind leg slender; attenuated portion of femur longer than swollen portion; hind tibia slightly thicker than femur; hind basitarsus swollen, about  $3\times$  longer than wide and just less than  $1/3$  as long

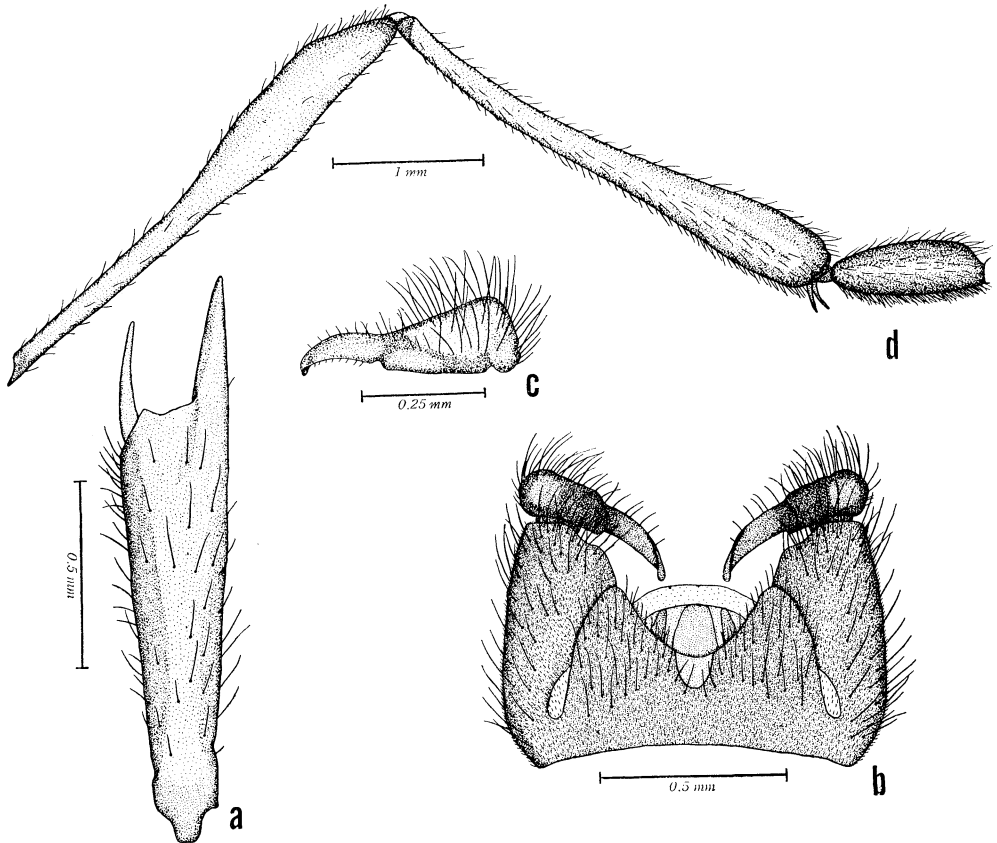


Fig. 21. *Bibio metaclavipes* n. sp.: a, front tibia of ♂; b, ♂ genitalia, dorsal view; c, clasper, ventral view; d, hind femur, tibia, and basitarsus of ♂.

as tibia (fig. 21, d). *Wings* subhyaline, faintly infuscated; stigma and anterior veins dark brown, posterior veins yellow, tinged with brown. Costa ends at apex of radial sector, and basal portion of radial sector about equal in length to r-m crossvein. Veins  $M_2$  and  $M_{3+4}$  extend to wing margin. *Abdomen* shining black in ground color, rather densely gray pubescent and yellow pilose, especially along sides and on venter. Sternum 9 about  $1/3$  wider than long. Cleft in middle of hind margin extends about  $1/3$  length of segment and median portion of cleft has a semi-membranous gibbosity. Claspers large, prominent; bases densely pilose but not distinctly lobate, apices long and slender and curved slightly downward (fig. 21, c). Tergum 9 has a rather deep concavity in middle of hind margin extending  $2/3$  length of segment (fig. 21, b). Length: Body 8 mm; wings 8.75.

Holotype ♂ (KU), Mt. Hikosan, Fukuoka Pref., Kyushu, 15 Nov. 1942 (Ito). Female unknown.

***Bibio montanus* Hardy and Takahashi, n. sp.** Fig. 22, a-d.

This species is rather closely related to *B. gracilipalpus* n. sp. but is differentiated by

the much shorter palpi, by the yellow to rufous tibiae of the ♂, the less slender hind leg (fig. 22, c), and by the slightly abbreviated veins  $M_2$  and  $M_{3+4}$ .

*Male*: Predominantly shining black species, rather densely black pilose. *Head*: Each eye semi-circular and from direct dorsal view head just slightly wider than long. Eyes densely long pilose, hairs about equal in length to first 3 flagellar segments of antenna. Cardio stipites not produced, scarcely visible from direct lateral view. Last segment of palpus 2–2.5× longer than wide. Penultimate segment approximately 2× longer than wide. Antepenultimate segment of palpus considerably thicker than other segments (fig. 22, a). Antenna composed of 9 distinct segments, apical portion probably consists of 2 fused segments. *Thorax* entirely polished black except for yellow humeral ridges. Halteres entirely black. *Legs*: Coxae, trochanters, femora and apical segments of tarsi shining black, tinged faintly with red. Tibiae and tarsi predominantly yellow to rufous, tinged with brown at apices of segments. Inner spur of front tibia very short, about 1/4 as long as outer (fig. 22, b). Hind femur and tibia strongly clavate, shaped as in fig. 22, c. Hind basitarsus 4× longer than wide (fig. 22, c). *Wings* very faintly infuscated, tinged with pale yellow-brown on anterior portion and in stigma. Costa extends to apex of radial sector and basal section of radial sector slightly shorter than r-m crossvein. Posterior veins faintly tinged yellow-brown, just slightly darker than wing membrane. Vein  $M_2$  appears somewhat variable, in type and in one ♂ paratype the vein evanesces well before wing margin; in other specimens the vein extends almost to wing margin. Vein  $M_{3+4}$  extends almost to margin. *Abdomen* shining black in ground color, rather densely gray pollinose, with mod-

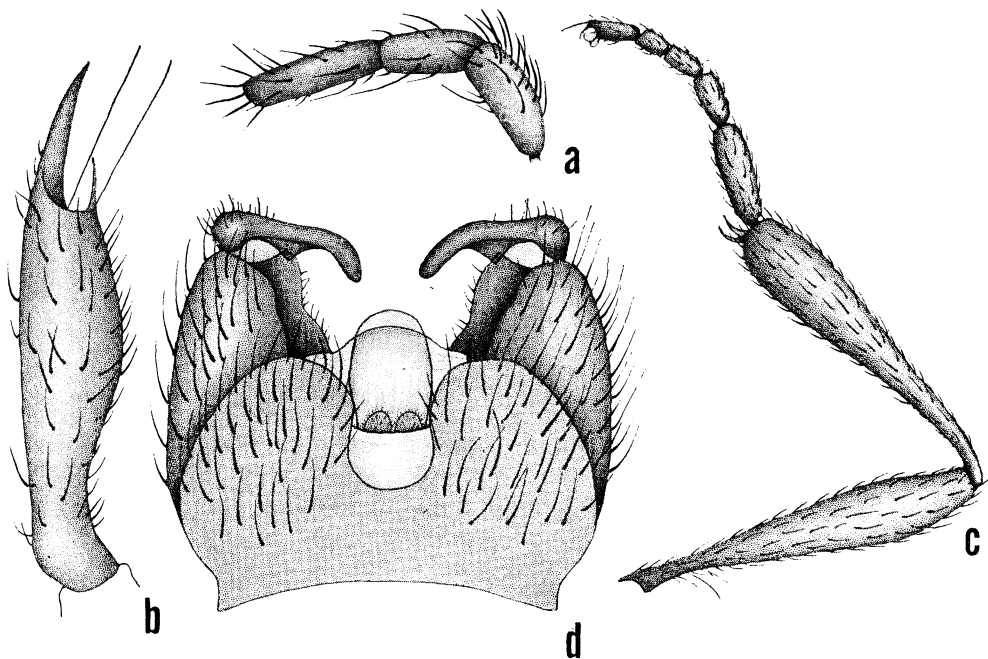


Fig. 22. *Bibio montanus* n. sp.: a, last 3 segments of palpus; b, front tibia of ♂; c, hind leg of ♂; d, ♂ genitalia, dorsal view.

erately long gray-black pile especially on sides. Tergum 9 has an U-shaped concavity extending about 1/2 length on hind margin. Claspers moderately slender and pointed inwardly (fig. 22, d). Sternum 9 is cleft 1/3 its length on hind margin and posterior median portion gibbose. Length: Body 6.5 mm; wings 6.7.

*Female*: One ♀ specimen is on hand which was loose in the box which contained the series of ♂ of *montanus*. It very probably had been encopula with one of the ♂ and came loose in shipment. It is very similar to the ♀ of *gracilipalpus*; however, the short apical segment of the palpus will readily differentiate it. The ♀ fits the above characters of ♂ except for secondary sexual characters. Head slightly longer than wide, front subopaque, finely rugose, and about 1/2 wider than one eye. Portion of head behind eyes about 3/4 as long as one eye. Body and legs yellow pilose. Coxae black, trochanters dark brown, tinged with red. Femora, tibiae, and basal segments of tarsi yellow, tinged with brown at apices. Entire wing faintly infuscated with yellow-brown. Abdomen brown, tinged with red. Length: Body 6.25 mm; wings 6.75.

Holotype ♂ (NIAS) and five paratypes (NIAS, USNM, BISHOP, UH), all ♂, from Mt. Norikura, Nagano Pref., 8 Sept. 1951 (Hasegawa). The above described ♀ is probably from the same locality. It is not being designated as the allotype, however, since the association with the ♂ is not certain.

***Bibio nigriclavipes* Hardy and Takahashi, n. sp.** Figs. 23, a-b.

This species is closely related to *B. pseudoclavipes* Okada. It is differentiated by having the legs entirely black except for the yellow bases of the tibiae and the hind femur of the ♂; by having the microtrichia continuous to the margin of the wings, and the wings distinctly infuscated with pale yellow-brown; by the hind basitarsus being longer, as in fig. 23, a; and by the outer lobe of each ♂ clasper being larger than the inner (fig. 23, b).

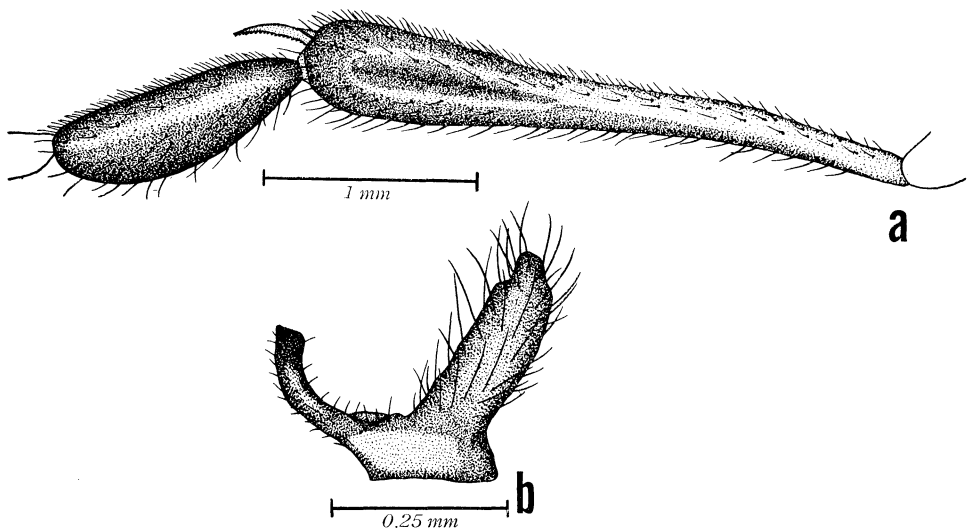


Fig. 23. *Bibio nigriclavipes* n. sp.: a, hind tibia and basitarsus of ♂; b, clasper, ventral view.

This species is also close to *deceptus* n. sp. and the distinctive details are given under the description of that species.

*Male*: Predominantly shining black, yellow pilose species. *Head*: From direct dorsal view head almost circular, just slightly wider than long. Eyes rather thickly covered with moderately long black hairs. Face densely yellow pilose in median portion, black pilose on sides. Antenna entirely black, with 10 distinct segments; apical portion obviously made up of 2 fused segments; flagellum straight sided, not noticeably swollen apically. Cardio stipites produced beyond bases of antennae. Last segment of each palpus 3× longer than wide; the other segments, beyond the first about 2× longer than wide, and the first segment as long as wide. *Thorax* entirely black, including humeral ridges; with 3 finely rugose areas extending down mesonotum. Halteres dark brown to black, tinged with yellow on stems. *Legs* almost entirely black, attenuated portion of hind femur yellow. Extreme bases of tibiae tinged with rufous and spurs of front tibia rufous, tinged with brown. Inner spur of front tibia almost as long as outer, as in figure of *pseudoclavipes*. Hind tibia about equal in thickness to femur and basitarsus equal in thickness to apex of tibia, former about 3× longer than wide (fig. 23, a). Spurs at apices of hind tibia serrated on dorsal surfaces. *Wings* faintly tinged with yellow-brown; anterior veins and stigma dark brown in color; posterior veins brownish yellow, distinctly darker than wing membrane. Costa ends at or very near apex of radial sector. Basal section of radial sector about 2/3 as long as r-m crossvein. Fork of  $M_{1+2}$  distinctly beyond m crossvein. Veins  $M_2$  and  $M_{3+4}$  extend to wing margin. *Abdomen* shining black, densely yellow pilose. Male genitalia very similar to those of *pseudoclavipes*, except that the cleft on tergum 9 more U-shaped and outer lobe on each clasper more strongly developed (fig. 23, b). Length: Body 8.5 mm; wings 7.5.

*Female*: Very similar to ♂, except for sexual differences; legs, however, entirely black with a faint tinge of rufous in the ground color. Humeral ridges yellow. As seen from dorsal view head about 1/3 longer than wide; widest through compound eyes. Front flat and area of front between eyes about equal in width to one eye. Portion of head behind compound eyes narrowed and slightly shorter than length of eye. Sclerotized portion of head in front of eyes about 1/3 as long as one eye. Length: Body 6.8–7 mm; wings 7.3.

Holotype ♂ (KU), Tamba, Sasayama, 11 Apr. 1958 (Nagatomi). Allotype ♀ (KU) and one paratype ♀ (UH), same data as type; the allotype is dated 10 Apr. 1958 and the paratype is without a date on the label. Type and allotype presented to Kyushu University, Fukuoka, by Akira Nagatomi.

***Bibio obuncus* Hardy and Takahashi, n. sp.** Figs. 24, a–c.

This species fits in the *B. amputonervis* complex because of the elongate inner spur of each front tibia and the incomplete veins  $M_2$  and  $M_{3+4}$ . It differs from *amputonervis* by its larger size; by the antennae not being clavate; by the costa ending at or very near the apex of the radial sector and the base of radial sector equal to or slightly longer than the r-m crossvein. Also the ♀ differs by having the thorax entirely yellow to rufous. The ♀ fits close to *B. simulans* n. sp. but differs by having the legs all yellow; the head nearly 2× longer than wide; the wings infuscated with yellow; and veins  $M_2$  and  $M_{3+4}$  incomplete.

*Male*: Predominantly black bodied, yellow pilose species. *Head*: Densely black pilose over entire head, including compound eyes. Eyes about  $1/4$  wider than high. Antennae with 10 distinct segments and entirely black except for a tinge of yellow on apical portion of pedicel. Cardo stipites well developed and protrude well beyond bases of antennae. Palpal segment 2 nearly  $3\times$  longer than wide; segment 4 just slightly longer than wide; segments 3 and 5 about  $1.5\times$  longer than wide. *Thorax* entirely subshining black except for yellow humeral ridges, also bases of halteres tinged with yellow. Pile entirely yellow. *Legs*: Coxae, trochanters, and apical segments of tarsi dark brown to black; remainder of legs yellow to rufous, tinged faintly with brown. Inner spur of front tibia almost as long as outer (fig. 24, b). Hind basitarsus not swollen, approximately  $4.2\times$  longer than wide. Spurs of hind tibia sharp pointed. Inner spur about  $2/5$  as long as basitarsus.

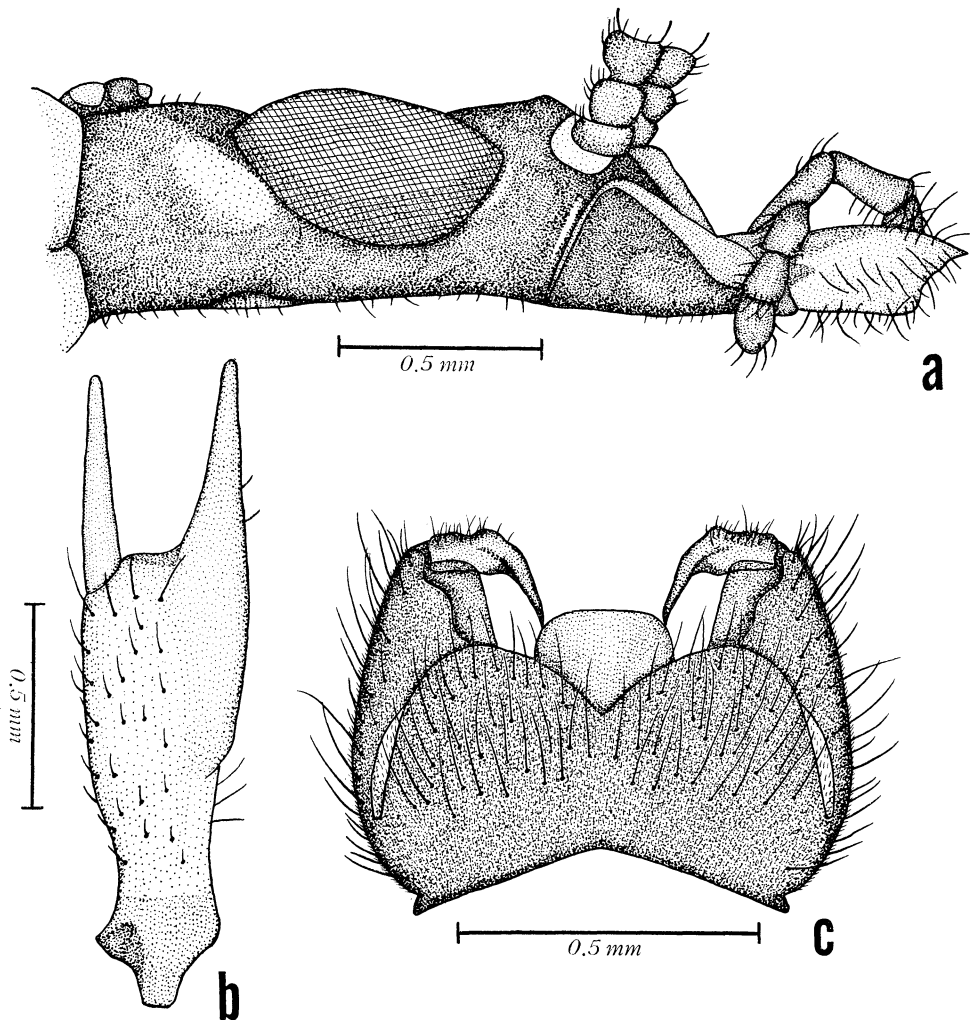


Fig. 24. *Bibio obuncus* n. sp.: a, head of ♀; b, front tibia of ♂; c, ♂ genitalia, dorsal view.



*Wings* hyaline or nearly so, very faintly tinged with yellow-brown. Costa ends at or near apex of radial sector. Basal section of Rs equal to or slightly longer than r-m crossvein. Anterior veins and stigma dark brown. Posterior veins faintly colored, almost concolorous with membrane. Veins  $M_2$  and  $M_{3+4}$  end distinctly before wing margin. *Abdomen* subshining black, densely yellow pilose along sides, on venter and over dorsum of first 2 segments; with short dark colored hairs scattered over dorsal points of terga beyond segment 2. Sternum 9 slightly wider than long, the cleft on the posterior margin extends about  $1/3$  the length of the segment. Claspers moderately slender and curved downward at their apices. Tergum 9 nearly  $2 \times$  wider than long and has a broad V-shaped concavity on hind margin extending about  $1/3$  length of segment (fig. 24, c). Length: Body and wings 7-7.7 mm.

*Female*: Thorax and legs entirely yellow except for insignificant markings of brown around wing bases, on pronotum, and on extreme apices of femora and tibiae. From a direct dorsal view head about  $2 \times$  longer than wide, front between eyes rather narrow, about equal in width to one eye. Portion of head behind eyes, measured from a lateral view, about  $3/4$  as long as one eye; sclerotized portion of head in front of eyes about  $1/2$  as long as one eye. Cardio stipites very prominently developed as in fig. 24, a. Wing more distinctly infuscated, brownish yellow, than in ♂, especially on anterior portion. Abdominal terga black, sterna yellow-brown. Length: Body 8.5 mm; wings 8.5-9.3.

Holotype ♂ (KU) and allotype ♀ (KU), Yoro, Yoro-Jima, Amami Is., 11 Mar. 1958 (Takahashi); 4 paratypes (USNM, UH; 2 in KU), 1 ♂ and 3 ♀, 2 same data as type; one Koniya, Amami-Oshima, Amami Is., 31 Mar. 1958 (Takahashi) and one Ukeamuro, Ukejima, Amami Is., 15 Mar. 1958 (Takahashi).

***Bibio omani* Hardy and Takahashi, n. sp.** Figs. 25, a-c.

The ♂ of this species fits rather close to *B. aneuretus* n. sp. but differs by having the femora predominantly yellow, the hind tibiae evenly tapered (fig. 25, b) and the inner spur of each hind tibia nearly  $1/2$  as long as the basitarsus. The ♀ is very different from that of *aneuretus* because of the all rufous thorax and infuscated wings. The ♀ fits very close to that of *simulans* n. sp. and is difficult to differentiate from this species. Most specimens can apparently be separated by the predominantly rufous tibiae and tarsi; this may not be a constant character, however, since 2 specimens are on hand which have dark colored tibiae and tarsi.

*Male*: Dark bodied, black pilose species. *Head* slightly wider than long as seen from direct dorsal view, thickly black pilose. Antennae entirely black, of 9 distinct segments, apical portion obviously consists of 2 fused segments. Cardio stipites not developed, scarcely visible from lateral view. Palpi moderately slender, last 3 segments  $2\frac{1}{2}$ - $3 \times$  longer than wide. *Thorax* shining black, except for yellow humeral ridges. Pile entirely black. Three bare areas extending longitudinally down mesonotum very indistinctly rugose; this is scarcely discernible especially down median portion of mesonotum. Halteres brown to black on knobs, yellow, tinged with brown stems. *Legs* predominantly pale colored; coxae and trochanters black. Apices of femora and tibiae brown to black and apical segments of tarsi brown to black. Legs otherwise yellow. Front tibia rather slender, inner spur almost equal to outer (fig. 25, a). Posterior basitarsus about  $5 \times$  longer than wide and about  $1/3$  as long as tibia (fig. 25, b). *Wings* hyaline or nearly so, slightly infuscated

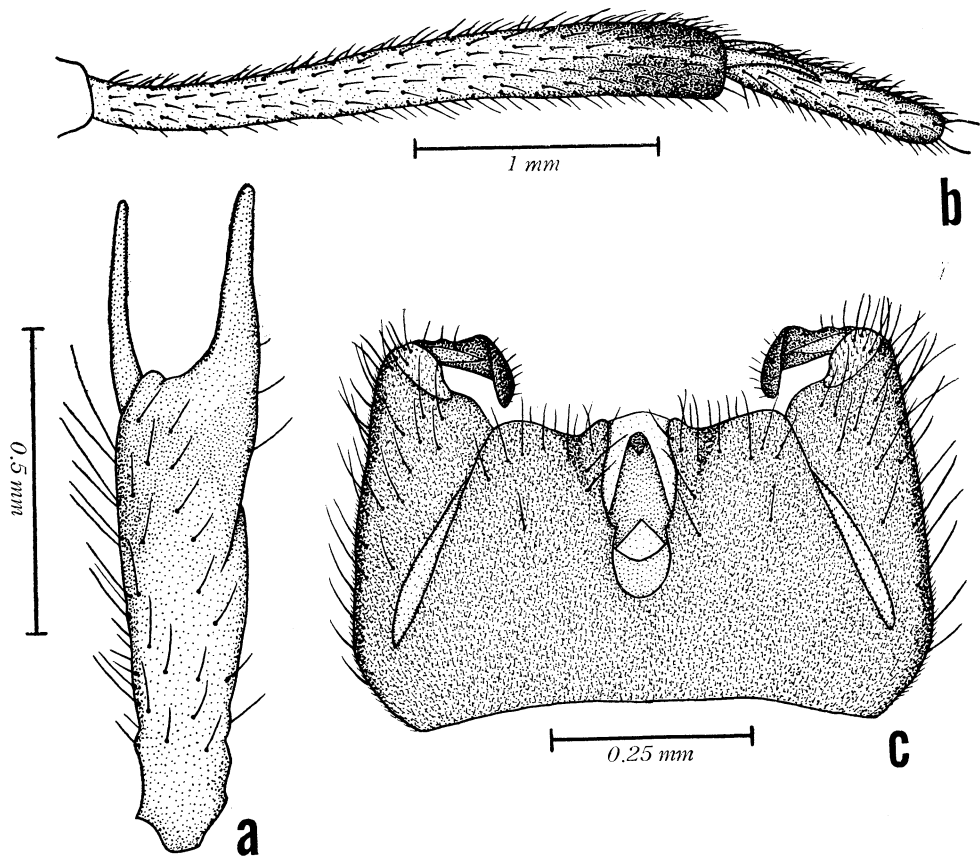


Fig. 25. *Bibio omani* n. sp.: a, front tibia of ♂; b, hind tibia and basitarsus of ♂; c, ♂ genitalia, dorsal view.

ed on anterior portion. Anterior veins yellow, tinged very faintly with brown; posterior veins concolorous with membrane. Stigma dark brown. Veins  $M_2$  and  $M_{3+4}$  extend almost to wing margin. Base of vein  $M_{3+4}$  (appearing like a crossvein) almost obliterated. Basal section of radial sector just slightly shorter than r-m crossvein. Abdomen shining black, black pilose, rather thickly gray-brown pubescent on dorsum. Sternum 9 nearly  $2/3$  wider than long, median portion of sclerite semi-membranous. Claspers rather small and curved downward at apices. Tergum 9 has a deep cleft extending about  $3/4$  length of segment, upper margins curve inward and slightly lobate (fig. 25, c). Length: Body 5.4–6 mm; wings 5.3–5.6.

*Female*: Fitting description of *B. simulans* in most details. Thorax entirely yellow to rufous, and legs predominantly so. Head just slightly longer than wide. Sclerotized portion of head in front of eyes short, scarcely  $1/4$  or  $1/5$  as long as eye, and portion of head behind eyes  $1/2$ – $3/5$  as long as one eye when seen in direct lateral view. Wings more distinctly tinged with yellow than in ♂. Knobs of halteres brownish yellow. Length:

Body 5.7 mm; wings 6.7.

Holotype ♂ (USNM), allotype ♀ (USNM) from Karuizawa, Nagano Pref., 31 May 1953 (Oman); 19 paratypes (NIAS, BM, BISHOP, UH; 6 in USMN), 7 ♀ and 12 ♂, from the following localities: Same as type; Mt. Takao, 29 Apr. 1949 (Hattori); Shimogamo, Kyoto, 29 Mar. 1949 (Hattori); and Kyoto, 23 Apr. 1939 (Takeuchi). One ♀ (KU) from Kobotoke-Toge, near Tokyo, 2 May 1959 (Tsutsumi) appears to belong here but is slightly aberrant and is not designated as a paratype.

It is with pleasure that we name this species after Dr. P. W. Oman, who has made many outstanding contributions in the field of leafhopper taxonomy.

***Bibio pomonae iwasukensis* Ouchi** Figs. 26, a-c.

*Bibio pomonae* var. *iwasukensis* Ouchi, 1940, Shanghai Sci. Inst., Jour. Sec, 3, 4: 294.

*Bibio pomonae* Fabricius has been recorded commonly in the Japanese literature. Ouchi treated the Japanese form as a variety of *pomonae* but we are considering it as a distinct subspecies. The specimens which we have seen from Japan differ from typical *pomonae* in that the wings are evenly infuscated with pale yellow-brown and the posterior veins are dark colored; rather than the wings being hyaline with the posterior veins concolorous with the wing membrane.

A moderately large species, entirely shining black except for rufous femora. Body and legs densely black pilose. Cardo stipites not produced, bases of palpi situated before bases of antennae. Palpi moderately elongate. Last 2 segments about  $4\times$  longer than wide, segment 3 flattened dorsoventrally and about  $2.5\times$  longer than wide. Segment 1 of palpus short, about as long as wide; segment 2 is  $2\times$  longer than wide. Antennae 10 segmented. Female head just slightly longer than wide as seen from direct dorsal view. Sclerotized portion in front of eyes short, about equal in length to first 2 antennal segments; portion of head behind eyes almost as long as eye. Front flat, and approximately  $2\times$  wider than compound eyes. Front tibia rather slender, inner spur about  $1/2$  as long as outer (fig. 26, a). Wing rather evenly yellow-brown fumose, darker along anterior portion. Costa ends at tip of radial sector. Basal section of Rs about  $2\times$  longer than r-m crossvein. Posterior veins pale brown. Hind basitarsus about  $4\times$  longer than wide, and about  $1/3$  as long as tibia (fig. 26, b). Hind tibia moderately clavate, at its widest point slightly broader than femur. Tergum 9 is  $2\times$  wider than long and has a moderately deep V-shaped cleft on hind margin, extending  $2/3$  length of segment (fig. 26, c). Sternum 9 is cleft about  $1/3$  its length on hind margin. Clasper rather slender (fig. 26, c). Length of ♂: Body 11.5–12.75 mm; wings 10.5–11. Female: Body 13–14.5 mm; wings 13.5–14.8.

Type locality: Mt. Iwasuga, Nagano Pref., Japan. Type in Academia Sinica, Peking, China.

This species has been reported to be rather widely distributed over Japan. We have examined specimens from the following localities: Mt. Choogatake, Japan Alps, Aug. 1955 (Hattori); Kiso-ontake, Aug. 1951 (Hasegawa); Nagano Pref., Sept. 1953 (Hasegawa); Mt. Norikura, Nagano Pref., Sept. 1959 (Hasegawa); Nakanoyu, Japan Alps, Aug. 1955 (Fukuhara); Kamikochi, Nagano Pref., Aug. 1949 and 1952 (Kato); Hakusan, Kaga, 12 Aug. 1954 (Takeuchi); and Mt. Ôtaki, Japan Alps, Aug. 1955 (Kato).

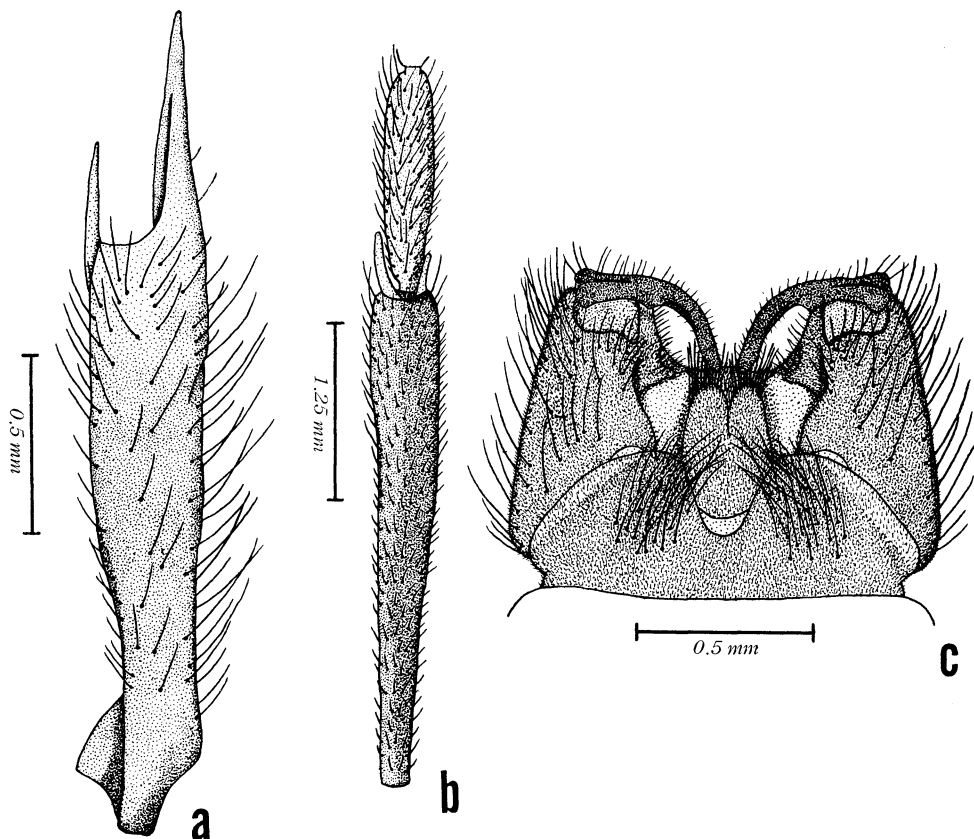


Fig. 26. *Bibio pomonae iwasugensis* Ouchi: a, front tibia of ♂; b, hind tibia and basitarsus of ♂; c, ♂ genitalia, dorsal view.

Typical *pomonae* apparently occurs in the islands north of Japan. The senior author has seen one specimen from Is. Horomushiro, Northern Kurile Islands, Aug. 1931 (Koba & Okada) which appears to be typical *pomonae*.

***Bibio pseudoclavipes* Okada** Figs. 27, a-f.

*Bibio pseudoclavipes* Okada, 1938, Fac. Agric. Hokkaido Imp. Univ., Jour. 42 (2): 214, pl. 8, fig. 5. [in Part]

*Bibio lepidus* Coquillett nec Loew, 1898, U. S. Nat. Mus., Proc. 21: 306. The senior author has examined the Coquillett series in the USNM.

This species is distinguished from other Japanese *Bibio* which have the elongate inner spurs of the front tibia (fig. 27, a), by the strongly swollen hind basitarsus of the ♂ (fig. 27, b) and by the ♂ genitalia (fig. 27, e). It is closely related to *B. nigriclavipes* n. sp. but the legs are predominantly yellow; the head is much shorter with the cardo stipites not

developed beyond bases of antennae; and the posterior margin of the wing has a narrow area free of microtrichia.

**Male:** Black bodied, predominantly yellow haired species. Antennae apparently 10 segmented although last 2 flagellar segments closely fused. Last segment of palpus 1.5–2.0× longer than wide, antepenultimate segments about 2× longer than wide and penultimate scarcely longer than wide. Cardo stipites small so bases of palpi situated before bases of antennae. Thorax subshining black in ground color, with 3 opaque, rugose areas extending down mesonotum. Inner spur of front tibia about as long and as strong as outer (fig. 27, a). Hind tarsus rather strongly swollen, basitarsus slightly over 2× longer than wide, about equal in length to next 2 tarsal segments and about as wide as apex of tibia (fig. 27, b). Hind femur attenuated on its basal 1/2 to 3/5 and swollen on apical portion. Legs somewhat variable in coloration, hind legs predominantly yellow, brown on swollen portion of femur and on apex of tibia, also a brown streak sometimes present along dorsal margin of tibia, apical 3 segments of tarsi brown. Front femur brown along dorsal and ventral surfaces and yellow on anterior and posterior surfaces. Middle femur predominantly brownish-yellow, more distinctly brown along dorsal surface. Front tibia yellow-brown, more distinctly yellow at apex and at base. Middle tibia yellow, brown at base

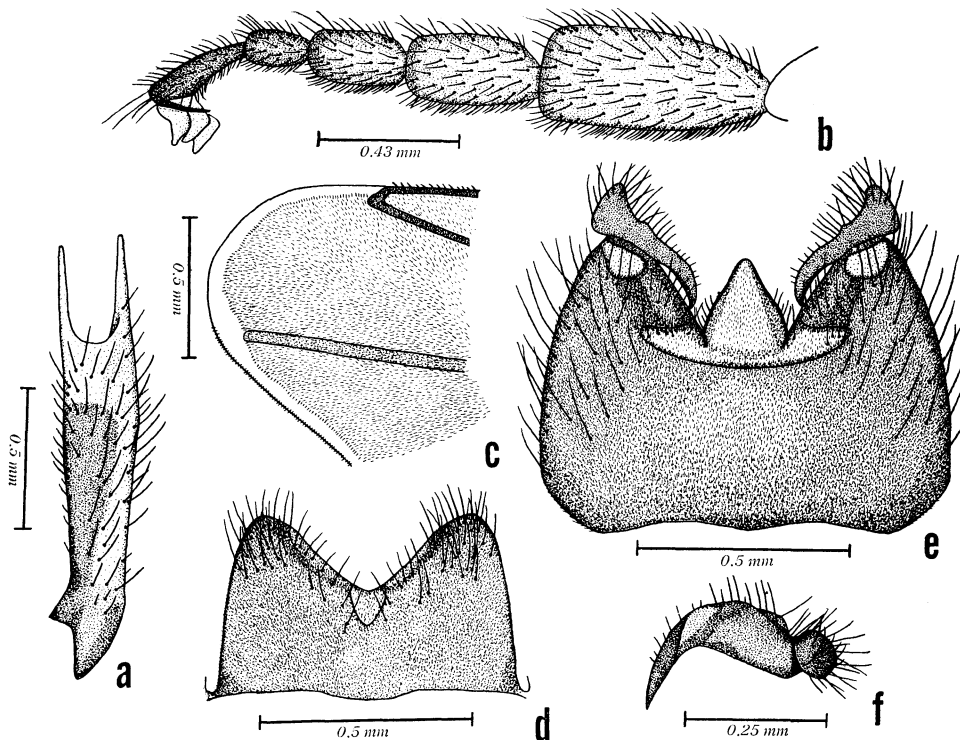


Fig. 27. *Bibio pseudoclavipes* Okada: a, front tibia of ♂; b, hind tarsus of ♂; c, tip of wing; d, tergum 9 of ♂; e, ♂ genitalia, ventral view; f, clasper, dorsal view.

and along dorsal surface. Wings hyaline, stigma dark brown. Costa ends at or near apex of radial sector. Base of Rs slightly shorter than r-m crossvein. Posterior margin of wing, from apex of radial sector to anal lobe, has a narrow border which is free of microtrichia (fig. 27, c). Tergum 9 of ♂ has a V-shaped cleft in middle of hind margin (fig. 27, d). Sternum 9 has a very shallow cleft on hind margin (fig. 27, e). Claspers strongly curved, very distinctive in shape, as in fig. 27, f. Length: Body 7–8.5 mm; wings 8.

The ♀ fits description of the ♂ in most respects. Propleura and sometimes remainder of pleura tinged with rufous and legs more consistently rufous, paler in color than in ♂. Head rather elongate, from direct dorsal view nearly 2 × longer than wide, portion of head behind eyes equal in length to eyes and portion in front of eyes about 1/2 as long as eyes. Basal 2 segments of antennae yellow in most specimens. Wings lightly tinged with yellow. Length: Body 7.5 mm; wings 8.2.

Type locality: Tajima, Honshu. Type in the collection of the Hokkaido University, Sapporo.

The type series apparently contained 2 species. Allotype and the darker colored specimens mentioned in the original from Hokkaido are *deceptus* n. sp. This is apparently one of the commonest of the Japanese Bibionidae. Okada (1938: 214–215) recorded it from several localities on Hokkaido and Honshu, and also from Korea. Specimens are on hand from Wakasugiyama (Chikuzen), Kyushu, 12 May 1929 (Nakahara); Yamanashi, Kiyokawa Mura, 17 Apr. 1953 (Skay & Crossman); Tamba, Sasayama, 12 Apr. 1956 (Nagatomi); Tokyo, Mar. 1931 (Gressitt) and May 1953 (Blodgett); Kobe, Hyogo Pref., May 1928 (Fullaway); Shimogamo, Kyoto, Mar. 1949 (Hattori); Aburatsubo, Kanagawa Pref., Mar. 1950 (Fukuhara); Chojamachi, Prov. Kadusa, Mar. 1928 (Kumasawa); Osima Farm, Maebashi, Apr. 1940; Shimogamo, Kyoto, Mar. 1959 (Sasakawa); Kyoto, Mar. 1958 (Takeuchi); and Hirayama Hill, Minamitama, Apr. 1956 (Okazaki).

• ***Biblio ryukyuensis* Hardy and Takahashi, n. sp.** Figs. 28, a–d.

This species is closely related to *B. obuncus* n. sp. and may possibly be a subspecies of it. It appears to differ distinctly, however, because of the much smaller size; the shorter rostrum and head in both sexes; by the narrow V-shaped cleft on the hind margin of tergum 9 of the ♂; and by having the claspers of the ♂ bent at right angles apically (fig. 28, d).

*Male*: Head slightly wider than long. Eyes densely black pilose. Hairs about equal in length to 2 or 3 antennal segments. Cardo stipites well developed and extend beyond bases of antennae. Palpi short, last 3 segments scarcely longer than wide; segment 2 slender, about 3 × longer than wide. Antennae 9 segmented, last 3–4 segments of flagellum closely joined. Apices of scape and pedicel, and base of flagellar segment 1 yellow, tinged with brown; remainder of antenna dark brown to black. Thorax entirely shining black except for yellow humeral ridges densely yellow pilose. Halteres dark brown to black. Legs: Coxae and trochanters black. Apical 3 segments of each tarsus dark brown. Remainder of legs rufous, tinged lightly with brown. Inner spur of front tibia almost as long as outer (fig. 28, b). Hind leg moderately slender. Femur attenuated on its basal 1/2; tibia evenly tapered, clavate in shape, distinctly broader than femur. Hind basitarsus 4 × longer than wide and slightly longer than segments 2 and 3 combined (fig. 28, c).

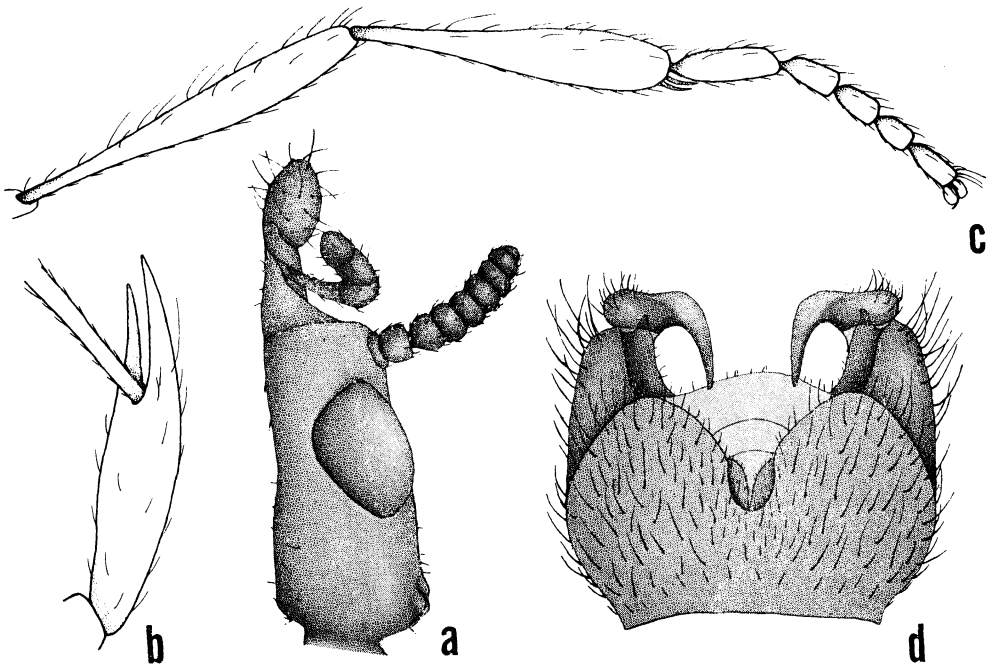


Fig. 28. *Bibio ryukyuensis* n. sp.: a, head of ♀; b, front tibia; c, hind leg of ♂; d, ♂ genitalia, dorsal view.

*Wings* subhyaline, slightly infuscated along anterior portion. Stigma and anterior veins dark brown. Costa ends at apex of radial sector and basal section of radial sector equal to or slightly longer than r-m crossvein. Posterior veins pale yellow-brown. Veins  $M_2$  and  $M_{3+4}$  evanesce before reaching margin. *Abdomen* entirely shining black in ground color, rather densely gray pollinose and densely yellow pilose, especially on sides. Tergum 9 about 2/3 wider than long and has a rather narrow V-shaped cleft in middle of hind margin extending approximately 1/2 length of segment (fig. 28, d). Cleft in middle of hind margin of sternum 9 extends about 1/3 length of segment and median portion semi-membranous, slightly gibbose. Claspers slender pointed, curved downward at right angles on apical 1/2 (fig. 28, d). Length: Body 5.5 mm; wings 5.

*Female*: Head rather elongate, almost  $2 \times$  longer than wide; sclerotized portion of head in front of eyes about 1/3 as long as eye, portion of head behind eyes 3/4–4/5 as long as eye (fig. 28, a). Scape, pedicel, and basal section of flagellum yellow. Thorax yellow to rufous except 3 black vittae down mesonotum and lower 1/2 of each sternopleuron black. One specimen at hand has thorax entirely yellow to rufous, very much like that of *obuncus* n. sp. Halteres pale yellow-brown. Legs entirely pale colored including coxae and trochanters, apical segments of tarsi, however, brown, tinged with red. Front femur stout, about  $2.5 \times$  longer than wide, has numerous black setae along anteroventral surface. Wings faintly tinged with yellow, anterior veins and stigma yellow, tinged lightly with brown. Abdomen brown, tinged with red in ground color. Length: Body

5.2–5.4 mm; wings 6.5–7.

Holotype ♂ (NIAS), allotype ♀ (NIAS), and 27 paratypes (USNM, BM, BISHOP, UH; 15 in NIAS), 25 ♂ and 2 ♀, from the Ryukyu Is. (no specific localities given, probably Okinawa), collected on several different dates from 19 Jan. to 16 Mar. 1953 (Shiraki).

**Bibio simulans** Hardy and Takahashi, n. sp. Fig. 29, a–d.

This species is apparently most closely related to *holomaurus* n. sp. but differs by having the legs distinctly bicolored; the cardo stipites not produced and the palpi more elongate; tergum 9 of the ♂ deeply cleft (fig. 29, b); the cleft of sternum 9 shallow; the claspers not so sharp pointed (fig. 29, d); and the thorax of ♀ entirely rufous.

*Male*: Predominantly shining black species, with black pile on body and legs. *Head*: Antennae of 9 distinct segments, apical portion obviously made up of 2, closely fused, segments. Palpi slender, segments 2–4 are  $2\frac{1}{2}$ –3 × longer than wide and segment 5 about 3.5 × longer than wide. *Thorax* entirely shining black except for yellow humeral ridges. Halteres black, except for a tinge of rufous on the stems. *Legs* largely shining black,

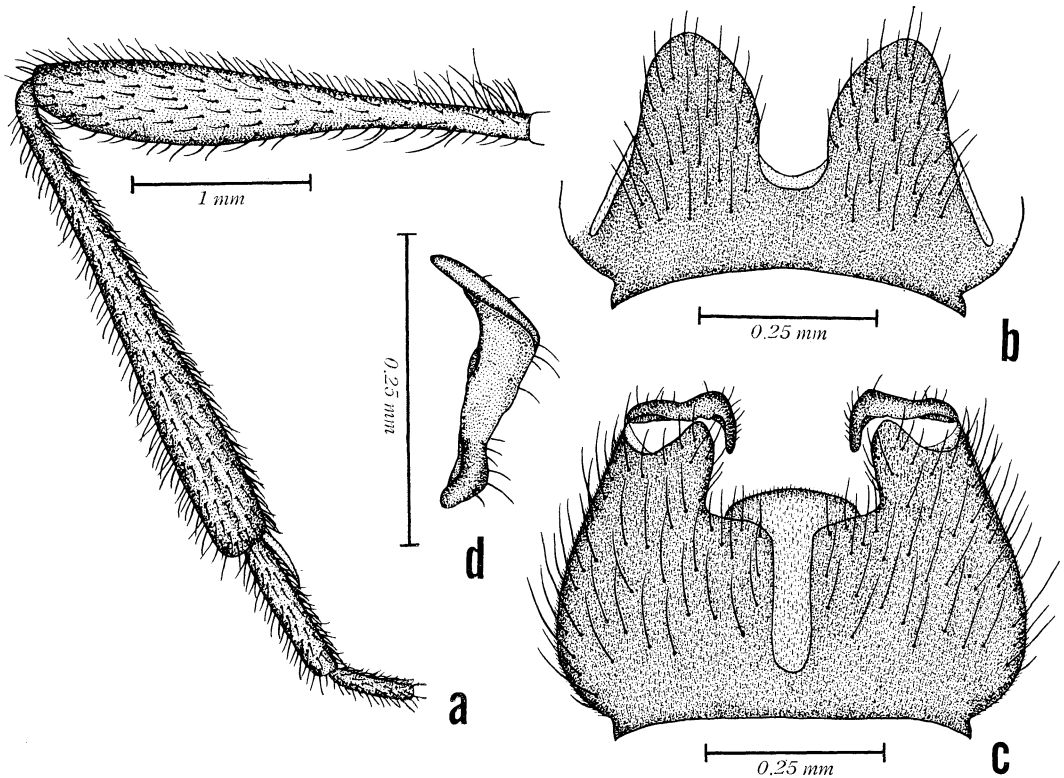


Fig. 29. *Bibio simulans* n. sp.: a, hind leg of ♂; b, tergum 9 of ♂; c, ♂ genitalia, ventral view; d, clasper, dorsal view.



tinged with rufous in ground color. Middle tibia and basitarsi of first 2 pairs of legs yellow, tinged with brown at apices; front tibia yellow to rufous discolored with brown to black in median portion; and basal portion of hind femur often yellow to rufous. Inner spur of front tibia almost as long as outer (as in fig. 13, a of *aneuretus*). Hind femur and tibia slender (fig. 29, a) and posterior basitarsus  $4\times$  longer than wide, and  $2\times$  longer than inner spur of tibia. Wings hyaline, anterior veins yellow, posteriors colorless. Stigma pale brown. Costa ends slightly beyond apex of radial sector and basal section of radial sector about  $2/3$  as long as r-m crossvein. Abdomen shining black in ground color, with moderately long black pile on lateral margins of terga. Tergum 9 has a deep U-shaped cleft extending about  $2/3$  length on hind margin (fig. 29, b). Cleft of sternum 9 rather shallow and a membranous area extends longitudinally down middle of sternum (fig. 29, c). Claspers as in fig. 29, d. Length: Body 6–7 mm; wings 5.4–6.1.

*Female*: Thorax entirely rufous and coxae, trochanters and femora rufous except for brown to black discolorations at apices of latter. Front tibia rufous, discolored with brown to black on median portion; other tibiae and all tarsi dark reddish brown to black. Front femur short and thick, about  $2.5\times$  longer than wide and each has numerous short spines along anteroventral surface (as in fig. 13, b of *aneuretus*). Wings tinged very lightly with yellow. Body pile yellow. Head shaped as in *aneuretus*. Basal 2 segments of antenna yellow. A tiny black spot present at base of each seta on mesonotum and scutellum. Length: Body 6.3 mm; wings 7.4.

Holotype ♂ (KU) and allotype ♀ (KU) from Tamba, Sasayama, 24 Apr. 1958 (Nagatomi); 31 paratypes (HYOGO, KU, SAIKYO, USNM, BM, BISHOP, UH), 19 ♂ and 12 ♀, all except 2 from the type locality collected from April to June 1954, 1957, and 1958. Also one paratype each from Tamba, Okamomura, Honshu, 1 May 1951 (Nagatomi); Iso, Kagoshima, Satsuma, 3 Apr. 1954 (Nagatomi): Hikosan, Kyushu, Fukuoka Pref., 8–10 May 1957 (Morimoto); and 1 paratype ♀, Saga, Kyoto, 7 May 1932 (Tokunaga). Type and allotype have been presented to Kyushu University by Akira Nagatomi.

***Biblio singularis* Hardy and Takahashi, n. sp. Fig. 30.**

This species apparently is closely related to *B. matsumurai* Okada but is differentiated by the inner spur of the front tibia being only about  $2/3$  as long as the outer (fig. 30), and by the thorax of the ♀ being entirely black. At the present time only the ♀ is known.

*Female*: Entirely black species with conspicuously dark colored wings. Head about as wide as long as seen from direct dorsal view. Front between eyes nearly  $2\times$  broader than one eye and portion of head behind eyes measured from lateral view about  $2/3$  as long as one eye. Sclerotized portion of head in front of eyes scarcely developed and cardo stipites not produced beyond front margin of head. Segments of palpi beyond 1st approximately  $2\times$  wider than long. Antennae 10 segmented. No carina present in middle of front. Ocelli situated on a moderately prominent tubercle. Thorax entirely black except for humeral ridges. Mesonotum subopaque. Legs entirely black except for brownish red tibial spurs. Spurs of front tibia as in fig. 30. Front femur short and thick, scarcely more than  $2\times$  longer than wide. Spurs of hind tibia sharp pointed, inner spur about  $1/3$  as long as basitarsus; hind basitarsus approximately  $1/3$  as long as tibia. Hind femur moderately attenuated at bases; basal  $2/5$  strongly narrowed. Wing evenly brown fumose, darker over

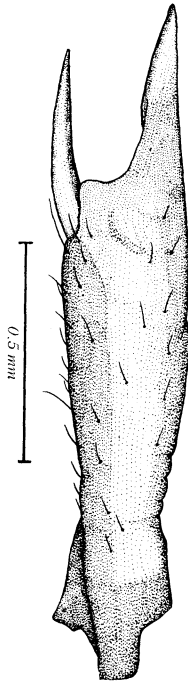


Fig. 30. *Bibio singularis* n. sp., front tibia of ♀.

anterior portion of wing; brown coloration extends through 1st costal cell, basal cells, and through alulae; costa ends at or near apex of radial sector; r-m crossvein slightly shorter than basal section of radial sector. Veins  $M_2$  and  $M_{3+4}$  extend to wing margin. Posterior veins dark brown, darker than wing membrane. *Abdomen* polished black with short black pile. Length: Body and wings 7.5 mm.

Holotype ♀ (KU), Nibushi, Lake Kuccharo, Hokkaido, 4 June 1957 (Takahashi); 2 ♀ paratypes (KU, UH) from Ashorobuto, Ashoro-Gun, Hokkaido, 29 May 1957 (Takahashi). Male unknown.

***Bibio tenebrosus*** Coquillett Figs. 13, a-f.

*Bibio tenebrosus* Coquillett, 1898, U. S. Nat. Mus., Proc. 21: 307.

*Bibio obscuripennis* de Meijere, 1904, Dijdr. tot de Dierkunde 18: 86. **New synonymy.**

*Bibio tenebrosus* var. *nigerrimus* Duda, 1930, In Lindner, Die Fliegen der Palaearkt. Reg., Bibionidae 4: 43, 70. **New synonymy.**

The senior author has compared numerous specimens from N. India with specimens from Japan and it is obvious that these are synonyms. Duda (*op. cit.*: 43) indicated that typical *tenebrosus* has the pile of the thorax and the abdomen yellow while his variety *nigerrimus* was characterized by having black hair on the thorax and abdomen. The typical *tenebrosus* (from Japan) are predominantly black pilose, with pale yellow pile on the pleura and on the sides of the first 2 abdominal terga; this was stated in the original description. Specimens, from Japan, have been studied which have all of the thoracic pile yellow, and others which have it all black and we question whether or not this character is of any significance. One slight difference which we see is that specimens from Japan all apparently have yellow pile on the sides of the first 2 abdominal terga while those from N. India have the abdominal pile all black; this is probably of no significance. There are also very slight differences in the lengths of the outer spurs of the front tibiae of the ♂ in specimens from Japan and India but these differences are not enough to be of any importance.

Large, entirely black species readily differentiated from all other *Bibio* by the wing venation and by blunt outer spurs of front tibiae (figs. 32, b & 31, c). Thorax shining black in ground color, except for 3, broad, rugose areas which extend longitudinally down mesonotum; median area (vitta) extends from anterior margin almost whole length of sclerite, each of lateral rugose areas extends from about anterior 1/3 to posterior 1/7 of sclerite. In ♂, front tibia long and slender, and outer spur short, about 1/6-1/7 as long as remainder of tibia. From direct dorsal view outer spur slightly tapered and sharp pointed (fig. 31, a). From lateral view spur nearly straight sided and blunt at apex (fig. 31, b). Tibia slightly convex ventrally, as seen in lateral view. Inner spur of front tibia very tiny, poorly developed. Spurs of hind tibia moderately long and slender. Hind basitarsus nearly 4 × longer than wide. The basal 1/2 of each hind femur rather strongly attenuated and

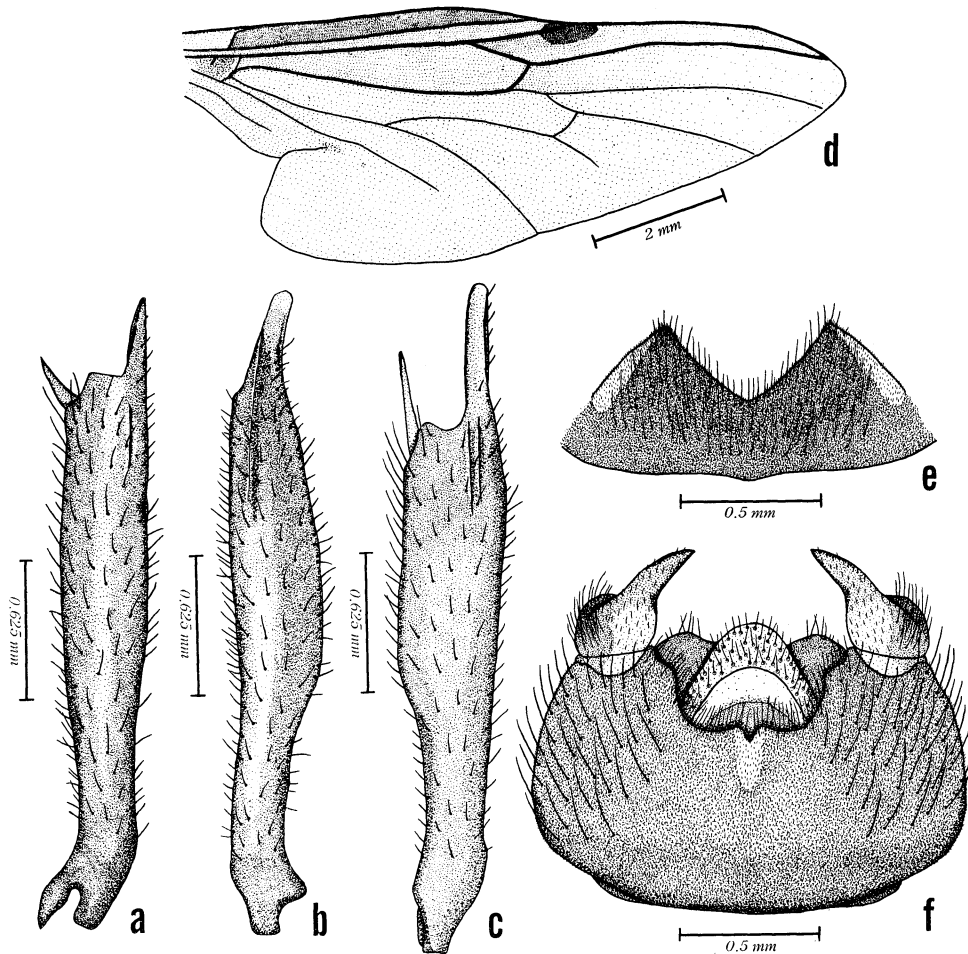


Fig. 31. *Bibio tenebrosus* Coquillett: a, front tibia of ♂, dorsal view; b, front tibia of ♂, lateral view; c, front tibia of ♀, dorsal view; d, wing of ♂; e, tergum 9 of ♂; f, ♂ genitalia, ventral view.

almost parallel sided, apical 1/2 swollen. Wings rather evenly infuscated with yellow brown, 2nd costal section and stigma brown. Vein  $M_{3+4}$  ends about 2/3 distance from m crossvein to wing margin (fig. 31, d). Costal vein extends slightly beyond apex of radial sector. Basal section of Rs nearly  $2 \times$  longer than r-m crossvein, and section of vein  $M_{1+2}$  beyond r-m crossvein about equal in length to crossvein. Front of ♀ has a moderately developed tubercle on anterior median margin; middle portion flat. A raised area extends from ocellar tubercle to back edge of head. Portion of head behind compound eyes almost equal in length to eyes. Length of head behind eyes seems to vary somewhat, some specimens have been seen which have a slightly shorter head. Front tibia of ♀ shorter and thicker than in ♂ and spurs larger; outer spur almost 1/3 as long as remainder of segment (fig. 31, c). Tergum 9 of ♂ has a rather deep V-shaped cleft in middle

of hind margin (fig. 31, e). Sternum 9 cleft about  $1/3$  its length. Claspers rather small, sharply curved inward and pointed at apices (fig. 31, f). Length: Body 11–14 mm; wings 7.5–13.5.

Type locality: "Japan". Type in the United States National Museum.

This species has been recorded from numerous localities on Honshu, Shikoku and Kyushu. It occurs in N. India and is probably widespread throughout the orient. Okada (1938: 215 and 1939: 20) also recorded it from Korea and from Java. We certainly would question this latter record.

We have studied specimens from the following localities in Japan: Kagoshima, 16 Apr. 1910 (Thompson); Kobe, 1909 (Thompson); Tokyo, 23 Sept. 1930 (Iwamoto); Tachibanayama (Chikuzen), Kyushu, 26 Apr. 1931 (Esaki, Takeya, Yasumatsu, Fujino, Hashimoto, & Choh); Sasayama, Tamba, Apr.-May 1952 (Miki & Iwata); Mt. Zōzu, Sanuki, Shikoku, May 1953 (Miyatake); Omogokei, Iyo, Shikoku, May 1958 (Miyatake); Kifune, Kyoto, Apr. 1955 (Takahashi); Mt. Takao, Tokyo May 1951 (Hasegawa); Tazimagahara, Saitama Pref., Apr. 1953 (Hattori); Numata, Gunma Pref., May 1949 (Takei); Nokogiriyama, Okutama, May 1951 (Kato); Tamagawa-Gakuen, Kanagawa Pref., May 1949 (Fukuhara); Nikko, Tochigi Pref., May 1950 (Kato); Tajima, May 1953 (Takeuchi); Ikuhina Mura, Tokushima Pref., May 1953 (Hirai); Machida, Tokyo, no date given (Okada); and Hakkosan, Apr. 1947 (Minamikawa).

The senior author has also seen specimens from the following localities: Loochoo, May 1910 (Thompson); Fukien, Ken Tchen, 7 Apr. 1933, no collector given; and Mishmi Hills, Delai, and Phlogam, Assam, India, 7 Nov. 1936, altitude 1500–1650 m (M. Steele).

#### Genus *Dilophus* Meigen

*Philia* Meigen, 1800, *Nouv. Class. Mouch.*, 20. A rejected name.

*Dilophus* Meigen, 1803. *Illiger's Mag.* 1 (2): 269.

Members of this genus are characterized by having 2 or 3 sets of strong spines on each front tibia (fig. 33, a) and also by the wing venation (fig. 36, b). The radial sector is not branched and the basal section of Rs is short compared to the r m crossvein. This genus is very poorly represented in Asia, to date only 7 species have been recorded. Okada (1938) recorded 2 species of this genus from Japan, one as *Dilophus femoratus* Meigen and one which he described as a new species, *kagoshimaensis* Okada, based upon a single ♀ specimen. In the collections which we have studied we have found no specimens which fit either of these species, we are convinced that *Dilophus femoratus* does not occur in Japan and that Okada may have confused 2 or more species under this name. The specimens of *femoratus* which the senior author has studied from England differ from any Japanese species which we have seen by the comparatively short, thick, blunt spines on the front tibia and in the front thoracic comb of both sexes (figs. 32, a, 32, b, and 32, d). The ♂ genitalia also differ as shown in fig. 32, c. Sternum 9 is slightly longer than wide in *femoratus*, has a moderately deep cleft in the middle of the hind margin extending about  $1/3$  the length of the segment; the upper edges of the cleft are slightly convergent. The mesonotum is black in both sexes of *femoratus*. The thorax is rufous in all of the ♀ specimens which we have seen from Japan; Okada, however, indicated that the ♀ of the species which he called *femoratus* had the thorax entirely black.

At least 4 species apparently occur in Japan.

We are reverting to the name *Dilophus* Meigen (1803) even though this question has not been settled to date, there now appears definite hope that the Commission will take action on the Meigen 1800 names. *Dilophus* has been used entirely in the Japanese literature.

Type of genus: *Tipula febrilis* Linnaeus.

#### KEY TO SPECIES OF DILOPHUS KNOWN FROM JAPAN

1. Rostrum (sclerotized portion of face beyond eyes) very short, scarcely longer than pedicel of antenna in ♂, or scape plus pedicel in ♀ ..... 2  
Rostrum well developed, conspicuously protruding beyond eye margins; in ♂ about 1/2 as long as lower division of eye and in ♀ about 1/2 as long as eye.. **fulviventris**
2. Five spines situated at middle of front tibia (fig 36, b). Female legs black except for reddish brown front femora. Wings of ♀ brownish, very dark colored on front margin (fig. 36, a) (known only from the type ♀) ..... **kagoshimaensis**  
Four spines in the middle set on front tibia. At least front and middle coxae and femora of ♀ yellow to rufous. Wings hyaline..... 3
3. Legs of ♂ entirely black, ♀ with coxae and femora rufous on all legs. Mesonotum of ♀ black. Claspers of ♂ capitate, not truncate at apices (fig. 33, c)..... **aquilonia**  
Front coxae, trochanters, and femora of both sexes, and middle coxae, trochanters, and femora of ♀ yellow to rufous. Mesonotum of ♀ rufous. Claspers of ♂ truncate at apices (fig 34, c)..... **brevirostrum**

***Dilophus aquilonia*** Hardy and Takahashi, n. sp. Figs. 33, a-c.

*Dilophus femoratus* Okada (*nec* Meigen), 1938, Coll. Agr. Hokkaido Imp. Univ., Jour. 42 (2) 216.

Okada (1938: 217) recorded *D. femoratus* Meigen from Sakhalin and Hokkaido. However, as far as the junior author examined Okada's collection in Hokkaido University, the specimens from Sakhalin are apparently *D. aquilonia* n. sp. The specimens from Hokkaido are lost from Okada's collection.

This species is nearest to *D. brevisrostrum* n. sp. but is readily differentiated by the entirely black legs of the ♂; by the all rufous coxae and femora of the ♀; by the all black mesonotum of the ♀; and by the differences in the ♂ genitalia as shown in figs. 33, c and 34, c. The species is superficially similar to *D. femoratus* Meigen and specimens probably have been confused under this name in the literature. The rostrum is distinctly shorter than in *femoratus*; the spines at middle of the front tibia and in the anterior thoracic comb are slender, acute, sharp-pointed, not broad and blunt; the spines at the middle of the front tibia are not arranged in an oblique row as in *femoratus* (cf. figs 32, a and 33, a); the front of the ♀ is rugose, not smooth and polished; and the ♂ genitalia are very different (compare figs. 32, c and 33, b).

*Male*: Entirely polished black, rather sparsely pilose. *Head*: Antennae entirely black, 10 segmented, with last 2 flagellar segments closely joined. Bases of palpi hidden within

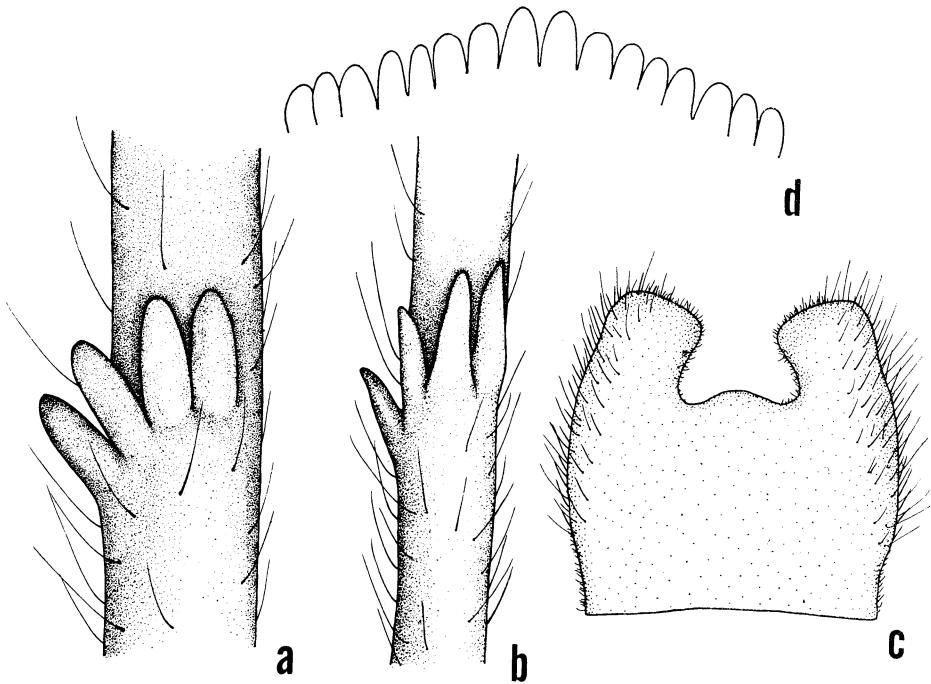


Fig. 32. *Dilophus femoratus* Meigen: a, middle of ♂ front tibia; b, middle of ♀ front tibia; c, ♂ genitalia, ventral view; d, anterior thoracic comb.

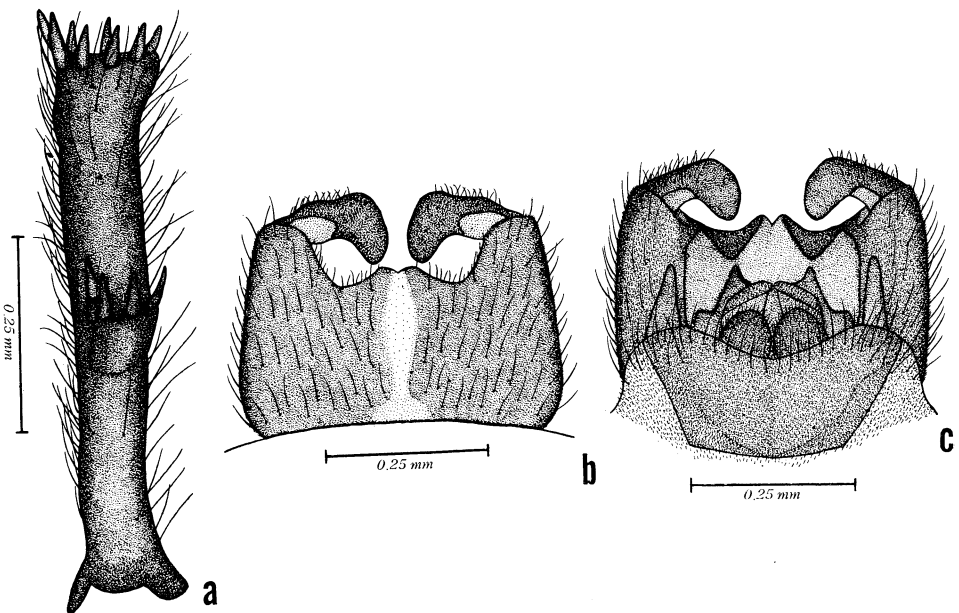


Fig. 33. *Dilophus aquilonia* n. sp.: a, front tibia of ♂; b, ♂ genitalia, ventral view; c, ♂ genitalia, dorsal view.

cavity formed by oral margin and only 3 segments readily visible. Last segment slightly less than  $2\times$  longer than wide and has several moderately long hairs at apex. Rostrum very short, protruding just a short distance beyond eye margin. *Thorax* polished black except for some yellow coloration on lower portion of each humeral ridge. Rather sparsely pilose, with brown to yellow-brown hairs around margin of mesonotum and with a row of dark colored hairs down each dorsocentral line. Thoracic combs not divided into 2 sets by median separation of teeth, and each comb consists of approximately 12 moderately developed, subacute teeth. Halteres black, with a faint tinge of yellow on stems. *Legs* entirely shining black, yellow pilose. Four spines situated at middle of front tibia, arranged with 2 spines situated close together on dorsal surface and with 2 spines displaced distally, rather wide apart and situated on anterodorsal and posterodorsal surfaces (fig. 33, a). Apical spur of front tibia about equal in size to spines of apical set. Hind femur moderately slender, gently tapered toward base. Hind tibia almost straight sided. Hind tarsi slender, not at all swollen. *Wings* entirely hyaline, stigma obsolete, concolorous with wing membrane. Costa extends about  $1/2$  distance between apices of radial sector and vein  $M_1$ . *Abdomen* entirely shining black, tinged slightly with brown in ground color especially on venter. Faintly gray-brown pollinose over dorsum and with moderately short yellow hairs on sides of terga and over sterna. Cleft on hind margin of sternum 9 extends about  $1/3$  length of segment and is expanded posteriorly. Claspers gently capitate, apices slightly rounded and produced at dorsoapical margin (fig. 33, b). Tergum 9 very gently concave on posterior margin (fig. 33, c). Length: Body 4.7 mm; wings 4.5.

*Female*: Predominantly polished black, colored similarly to ♂ except sides of notum between thoracic combs yellow, also propleura entirely yellow and coxae and femora of all legs yellow. Head slightly longer than wide as seen in direct dorsal view, rostrum short, approximately equal in length to scape plus pedicel of antenna. Front finely rugose and sparsely covered with erect yellow setae. Portion of head behind compound eyes about  $2/3$ – $3/4$  as long as eye. Stigma of wing dark brown. Sternum 7 rufous in median portion, brown to black on sides. Length: Body 4.65 mm; wings 4.25.

Holotype ♂ (KU) and allotype ♀ (KU) from Aizankei, Daisetsu, Hokkaido, 26 June 1957 (Takahashi); 11 paratypes (KU, USNM, BM, BISHOP, UH), all ♂, 4 same data as type, and 7 from Rebun Island, A nama, 18 June 1956 (Hattori).

***Dilophus brevisrostrum* Hardy and Takahashi, n. sp.      Figs. 34, a–c.**

This species closely resembles *D. femoratus* Meigen and has probably been confused under this name in the Japanese literature. It is readily differentiated from *femoratus* by almost completely lacking a rostrum, and by the rufous front femora; also the spines of the front tibiae and the thoracic combs are not so short and blunt as in *femoratus*. The very short rostrum and the pale front femora of the ♂ and the black hind femora of the ♀ will also differentiate this from other known Japanese *Dilophus*.

*Male*: *Head* entirely gray-brown to black pilose. Antenna black, flagellum short, made up of 8 closely fused segments. Palpi moderate in length, apical segment about  $3\times$  longer than wide, penultimate segment about  $2\times$  longer than wide; antepenultimate segment rather broad, flattened dorsally and about  $1.5\times$  longer than wide. *Thorax* polished black, rather sparsely yellow pilose. Anterior thoracic comb made up of about 14 stout,

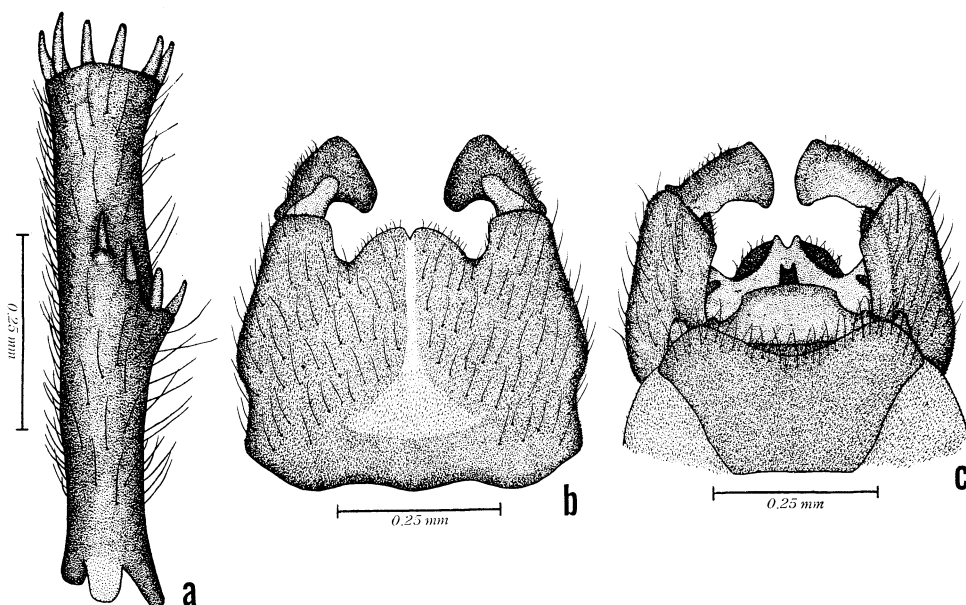


Fig. 34. *Dilophus brevisrostrum* n. sp.: a, front tibia of ♂; b, ♂ genitalia, ventral view; c, ♂ genitalia, dorsal view.

rather blunt teeth; these are in a continuous row with no distinct separation in the middle. Knobs of halteres dark brown, stems yellow, tinged with brown. Legs predominantly black, tinged with reddish brown on femora and bases of tibiae, front femora rufous, tinged with brown. Legs pile predominantly pale. Front tibia as shown in fig. 34, a. Wings hyaline, slightly milky in direct light. Stigma and anterior veins pale brownish yellow. Posterior veins concolorous with wing membrane. Costal margin extends almost 1/2 distance between tips of veins Rs and M<sub>1</sub>. Abdomen subshining black in ground color, rather densely gray-brown pollinose on dorsum; yellow pilose, especially on sides and on venter. Sternum 9 slightly wider than long. Cleft in middle of hind margin shallow, extending less than 1/5 length of segment, median portion of cleft has a moderately large gibbosity (fig. 34, b). Claspers blunt at apices, rather capitate (fig. 34, b). Tergum 9 about 2 × wider than long, hind margin gently concave (fig. 34, c). Length: Body 4.75 mm; wings 4.3.

*Female*: Mesonotum rufous, pleura dark brown to black, tinged with red. Pedicel of antennae yellow. Rostrum about equal in length to scape plus pedicel. Hind legs black except for yellow basal segments of tarsi. Coxae, trochanters and femora of front and middle legs yellow. Cerci broad, rather quadrate in shape. Length: Body 4.75 mm; wings 5.4.

Holotype ♂ (KU), allotype ♀ (KU) and 23 paratypes (KU, HYOGO, USNM, BM, BISHOP, UH), 7 ♂ and 16 ♀, from Tamba, Sasayama, 24 Apr. 1959 (Nagatomi). Holotype and allotype presented to Kyushu University, Fukuoka, by Akira Nagatomi.

*Dilophus fulviventris* Hardy and Takahashi, n. sp. Figs. 35, a–d.

This species is readily differentiated from other known Japanese *Dilophus* by its well



developed rostrum.

*Male*: Entirely shining black species. *Head* typically entirely black pilose, occasionally with yellow pile on underpart of head and on femora. Rostrum well developed, extending approximately 1/2 as long as lower division of eye. Cardio stipites and bases of palpi hidden inside lips of rostrum. The 3 visible segments of palpi are each just slightly longer than wide. Flagellum composed of 10 closely joined segments. Antennae rather short, flagellum about 2/3 as long as lower division of compound eyes. *Thorax* polished black, with black pile. Front set of combs not divided down median portion. Halteres entirely brown. *Legs* shining black with gray-brown to black pile. Typically 4 sharp-pointed spines situated near middle of front tibia in an almost transverse row (fig. 35, a). Sometimes middle 2 spines situated close together and 2 spines set slightly below and farther apart than middle spines. Some specimens have been seen which have 5 spines in the middle set and on 2 specimens 6 spines present in the middle set. *Wings* hyaline, milky in direct light. Anterior veins and stigma brown. Posterior veins concolorous with membrane. Costal margin extends 1/2 the distance between apices of Rs and M<sub>1</sub>. *Abdo-*

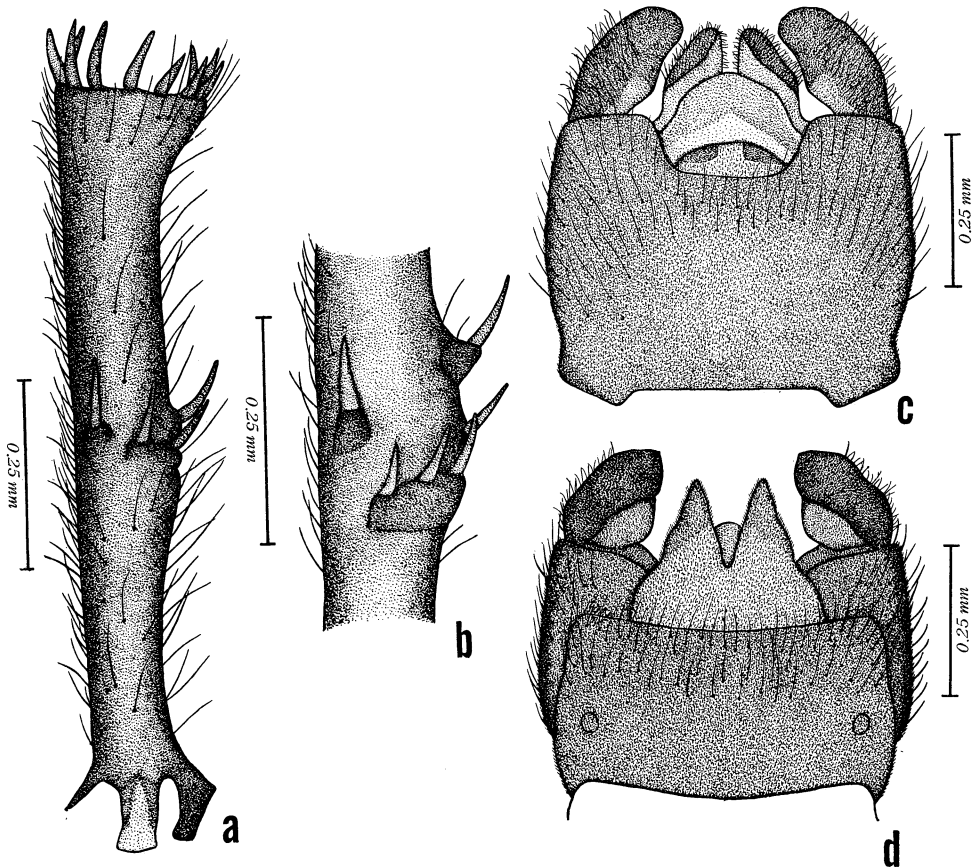


Fig. 35. *Dilophus fulviventris* n. sp.: a, front tibia of ♂; b, middle of ♀ front tibia; c, ♂ genitalia, ventral view; d, ♂ genitalia, dorsal view.

*men* entirely black, gray-brown pollinose above, polished below. Abdomen predominantly yellow pilose. Sternum 9 about as long as wide, and has a shallow cleft with a median gibbosity on hind margin (fig. 35, c). Claspers broad and blunt, rounded at apices. Tergum 9 about 2× wider than long, hind margin very slightly concave and has a pair of weakly sclerotized median lobes which extend dorsad into the genital chamber (fig. 35, d). Length: Body and wings 5.35 mm.

*Female*: Head 1.55× longer than wide as seen in direct dorsal view. Rostrum well developed, about 4/5 as long as eye. Portion of head behind eye about 1/2 as long as eye. Typically thorax almost entirely rufous, lower portions of each sternopleuron and hypopleuron polished brown to black and median portion of mesonotum sometimes tinged with brown; sometimes a broad black median vitta present down mesonotum and occasionally 3 black vittae present. Scutellum reddish brown to black. Coxae and femora yellow to rufous, except for brown to black apices of the latter. Remainder of legs shining black. Abdomen brown to black on dorsum, yellow-red on venter. Wing hyaline with colorless posterior veins, as in ♂. Length: Body 5.3–5.6 mm; wings 6–63.

Holotype ♂ (KU) and allotype ♀ (KU), Nibushi, Lake Kuccharo, Hokkaido, 4 June 1957 (Takahashi); 35 paratypes (KU, USNM, BISHOP, UH), 15 ♂ and 20 ♀, from the following localities: Same data as type, some taken 7 June 1957. Osappe, Lake Kuccharo, Hokkaido, 5 June 1957 (Takahashi); Ashorobuto, Ashoro Gun, Hokkaido, 24 May 1957 and 3 July 1958 (Takahashi); and Omogo Valley, Ehime Pref., 3 May 1956 (Morimoto).

***Dilophus kagoshimaensis* Okada** Fig. 36, a–b.

*Dilophus kagoshimaensis* Okada, 1938, Fac. Agric. Hokkaido Imp. Univ., Jour. **42** (2): 217.

This species was based upon a single ♀ specimen and has not been recognized since the original description. It apparently is a distinctive species differentiated from other known Japanese *Dilophus* by the presence of 5 spines in the middle of the front tibia (fig. 36, a) (although this may be a variable character); by having the body entirely black except for the reddish brown mesonotum; and by the brown fumose wings.

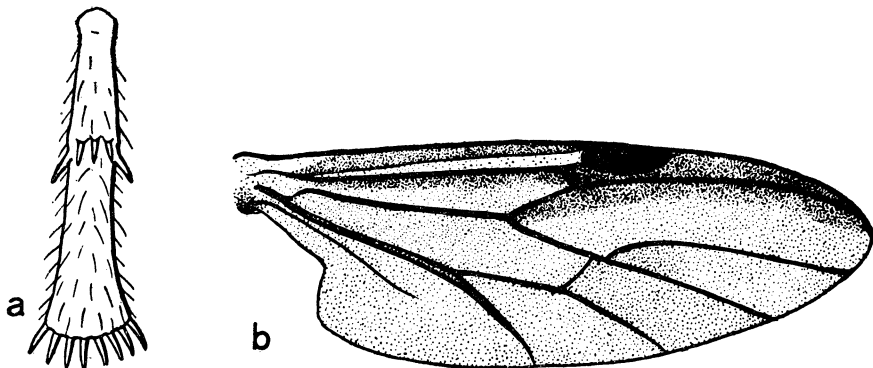


Fig. 36. *Dilophus kagoshimaensis* Okada: a, front tibia of ♀; b, wing of ♀. (abstracted from Okada, 1938a)

*Female*: Predominantly black species except for reddish brown mesonotum. Wings dark colored, especially on anterior margin. All wing veins brown. Legs entirely shining black, tinged with reddish brown on front femora. Rostrum rather short. Length of body 5 mm.

Male unknown.

Holotype ♀, Kagoshima, Kyushu. The type is in the Takeuchi Entomological Museum in Kyoto.

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